Due to the size of the attachments, this e-mail is being sent as 2 of 4.

To Whom It May Concern:

Herewith attached is LADWP Demand Forecast Data, required by the CEC.

Forthcoming in the mail are hardcopies of this submittal.

If any additional attention is required concerning this matter, please contact me at (213) 367-3367.

Best regards,

Than Aung

Los Angeles Department of Water & Power
Power System
Regulatory Standards & Compliance Group
Office (213) 367-3367
E-mail Than.Aung@ladwp.com

Preliminary Assessment - Potential Loads from Electrification Initiatives within POLA Footprint

(ANALYSIS ASSUMPTIONS - 01/09/08 POLA - DWP JEC MEETING)

Description	2008			2014 (+ 6 Yrs)			2020 (+ 12 Yrs)			Preliminary Assessment Notes & Assumptions:
	Demand (MW)	Total Energy (MWh)	Annual LF %	Demand (MW)	Total Energy (MWh)	Annual LF %	Demand (MW)	Total Energy (MWh)	Annual LF %	
Port Operations (est.)	35	169,000	55%	40	193,000	55%	45	217,000	55%	Preliminary assessment based on sampling of '05-'06 LADWP bills for 4 terminal operators (load factors ranged 30% to 70%) extrapolated to other terminal operators. Load growth at approx. 2% per yr.
AMP (Clean Air Action Plan)	20	11,000	6%	45	80,000	20%	45	80,000	20%	Basic assumptions are as follows: Container Ships: 1.5 MW at 72 hrs per call; Tanker Ships: 10 MW at 72 hrs per call; Cruise Ships: 8 MW at 8 hrs per call; See backup sheets for AMP analysis based on POLA Clean Air Action Plan.
AMP (New Cruise Terminal)	-	-	-	-	-	-	24	6,400	3%	Development of a second (new) cruise terminal Peak demand based on 3 ships berthed at 8 MW avg ship demand, energy based on total of 100 calls per year at 8 hours per call.
New Railyard - Electric Rail Cranes	-	-	-	6	27,000	51%	6	27,000	51%	Assume six (6) cranes at 1 MW each operating 280 days per year at 16 hours per day.
New Railyard & Port Terminals Electric RTGC	-	-	-	15	67,200	51%	15	67,200	51%	30 E-RTGC at 500 kW per unit operating at 280 days per year at 16 hours per day.
Electric Roadway Trucks FastChrger	-	-	-	30	201,600	77%	38	252,000	77%	400 trucks in 2014 and 500 trucks in 2020. Analysis based on 250 kW per truck with 30% average constant-charging throughout day at 280 days per year.
Electric Rail Container Movement System	-	-	-	5	28,000	64%	25	140,000	64%	(2014) Prototype system @ 1 MW per mile x 2 bi-directional operating x 2.5 miles in DWP territory at 280 days per year at 20 hours per day. (2020) Full-scale of 12.5 miles in DWP territory under same operating parameters.
Waterfront Devlp.	-	-	-	2	9,000	50%	4	19,000	52%	Commercial, residential, port area-community development. Load growth at 1% per year.
Totals	55	180,000	37%	133	598,800	51%	192	801,600	48%	

Summary Analysis: Estimation of AMP Demand (Max MW)

BASED ON CLEAN AIR ACTION PLAN

San Pedro Bay Ports - Clean Air Action Plan

Table 5.10: POLA AMP Infrastructure by Berth Over Next Five Fiscal Years (Page 79)

Site	Number of Berths	Date Operational
B90-93 (Cruise Terminal)	2 Berths (2 Vessels)	Jan 2008
B100-102 (CS)	1 Completed, 1 to Go	Jan 2009
B121-131 (WBCT)	2 Berths	Jul 2010
B136-147 (TraPac)	2 Berths	Jul 2009
B175-181 (Pasha)	1 Berth	Jan 2011
B206-209 (LTT)	1 Berth	Jan 2011
B212-218 (YTI)	1 Berth	Dec 2006
B224-236 (Evergreen)	1 Berth	Jan 2008
Pier 300 (APL)	1 Berth	Jan 2011
Pier 400 (APM)	1 Berth	Jan 2011
Pier 400 (Liquid Bulk)	1 Berth	Jan 2009
Total AMP'd Berths	**15 Berths**	

(EPG ANALYSIS)

Conversion of 5.10 Table into monthly/annual berth AMP capacity and demand projection

AMP Demand Assumption (per vessel/berth)

Container	1,500	kW	Tanker	10,000	kW
Cruise	8,000	kW			

2007	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B212-218 (YTI)	1	1	1	1	1	1	1	1	1	1	1	1
B224-236 (Evergreen)	0	0	0	0	0	0	0	0	0	0	0	0
Pier 400 (APM)	0	0	0	0	0	0	0	0	0	0	0	0
B136-147 (TraPac)	0	0	0	0	0	0	0	0	0	0	0	0
Pier 300 (APL)	0	0	0	0	0	0	0	0	0	0	0	0
B100-102 (CS)	1	1	1	1	1	1	1	1	1	1	1	1
B121-131 (WBCT)	0	0	0	0	0	0	0	0	0	0	0	0
B175-181 (Pasha)	0	0	0	0	0	0	0	0	0	0	0	0
B206-209 (LTT)	0	0	0	0	0	0	0	0	0	0	0	0
Pier 400 (Liquid Bulk)	0	0	0	0	0	0	0	0	0	0	0	0
B90-93 (Cruise Terminal)	0	0	0	0	0	0	0	0	0	0	0	0
Total AMP Berths	2	2	2	2	2	2	2	2	2	2	2	2

2007	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
B212-218 (YTI)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B224-236 (Evergreen)	0	0	0	0	0	0	0	0	0	0	0	0	
Pier 400 (APM)	0	0	0	0	0	0	0	0	0	0	0	0	
B136-147 (TraPac)	0	0	0	0	0	0	0	0	0	0	0	0	
Pier 300 (APL)	0	0	0	0	0	0	0	0	0	0	0	0	
B100-102 (CS)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B121-131 (WBCT)	0	0	0	0	0	0	0	0	0	0	0	0	
B175-181 (Pasha)	0	0	0	0	0	0	0	0	0	0	0	0	
B206-209 (LTT)	0	0	0	0	0	0	0	0	0	0	0	0	
Pier 400 (Liquid Bulk)	0	0	0	0	0	0	0	0	0	0	0	0	Max. kW
B90-93 (Cruise Terminal)	0	0	0	0	0	0	0	0	0	0	0	0	Demand
Max. kW Demand	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000

2008	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B212-218 (YTI)	1	1	1	1	1	1	1	1	1	1	1	1
B224-236 (Evergreen)	1	1	1	1	1	1	1	1	1	1	1	1
Pier 400 (APM)	0	0	0	0	0	0	0	0	0	0	0	0
B136-147 (TraPac)	0	0	0	0	0	0	0	0	0	0	0	0
Pier 300 (APL)	0	0	0	0	0	0	0	0	0	0	0	0
B100-102 (CS)	1	1	1	1	1	1	1	1	1	1	1	1
B121-131 (WBCT)	0	0	0	0	0	0	0	0	0	0	0	0
B175-181 (Pasha)	0	0	0	0	0	0	0	0	0	0	0	0
B206-209 (LTT)	0	0	0	0	0	0	0	0	0	0	0	0
Pier 400 (Liquid Bulk)	0	0	0	0	0	0	0	0	0	0	0	0
B90-93 (Cruise Terminal)	2	2	2	2	2	2	2	2	2	2	2	2
Total AMP Berths	5	5	5	5	5	5	5	5	5	5	5	5

2008	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
B212-218 (YTI)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B224-236 (Evergreen)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
Pier 400 (APM)	0	0	0	0	0	0	0	0	0	0	0	0	
B136-147 (TraPac)	0	0	0	0	0	0	0	0	0	0	0	0	
Pier 300 (APL)	0	0	0	0	0	0	0	0	0	0	0	0	
B100-102 (CS)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B121-131 (WBCT)	0	0	0	0	0	0	0	0	0	0	0	0	
B175-181 (Pasha)	0	0	0	0	0	0	0	0	0	0	0	0	
B206-209 (LTT)	0	0	0	0	0	0	0	0	0	0	0	0	
Pier 400 (Liquid Bulk)	0	0	0	0	0	0	0	0	0	0	0	0	Max. kW
B90-93 (Cruise Terminal)	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	Demand
Max. kW Demand	20,500	20,500	20,500	20,500	20,500	20,500	20,500	20,500	20,500	20,500	20,500	20,500	20,500

2009	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B212-218 (YTI)	1	1	1	1	1	1	1	1	1	1	1	1
B224-236 (Evergreen)	1	1	1	1	1	1	1	1	1	1	1	1
Pier 400 (APM)	0	0	0	0	0	0	0	0	0	0	0	0
B136-147 (TraPac)	0	0	0	0	0	0	2	2	2	2	2	2
Pier 300 (APL)	0	0	0	0	0	0	0	0	0	0	0	0
B100-102 (CS)	2	2	2	2	2	2	2	2	2	2	2	2
B121-131 (WBCT)	0	0	0	0	0	0	0	0	0	0	0	0
B175-181 (Pasha)	0	0	0	0	0	0	0	0	0	0	0	0
B206-209 (LTT)	0	0	0	0	0	0	0	0	0	0	0	0
Pier 400 (Liquid Bulk)	1	1	1	1	1	1	1	1	1	1	1	1
B90-93 (Cruise Terminal)	2	2	2	2	2	2	2	2	2	2	2	2
Total AMP Berths	7	7	7	7	7	7	9	9	9	9	9	9

2009	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
B212-218 (YTI)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B224-236 (Evergreen)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
Pier 400 (APM)	0	0	0	0	0	0	0	0	0	0	0	0	
B136-147 (TraPac)	0	0	0	0	0	0	3,000	3,000	3,000	3,000	3,000	3,000	
Pier 300 (APL)	0	0	0	0	0	0	0	0	0	0	0	0	
B100-102 (CS)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
B121-131 (WBCT)	0	0	0	0	0	0	0	0	0	0	0	0	
B175-181 (Pasha)	0	0	0	0	0	0	0	0	0	0	0	0	
B206-209 (LTT)	0	0	0	0	0	0	0	0	0	0	0	0	
Pier 400 (Liquid Bulk)	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	Max. kW
B90-93 (Cruise Terminal)	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	Demand
Max. kW Demand	32,000	32,000	32,000	32,000	32,000	32,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000

2010	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B212-218 (YTI)	1	1	1	1	1	1	1	1	1	1	1	1
B224-236 (Evergreen)	1	1	1	1	1	1	1	1	1	1	1	1
Pier 400 (APM)	0	0	0	0	0	0	0	0	0	0	0	0
B136-147 (TraPac)	2	2	2	2	2	2	2	2	2	2	2	2
Pier 300 (APL)	0	0	0	0	0	0	0	0	0	0	0	0
B100-102 (CS)	2	2	2	2	2	2	2	2	2	2	2	2
B121-131 (WBCT)	0	0	0	0	0	0	2	2	2	2	2	2
B175-181 (Pasha)	0	0	0	0	0	0	0	0	0	0	0	0
B206-209 (LTT)	0	0	0	0	0	0	0	0	0	0	0	0
Pier 400 (Liquid Bulk)	1	1	1	1	1	1	1	1	1	1	1	1
B90-93 (Cruise Terminal)	2	2	2	2	2	2	2	2	2	2	2	2
Total AMP Berths	9	9	9	9	9	9	11	11	11	11	11	11

2010	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
B212-218 (YTI)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B224-236 (Evergreen)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
Pier 400 (APM)	0	0	0	0	0	0	0	0	0	0	0	0	
B136-147 (TraPac)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
Pier 300 (APL)	0	0	0	0	0	0	0	0	0	0	0	0	
B100-102 (CS)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
B121-131 (WBCT)	0	0	0	0	0	0	3,000	3,000	3,000	3,000	3,000	3,000	
B175-181 (Pasha)	0	0	0	0	0	0	0	0	0	0	0	0	
B206-209 (LTT)	0	0	0	0	0	0	0	0	0	0	0	0	
Pier 400 (Liquid Bulk)	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	Max. kW
B90-93 (Cruise Terminal)	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	Demand
Max. kW Demand	35,000	35,000	35,000	35,000	35,000	35,000	38,000	38,000	38,000	38,000	38,000	38,000	38,000

2011	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B212-218 (YTI)	1	1	1	1	1	1	1	1	1	1	1	1
B224-236 (Evergreen)	1	1	1	1	1	1	1	1	1	1	1	1
Pier 400 (APM)	1	1	1	1	1	1	1	1	1	1	1	1
B136-147 (TraPac)	2	2	2	2	2	2	2	2	2	2	2	2
Pier 300 (APL)	1	1	1	1	1	1	1	1	1	1	1	1
B100-102 (CS)	2	2	2	2	2	2	2	2	2	2	2	2
B121-131 (WBCT)	2	2	2	2	2	2	2	2	2	2	2	2
B175-181 (Pasha)	1	1	1	1	1	1	1	1	1	1	1	1
B206-209 (LTT)	1	1	1	1	1	1	1	1	1	1	1	1
Pier 400 (Liquid Bulk)	1	1	1	1	1	1	1	1	1	1	1	1
B90-93 (Cruise Terminal)	2	2	2	2	2	2	2	2	2	2	2	2
Total AMP Berths	15	15	15	15	15	15	15	15	15	15	15	15

2011	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
B212-218 (YTI)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B224-236 (Evergreen)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
Pier 400 (APM)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B136-147 (TraPac)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
Pier 300 (APL)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B100-102 (CS)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
B121-131 (WBCT)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
B175-181 (Pasha)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B206-209 (LTT)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
Pier 400 (Liquid Bulk)	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	Max. kW
B90-93 (Cruise Terminal)	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	Demand
Max. kW Demand	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000

2012	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B212-218 (YTI)	1	1	1	1	1	1	1	1	1	1	1	1
B224-236 (Evergreen)	1	1	1	1	1	1	1	1	1	1	1	1
Pier 400 (APM)	1	1	1	1	1	1	1	1	1	1	1	1
B136-147 (TraPac)	2	2	2	2	2	2	2	2	2	2	2	2
Pier 300 (APL)	1	1	1	1	1	1	1	1	1	1	1	1
B100-102 (CS)	2	2	2	2	2	2	2	2	2	2	2	2
B121-131 (WBCT)	2	2	2	2	2	2	2	2	2	2	2	2
B175-181 (Pasha)	1	1	1	1	1	1	1	1	1	1	1	1
B206-209 (LTT)	1	1	1	1	1	1	1	1	1	1	1	1
Pier 400 (Liquid Bulk)	1	1	1	1	1	1	1	1	1	1	1	1
B90-93 (Cruise Terminal)	2	2	2	2	2	2	2	2	2	2	2	2
Total AMP Berths	15	15	15	15	15	15	15	15	15	15	15	15

2012	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
B212-218 (YTI)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B224-236 (Evergreen)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
Pier 400 (APM)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B136-147 (TraPac)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
Pier 300 (APL)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B100-102 (CS)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
B121-131 (WBCT)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
B175-181 (Pasha)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B206-209 (LTT)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
Pier 400 (Liquid Bulk)	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	Max. kW
B90-93 (Cruise Terminal)	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	Demand
Max. kW Demand	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000

2013	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B212-218 (YTI)	1	1	1	1	1	1	1	1	1	1	1	1
B224-236 (Evergreen)	1	1	1	1	1	1	1	1	1	1	1	1
Pier 400 (APM)	1	1	1	1	1	1	1	1	1	1	1	1
B136-147 (TraPac)	2	2	2	2	2	2	2	2	2	2	2	2
Pier 300 (APL)	1	1	1	1	1	1	1	1	1	1	1	1
B100-102 (CS)	2	2	2	2	2	2	2	2	2	2	2	2
B121-131 (WBCT)	2	2	2	2	2	2	2	2	2	2	2	2
B175-181 (Pasha)	1	1	1	1	1	1	1	1	1	1	1	1
B206-209 (LTT)	1	1	1	1	1	1	1	1	1	1	1	1
Pier 400 (Liquid Bulk)	1	1	1	1	1	1	1	1	1	1	1	1
B90-93 (Cruise Terminal)	2	2	2	2	2	2	2	2	2	2	2	2
Total AMP Berths	15	15	15	15	15	15	15	15	15	15	15	15

2013	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
B212-218 (YTI)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B224-236 (Evergreen)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
Pier 400 (APM)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B136-147 (TraPac)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
Pier 300 (APL)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B100-102 (CS)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
B121-131 (WBCT)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
B175-181 (Pasha)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B206-209 (LTT)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
Pier 400 (Liquid Bulk)	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	Max. kW
B90-93 (Cruise Terminal)	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	Demand
Max. kW Demand	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000

2014	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B212-218 (YTI)	1	1	1	1	1	1	1	1	1	1	1	1
B224-236 (Evergreen)	1	1	1	1	1	1	1	1	1	1	1	1
Pier 400 (APM)	1	1	1	1	1	1	1	1	1	1	1	1
B136-147 (TraPac)	2	2	2	2	2	2	2	2	2	2	2	2
Pier 300 (APL)	1	1	1	1	1	1	1	1	1	1	1	1
B100-102 (CS)	2	2	2	2	2	2	2	2	2	2	2	2
B121-131 (WBCT)	2	2	2	2	2	2	2	2	2	2	2	2
B175-181 (Pasha)	1	1	1	1	1	1	1	1	1	1	1	1
B206-209 (LTT)	1	1	1	1	1	1	1	1	1	1	1	1
Pier 400 (Liquid Bulk)	1	1	1	1	1	1	1	1	1	1	1	1
B90-93 (Cruise Terminal)	2	2	2	2	2	2	2	2	2	2	2	2
Total AMP Berths	15	15	15	15	15	15	15	15	15	15	15	15

2014	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
B212-218 (YTI)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B224-236 (Evergreen)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
Pier 400 (APM)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B136-147 (TraPac)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
Pier 300 (APL)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B100-102 (CS)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
B121-131 (WBCT)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
B175-181 (Pasha)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B206-209 (LTT)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
Pier 400 (Liquid Bulk)	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	Max. kW
B90-93 (Cruise Terminal)	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	Demand
Max. kW Demand	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000

2015	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B212-218 (YTI)	1	1	1	1	1	1	1	1	1	1	1	1
B224-236 (Evergreen)	1	1	1	1	1	1	1	1	1	1	1	1
Pier 400 (APM)	1	1	1	1	1	1	1	1	1	1	1	1
B136-147 (TraPac)	2	2	2	2	2	2	2	2	2	2	2	2
Pier 300 (APL)	1	1	1	1	1	1	1	1	1	1	1	1
B100-102 (CS)	2	2	2	2	2	2	2	2	2	2	2	2
B121-131 (WBCT)	2	2	2	2	2	2	2	2	2	2	2	2
B175-181 (Pasha)	1	1	1	1	1	1	1	1	1	1	1	1
B206-209 (LTT)	1	1	1	1	1	1	1	1	1	1	1	1
Pier 400 (Liquid Bulk)	1	1	1	1	1	1	1	1	1	1	1	1
B90-93 (Cruise Terminal)	2	2	2	2	2	2	2	2	2	2	2	2
Total AMP Berths	15	15	15	15	15	15	15	15	15	15	15	15

2015	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
B212-218 (YTI)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B224-236 (Evergreen)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
Pier 400 (APM)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B136-147 (TraPac)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
Pier 300 (APL)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B100-102 (CS)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
B121-131 (WBCT)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
B175-181 (Pasha)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B206-209 (LTT)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
Pier 400 (Liquid Bulk)	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	Max. kW
B90-93 (Cruise Terminal)	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	Demand
Max. kW Demand	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000

2016	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B212-218 (YTI)	1	1	1	1	1	1	1	1	1	1	1	1
B224-236 (Evergreen)	1	1	1	1	1	1	1	1	1	1	1	1
Pier 400 (APM)	1	1	1	1	1	1	1	1	1	1	1	1
B136-147 (TraPac)	2	2	2	2	2	2	2	2	2	2	2	2
Pier 300 (APL)	1	1	1	1	1	1	1	1	1	1	1	1
B100-102 (CS)	2	2	2	2	2	2	2	2	2	2	2	2
B121-131 (WBCT)	2	2	2	2	2	2	2	2	2	2	2	2
B175-181 (Pasha)	1	1	1	1	1	1	1	1	1	1	1	1
B206-209 (LTT)	1	1	1	1	1	1	1	1	1	1	1	1
Pier 400 (Liquid Bulk)	1	1	1	1	1	1	1	1	1	1	1	1
B90-93 (Cruise Terminal)	2	2	2	2	2	2	2	2	2	2	2	2
Total AMP Berths	15	15	15	15	15	15	15	15	15	15	15	15

2016	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
B212-218 (YTI)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B224-236 (Evergreen)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
Pier 400 (APM)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B136-147 (TraPac)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
Pier 300 (APL)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B100-102 (CS)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
B121-131 (WBCT)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
B175-181 (Pasha)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
B206-209 (LTT)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	
Pier 400 (Liquid Bulk)	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	Max. kW
B90-93 (Cruise Terminal)	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	Demand
Max. kW Demand	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000

Program	2008	2014	2020
AMP - (Clean Air Action Plan)	11	80	80
AMP - (New Cruise Terminal)		0	6
New Railyard - Electric Rail Cranes		27	27
New Railyard & Port Terminals - Electric RTGC		67	67
Electric Roadway Trucks - Fast Charger		202	252
Electric Rail - Container Movement System		28	140
Demand Totals (MW)	**11**	**404**	**573**

Summary Analysis: Estimation of AMP Consumption (MWh)

BASED ON CLEAN AIR ACTION PLAN

San Pedro Bay Ports Clean Air Action Plan (Appendix A - page 69)

Assumed Schedule for Containership AMP Participation - POLA					
	FY '06/07	FY '07/08	FY '08/09	FY '09/10	FY '10/11
B212-218 (YTI)	4	0	11	36	52
B224-236 (Evergreen)	0	0	11	36	52
Pier 400 (APM)	0	0	0	0	10
B136-147 (TraPac)	0	0	0	40	106
Pier 300 (APL)	0	0	0	0	72
B100-102 (CS)	54	54	54	92	131
B121-131 (WBCT)	0	0	0	0	36
Total Container Calls	58	54	76	204	459
5-Year	851				
kw-HR	6,264,000	5,832,000	8,208,000	22,032,000	49,572,000
Assumed Schedule for Liquid Bulk (tanker) AMP Participation					
Pier 400 (Liquid Bulk)	0	0	0	6	12
kw-HR	0	0	0	4,320,000	8,640,000
Assumed Schedule for Cruise Ship AMP Participation					
B90-93 (Cruise Terminal)	0	0	100	200	200
kw-HR	0	0	6,400,000	12,800,000	12,800,000
Total AMP Calls	58	54	176	410	671

(EPG ANALYSIS)

Outside of Timeframe in Clean Air Plan - assume AMP calls held constant

Fiscal (Jul - Jun)	FY '06/07	FY '07/08	FY '08/09	FY '09/10	FY '10/11	FY '11/12	FY '12/13	FY '13/14	FY '14/15	FY '15/16	FY '16/17
B212-218 (YTI)	4	8	11	36	52	52	52	52	52	52	52
B224-236 (Evergreen)	0	0	11	36	52	52	52	52	52	52	52
Pier 400 (APM)	0	0	0	0	10	10	10	10	10	10	10
B136-147 (TraPac)	0	0	0	40	106	106	106	106	106	106	106
Pier 300 (APL)	0	0	0	0	72	72	72	72	72	72	72
B100-102 (CS)	54	54	54	92	131	131	131	131	131	131	131
B121-131 (WBCT)	0	0	0	0	36	36	36	36	36	36	36
B175-181 (Pasha)	0	0	0	0	0	36	36	36	36	36	36
B206-209 (LTT)	0	0	0	0	0	52	52	52	52	52	52
Pier 400 (Liquid Bulk)	0	0	0	6	12	12	12	12	12	12	12
B90-93 (Cruise Terminal)	0	0	100	200	200	200	200	200	200	200	200
Total AMP Calls	58	62	176	410	671	759	759	759	759	759	759

(rounded) Conversion of above Table from FY to Annual using approach of 1/2 said Current FY (Jan - Jun) plus 1/2 of said Next FY (Jul - Dec)

Annual AMP Calls	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
B212-218 (YTI)	6	10	24	44	52	52	52	52	52	52
B224-236 (Evergreen)	0	6	24	44	52	52	52	52	52	52
Pier 400 (APM)	0	0	0	5	10	10	10	10	10	10
B136-147 (TraPac)	0	0	20	73	106	106	106	106	106	106
Pier 300 (APL)	0	0	0	36	72	72	72	72	72	72
B100-102 (CS)	54	54	73	112	131	131	131	131	131	131
B121-131 (WBCT)	0	0	0	18	36	36	36	36	36	36
B175-181 (Pasha)	0	0	0	0	18	36	36	36	36	36
B206-209 (LTT)	0	0	0	0	26	52	52	52	52	52
Pier 400 (Liquid Bulk)	0	0	3	9	12	12	12	12	12	12
B90-93 (Cruise Terminal)	0	50	150	200	200	200	200	200	200	200
Total AMP Calls	60	120	294	541	715	759	759	759	759	759

Assumptions:

AMP Usage per Vessel Call

Container	1.5 MW	72 Hrs
Tanker	10 MW	72 Hrs
Cruise	8 MW	8 Hrs

Annual AMP Electricity - MWh	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
B212-218 (YTI)	648	1,080	2,592	4,752	5,616	5,616	5,616	5,616	5,616	5,616
B224-236 (Evergreen)	0	648	2,592	4,752	5,616	5,616	5,616	5,616	5,616	5,616
Pier 400 (APM)	0	0	0	540	1,080	1,080	1,080	1,080	1,080	1,080
B136-147 (TraPac)	0	0	2,160	7,884	11,448	11,448	11,448	11,448	11,448	11,448
Pier 300 (APL)	0	0	0	3,888	7,776	7,776	7,776	7,776	7,776	7,776
B100-102 (CS)	5,832	5,832	7,884	12,096	14,148	14,148	14,148	14,148	14,148	14,148
B121-131 (WBCT)	0	0	0	1,944	3,888	3,888	3,888	3,888	3,888	3,888
B175-181 (Pasha)	0	0	0	0	1,944	3,888	3,888	3,888	3,888	3,888
B206-209 (LTT)	0	0	0	0	2,808	5,616	5,616	5,616	5,616	5,616
Pier 400 (Liquid Bulk)	0	0	2,160	6,480	8,640	8,640	8,640	8,640	8,640	8,640
B90-93 (Cruise Terminal)	0	3,200	9,600	12,800	12,800	12,800	12,800	12,800	12,800	12,800
Total MWh	6,480	10,760	26,988	55,136	75,764	80,516	80,516	80,516	80,516	80,516

LADWP BOARD APPROVAL LETTER

TO: BOARD OF WATER AND POWER COMMISSIONERS		DATE: September 10, 2007
SUBMITTED BY:		SUBJECT: LADWP Energy Efficiency Goals Submittal to the California Energy Commission (AB 2021)
JEFFERY L. PELTOLA **Director** **Budget, Rates, and Efficiency Division**	**ROBERT K. ROZANSKI** **Acting General Manager**	**FOR COMMISSION OFFICE USE:**
BOARD COMMITTEE APPROVAL:		
CITY COUNCIL APPROVAL REQUIRED: Yes ☐ No ☒	**IF YES, BY WHICH CITY CHARTER SECTION:**	

PURPOSE:

To adopt a resolution approving the Los Angeles Department of Water and Power's (LADWP) target for energy efficiency savings and demand reduction over 10 years, that will be submitted to the California Energy Commission (CEC) by September 30, 2007 pursuant to the requirements of Section 2 and Section 3, of Assembly Bill 2021 (added Section 25310 to Public Resources Code and amended Section 9615 of the Public Utilities Code).

BACKGROUND:

- In accordance with Levine, Chapter 734, Statutes of 2006, the State Legislature has intended that load-serving entities procure all cost-effective energy efficiency measures so that the state can meet the goal of reducing total forecasted electricity consumption by 10 percent over the next 10 years.

- Each local publicly owned electric utility is directed to first acquire all energy efficiency and demand reduction resources that are cost-effective, reliable, and feasible.

- The energy savings achieved through the enactment of the Act are an essential component of the state's plan to meet the Governor's greenhouse gas reduction targets established in Executive Order S-3-05.

- Pursuant to AB 2021, publicly owned utilities are further instructed to identify achievable, cost-effective efficiency potential every three years and establish annual targets based on that potential for a 10-year period.

- Publicly owned utilities will identify potential and establish draft annual targets and submit to the CEC within 60 days of their adoption date. The Board of Water and Power Commissioners (Board) approved targets are to be submitted to the CEC on or before September 30, 2007.

SUMMARY OF AB 2021 PLAN SUBMITTAL

The attached presentation outlining managements proposed plan was given to the Board on September 4, 2007. Essential elements of this plan are:

- LADWP hired Quantum (now Itron) to conduct an Energy Efficiency Potential Study to determine the potential energy savings over a 12-year period. The report was completed and published February 2006.

- Based on the study results, the Board adopted the Maximum Achievable Scenario for the efficiency programs, which projected the energy savings using the assumed efficiency adoption strategies.

- Consistent with the Board-approved budget, LADWP is currently ramping-up the energy efficiency programs that were identified in the study. The immediate focus is on implementing these aggressive programs to mitigate all load growth during the next five fiscal years.

- The proposed AB 2021 Submittal represents an increase from the 8 percent goal identified under the Maximum Achievable Scenario to a 10 percent target of energy use reduction over the next 10 years consistent with the intent of the bill. Specific strategies to accomplish this include the following:

    - Removing barriers to efficiency measure adoption by increasing target cost-effectiveness limit for efficiency program design from current $0.03 to $0.04 per kWH while maintaining reasonable cost-benefit ratios

    - Targeting expansion of existing commercial and residential sector programs for greater customer participation through the Small Business Direct Install and the Refrigerator Exchange programs

    - Leveraging partnerships with City and other Institutional facilities to implement the efficiency measures.

In addition to the existing energy efficiency measures included in LADWP's current programs, additional measures (e.g. attic fans) are being evaluated for energy savings potential and future inclusion in LADWP's incentive program.

The following table identifies LADWP's target energy reduction goals (cumulative 2,491 GWH savings and 497 MW demand reduction) that exceed the Maximum Savings Potential and will meet the requirements of AB 2021.

LADWP ENERGY EFFICIENCY TARGET GOALS (AB 2021)

FISCAL YEAR	GWH SAVINGS	% OF LOAD	CUM. GWH	% OF LOAD	PEAK MW SAVINGS
2006-2007	68 (Actual Achieved) 58 (Net Savings)*	.2 %	58	.2 %	12
2007-2008	275 *	1.2 %	333	1.4 %	50
2008-2009	315	1.3 %	648	2.7%	58
2009-2010	300	1.2%	948	3.9 %	57
2010-2011	280	1.1 %	1,228	5.0%	55
2011-2012	255	1.0 %	1,483	6.0 %	53
2012-2013	252	1.0 %	1,735	7.0 %	53
2013-2014	252	1.0 %	1,987	8.0 %	53
2014-2015	252	1.0%	2,239	9.0%	53
2015-2016	252	1.0%	2,491	10.0%	53
TOTALS	2,491	10.0 %			497

* Projections are all net values per CEC guidelines.

COST AND DURATION:

Energy efficiency programs required to meet the first five years of targets above are in keeping with the five-year budget previously presented to the Board. The latter five-year targets will require an assessment of budget needs that will be presented for future approval by the Board.

FUNDING SOURCE:

Fiscal Year: 2007-2008 (for current year goal)
Functional Item No.: 371-3520
Location in Budget: Various locations

FISCAL IMPACT STATEMENT:

Budgeted funding expended on energy efficiency programs will result in the meeting or exceeding of target energy reduction goals. Energy savings will be procured on a cost effective basis.

TYPE OF INSURANCE COVERAGE(S): N/A

PRE-AWARD CHECKLIST:

Yes ☐ **No** ☐ **N/A** ☒ Contract Compliance
Yes ☐ **No** ☐ **N/A** ☒ Subcontracting Opportunities
Yes ☐ **No** ☐ **N/A** ☒ Service Contractor Worker Retention Ordinance
Yes ☐ **No** ☐ **N/A** ☒ Child Support Policy
Yes ☐ **No** ☐ **N/A** ☒ Living Wage Ordinance
Yes ☐ **No** ☐ **N/A** ☒ Labor Relations Notification
Yes ☐ **No** ☐ **N/A** ☒ Charter Section 1022 Findings

CONTRACT ADMINISTRATION: N/A

FORMAL OBJECTIONS TO AWARD OF CONTRACT: N/A

JOB OPPORTUNITIES AND TRAINING POLICY: ☐Applicable ☒Not Applicable

INTERNAL AUDIT: N/A

EXTERNAL AUDIT: N/A

CHARTER SECTION 1022 FINDINGS AND BASIS THEREOF: N/A

MEMORANDUM OF UNDERSTANDING PROPOSED CONTRACT REVIEW PROCESS: N/A

METHOD OF SELECTION: N/A

OUTREACH EFFORTS TAKEN: N/A

MINORITY/WOMEN BUSINESS ENTERPRISE (MBE/WBE) SUBCONTRACTING PARTICIPATION: N/A

VENDOR HISTORY: N/A

VENDOR PERFORMANCE: N/A

ENVIRONMENTAL DETERMINATION:

In accordance with the California Environmental Quality Act (CEQA) it has been determined that the approval of revised energy efficiency savings goals are exempt pursuant to the General Exemption described in CEQA Guidelines Sections 15061(b)(3). General Exemptions apply in situations where it can be seen with

reasonable certainty that there is no possibility that the activity in question may have a significant effect on the environment.

RECOMMENDATION

It is recommended that your Honorable Board adopt the accompanying resolution, approved as to form and legality by the City Attorney, and that the energy efficiency target goals shown therein be approved.

RR/TG:sc
Attachments
c/att: Robert K. Rozanski, Acting General Manager
Barbara K. Garrett
Richard M. Brown
Enrique Martinez
James B. McDaniel
Robert K. Rozanski, Chief Administrative Officer
Ronald O. Vazquez
Lillian Y. Kawasaki
Hal D. Lindsey
Pamela T. Porter
Cecilia K.T. Weldon
Albert A. Stephens
Jeffery L. Peltola
Thomas Gackstetter
Reynaldo Reyes

RESOLUTION NO. _____

WHEREAS, the Los Angeles Department of Water and Power (LADWP) is committed to the promotion of energy efficiency through the sustained implementation of programs and services; and

WHEREAS, there continues to be a statewide need to promote the efficient use of energy and meet the Governor's greenhouse gas reduction targets established in Executive Order S-3-05; and

WHEREAS, in accordance with Levine, Chapter 734, Statues of 2006, the State Legislature has intended that load-serving entities procure all cost-effective energy efficiency measures so the state can meet its goal of reducing total forecasted electricity consumption by 10 percent over the next 10 years; and

WHEREAS, the State of California has enacted Assembly Bill 2021 (added Section 25310 to Public Resources Code and amended Section 9615 of the Public Utilities Code) which directs investor owned utilities and publicly owned utilities to identify achievable, cost-effective efficiency potential every three years and establish annual targets based on that potential over a 10-year period; and

WHEREAS, publicly owned utilities are directed to identify efficiency potential and establish draft annual targets for submission to the California Energy Commission within 60 days of their adoption dates;

NOW, THEREFORE, BE IT RESOLVED that the Board hereby adopts its 10-year energy efficiency target goals as shown in the attached table, which meet the goals established in Assembly Bill 2021.

BE IT FURTHER RESOLVED, that the Chief Accounting Employee of the Department, is authorized and directed to draw demands on the Public Benefits Fund and/or the Energy Cost Adjustment Factor revenues established for this purpose, as approved in the budget; and

BE IT FURTHER RESOLVED, that the General Manager or his designee, and the Secretary, Assistant Secretary or the Acting Secretary of the Board are hereby authorized and directed to execute the necessary documents transmitting the AB 2021 compliance plan to the California Energy Commission for and on behalf of this Department resulting from this Board action.

I HEREBY CERTIFY that the foregoing is a full, true, and correct copy of a resolution adopted by the Board of Water and Power Commissioners of the City of Los Angeles at its meeting held

_____
Secretary

LADWP ENERGY EFFICIENCY TARGET GOALS (AB 2021)

FISCAL YEAR	GWH SAVINGS	% OF LOAD	CUM. GWH	% OF LOAD	PEAK MW SAVINGS
2006-2007	68 (Actual Achieved) 58 (Net Savings)*	.2 %	58	.2 %	12
2007-2008	275 *	1.2 %	333	1.4 %	50
2008-2009	315	1.3 %	648	2.7%	58
2009-2010	300	1.2%	948	3.9 %	57
2010-2011	280	1.1 %	1,228	5.0%	55
2011-2012	255	1.0 %	1,483	6.0 %	53
2012-2013	252	1.0 %	1,735	7.0 %	53
2013-2014	252	1.0 %	1,987	8.0 %	53
2014-2015	252	1.0%	2,239	9.0%	53
2015-2016	252	1.0%	2,491	10.0%	53
TOTALS	2,491	10.0 %			497

* Projections are all net values per California Energy Commission guidelines.

Assembly Bill 2021

AB 2021 Intent

(Levine, Chapter 743, Statutes

- It is the intent of the Legislature that load-serving entities procure all cost-effective energy efficiency measures so that the state can meet the goal of reducing total forecasted electricity consumption by **10 percent over the next 10 years.**
- Each local publicly owned electric utility…shall first acquire all energy efficiency and demand reduction resources that are cost-effective, reliable, and feasible.
- The energy savings achieved through the enactment of this Act are an essential component of the state's plan to meet the Governor's greenhouse gas reduction targets established in Executive Order S-3-05.

2

AB 2021 Requirements And Schedule

- Publicly Owned Utilities (POUs) identify ac[illegible] cost-effective efficiency potential every 3 years and establish annual targets based on that potential for a 10-year period.
- On or before June 30, 2007, POUs will identify potential and establish draft annual targets and submit to the Energy Commission within 60 days of their adoption date. Board approved targets to be submitted on or before September 30, 2007.
- By November 1, 2007, the Energy Commission "in consultation with the CPUC" prepares a statewide potential estimate and establishes annual efficiency targets in a public process that is based, "at least in part," on the most recent IOU and POU targets.
- Schedule is repeated every 3 years thereafter.

3

Process Followed to Develop LADW[illegible]alls

1. Hired Quantum (now Itron) to conduct an [illegible] Potential Study (EEPS) to determine the potential energy savings over a 12-year period (Report Published February 2006).
2. Based on the EEPS, adopted the Maximum Achievable Scenario for the Efficiency Programs which projected the energy savings using the assumed efficiency adoption strategies.
3. Developing and implementing Innovative Programs to support the Maximum Achievable Scenario identified in the EEPS.

4

LADWP Energy Efficiency Potential Results

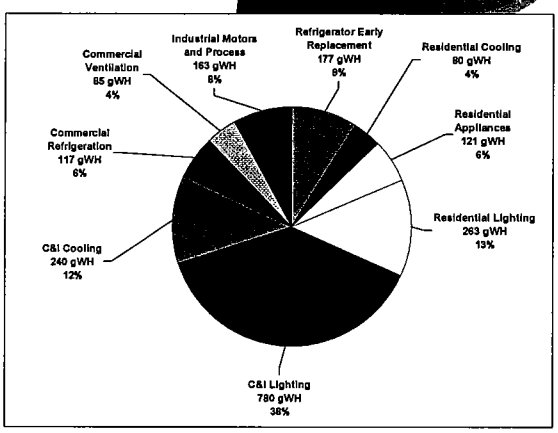
OVERALL AND SECTOR TECHNICAL, ECONOMIC AND MAXIMUM ACHIEVABLE POTENTIAL GWH (2016)

SEGMENT	TECHNICAL	ECONOMIC	MAXIMUM ACHIEVABLE
RESIDENTIAL-EXISTING	1,801	1,304	560
RESIDENTIAL-NEW	234	135	57
COMMERCIAL-EXISTING	2287	1,934	1,096
COMMERCIAL-NEW	187	174	109
INDUSTRIAL	547	502	204
TOTAL	5,057	4,049	2,026
10 Year Cumulative Reduction in Consumption (Percent)			**8%**

Note: Quantum Study's Maximum Achievable Scenario (most aggressive program scenario possible) identified potential savings corresponding to 8 % reduction in consumption over 10 years. 5

Maximum Achievable Efficiency Potential by End Use (2016)

- **Over ½ of all potential efficiency measures are lighting related**
- **Commercial Cooling and Refrigeration measures account for 18 % of total potential**



Efficiency Potential By 2016 = 2,026 GWH

6

LADWP 2021 Draft Submittal Program Ramp-Up

- LADWP is currently ramping-up the energy efficiency programs that have been identified in the Energy Efficiency Potential Study.
- Energy savings achieved in Fiscal Year (FY) 2006-07 exceeded FY 2005-06 savings by more than four times.
- Savings projected for FY 2007-08 are an additional four-fold increase over 2006-07 actual results. The current focus is on implementing these aggressive programs to mitigate all load growth during the next five fiscal years.

7

LADWP AB 2021 Draft Submittal 10-Year Program

Attribute	Quantum Study (8 %)	LADWP Goal (10%)
Energy Potential (GWH)	2,026	2,491
Strategies to Meet Additional GWH Goals	• Remove Barriers to Efficiency Measure Adoption – Increase target cost-effectiveness limit for efficiency program design from current $0.03 to $0.04 per kWH while maintaining reasonable cost-benefit ratios • Target expansion of existing commercial and residential sector programs for greater program participation – Small Business Direct Install – Refrigerator Exchange Program • Leverage partnerships with City and other Institutional facilities to implement measures	

8

LADWP AB 2021 Draft Submittal

Initial submittal sent June 30, 2007 to the Commissi[redacted] required by September 30, 2007

Projected Energy Efficiency Targets – GWH (Fiscal Year) *

FISCAL YEAR	GWH SAVINGS	% OF LOAD	[redacted]	% OF LOAD
2006-2007	68 (Actual Achieved) 58 (Net Savings)**	.2 %	58	.2 %
2007-2008	275 **	1.2 %	333	1.4 %
2008-2009	315	1.3 %	648	2.7%
2009-2010	300	1.2%	948	3.9 %
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2014-2015	252	1.0%	2,239	9.0%
2015-2016	252	1.0%	2,491	10.0%
TOTALS	2,491	10.0 %		

* Adjusted to meet 10% energy usage reduction target over 10 years.

** Projections are all Net Values - Amounts after Net-to-Gross Factors applied as per CEC Guidelines

9

LADWP AB 2021 Draft Submittal

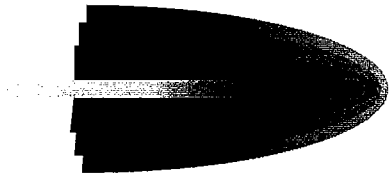
Recommendations and Sour[redacted]tional Savings

	Quantum Study (8% Goal)	Break-Down	L[redacted]	Break-Down
Programs Identified By Potential Study	Small Business Direct Install	.5	Expand to include all A1 and potentially include A2	1.2
	Low Income Refrigerator Exchange	.7	Develop and Expand to Include Multi-Family dwellings	1.5
	CFL Distribution	1	Continue offering aggressive program	1
	Consumer Rebate Program	.4	Expand to include partnerships with retailers thru Point of Sale Discount (POS) program	.4
	Refrigerator Recycling	.4	Continue implementation of aggressive program	.4
	Chiller Efficiency Program	.7	Continue offering program covering 100% Inc cost	.7
	Commercial Lighting Efficiency Offer	2.4	Continue offering aggressive program with increased incentives up to $.04/kwh savings or higher	2.4
	Custom Program	1.0	Implement aggressive outreach using Major Accounts	1.0
	Refrigeration Program	.5	Continue promoting aggressive program	.5
	All Others (Rcx, New Construction, DSM Bid)	.4	Pursue Retrocommissioning Program with City/ Institutional Customers and other Facilities	.9
	Total (Percent Goal)	8		10

* As new technologies emerge (e.g. LED lighting), LADWP will re-evaluate its program goals for inclusion of new energy efficiency opportunities.

10

LADWP AB 2021 Draft Submittal



Q & A

November 5, 2008

Mike Cockayne
Department of Water & Power
City of Los Angeles
111 North Hope Street Room 456
Los Angeles, California 90012

Dear Mr. Cockayne:

In accordance with our agreement with the Department of Water & Power, enclosed is the quarterly short-term update of The UCLA Anderson Los Angeles County Forecast. As always, we welcome your comments and questions.

Sincerely,

Akinori Tomohara
UCLA Anderson Forecast

The Los Angeles County Report: Third Quarter Update

Jerry Nickelsburg, Senior Economist
Akinori Tomohara, Economist
UCLA Anderson Forecast
October 2008

Summary

Turning points in economic growth, and more importantly the reason for them are the essence of economic forecasting. We have been closely monitoring the Los Angeles economy for such a turning point since the housing market began to weaken two and a half years ago. In the last L.A. Report we discussed the cessation of employment growth in the 2nd Quarter, but showed that this weakness, due in part to labor actions and adjustments in temporary employment, did not rise to the level of a turning point. We now have some evidence that personal income, which is the best measure of overall economic activity, increased in the midst of the 2nd quarter weakness in the local economy. The Los Angeles economy has continued to weaken since that time and job losses have become larger and more widespread. The 3rd quarter provides evidence of a turning point in the local economy and predicts a downturn in personal income in the coming quarters. Inflation eating away at the value of stagnant nominal income more than a contraction in economic activity is the story of the 3rd quarter, and an outright contraction is expected in the 4th quater. Los Angeles ought to be better positioned to weather the current economic storm than most regional economies in the U.S. due to its geographical proximity to the Pacific Rim, its export oriented manufacturing and ports, and its lack of major exposure to the residential construction slowdown. Nevertheless, it will not escape it. In this L.A. Report we are going to examine that thesis and its impact on the forecast, we are going to look back on our discussion of the three strikes in the June report to see what impact they had on employment, income and the 2009 forecast, and in the final section of this report we look forward to 2009 and 2010 with an analysis of how this downturn and recovery will play out.

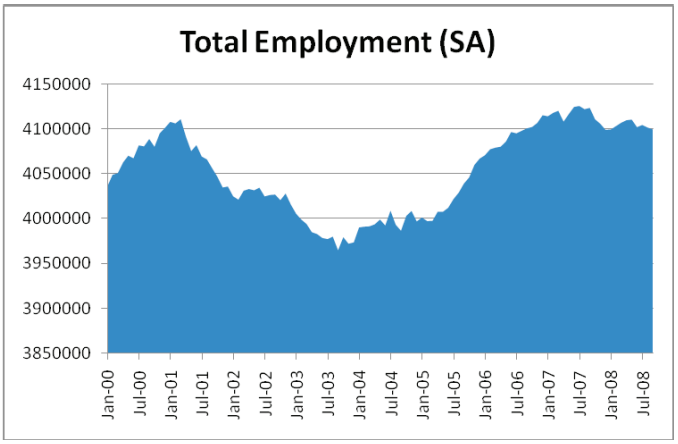
All forecasters need to critically review their predictions. Three months ago we stated "If we are right about the U.S. and California economies, L.A. ought to rebound from the 2nd quarter hiatus and resume employment growth in the 3rd quarter." We were wrong. How did we miss this forecast three months out? The answer can be found in the data. The housing market peaked in late 2005. Since the middle of 2007 there has been a financial squeeze on Wall Street and falling home prices in California. And yet, consumption, which represents 70% of all economic activity, held up. When we studied the impact of similar events in the past, the S&L meltdown in the late 80's, the collapse of asset values at the end of the dot-com speculative bubble in 2000, and a wide spectrum of economic studies on wealth effects, it was clear that the problems of Wall Street, the real estate sector and the residential construction sector, as bad as they were, were insufficient to cause a downturn in overall economic activity. Manufacturing, retail, exports, jobs were all holding up at levels that were anything but recessionary.

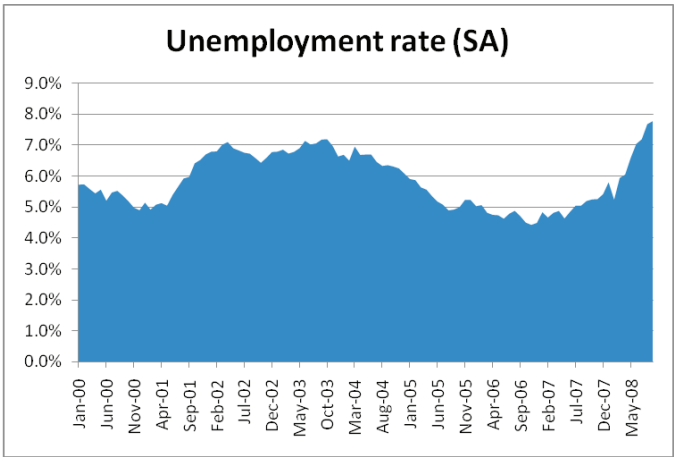
All of this held true until September. The month of September 2008 will be remembered as one of an unexpected, spectacular failure of the financial sector and a massive, yet poorly articulated, intervention by the Federal Reserve and the Treasury. This is a totally new event which, while it reminds us of the Panic of 1907 and the Bank Crisis of 1933, differs in the existence of the Federal Reserve System and the electronic age of international finance. The story is as much a story of fits and starts in economic policy as it is a weakness in the large investment banks and non-bank

financial institutions. As such, the precursors of it are not seen in the non-financial economic data nor in banking sector, Federal Reserve, and Treasury pronouncements. Indeed, it caught the Federal Reserve by surprise. All of this was enough to cause a collapse of consumption in September. Since this is more a crisis of confidence, of uncertainty about the future than of structural imbalance in the "main street" economy, we do not expect the impact to last for more than a few quarters. Nevertheless, it has caused us to ramp down our forecast for Los Angeles significantly. The new forecast shows Los Angeles with three quarters of declining economic activity, three quarters of declining payroll employment and four quarters of declining overall employment and of declining real taxable sales. As events unfold in the 4th quarter, we will be looking for signs that the uncertainty currently prevalent in the U.S. economy, in California and in our local economy are abating. At present, we are forecasting a mildly bad holiday season for retail. If consumer uncertainty remains at elevated levels and it turns worse, the forecast will need to be ramped downward even more.

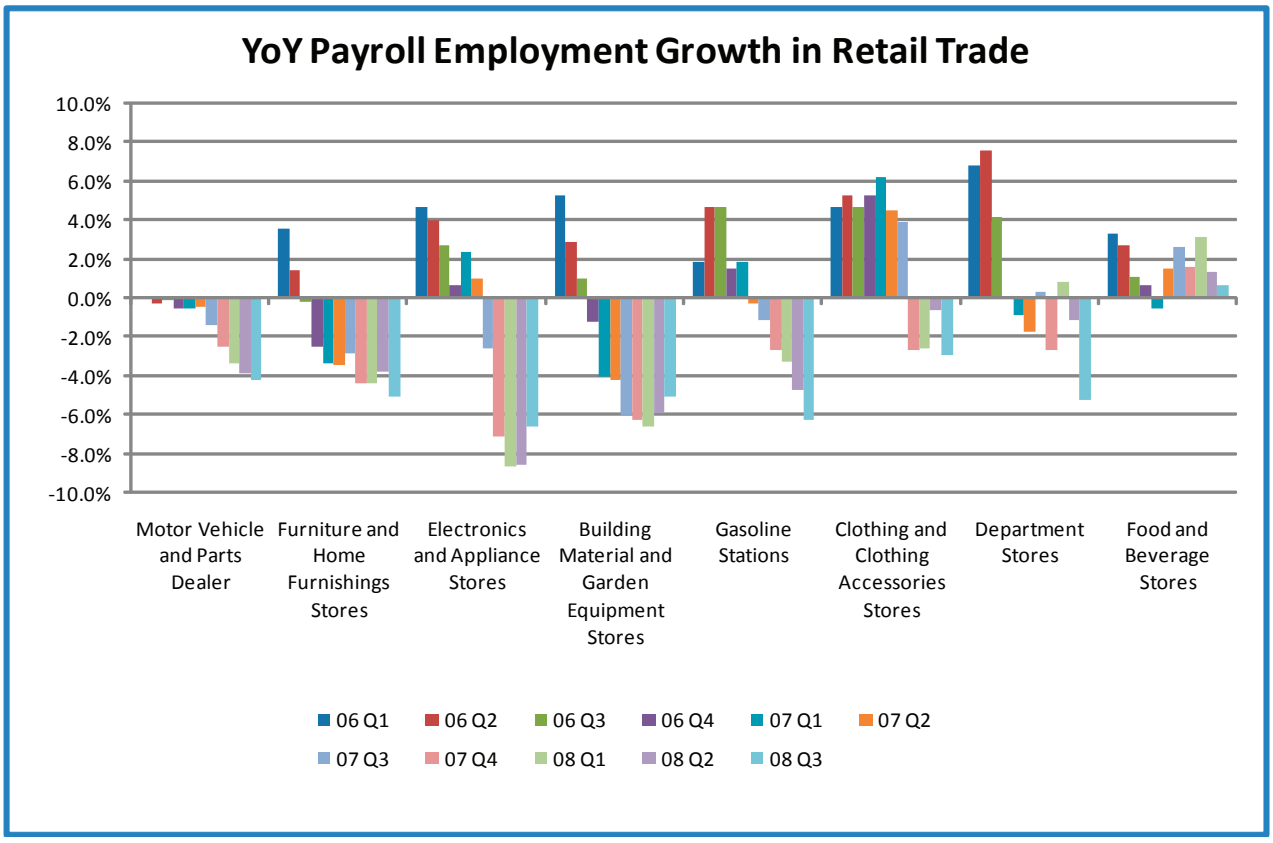
A Review Of Employment and Unemployment

The increase in L.A.'s unemployment rate accelerated in the third quarter. Earlier in the year, L.A. enjoyed a lower rate of unemployment than the state, but in the last quarter the rate jumped by 25% reaching a level of 7.6%. This jump is primarily in the "self employed" class of workers which we define as the difference between the household survey of employment, taken at the residential/employee level and the payroll survey taken at the employment location/employer level. Payroll jobs decreased by 21,000 jobs, most of which can be explained by declines in construction, finance and manufacturing. In the next two sections we will look at those in more detail, followed by an analysis of the impact of the strikes and the distortions in the self employed. Yet the dramatic rise in unemployment cannot be entirely dismissed as housing and strike related. The other sectors of the L.A. economy reveal an underlying weakness, which when combined with national economic weakness, lead us to a forecast of declining employment in Los Angeles in the coming quarter. We begin our discussion with these other sectors.





Overall, the service sectors in Los Angeles show very meager growth and losses in 2008. The net is negative overall growth in services driven primarily by declines information and finance employment. Two of the other weak sectors are administrative and support services, and management of companies. These sectors include temporary workers and consultants. Temps are the first to lose their jobs in a soft economy as the cost of firing them is virtually zero and the value of retaining a regular employee through a slowdown can be substantial, so the decline is just further evidence of a weak local labor market. Health care, professional, scientific and technical services, education, and leisure and hospitality have grown through the year but their rate of growth is not enough to counter weakness elsewhere.



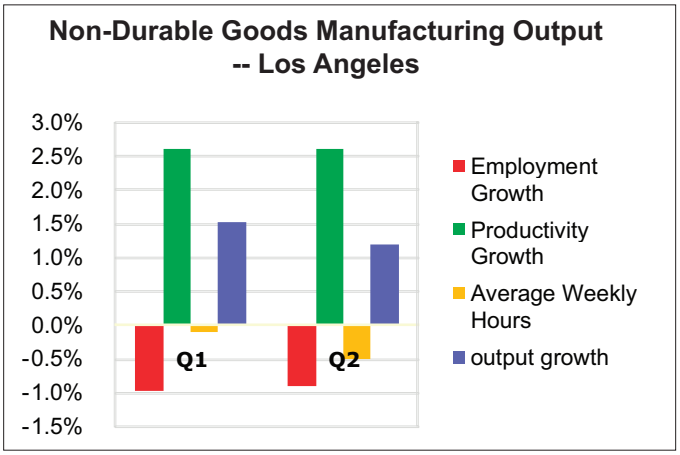
Employment in retail trade began to decline in the 4th quarter of 2007 and has continued declining since then. A closer examination shows important differences in employment among various retail trade sectors. The decline in overall retail employment was not widespread initially. It reflected the weak housing market (furniture, home furnishings, building and garden supplies) as well as the steady decline in consumer demand for autos. This was followed by a declining quantity of gasoline purchases by Californians in the face of sharply higher gas prices and an adjustment in consumer budgets away from department store purchases. More recently the decline in retail employment has become widespread and includes most consumption categories.

The most recent quarterly decline in retail employment, in the face of the September collapse in consumer demand, is not surprising. What remains puzzling about retail employment is the fact that retail sales held up through the summer, yet employment did not. We have three views on this, each of which could be part of the story. Nevertheless, we are going to have to see how retail responds to the recovery to begin to sort them out. First, automation in the face of severe competition may bring increased productivity and reduced employment to retail outlets. Second, the increase in consumption through internet sales has allowed retail outlets to have fewer customer service representatives. Third, over the last decade, communities competed to have retail outlets locate within their boundaries for tax reasons. They provided incentives which lowered the cost of new big box retail outlets. One consequence of this is too many outlets. What we are observing now is a shakeout with the failure of Mervyns, and Linens and Things, and the contraction of other retail chains. While the weak economy is a causal factor, more stores than are needed or desired by the ultimate consumer may be the driver. The sustained growth in retail employment during the housing boom of 2003 to 2006 gives some credence to this view, but not enough for us to be convinced that this is the entire story.

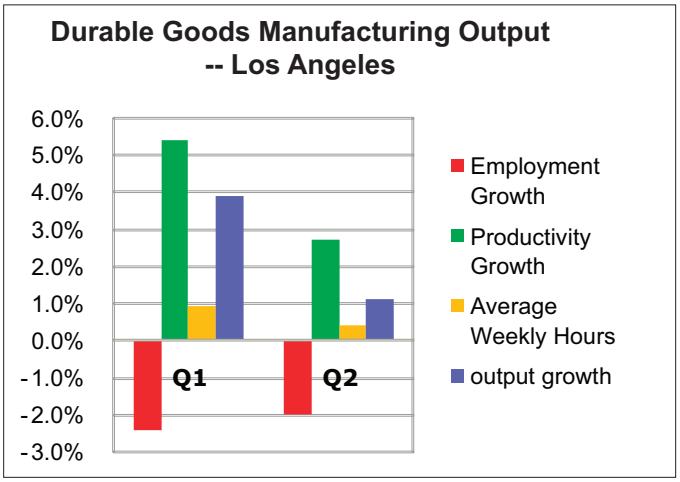
Export Led Growth: Where Are The Jobs?

Exports from the U.S. grew at an astonishing 9+% this year. It was that growth that kept us out of a recession through the first half of the year, and in the absence of the uncertainty emanating from the financial crisis, might have averted one altogether. For Los Angeles, this should be good news. Although manufacturing is a much smaller part of today's diversified L.A. economy, it is still an important component. It amounts to 11% of the region's employment and is the third largest sector after professional and business services and government. Indeed, L.A. is the largest manufacturing center in the U.S. With the ports of Los Angeles and Long Beach nearby, goods manufactured for export to Asia have a short, direct logistics chain. With such rapid growth in exports we would expect to see a jump in L.A.'s manufacturing, warehousing and transportation employment. But, it did not happen. Employment in manufacturing shrunk by -1.5% in the 2nd quarter, and again by -1.4% in the 3rd quarter. Employment in transportation and warehousing shrunk by -0.9% in the 2nd quarter and recovered by the same amount in the 3rd quarter.

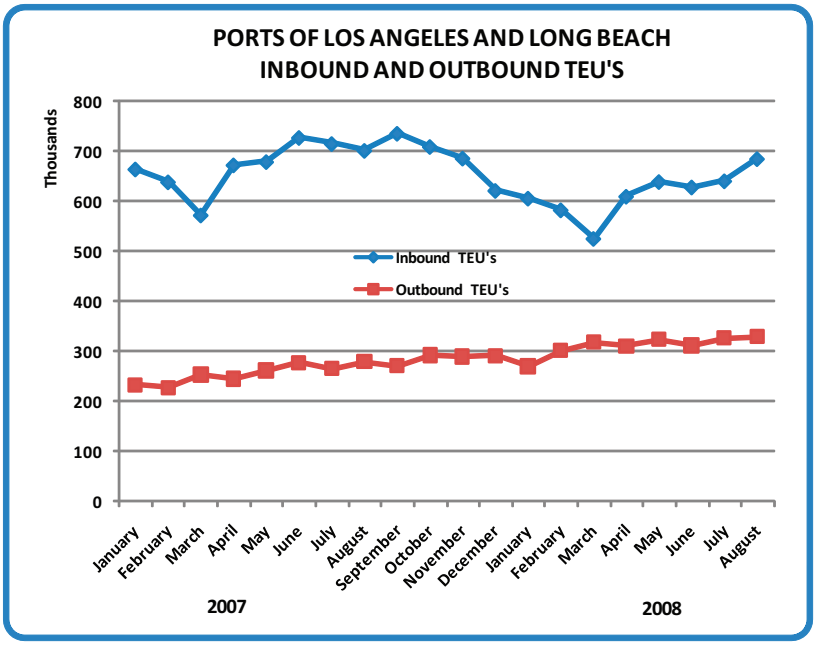
Often we consider employment as our gauge of economic activity. It works well in most cases but it is not the entire story. Economic activity is the production of goods and services and labor is but one input. Capital, production processes, raw materials, and innovations are the other inputs. Since the recession of 2001, American manufacturing has become increasingly efficient. Labor intensive manufacturing and manufacturing which was not amenable to rapid gains in productivity left the Southland for the labor abundant economies of Asia. Throughout the recovery from the 2001 recession, manufacturing productivity grew as American firms competed in the world market place. This has remained true over the past year. Though manufacturing employment, both in durable goods and non-durable goods contracted in the first half of the year in Los Angeles, output actually increased.



Looking at the numbers, in durable goods 2nd quarter employment fell by 2%. Productivity improved by 2.7% in the same quarter for a net increase in output of 0.7%. Add to that a 0.4% increase in the number of hours worked per employee and you have a 1.1% increase in output. The same holds for non-durable goods except that the number of hours worked declined rather than grew. So, in both durable and non-durable goods output was up, income was up, but employment was down. Employment in durable goods in the 3rd quarter was down by 1.2% and non-durable goods by 1.6%. The numbers on productivity for the 3rd quarter are not yet published, but if the same 2% productivity gains hold, then output and income will be up once again and we will continue the jobless growth in manufacturing. However, a slight negative in the 3rd quarter would not be a surprise. Commencing September 6, machinists at Boeing walked off their jobs in a labor action. An agreement was reached November 1 after a two month walkout. Los Angeles based suppliers of components for Boeing aircraft had a reduction in demand as Boeing, the largest exporter in the U.S., let aircraft production grind to a halt.



With manufactured exports growing, albeit jobless growth, we expect transportation and warehousing to grow as well. The problem is that imports have fallen. The ports of Los Angeles and Long Beach are the nation's largest container ports carrying 43% of all container imports to the U.S. The top containerized imports through the Port of Los Angeles are furniture, auto parts, toys, apparel, and electronics -- all items which are experiencing slack consumer demand. So imported container traffic is down for the year. The number of exported full containers is up as we expected. The problem is that the number of imported containers dictates the level of employment. When a container full of toy dolls comes into the ports it is taken off a ship, sent to a warehouse in the eastern part of the county, broken down, and sent to retail stores across the country. The container is then put on a truck, sent to the port, loaded on a ship and sent back to China or Southeast Asia for another shipment. This is true whether or not the container is full. So the only jobs added with the expansion of exports are jobs loading the container and jobs processing the logistics paperwork to document and track the cargo. With the reduction in imports, and imports still exceeding exports in terms of TEU's through the port, there is no net gain in jobs. Once again we have growth, but jobless growth.



What does all of this portend for the Los Angeles economy going forward? With the slowing of economic growth in Europe, Canada, Mexico and Asia we expect a deceleration if not decline in export demand the balance of 2008 and into early 2009. So, and expansion in manufacturing overcoming the reduction in employment due to productivity gains is not in the cards. The fall off of U.S. consumer demand means a contraction in trade and transportation as well. The good news is that with the weaker dollar, the underlying strength in the emerging Asian economies and the shift in consumption to more normal levels, exports will lead the U.S. recovery. As L.A. is well positioned to benefit, we expect to see increases in manufacturing, warehousing and transportation as well as the ripple effects of this growth in L.A. towards the end of our forecast horizon.

An Update On The Strikes

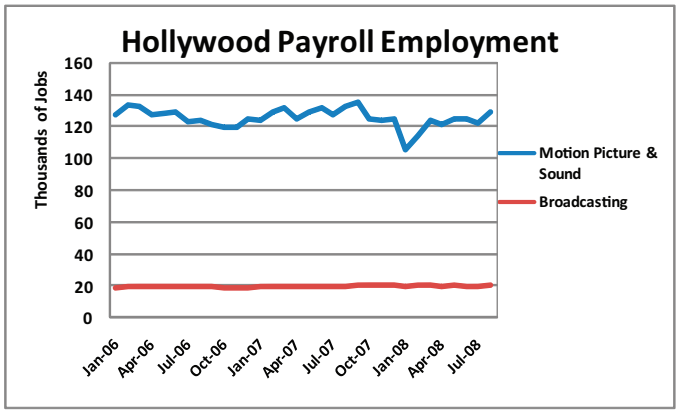
In our last report we commented on three strikes and missed the big one at Boeing. The strike at the ports was averted and the Boeing strike has had a clear effect on Southland manufacturing. The strike still of concern for local economic growth is once again in the entertainment industry. As of this writing, the labor situation between the AMPTP and SAG remains in limbo. With regard to SAG/AMPTP, producers are tentatively moving ahead with their production schedules for 2009. November will be a time of negotiation between the two sides through a mediator. If that were to break down, we would expect at least one month before a strike authorization vote would be taken and if approved, some interval of time to pass before a strike commences. Of course, the AMPTP could engage in a preemptory lockout action before then. Predicting the onset and conclusion of a strike is risky business at best, and we hesitate to get into that game. But, it seems clear that were there to be a labor action, it would not take place until the 1st quarter of 2009.

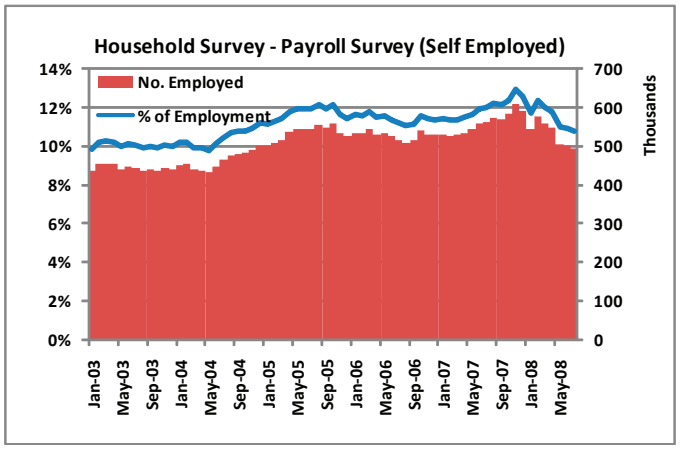
Our forecast for California and Los Angeles shows a very weak 1st quarter with negative personal income and employment growth. The forecast assumes that there is no labor action in the entertainment industry. Like the WGA

strike, the overall economic impact of a SAG strike on the Los Angeles economy would be modest and would serve to speed the transition of the industry to other forms of content delivery. But a modest overall impact does not imply no specific monthly impact. We estimated a 0.25% decline in the growth rate of the L.A. economy in the 1st quarter of 2008 due to the WGA strike and a SAG strike could have a similar implications. Of course, there are different production activities engaged in by members of the two unions and SAG has a competing union in AFTRA, so the impact would not be identical between a SAG labor action and the WGA labor action. Nevertheless, it would be of the same order of magnitude.

In spite of speculative statements putting the WGA strike's impact at $2.5B, the employment numbers belie these claims. Payroll employment in movie production clearly showed a drop of only 19,000 jobs for January 2008 and 12,000 for February. March was a return to average employment. Ignoring the surge in employment prior to the strike, and the surge which would have occurred in March but for the threatened SAG labor action, the impact of this employment drop is in the $120M - $150M range. The multiplier effect, used correctly, adds some, but not very much to these numbers. The additional multiple effect is in the range of $20M to $30M.

There is a component of television and film production employment which does not show up in the payroll employment numbers. These are the self employed independent contractors. They appear in the household survey, but are not identified by industry. The independent contractors in the film industry are lumped with self employed consultants, entrepreneurs, independent sub-contractors in residential construction and 1099 mortgage and real estate brokers. So it is a bit difficult to infer the impact of the strike from the total numbers. Nevertheless, the pattern in the numbers is striking. The WGA strike began in November 2007. This was the 8th quarter of the housing downturn and construction and finance were shedding the jobs they added between 2003 and 2006. So in the absence of anything else, the number of self-employed in Los Angeles should have been declining. However, there is a build-up in self-employed corresponding to the build-up in motion picture production employment prior to the strike, a fall off in the self-employed corresponding to the decline in payroll employment in motion picture production during the strike and a build up right after the strike ended. The independent contractor numbers showed a shift of jobs from January and February of 2009 to August-October 2008 and no net decline. Since the underlying trend in the number and percentage of self employed is negative, this shows no evidence of a net loss of jobs in the entertainment industry.





The unexpected impact of the strike was to confound employment number analysts. The television and film industry engages in seasonal hiring as it prepares for its seasonal releases. This seasonal pattern

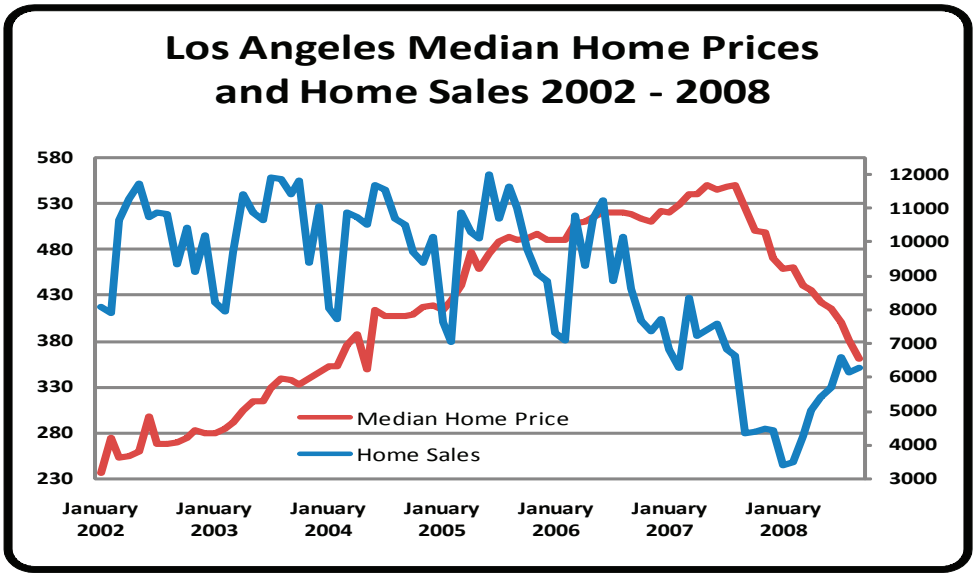
is relatively stable and therefore is incorporated in the statistical analysis which seasonally adjusts the employment numbers. But, because of the WGA strike and the uncertainty with respect to the SAG / AMPTP negotiations, production was moved from its normal months to other months prior to or just after the WGA strike. This non-seasonal employment is amplified in seasonal adjustment. So, one has to interpret the employment numbers for L.A. with this distortion of the ups and downs in mind.

The Housing Downturn: When Will It End?

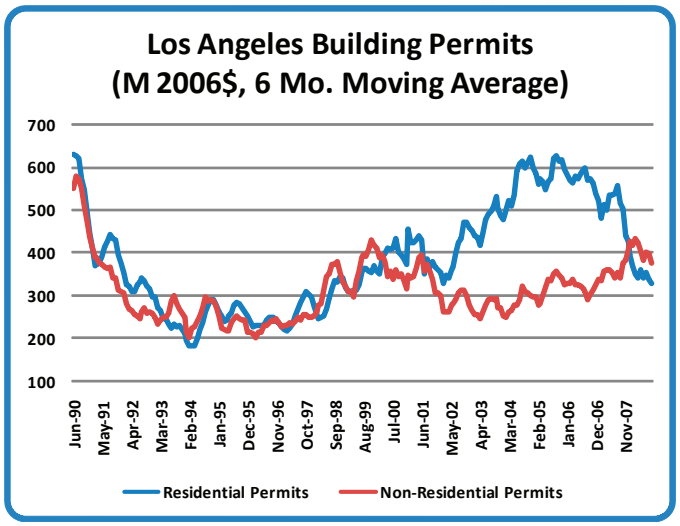
Last quarter we reported that "we are finally seeing indications that the downslide is coming to an end." This remains true. The indicators for Los Angeles continue to point to a middle of 2009 stabilization of the housing market in the sense that prices and sales volumes will bottom out. It is at that point, that the housing market is no longer a drag on economic growth in Los Angeles. When builders see this, they will begin building to the new price levels and residential construction will begin to grow.

Since the middle of 2007, home prices have been falling in L.A. The median home price as reported by DataQuick is now down 35% since the peak. Of course there are compositional effects. A greater percentage of the housing on the market is lower cost housing because that is where the mortgage stress has been. This can generate a lower median price without any actual price declines. But other measures seem to confirm the rapid fall in all home prices. Using the same-house data from the OFHEO HPI we find that home prices in L.A. are down about 15% from their peak. If normal inflation adjusted appreciation of homes in L.A. is at a 2% rate and home prices continue to fall at the same rate as in they did in the 2nd Quarter, then the OFHEO index tells us that the bottom will be achieved in early 2010. If the trend in home price declines in the OFHEO index continues, that is if home prices continue to fall at an ever faster rate, then the bottom measured by a return to the long-run appreciation trend levels is achieved in early 2009. The truth is somewhere in between. With sales finally coming back as potential home buyers see homes that they can afford and come back into the market, our forecast of a mid-2009 bottom seems reasonable.

One caveat is the overall economic slowdown. If job loss becomes pronounced in L.A., as it may well be, then we can expect to see the bottom to the long slide in the housing market delayed by a few quarters. This is because the



downturn in housing has, in the main, been an asset valuation phenomenon. The housing bubble created excess appreciation in home values and when the bubble burst, homes purchased at these inflated prices became poor investments. Homeowners, strapped for cash or otherwise cognizant of the bad investment they owned, have been defaulting on their mortgages at record rates. But this was a function of the investment value of the house rather than the more common reason for default on home mortgages, loss of employment. A substantial downturn in employment will add to the already stressed housing market as homeowners who would otherwise not default on their mortgage, are forced to by a lack of income.



Non-residential construction continues to be more important on a value basis than residential construction in L.A. The fall in residential permits continued through September, but at a slower rate than earlier in the year. This is expected to continue until the middle of 2009. Non-residential permits, particularly for office space in desirable markets, ought to pick up once again as funding from credit markets opens up in the coming months. However the increasing retail vacancy rates and the soft import demand ought to retard the development of new retail and industrial space. Finally, the housing market bubble Los Angeles with a legacy of ample, soon to be very affordable, housing in its outlying areas. But the cost of transportation and demographic trends favor multi-family housing closer to employment centers going forward. Thus, office and apartment construction as well as public works/infrastructure ought to be the growth segments of the non-residential construction sector over the forecast horizon.

Near-Term Los Angeles Forecast

After a review of the 3rd quarter performance, one could be reasonably optimistic about the near-term prospects for L.A. Export-led growth has been increasing income, and if productivity growth ever slows down, will increase employment. The end of the housing downturn is in sight and it will be a decreasing drag on economic growth. Hollywood will get past the SAG negotiations and 2009 should be a more normal year in Tinsletown. Outside of retail, services are growing, albeit slowly. But the events of the past two months cause us to take a more pessimistic view, even more pessimistic than our early September national forecast would suggest.

Our forecast of personal income growth reflects the uncertainty created by the national economic crisis in September. The consumer held up under the housing slump, high gas prices, and a loss of value in equity markets through August. National retail sales excluding autos and adjusted for inflation showed slight growth each month. September changed the game. Beginning the first week of September we received a spate of bad news with the failures of AIG, Lehman, Merrill, Fannie Mae, Freddie Mac, Wachovia and WaMu. To be sure, not all of these were outright failures, but all made the headlines as companies in danger of failing. The policy pronouncements from Washington were clear, the economy is in deep trouble. Each day, consumers heard of new policies to counter act the economic crisis being proffered in Washington. The Federal Reserve and the Treasury went from a loan guaranteed with convertible warrants, to nationalization, to opening the discount window to non-bank financial institutions, to lending in the commercial paper market, to purchasing toxic loans, and to investing in commercial banks. All of this added up to a huge scare to the U.S. consumer. The bottom line was that we did not have a coherent economic policy whose consequences were well understood. The debate in Congress over the bailout plan is the most prominent but just one case in point.

What did all of this mean for Los Angeles? Consumers are resilient in the face of changes in asset values. Basically, consumers know that their portfolios and their homes are going to go up and down in value over time and they discount this in making their consumption purchases. But what consumers don't like is uncertainty. The meltdown on Wall Street and seeming inability of Washington to stop the continued bad news created a level of uncertainty that has not been seen since the housing market peaked in the 4th quarter of 2005. With September's uncertainty about future job prospects, future prices, future economic health, and the ability of the financial sector to protect hard earned wealth, the consumer pulled back purchases. We already see evidence that October will be more of the same. The bottom line is a collapse in consumption leading to a downturn in economic activity in Los Angeles.

We have reduced our forecast in light of the events of the last two months. Real Personal Income, which had been stronger than expected earlier this year will, when a declining 4th quarter is factored in, grow at the anemic rate of 0.2% during 2008. The decrease in Real Personal Income in early 2009 will keep 2009's growth rate at 0.4%. The export led growth recovery in 2010 will show a return to normal growth rates of around 2.4%. Inflation had been elevated to over 4% for 2008 due to the run up in petroleum and food earlier in the year, but it is now expected to moderate to about 2% after 2009. Our forecast for taxable sales in L.A. has been revised downward dramatically. Taxable Sales for the county is now expected to decline at a -2.9% rate this year, flat at -0.1% rate in 2009 and returning to over 5% growth rate in 2010. As a consequence, sales tax revenue, particularly non-gasoline sales tax revenue, for the 2008/2009 and 2009/2010 fiscal year will be declining. This combined with reduced transfer taxes and possible declines in property assessments translates into lean fiscal revenues for the county and city governments.

The employment forecast for the coming year calls for construction to shed nearly 6% of its remaining jobs this year and finance to shed approximately 3%. This will mark the end of large declines in housing market related layoffs. However retail and temporary business services are shedding jobs the next through the next year. Overall, the forecast is for a contraction in payroll jobs for Los Angeles in the current year and no net gain in jobs over 2007 levels until 2010. Unemployment peaks next year at 8.4% and abates only slightly in 2010.

On a quarterly basis, the forecast is for the downturn to have hit income, employment, taxable sales and unemployment earlier than expected. The bad news of September resulted in a contraction in each of these measures of economic activity in the 3rd quarter of this year. This contraction is expected to continue through the 1st quarter of 2009 followed by very slow growth for the balance of the year. Even though Los Angeles is a well diversified economy, it will be unable to avoid the impact of a generalized turndown in consumer demand nationwide.

Summary of the UCLA Forecast for Los Angeles County by Calendar Year

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Personal Income, Taxable Sales, and Price Inflation (%Change)											
Personal Income											
(Billion $)	279.8	294.5	301.0	309.8	326.4	346.4	369.2	391.5	409.0	421.5	440.1
(% Change)	6.0	5.3	2.2	2.9	5.4	6.1	6.6	6.0	4.5	3.0	4.4
Real Personal Income											
(Bil 2000$)	279.8	284.9	283.4	284.3	289.8	294.5	300.9	309.0	309.6	310.8	318.2
(% Change)	2.6	1.8	-0.5	0.3	1.9	1.6	2.2	2.7	0.2	0.4	2.4
Taxable Sales											
(Billion $)	106.7	107.4	108.7	113.6	122.5	130.6	136.1	137.2	133.3	133.2	140.4
(% Change)	9.7	0.7	1.2	4.5	7.8	6.6	4.2	0.8	-2.9	-0.1	5.4
Real Taxable Sales											
(Bil 2000$)	106.7	103.9	102.3	104.3	108.8	111.0	111.0	108.3	100.9	98.2	101.5
(% Change)	6.2	-2.5	-1.5	1.9	4.3	2.1	-0.0	-2.4	-6.9	-2.7	3.3
Consumer Prices (% Ch)	3.3	3.4	2.8	2.6	3.3	4.5	4.3	3.3	4.3	2.6	2.0
Employment and Labor Force - (Household Survey, %Change)											
Employment	2.7	1.3	-0.8	-0.5	0.8	2.2	1.3	1.2	-1.5	-0.8	1.3
Labor Force	2.1	1.6	0.4	-0.2	0.2	0.9	0.7	1.5	0.7	0.8	0.7
Unemployment Rate (%)	5.4	5.7	6.8	7.0	6.5	5.3	4.7	5.0	7.0	8.4	8.0
Nonfarm Employment (Payroll Survey, %Change)											
Total Nonfarm	1.7	0.0	-1.2	-1.1	0.3	0.7	1.7	0.6	-0.3	0.2	1.2
Natural Resources & Min.	-1.5	13.1	-2.7	2.7	-0.9	-2.2	9.0	9.9	0.1	3.9	2.7
Construction	3.8	3.9	-1.7	0.1	4.1	6.1	5.9	-0.2	-5.9	-1.1	2.5
Manufacturing	-2.1	-5.6	-7.5	-6.5	-3.3	-2.5	-2.1	-3.1	-1.5	-0.1	0.8
Nondurable Goods	-0.9	-6.4	-6.8	-5.0	-3.6	-3.5	-1.9	-2.7	-0.7	-0.2	0.5
Durable Goods	-3.0	-5.0	-8.0	-7.7	-3.0	-1.6	-2.3	-3.5	-2.1	-0.1	1.2
Trans., Warehousing & Ut	1.3	0.6	-4.8	-3.4	-0.2	0.4	2.1	0.7	-0.1	-0.7	1.1
Trade	2.0	0.5	0.2	-0.3	1.2	2.1	2.4	0.7	-1.4	-1.3	1.6
Information	3.0	-7.2	-8.4	-2.4	4.7	-2.0	-1.0	1.8	-2.5	4.4	1.9
Financial Activities	-1.0	2.0	1.6	3.1	0.8	1.0	2.0	-1.5	-2.9	-1.1	0.2
Professional & Busi. Srv	2.2	0.0	-2.2	-2.6	0.4	2.4	3.9	1.2	-0.1	-0.4	1.5
Edu. & Health Services	3.6	3.7	4.2	2.2	1.4	0.9	1.6	2.0	2.2	1.8	1.4
Leisure & Hospitality	2.6	1.1	1.6	2.4	2.8	1.3	2.8	2.3	1.5	1.4	1.4
Other Services	2.3	2.3	1.7	-0.1	-0.5	-0.3	0.7	1.3	1.4	1.6	1.3
Federal Gov't	1.5	-6.2	-0.4	2.5	-2.0	-1.6	-2.1	-3.5	-2.9	0.1	0.0
State and Local Gov't	3.7	3.9	1.5	-1.5	-2.0	-0.5	1.3	1.3	1.4	-0.5	-0.0
Nonfarm Employment (Payroll Survey, Thous.)											
Total Nonfarm	4072.2	4073.8	4026.9	3982.9	3996.4	4024.1	4092.1	4115.8	4103.4	4109.8	4157.5
Natural Resources & Min.	3.4	3.8	3.7	3.8	3.8	3.7	4.0	4.4	4.4	4.6	4.7
Construction	131.7	136.9	134.5	134.6	140.2	148.7	157.5	157.2	148.0	146.4	150.1
Manufacturing	612.2	577.9	534.8	500.0	483.6	471.7	461.7	447.1	440.6	440.1	443.8
Nondurable Goods	269.9	252.5	235.5	223.8	215.7	208.3	204.3	198.7	197.4	197.0	197.9
Durable Goods	342.3	325.4	299.3	276.2	267.8	263.4	257.3	248.4	243.2	243.1	245.9
Trans., Warehousing & Ut	174.5	175.5	167.2	161.5	161.1	161.7	165.2	166.3	166.2	165.1	166.9
Trade	611.4	614.2	615.4	613.3	620.4	633.6	648.8	653.3	644.3	635.9	646.2
Information	243.7	226.3	207.3	202.3	211.8	207.5	205.6	209.2	204.0	212.9	216.9
Financial Activities	224.6	229.0	232.6	239.8	241.6	244.0	248.8	245.0	238.0	235.5	235.9
Professional & Busi.Serv	588.0	588.2	575.1	560.0	562.4	576.1	598.8	605.7	605.4	602.8	611.6
Edu. & Health Services	416.7	432.0	450.3	460.3	467.0	471.3	478.7	488.2	499.2	508.2	515.5
Leisure & Hospitality	344.8	348.5	354.3	362.6	372.8	377.8	388.5	397.3	403.2	408.7	414.3
Other Services	140.0	143.1	145.6	145.4	144.7	144.3	145.2	147.1	149.2	151.5	153.5
Federal Gov't	57.9	54.4	54.1	55.5	54.3	53.5	52.3	50.5	49.1	49.1	49.1
State and Local Gov't	523.3	543.9	551.9	543.7	532.7	530.2	537.0	544.3	551.8	549.0	548.9
Construction Activity and Population											
Residential Building											
Permits (Thous. Units)	17.2	18.4	19.0	21.3	27.1	26.1	26.0	20.4	15.7	18.4	24.0
Nonresidential Construction											
Real (Mil. 2000$)	3294.4	3374.0	2640.8	2573.8	2610.8	2831.2	2572.8	2989.8	3217.6	3374.4	3311.9
Nominal (Mil. $)	3292.6	3549.7	2907.0	2931.1	3158.6	3825.6	3903.6	4717.2	5217.8	5518.4	5432.1
Net Inmigration (Thous.)	84	65	67	38	10	-23	-39	-45	-48	-38	-24
Population (Thous.)	9547	9715	9876	10018	10130	10211	10267	10315	10356	10399	10454
(% Change)	1.8	1.8	1.7	1.4	1.1	0.8	0.6	0.5	0.4	0.4	0.5

Summary of the UCLA Forecast for Los Angeles County by Quarter

	2008:2	2008:3	2008:4	2009:1	2009:2	2009:3	2009:4	2010:1	2010:2	2010:3	2010:4
Personal Income, Taxable Sales, and Price Inflation (%Change)											
Personal Income											
(Billion $)	408.6	411.7	414.5	416.4	418.6	422.9	427.9	432.8	437.7	442.4	447.5
(% Change)	7.6	3.1	2.7	1.8	2.2	4.2	4.8	4.7	4.5	4.4	4.6
Real Personal Income											
(Bil 2000$)	310.8	309.2	308.7	308.5	309.7	311.4	313.7	315.6	317.3	319.0	320.7
(% Change)	1.7	-2.1	-0.5	-0.4	1.6	2.3	3.0	2.4	2.2	2.1	2.3
Taxable Sales											
(Billion $)	134.5	132.6	131.5	131.6	132.0	133.4	135.7	137.6	139.4	141.3	143.3
(% Change)	-0.1	-5.5	-3.4	0.4	1.3	4.3	7.0	5.7	5.4	5.6	5.8
Real Taxable Sales											
(Bil 2000$)	102.3	99.6	97.9	97.5	97.7	98.3	99.5	100.3	101.1	101.9	102.7
(% Change)	-5.6	-10.2	-6.5	-1.7	0.7	2.4	5.1	3.4	3.1	3.2	3.4
Consumer Prices (% Ch)	5.8	5.3	3.3	2.1	0.6	1.8	1.8	2.2	2.3	2.3	2.3
Employment and Labor Force - (Household Survey, %Change)											
Employment	-3.4	-5.6	-0.8	-0.2	0.3	1.3	2.0	1.3	1.1	1.0	1.0
Labor Force	0.4	-0.8	1.5	1.0	0.8	0.8	0.9	0.6	0.6	0.7	0.8
Unemployment Rate (%)	6.5	7.7	8.2	8.5	8.6	8.5	8.2	8.1	8.0	7.9	7.9
Nonfarm Employment (Payroll Survey, %Change)											
Total Nonfarm	0.5	-0.6	-0.2	-0.2	0.1	1.3	2.0	1.1	1.0	0.8	0.8
Nat. Resources & Mining	-5.7	1.7	3.5	5.6	7.5	3.3	2.7	2.9	2.2	1.1	1.2
Construction	-6.3	-3.3	-2.5	-1.3	-0.6	2.7	5.3	2.3	1.1	2.7	2.2
Manufacturing	-1.6	-3.1	0.0	-0.0	0.8	1.2	1.0	0.7	0.8	0.6	0.7
Nondurable Goods	-1.1	-2.1	-0.3	-0.2	0.5	0.8	0.9	0.2	0.3	0.4	0.5
Durable Goods	-2.0	-3.8	0.3	0.1	1.1	1.6	1.1	1.2	1.2	0.7	0.9
Trans., Warehousing & Utl.	-0.1	4.7	-3.4	-2.7	-2.1	2.7	2.5	0.7	0.6	0.5	0.6
Trade	-1.2	-3.1	-3.8	-1.7	-1.0	2.3	3.9	1.3	0.9	1.0	1.1
Information	18.9	6.3	5.3	2.3	2.3	2.6	3.0	1.7	1.2	1.1	1.1
Financial Activities	-1.7	-3.1	-1.1	-0.7	-0.7	-0.5	0.4	0.2	0.6	0.3	0.3
Professional & Busi. Srvc.	-1.8	-1.7	-1.5	-0.6	-0.1	1.6	2.6	1.7	1.4	0.6	0.5
Edu. & Health Services	2.9	1.5	2.2	1.6	1.7	1.6	1.7	1.3	1.3	1.3	1.2
Leisure & Hospitality	-0.1	0.8	2.4	1.2	1.1	2.0	1.4	1.3	1.3	1.2	1.2
Other Services	0.5	1.9	1.4	1.3	1.9	1.8	2.1	0.9	0.9	1.0	1.0
Federal Gov't	-1.4	-3.8	-1.3	1.4	0.7	2.2	1.8	-0.8	-1.2	-1.1	-1.1
State and Local Gov't	2.1	0.3	0.6	-1.4	-1.4	-1.2	-0.2	0.4	0.5	0.4	0.5
Nonfarm Employment (Payroll Survey, Thous.)											
Total Nonfarm	4108.2	4102.3	4099.7	4097.2	4098.1	4111.9	4132.0	4143.4	4153.4	4162.1	4170.9
Nat. Resources & Mining	4.4	4.4	4.5	4.5	4.6	4.6	4.7	4.7	4.7	4.7	4.8
Construction	148.3	147.0	146.1	145.6	145.4	146.3	148.2	149.1	149.5	150.5	151.3
Manufacturing	441.9	438.4	438.5	438.4	439.3	440.7	441.8	442.6	443.5	444.1	444.9
Nondurable Goods	197.8	196.8	196.6	196.5	196.7	197.1	197.6	197.7	197.8	198.0	198.2
Durable Goods	244.1	241.7	241.8	241.9	242.6	243.5	244.2	245.0	245.7	246.2	246.7
Trans., Warehousing & Utl.	165.6	167.6	166.1	165.0	164.1	165.2	166.2	166.5	166.8	167.0	167.2
Trade	647.9	642.8	636.6	633.8	632.2	635.7	641.8	643.9	645.3	646.9	648.6
Information	203.9	207.1	209.8	211.0	212.2	213.5	215.1	216.0	216.6	217.2	217.8
Financial Activities	238.9	237.0	236.4	235.9	235.5	235.2	235.4	235.6	235.9	236.0	236.2
Professional & Busi. Srvc.	606.6	603.9	601.7	600.8	600.6	603.0	606.9	609.4	611.5	612.4	613.2
Edu. & Health Services	498.5	500.3	503.0	505.0	507.2	509.2	511.3	513.0	514.7	516.3	517.9
Leisure & Hospitality	402.1	402.9	405.3	406.5	407.6	409.7	411.1	412.4	413.7	415.0	416.2
Other Services	148.7	149.4	149.9	150.4	151.1	151.8	152.6	153.0	153.3	153.7	154.1
Federal Gov't	49.3	48.8	48.7	48.8	48.9	49.2	49.4	49.3	49.2	49.0	48.9
State and Local Gov't	552.1	552.4	553.3	551.4	549.4	547.7	547.4	548.0	548.6	549.2	549.8
Construction Activity and Population											
Residential Building											
Permits (Thous. Units)	15.6	17.1	17.1	17.3	17.6	18.7	20.2	23.0	23.6	24.3	25.0
Nonresidential Construction											
Real (Mil. 2000$)	2999.8	3418.3	3419.1	3399.1	3382.8	3369.2	3346.5	3331.9	3318.7	3306.3	3290.9
Nominal (Mil. $)	4847.7	5570.4	5594.1	5568.6	5535.1	5506.3	5463.8	5443.6	5429.6	5427.9	5427.2
Net Inmigration (Thous.)	-48	-47	-46	-42	-39	-37	-33	-37	-29	-19	-10
Population (Thous.)	10351	10360	10370	10381	10393	10405	10418	10431	10445	10461	10479
(% Change)	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.7

Metropolitan Construction Insight

Forecasts and Analysis of Metropolitan Construction Markets

Fall 2008

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Bedford, MA 01730
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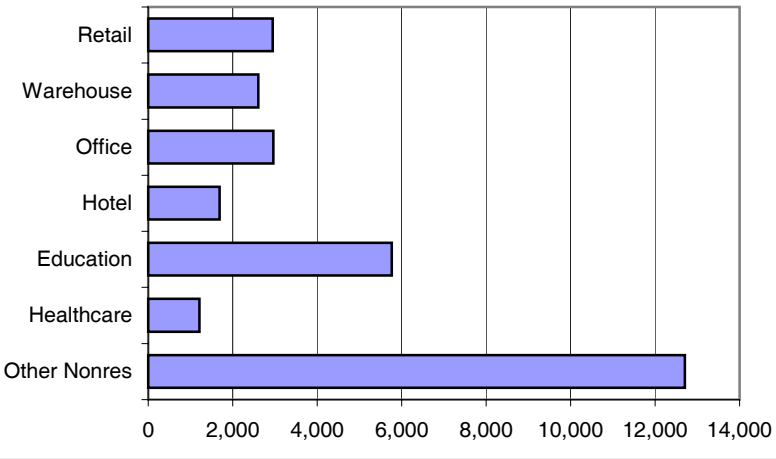
Metro Summary

Los Angeles

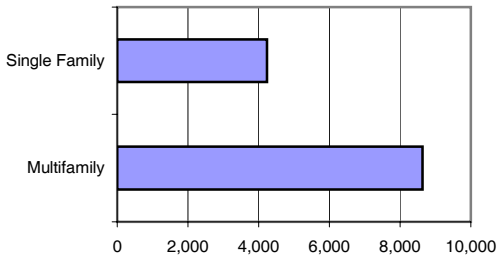
Nonresidential Construction -- Los Angeles

Thousands of Square Feet, 2008



Residential Housing -- Los Angeles

Units, 2008



Metro Summary

Los Angeles

ECONOMY: Los Angeles is in recession. The job losses are pushing the unemployment rate over 6% with with housing starts and home prices down over recent months. Information, manufacturing & finance are also displaying weakness. The local economy will not bounce back before 2010.

RETAIL: Awards for retail centers are due to dip 49% in 2008 to the lowest level in decades. But underlying momentum in retail has not completely dissipated and rents are still rising.

WAREHOUSE: Industrial vacancies are still low in the Los Angeles area. Net absorption was exceptional over 2004-06 but fell last year. Trade will recovery quickly and starts will jump by 2009.

OFFICE: Weakness in the finance and information is slowing the demand for office space in 2008 as absorption turns negative & vacancies rise. As a result office construction will moderate.

HOTEL: Hotel awards surged in 2007, reaching more than 2.4 msf. And despite the slowing economy, travel and tourism will stay strong in Los Angeles, sustaining contracting at high levels.

EDUCATION: The LAUSD is in the middle of its school bldg program funded by $12.6 in bond revenues. The District has spend less than half of the total, ensuring high contracting for years.

HEALTHCARE: Hospital awards will dip this year but stay at historically high levels. Over 50% of LA facilities, totaling millions of sqft, need to be rebuilt or retrofitted for earthquakes.

RESIDENTIAL: According to one source, single family home prices are down 30% from their peak & vultures are buying up properties. But with defaults still rising improved markets remain far away.

ECONOMIC INDICATORS

Source: Economy.com	2008		1999-08 Avg Growth*		2008-13 Avg Growth*	
	Market	U.S.	Market	U.S.	Market	U.S.
Population (000s)	12,955	303,980	0.5%	0.9%	0.8%	0.7%
Households (000s)	4,269	113,932	0.5%	0.9%	1.0%	0.9%
Per Cap Income ($)	43,146	39,866	3.9%	3.6%	2.4%	2.9%
Unemp Rate (%)	5.8	5.5	5.4%	5.0%	5.5%	5.5%

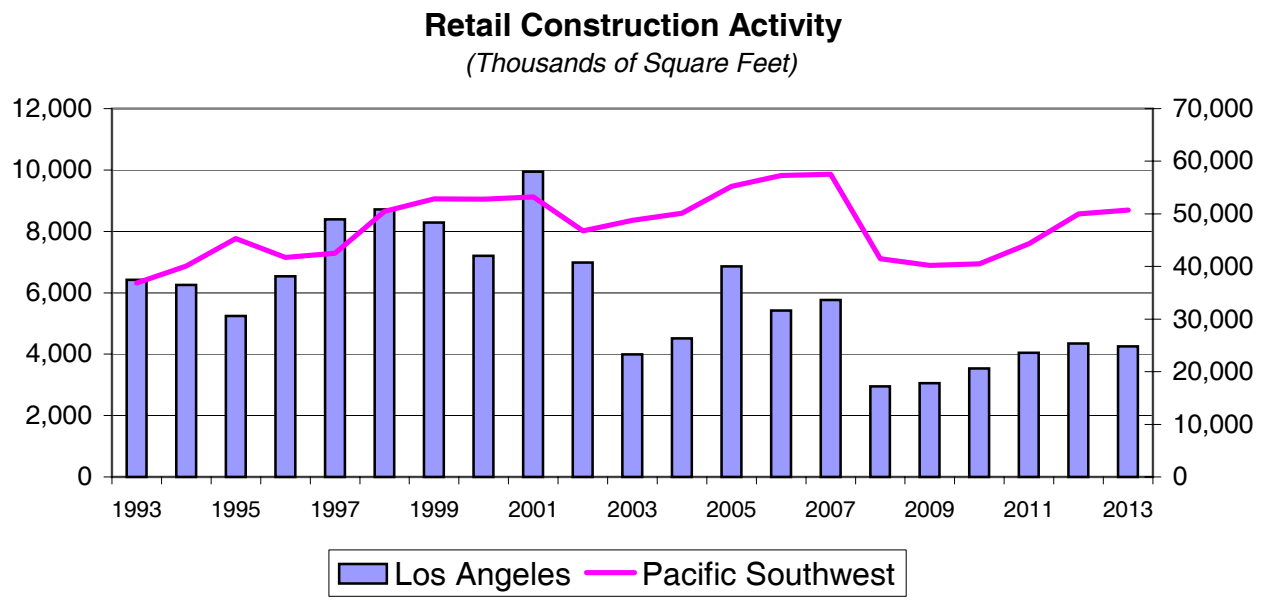
** Unemployment rate is average for period*

CONSTRUCTION SUMMARY

	History				*Forecast*					
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Nonres (000sf)	**35,381**	**42,267**	**44,649**	**34,715**	**29,890**	**33,593**	**35,745**	**37,260**	**39,528**	**39,303**
Retail	4,512	6,863	5,418	5,766	2,951	3,056	3,534	4,042	4,352	4,256
Warehouse	7,370	6,614	5,254	2,728	2,605	4,329	5,087	5,114	5,575	5,425
Office	3,887	5,721	6,463	3,959	2,965	2,448	2,878	3,188	3,674	3,595
Hotel	465	782	1,845	2,469	1,690	1,577	1,799	1,881	1,954	1,987
Education	4,617	3,436	4,977	4,169	5,767	5,985	5,541	5,192	5,366	5,559
Healthcare	2,694	2,092	2,222	1,569	1,212	1,276	1,288	1,416	1,525	1,492
Other Nonres	11,837	16,760	18,470	14,054	12,701	14,920	15,618	16,427	17,083	16,989
Residential (Units)	**29,815**	**31,372**	**31,059**	**21,131**	**12,862**	**15,187**	**17,108**	**20,824**	**23,316**	**22,248**
Single Family	14,701	15,381	11,595	8,175	4,233	4,913	6,042	8,480	9,634	9,197
Multifamily	15,114	15,991	19,464	12,956	8,629	10,274	11,065	12,344	13,682	13,051

Retail

Los Angeles

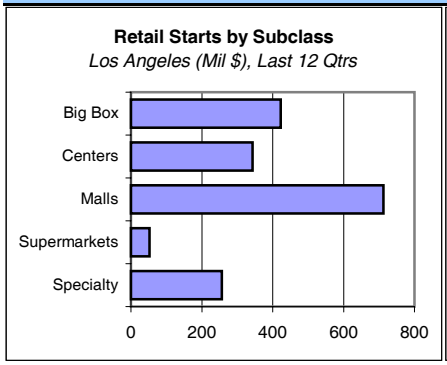


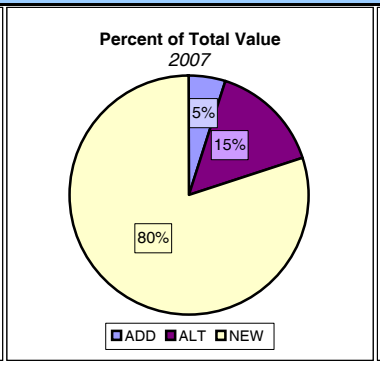
RETAIL CONSTRUCTION INDICATORS -- DODGE

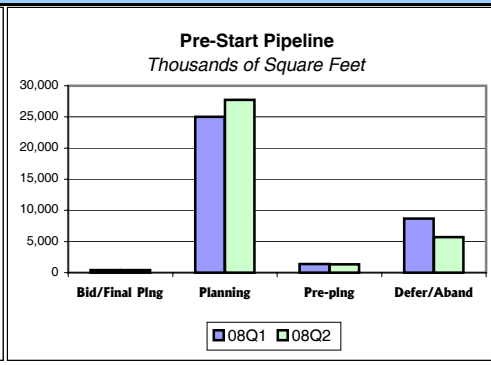
	History				Forecast					
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Starts (000 sf)	4,512	6,863	5,418	5,766	2,951	3,056	3,534	4,042	4,352	4,256
% Change	*13*	*52*	*-21*	*6*	*-49*	*4*	*16*	*14*	*8*	*-2*
Starts (Mil $)	409	746	612	726	542	538	605	686	734	736
% Change	*-13*	*83*	*-18*	*19*	*-25*	*-1*	*12*	*13*	*7*	*0*
Spending (Mil $)	465	532	643	641	573	555	567	637	701	754
% Change	*-16*	*15*	*21*	*0*	*-11*	*-3*	*2*	*12*	*10*	*8*
Completions (000 sf)	4,198	4,550	5,766	5,964	5,434	3,867	4,075	4,265	4,739	5,051
% Change	*-47*	*8*	*27*	*3*	*-9*	*-29*	*5*	*5*	*11*	*7*

Area figures include new construction and additions; Value includes new, additions, and alterations.

RETAIL CONSTRUCTION DETAILS

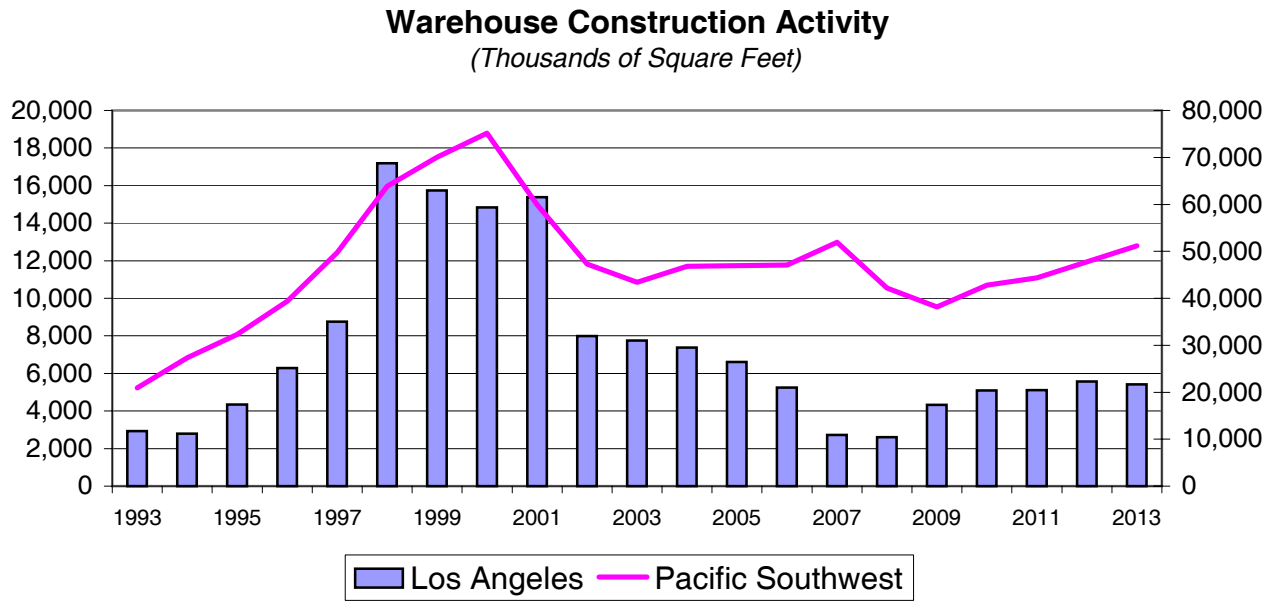






Warehouses

Los Angeles

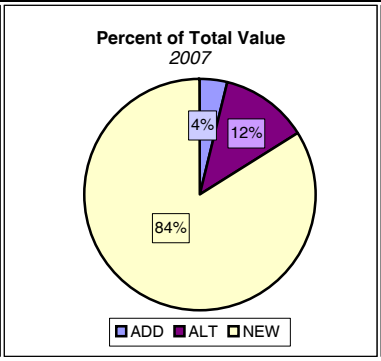


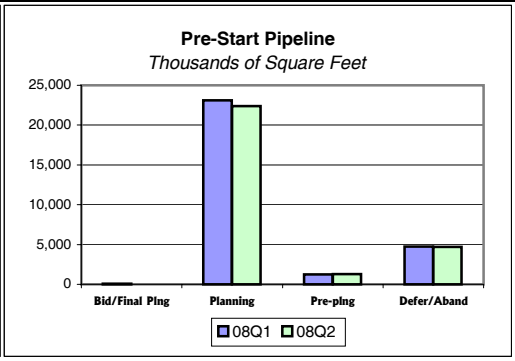
WAREHOUSE CONSTRUCTION INDICATORS -- DODGE

	History				Forecast					
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Starts (000 sf)	7,370	6,614	5,254	2,728	2,605	4,329	5,087	5,114	5,575	5,425
% Change	*-5*	*-10*	*-21*	*-48*	*-5*	*66*	*17*	*1*	*9*	*-3*
Starts (Mil $)	349	322	281	236	144	255	301	312	350	357
% Change	*5*	*-8*	*-13*	*-16*	*-39*	*76*	*18*	*4*	*12*	*2*
Spending (Mil $)	337	327	327	254	219	228	232	261	300	333
% Change	*-18*	*-3*	*0*	*-22*	*-14*	*4*	*2*	*13*	*15*	*11*
Completions (000 sf)	6,803	8,363	7,616	5,921	4,135	2,826	3,989	3,776	4,458	5,125
% Change	*-57*	*23*	*-9*	*-22*	*-30*	*-32*	*41*	*-5*	*18*	*15*

Area figures include new construction and additions; Value includes new, additions, and alterations.

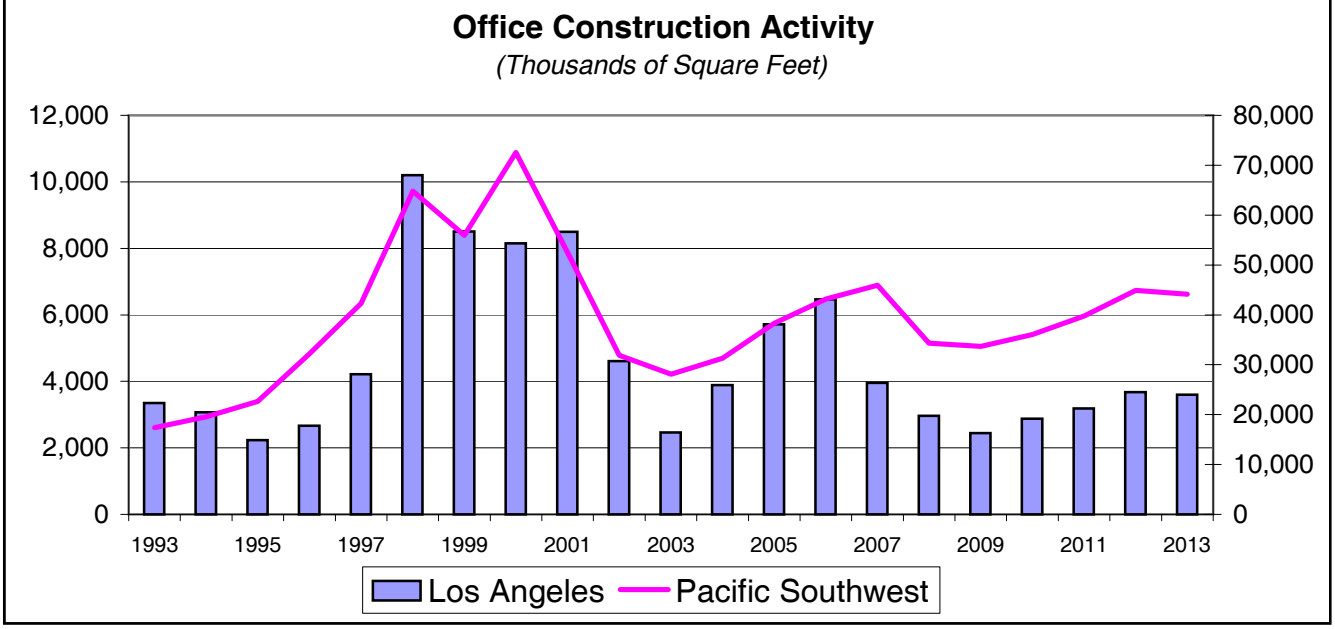
WAREHOUSE CONSTRUCTION DETAILS





Offices

Los Angeles

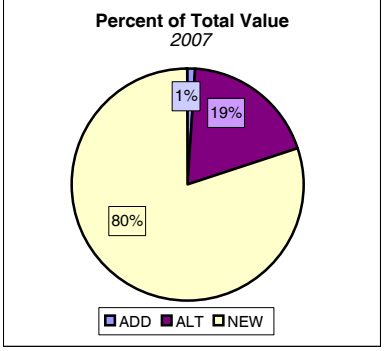


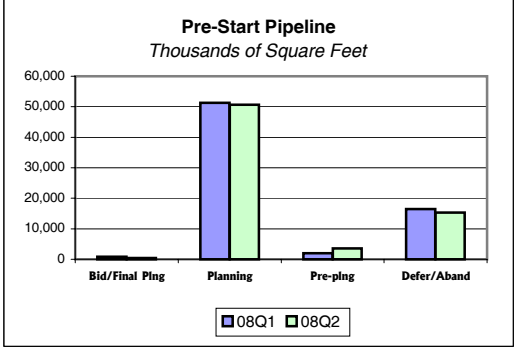
OFFICE CONSTRUCTION INDICATORS -- DODGE

	History				Forecast					
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Starts (000 sf)	3,887	5,721	6,463	3,959	2,965	2,448	2,878	3,188	3,674	3,595
% Change	*58*	*47*	*13*	*-39*	*-25*	*-17*	*18*	*11*	*15*	*-2*
Starts (Mil $)	663	831	1,082	719	477	450	579	658	745	767
% Change	*78*	*25*	*30*	*-34*	*-34*	*-6*	*29*	*14*	*13*	*3*
Spending (Mil $)	490	602	987	852	685	645	709	844	972	1,069
% Change	*-18*	*23*	*64*	*-14*	*-20*	*-6*	*10*	*19*	*15*	*10*
Completions (000 sf)	4,959	2,819	3,922	6,107	5,441	3,702	3,239	3,565	4,147	4,709
% Change	*-13*	*-43*	*39*	*56*	*-11*	*-32*	*-13*	*10*	*16*	*14*

Area figures include new construction and additions; Value includes new, additions, and alterations.

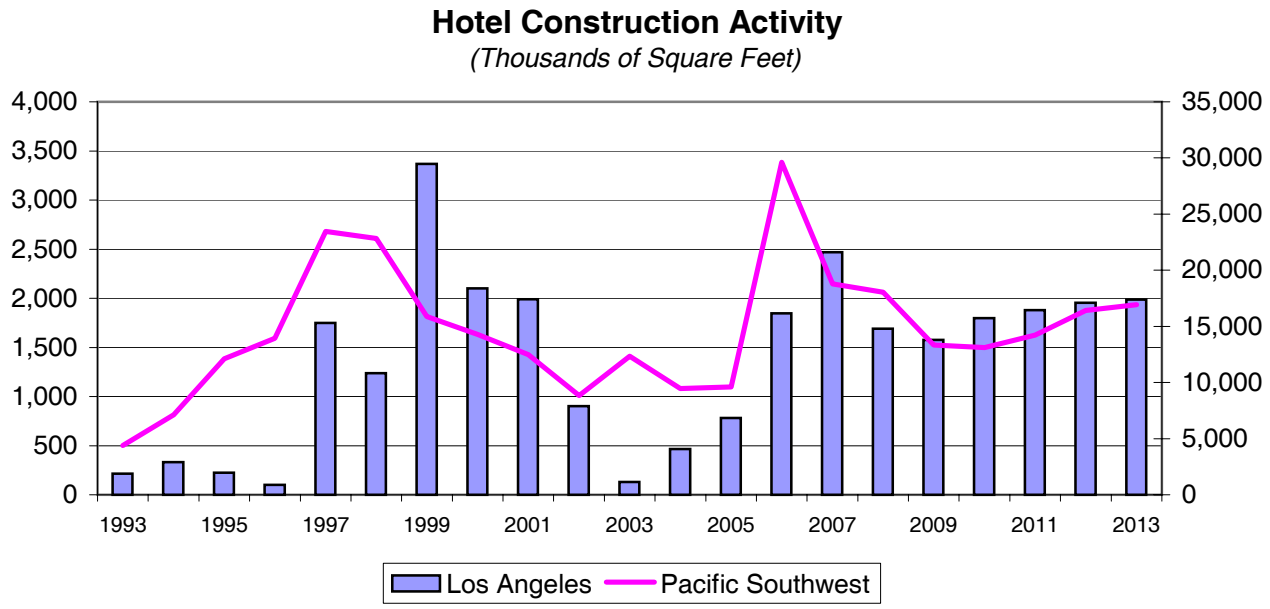
OFFICE CONSTRUCTION DETAILS





Hotels

Los Angeles

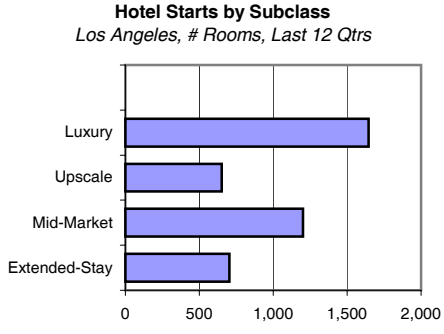


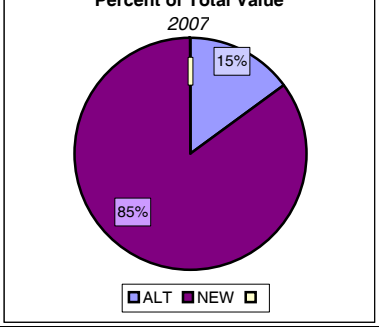
HOTEL CONSTRUCTION INDICATORS -- DODGE

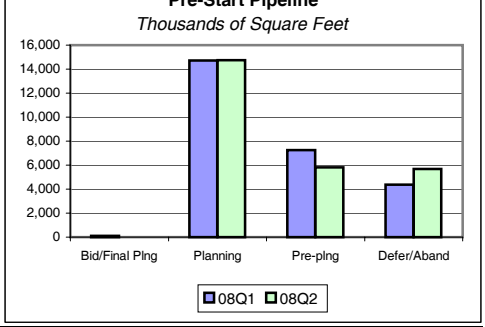
	History				Forecast					
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Starts (000 sf)	465	782	1,845	2,469	1,690	1,577	1,799	1,881	1,954	1,987
% Change	*259*	*68*	*136*	*34*	*-32*	*-7*	*14*	*5*	*4*	*2*
Starts (Mil $)	198	197	397	768	291	325	392	445	471	493
% Change	*1098*	*0*	*101*	*93*	*-62*	*12*	*21*	*13*	*6*	*4*
Spending (Mil $)	60	165	247	475	553	479	463	490	505	527
% Change	*-28*	*175*	*49*	*93*	*16*	*-13*	*-3*	*6*	*3*	*4*
Completions (000 sf)	246	259	988	938	1,957	2,292	1,736	1,694	1,628	1,683
% Change	*-82*	*5*	*282*	*-5*	*109*	*17*	*-24*	*-2*	*-4*	*3*

Area figures include new construction and additions; Value includes new, additions, and alterations.

HOTEL CONSTRUCTION DETAILS

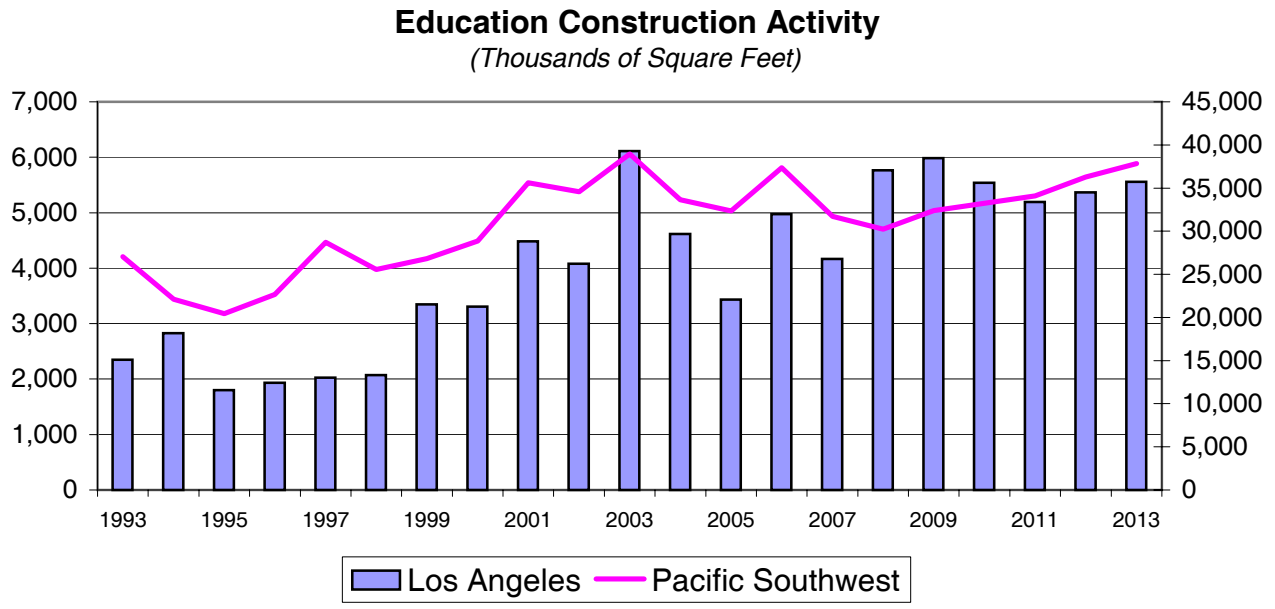






Education

Los Angeles

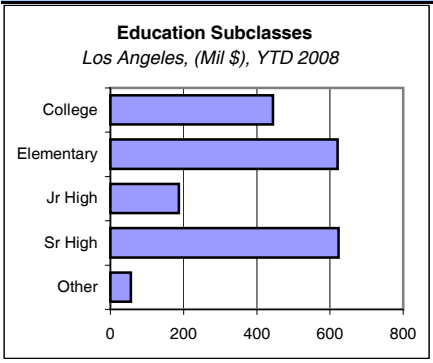


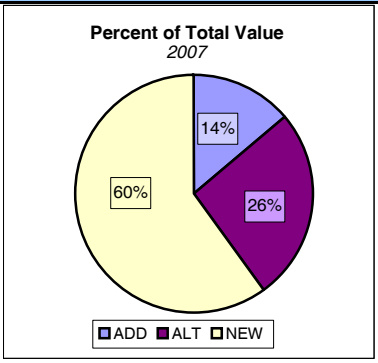
EDUCATION CONSTRUCTION INDICATORS -- DODGE

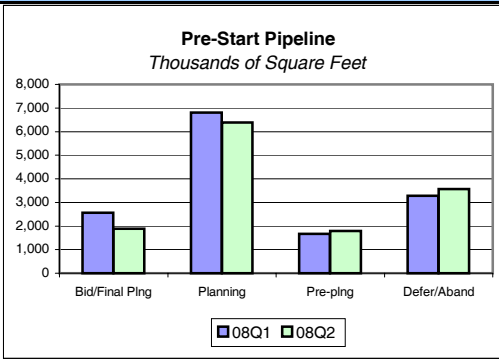
	History				Forecast					
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Starts (000 sf)	4,617	3,436	4,977	4,169	5,767	5,985	5,541	5,192	5,366	5,559
% Change	*-24*	*-26*	*45*	*-16*	*38*	*4*	*-7*	*-6*	*3*	*4*
Starts (Mil $)	2,169	1,244	2,001	1,901	2,513	2,461	2,451	2,439	2,593	2,765
% Change	*15*	*-43*	*61*	*-5*	*32*	*-2*	*0*	*0*	*6*	*7*
Spending (Mil $)	2,008	1,719	1,545	1,755	2,081	2,250	2,251	2,332	2,546	2,782
% Change	*49*	*-14*	*-10*	*14*	*19*	*8*	*0*	*4*	*9*	*9*
Completions (000 sf)	4,759	5,924	3,700	3,934	4,794	4,731	4,665	4,455	4,577	4,854
% Change	*8*	*24*	*-38*	*6*	*22*	*-1*	*-1*	*-4*	*3*	*6*

Area figures include new construction and additions; Value includes new, additions, and alterations.

EDUCATION CONSTRUCTION DETAILS

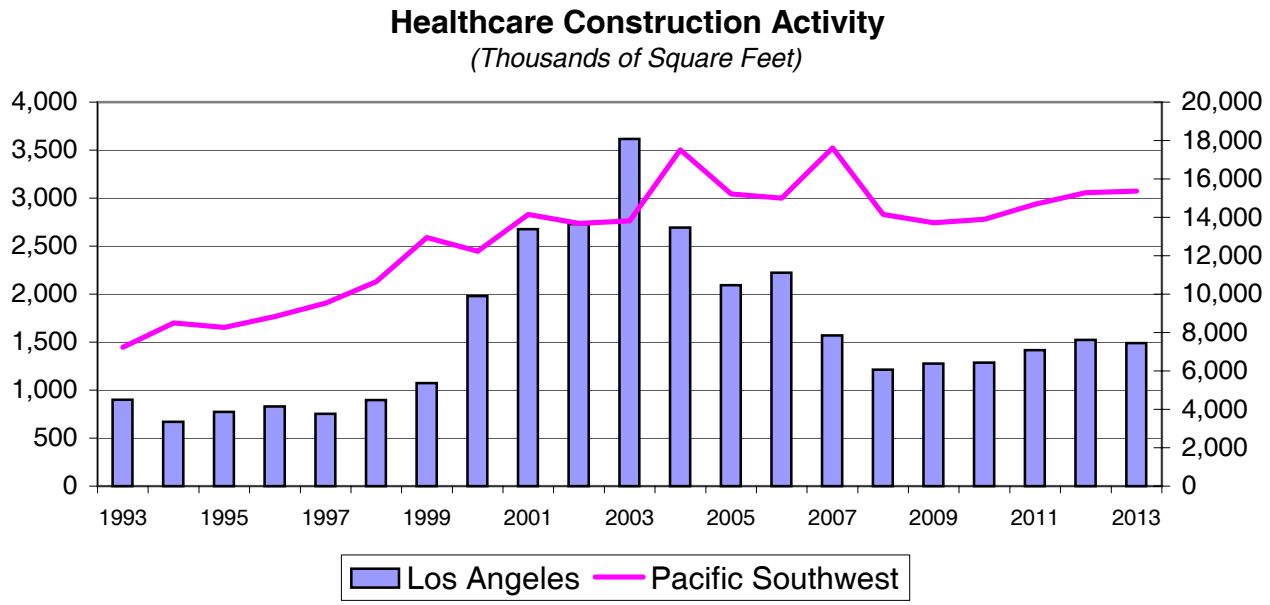






Healthcare

Los Angeles

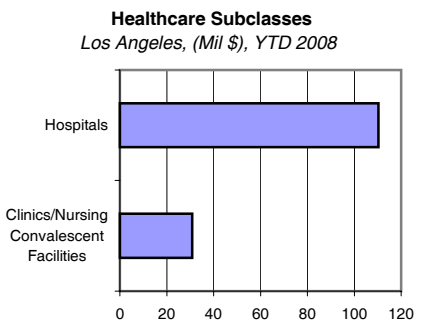


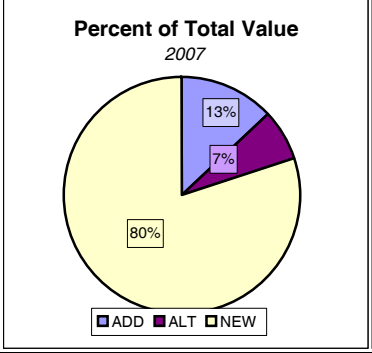
HEALTHCARE CONSTRUCTION INDICATORS -- DODGE

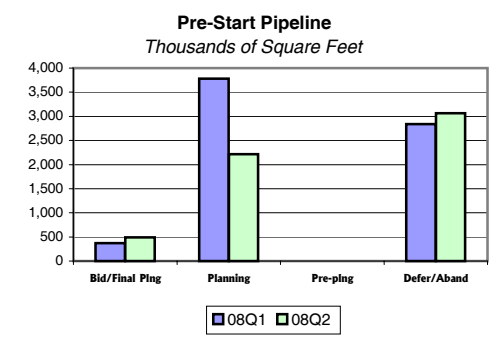
	History				Forecast					
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Starts (000 sf)	2,694	2,092	2,222	1,569	1,212	1,276	1,288	1,416	1,525	1,492
% Change	*-26*	*-22*	*6*	*-29*	*-23*	*5*	*1*	*10*	*8*	*-2*
Starts (Mil $)	619	805	601	388	362	422	439	496	552	565
% Change	*-24*	*30*	*-25*	*-35*	*-7*	*17*	*4*	*13*	*11*	*2*
Spending (Mil $)	667	611	716	616	458	381	411	478	557	636
% Change	*15*	*-8*	*17*	*-14*	*-26*	*-17*	*8*	*16*	*17*	*14*
Completions (000 sf)	3,064	2,646	2,391	2,157	2,945	2,020	1,089	1,460	1,552	1,699
% Change	*32*	*-14*	*-10*	*-10*	*37*	*-31*	*-46*	*34*	*6*	*9*

Area figures include new construction and additions; Value includes new, additions, and alterations.

HEALTHCARE CONSTRUCTION DETAILS

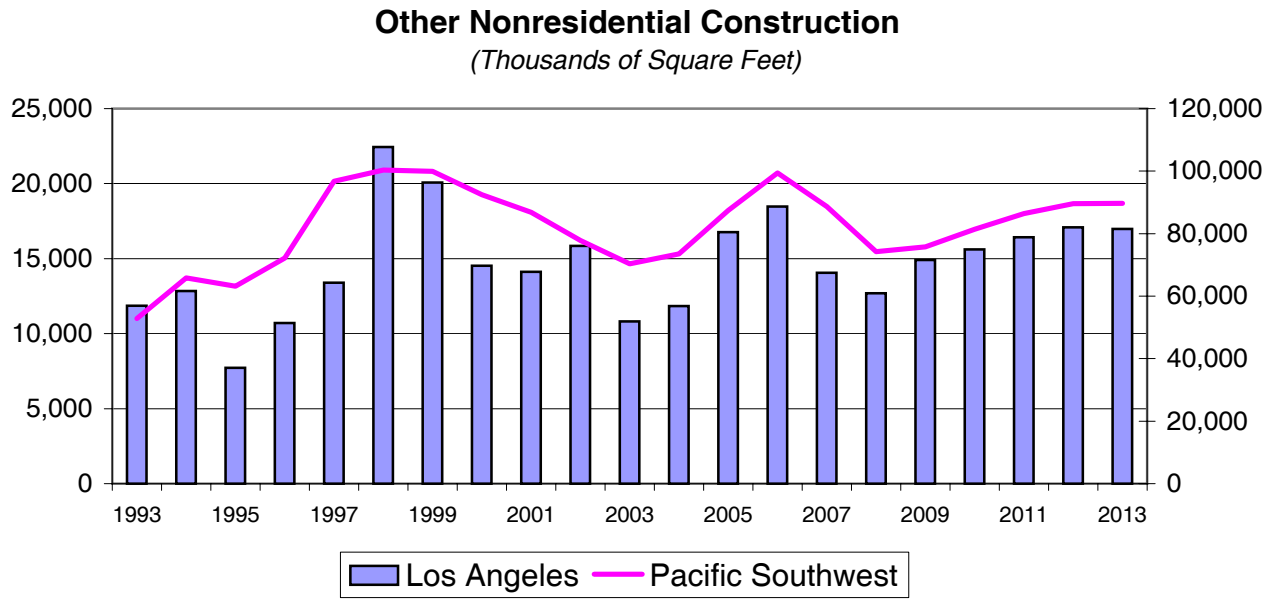






Other Nonresidential

Los Angeles

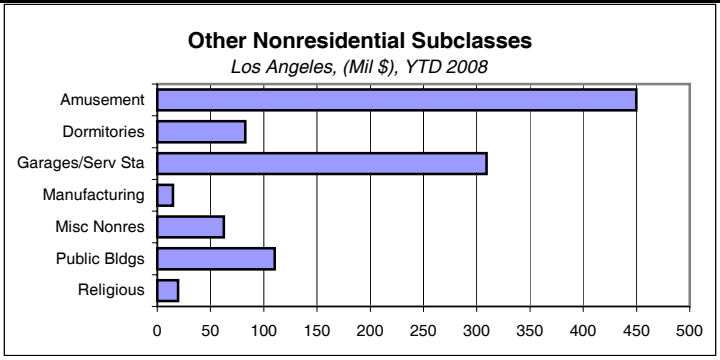


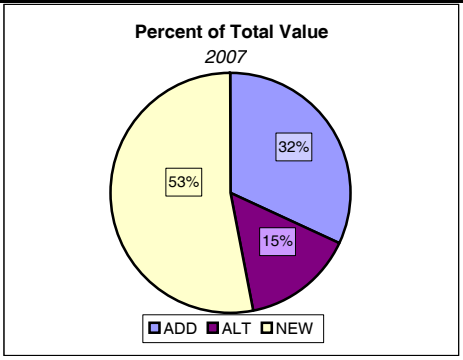
OTHER NONRESIDENTIAL CONSTRUCTION INDICATORS -- DODGE

	History				Forecast					
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Starts (000 sf)	11,837	16,760	18,470	14,054	12,701	14,920	15,618	16,427	17,083	16,989
% Change	*9*	*42*	*10*	*-24*	*-10*	*17*	*5*	*5*	*4*	*-1*
Starts (Mil $)	1,056	1,607	1,947	2,374	2,167	2,387	2,599	2,734	2,851	2,946
% Change	*-5*	*52*	*21*	*22*	*-9*	*10*	*9*	*5*	*4*	*3*
Spending (Mil $)	1,130	1,287	1,558	2,012	2,062	2,020	2,036	2,148	2,268	2,351
% Change	*4*	*14*	*21*	*29*	*3*	*-2*	*1*	*5*	*6*	*4*
Completions (000 sf)	11,661	12,725	14,488	17,622	14,726	12,126	11,745	12,173	13,337	14,209
% Change	*-28*	*9*	*14*	*22*	*-16*	*-18*	*-3*	*4*	*10*	*7*

Area figures include new construction and additions; Value includes new, additions, and alterations.

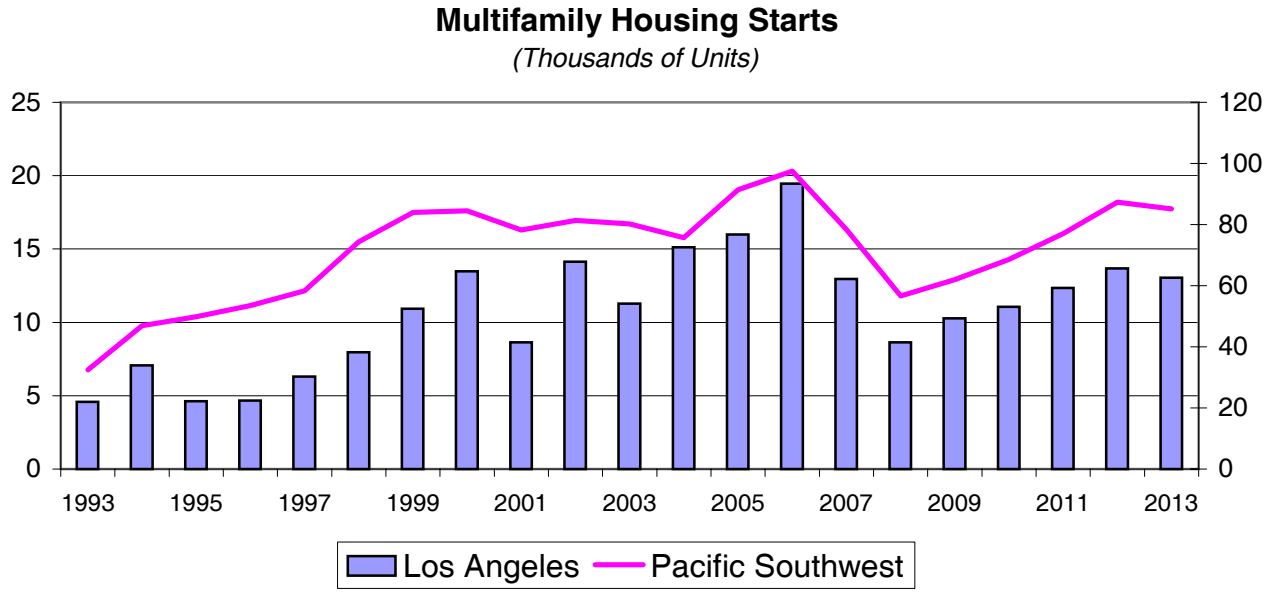
OTHER NONRESIDENTIAL CONSTRUCTION DETAILS





Multifamily Housing

Los Angeles

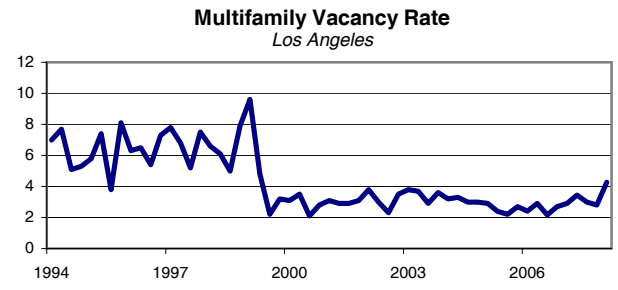


MULTIFAMILY CONSTRUCTION INDICATORS -- DODGE

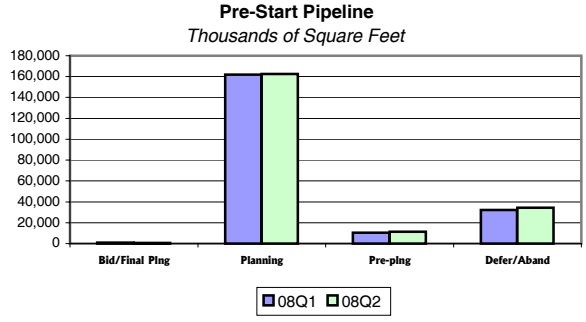
	History				Forecast					
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Starts (Units)	15,114	15,991	19,464	12,956	8,629	10,274	11,065	12,344	13,682	13,051
% Change	*34*	*6*	*22*	*-33*	*-33*	*19*	*8*	*12*	*11*	*-5*
Starts (Mil $)	1,688	2,217	3,229	2,666	1,823	2,341	2,594	2,976	3,392	3,349
% Change	*36*	*31*	*46*	*-17*	*-32*	*28*	*11*	*15*	*14*	*-1*
Spending (Mil $)	1,371	1,751	2,425	2,831	2,459	2,168	2,187	2,433	2,728	2,898
% Change	*12*	*28*	*39*	*17*	*-13*	*-12*	*1*	*11*	*12*	*6*
Compltns (Units)	12,036	11,701	15,622	16,863	17,000	14,128	9,297	10,902	12,125	13,737
% Change	*6*	*-3*	*34*	*8*	*1*	*-17*	*-34*	*17*	*11*	*13*

Area figures include new construction and additions; Value includes new, additions, and alterations.

MULTIFAMILY CONSTRUCTION DETAILS

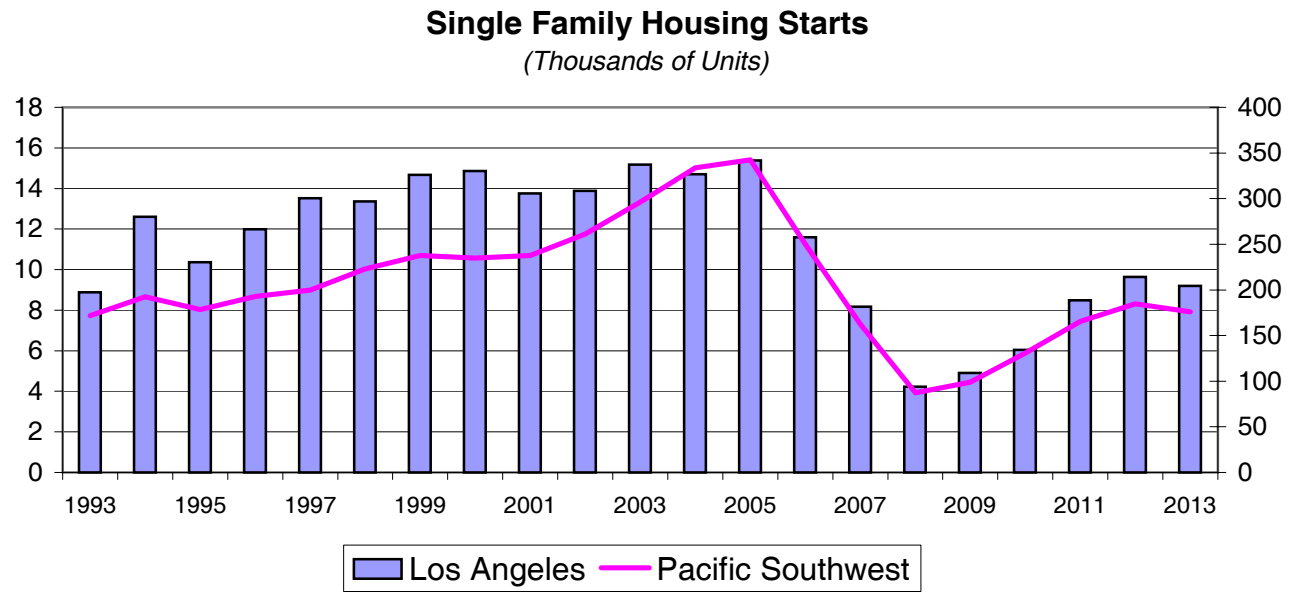


Source: Torto Wheaton Research



Single Family Housing

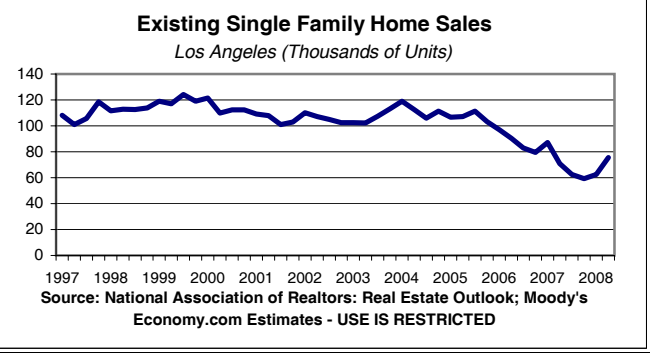
Los Angeles

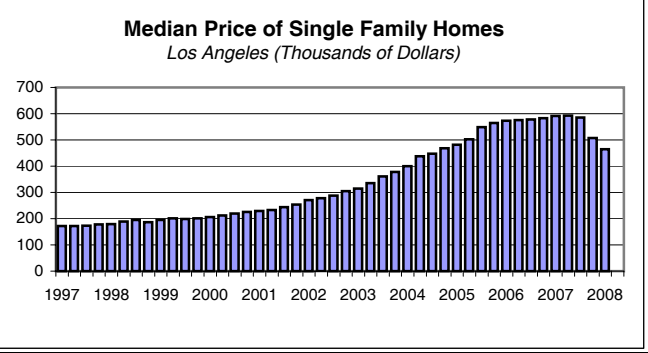


SINGLE FAMILY CONSTRUCTION INDICATORS -- DODGE

	History				Forecast					
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Starts (Units)	14,701	15,381	11,595	8,175	4,233	4,913	6,042	8,480	9,634	9,197
% Change	*-3*	*5*	*-25*	*-29*	*-48*	*16*	*23*	*40*	*14*	*-5*
Starts (000 sf)	34,959	36,576	27,573	19,440	10,681	12,756	15,179	20,169	21,947	21,217
% Change	*-3*	*5*	*-25*	*-29*	*-45*	*19*	*19*	*33*	*9*	*-3*
Starts (Mil $)	4,066	4,090	3,382	2,538	1,383	1,596	2,012	2,899	3,377	3,322
% Change	*8*	*1*	*-17*	*-25*	*-46*	*15*	*26*	*44*	*16*	*-2*
Compltns (Units)	15,123	15,211	13,289	8,700	5,075	5,397	6,799	8,320	9,612	9,709
% Change	*1*	*1*	*-13*	*-35*	*-42*	*6*	*26*	*22*	*16*	*1*

SINGLE FAMILY DRIVERS





Recent Starts
Los Angeles

Value Mil $	Area (000s)	Project Title/Address	Description	
100	0	The Santa Monica Place LOS ANGELES, CA	Started: 05/2008 Primary Structure Group:	Type: Alteration Retail
94	562	University Gateway Mixed-Use Residntl Cntr LOS ANGELES, CA	Started: 07/2008 Primary Structure Group:	Type: New Multifamily
85	155	Valley Region High School #5 LOS ANGELES, CA	Started: 07/2008 Primary Structure Group:	Type: New Education
65	100	ELAC Performing and Fine Arts Center LOS ANGELES, CA	Started: 05/2008 Primary Structure Group:	Type: New Other Nonres
59	111	Central Regional Middle School #7 LOS ANGELES, CA	Started: 07/2008 Primary Structure Group:	Type: New Education
55	298	Police HQ Facility Parking/Motor Trnsprt Div LOS ANGELES, CA	Started: 05/2008 Primary Structure Group:	Type: New Other Nonres
54	98	South Region Middle School #6 LOS ANGELES, CA	Started: 05/2008 Primary Structure Group:	Type: New Education
54	96	WLAC Gnrl Classroom & Student Serv Bldgs LOS ANGELES, CA	Started: 05/2008 Primary Structure Group:	Type: New Education
52	220	Residential Suites Phase II LOS ANGELES, CA	Started: 07/2008 Primary Structure Group:	Type: New Other Nonres
50	280	Long Beach Airport Parking Structure LOS ANGELES, CA	Started: 07/2008 Primary Structure Group:	Type: New Other Nonres
50	78	Valley Region High School #4 LOS ANGELES, CA	Started: 07/2008 Primary Structure Group:	Type: New Education
44	65	South Region ES #2 LOS ANGELES, CA	Started: 06/2008 Primary Structure Group:	Type: New Education
41	53	South Region ES #3 and Early EC #1 LOS ANGELES, CA	Started: 06/2008 Primary Structure Group:	Type: New Education
39	109	Sepulveda Blvd Condos/Parking Garage LOS ANGELES, CA	Started: 06/2008 Primary Structure Group:	Type: New Multifamily

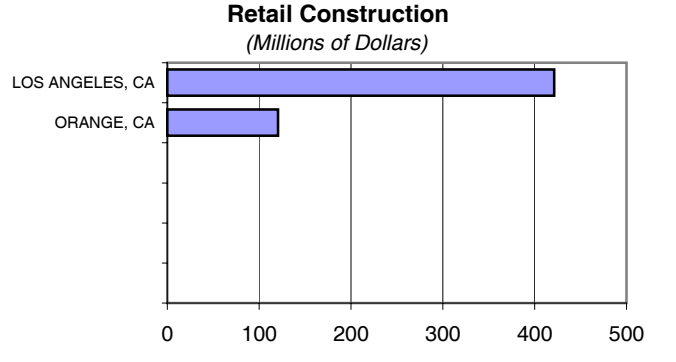
Nearing Start
Los Angeles

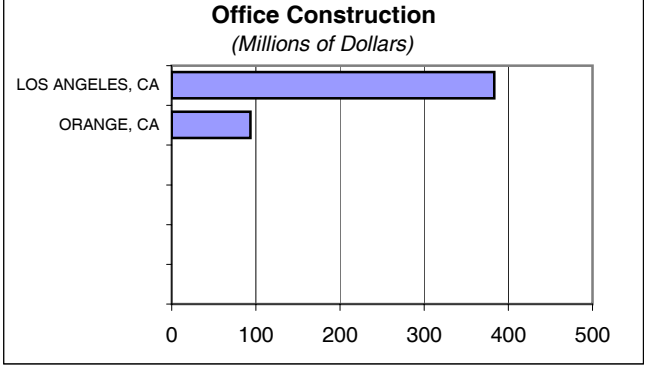
Value Mil $	Area (000s)	Project Title/Address	Description	
900	1,262	The Experience at Gene Autry Way Mxd-Use ORANGE, CA	Stage: Planning Primary Structure Group:	Type: New Multifamily
550	1,954	Grand Avenue Mandarin Htl/Condo/Apt/Rtl LOS ANGELES, CA	Stage: Planning Primary Structure Group:	Type: New Multifamily
400	800	The Olympic and The City House Towers LOS ANGELES, CA	Stage: Planning Primary Structure Group:	Type: New Multifamily
375		Northwest Campus Housing Project LOS ANGELES, CA	Stage: Planning Primary Structure Group:	Type: New Multifamily
330	82	Carlyle on Wilshire Condos/Rtl/Pkg Garage LOS ANGELES, CA	Stage: Planning Primary Structure Group:	Type: New Multifamily
300	10,346	9900 Wilshire Condos/Retail/Restaurants LOS ANGELES, CA	Stage: Planning Primary Structure Group:	Type: New Multifamily
300	836	Brookhurst Triangle Mixed-Use ORANGE, CA	Stage: Planning Primary Structure Group:	Type: New Multifamily
300	880	One Broadway Plaza and Parking Garage ORANGE, CA	Stage: Planning Primary Structure Group:	Type: New Office
250	490	Natural History Museum Restoration LOS ANGELES, CA	Stage: Planning Primary Structure Group:	Type: New Education
180	367	Fremont Avenue Condos/Parking Garage LOS ANGELES, CA	Stage: Planning Primary Structure Group:	Type: New Multifamily
160		Harbor-UCLA Med Ctr Surgery/Emergency LOS ANGELES, CA	Stage: Planning Primary Structure Group:	Type: New Healthcare
130	665	Paseo Plaza Mixed-Use LOS ANGELES, CA	Stage: Planning Primary Structure Group:	Type: New Multifamily
125	617	Hollywood Park Retail LOS ANGELES, CA	Stage: Planning Primary Structure Group:	Type: New Retail
125	209	South Region High School #4 LOS ANGELES, CA	Stage: Bidding Primary Structure Group:	Type: New Education

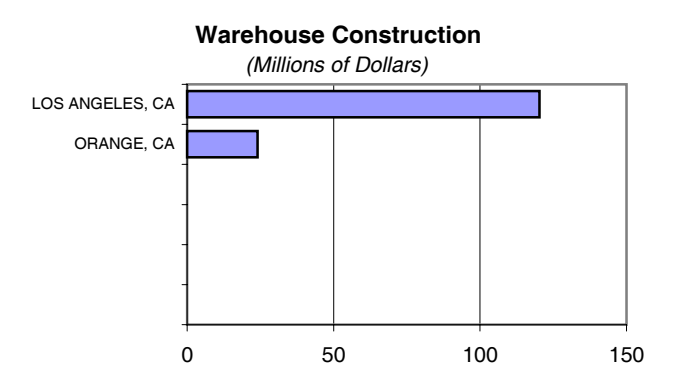
Deferred/Abandoned
Los Angeles

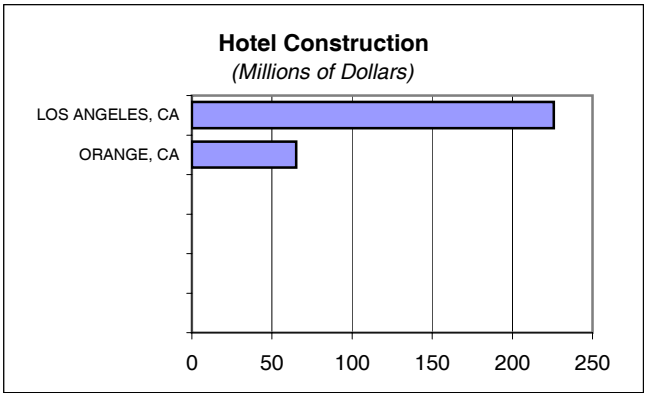
Value Mil $	Area (000s)	Project Title/Address	Description	
333	1,000	Federal Courthouse LOS ANGELES, CA	Stage: Deferred Primary Structure Group:	Type: New Other Nonres
300	750	Medical Complex LOS ANGELES, CA	Stage: Deferred Primary Structure Group:	Type: New Healthcare
245		Rio Hondo College Capital Improvements LOS ANGELES, CA	Stage: Abandoned Primary Structure Group:	Type: New Education
225	1,700	Marquis at Park Place II High Rise Condos ORANGE, CA	Stage: Deferred Primary Structure Group:	Type: New Multifamily
201		Fire Facilities Bond Program LOS ANGELES, CA	Stage: Abandoned Primary Structure Group:	Type: New Other Nonres
200		Los Angeles County Museum of Art LOS ANGELES, CA	Stage: Abandoned Primary Structure Group:	Type: New Education
175	37	Security Prog In-Line Baggage Screen Sys LOS ANGELES, CA	Stage: Abandoned Primary Structure Group:	Type: Addition Other Nonres
160	0	County Hall of Administration Repairs & Alts LOS ANGELES, CA	Stage: Deferred Primary Structure Group:	Type: Alteration Office
140		San Fernando Bus Rapid Transit Line/Stat LOS ANGELES, CA	Stage: Abandoned Primary Structure Group:	Type: New Other Nonres
127		Rancho Los Amigos Nat'l Rehab Cntr Bldg B LOS ANGELES, CA	Stage: Abandoned Primary Structure Group:	Type: New Healthcare
102	0	CHS South Tower Seismic Renov Phs A LOS ANGELES, CA	Stage: Deferred Primary Structure Group:	Type: Alteration Education

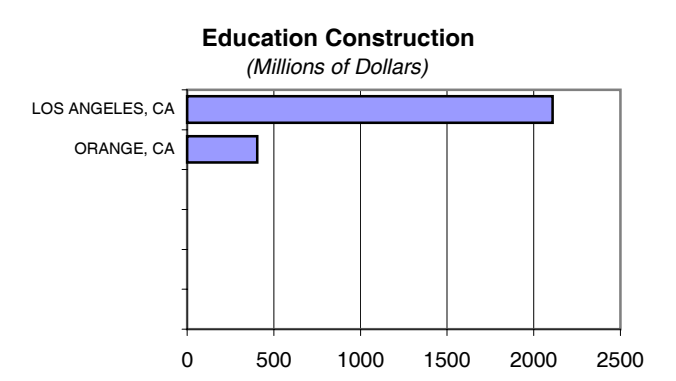
Los Angeles Counties: 2008 Forecast

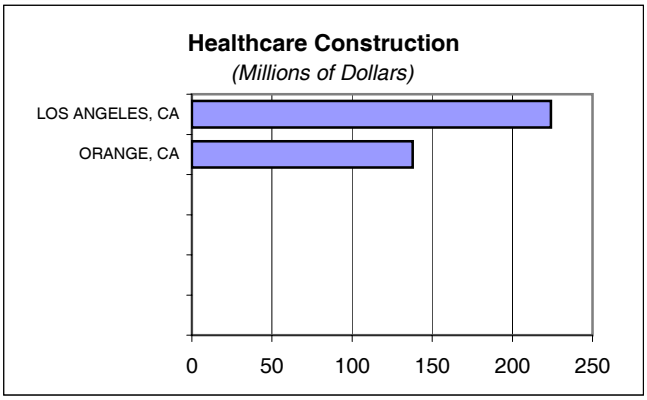


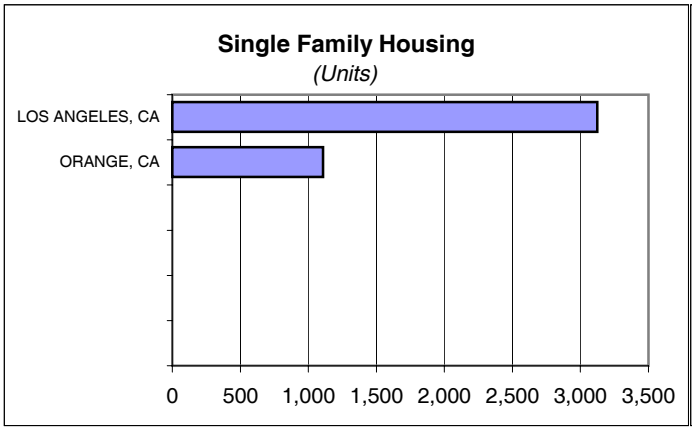


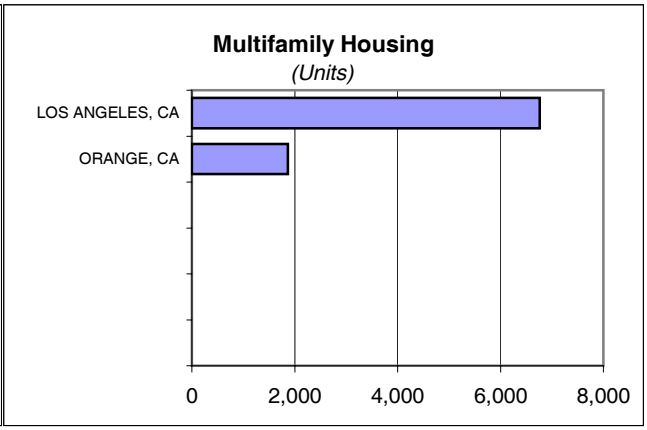












Los Angeles County
Long-term Forecast

UCLA Anderson Forecast
July 2008

Long-term Forecast of Los Angeles County

Prepared by

The UCLA Anderson Forecast
Anderson Graduate School of Management
University of California, Los Angeles

This forecast was prepared based upon assumptions reflecting the Forecast's judgement as of the date it bears. Actual results could vary materially from the forecast. Neither the UCLA Anderson Forecast nor the Regents of the University of California shall be held responsible as a consequence of any such variance. Unless approved by the UCLA Anderson Forecast, the publication or distribution of this forecast and the preparation, publication or distribution of any excerpts from this forecast are prohibited.

Los Angeles Report, 2nd Quarter 2008
Retrospective, Short and Long Term Forecast

Jerry Nickelsburg
Economist

Akinori Tomohara
Economist

Patricia Nomura
Demographer

UCLA Anderson Forecast

Summary

We have been talking about sluggish growth in the Los Angeles economy for some time. Like the "engine that could," the L.A. economy has been steadily pulling against the drag of the housing and the home mortgage finance turndown. As such, it has provided much of the employment and income growth California experienced over the past four quarters. Our review of the 2nd quarter is no longer about continued sluggish growth in L.A. and L.A. (along with the Bay Area) driving California growth. It is a about a gloomier no growth trifecta. The engine took a break from growth this quarter. First, there were virtually no net jobs created in Los Angeles in the quarter. Second, unemployment shot up during the quarter as a result of an expanding labor force and no job creation. To the extent that there were layoffs, the small amount of job creation in the services sector and the recovery from the writer's strike offset them. And filling out the trifecta, L.A. consumers were faced with skyrocketing prices for gasoline at the pump and for all things related to corn. The highlights of the first half of the year are the slowing of growth in L.A., the expected ¼ % reduction in growth rates due to the WGA strike, the fall off in import traffic through the ports, and the continued drag created by the mortgage finance and residential construction industries. This weakness in the L.A. economy is a bit of a surprise as we expected export growth from L.A. to be stronger than it turned out to be. Our expectation with regard to these developments is that all of these factors are mid-cycle adjustments and therefore, are temporary. Nevertheless, the forecast for 2009 is weaker than the forecast published in the last L.A. Report as the U.S. economy is taking longer than expected to turn the corner and specific L.A. factors are augmenting the weakness more general economic slowing.

The spectacular collapse of IndyMac, the possibility of another strike in the entertainment industry, and the ILWU labor negotiations with the Pacific Maritime Association all lead to some nervousness about how the finance and trade sectors might add to the weak real estate and residential construction sectors and push Los Angeles into negative employment and income growth later in the year. But this is all a little tricky. The WGA strike and the threatened SAG strike changed the pattern of employment in motion picture production and television and sound recording from its normal seasonal pattern. When we sterilize the data for the labor actions, which to be sure are related to economic activity but are not derivative of the underlying strength or weakness of the broader L.A. economy, we find that payroll employment increased slightly in the 2nd quarter. This is not true about total employment though. The prevalence of 1099 real estate and mortgage brokers in the finance industry, of self employed single proprietors in the construction trades, and self-employed independent contractors in film production resulted in an adjusted net loss of about 10,000 jobs. The principal source of the weakness remains housing and housing related activity, but the problem was that the rest of L.A.'s diversified economy failed to take up the slack. Still, the underlying fundamentals of the L.A. economy remain unchanged. We are watching this closely to see if a trend extending into subsequent quarters begins to emerge. If we are right about the U.S. and California economies, L.A. ought to rebound from the 2nd quarter hiatus and resume employment growth in the 3rd quarter.

On the income front we do not expect to see any decline in real personal income for the year. As we explored in a previous L.A. Report, personal income in Los Angeles behaves much like U.S. GDP. U.S. income grew in both the 1st and 2nd quarter and consequently, we expect that to be reflected in the local income numbers when they become available. This expectation is bolstered by the observation that historically we need a substantial decline in local employment to generate a decline in overall income. A stagnant employment picture would not be sufficient. Moreover, the major studios reported decent first quarter earnings in spite of the WGA strike so downward pressure on L.A. personal income from profits in the entertainment industry did not appear.

Though employment seems to be okay, albeit barely, the unemployment the picture is a bit more gloomy. Unemployment will continue to be high through the year though growth in the service sectors is expected to make marginal improvements as we move through the next two quarters. We are now at rates of unemployment hovering around 6.5% on a quarterly basis. This gets people thinking about the "R word," but the other components of a contraction in L.A. economic activity are not apparent. As the L.A. economy begins to grow again in 2009, the unemployment rate should inch down. In part, the reason for the stickiness in unemployment in L.A. is that the unemployed from construction and non-durable goods manufacturing have to either retrain for other kinds of employment or wait the slowdown out.

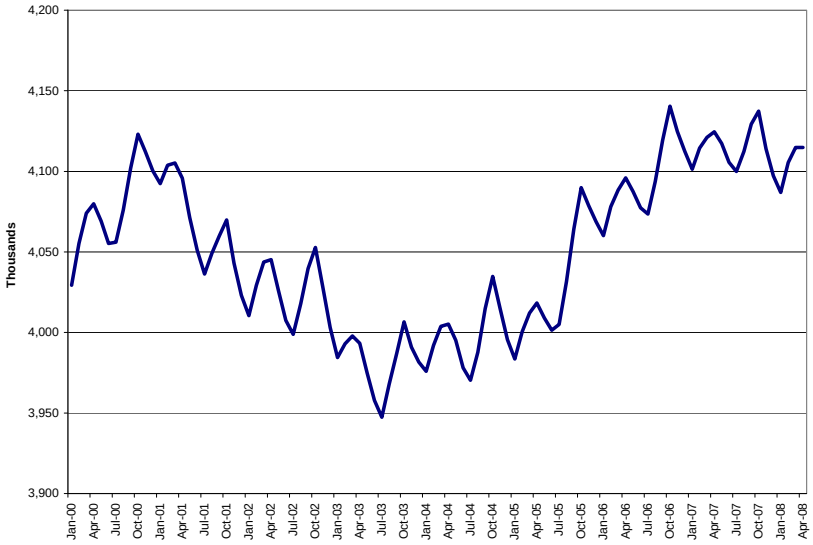
Consumer prices spiked in the 2nd quarter of the year as the price of gasoline skyrocketed. We do not expect this trend to continue and a moderation of inflation to 2% should occur in the coming year.

So, lots of bad news, but none seem to have the legs to carry into the forecast more than another quarter or two. This near term weakness negatively affects the base from which the long term growth begins and therefore the long term forecast. In this Los Angeles Quarterly Update we will look at these sources of nervousness, and the reasons to be cautiously optimistic about the near future, and discuss the revised Long Term Forecast. The overall near term forecast is slightly weaker but not much different than last quarter—weakness through 2008, the beginning of a recovery at the end of 2009 and return to normal growth in 2010.

Sectoral Employment

L.A.'s unemployment rate continued to increase during the quarter recording a level of 7.1% in June and an average of 6.5% for the quarter. This is partly due to a decrease in self-employment jobs, which on a month to month basis are highly variable. Though non-farm payroll employment added 56,000 jobs over the last six months – most of which came earlier in the year – the number of self-employment jobs declined by nearly double that amount. The preliminary evidence on the benchmark revision suggests that L.A. payroll employment did a bit better than the current figures suggest and we are looking for an upward revision for the first half of 2008 when the benchmarks come out. Nevertheless, the growth of the labor market probably did not keep up with the growth of the labor force and we expect the increase in the unemployment rate to show up in the benchmark revisions.

Non-Farm Employment, Los Angeles (3 Month Moving Average)



Unemployment Rate, Los Angeles (3 Month Moving Average)

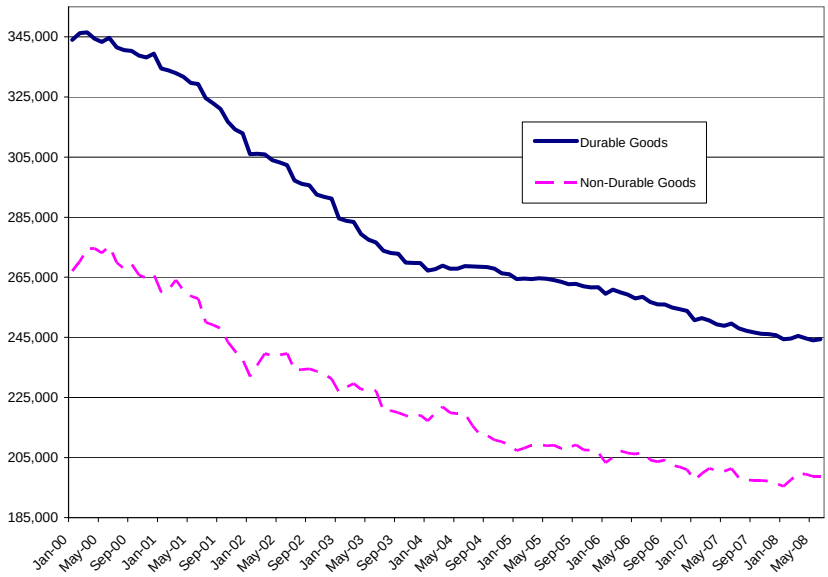
We begin to dissect this with a look at the details of employment by sector. Total non-farm employment declined 23,500 jobs from last June. Educational and health services, which remain an important engine of L.A. employment growth, added 14,100 or more than half of jobs. However, other sectors such as manufacturing, construction, financial activities, trade, transportation, and utilities, and information (specifically, motion picture and sound recording) lost 46,200 jobs. One third of the job loss was in the construction and durable goods sectors while the balance was widespread across other sectors. Despite the few good sectors, most sectors of the L.A. economy were stagnant to negative on a year over year basis.

Manufacturing employment showed a slight increase in the 2nd quarter compared to the 1st quarter. While employment in the durable goods sector decreased a bit, the increase in the non-durable goods sector more than offset the decline in the durable goods sector. Among the durable goods sub-sectors, furniture and related products account for most of the decreased durable goods employment this quarter. Our previous expectation was that export demand would moderate this trend in durable goods manufacturing employment more than it did, but that did not materialize in the 2nd quarter. The furniture and related product sector is a structurally declining industry as it is a lower skilled, labor intensive manufacturing activity. A decline in this sector has been observed for the last eight years and it has been further exacerbated by the reduction in the construction of new and remodeled housing.

On the other hand, the apparel industry led the employment increase in the non-durable goods sector. Apparel industry employment increased by more than 4,000 payroll employees over the last six months. This does not mean a robust revival of the industry to its former levels as it is merely a recovery from a large drop in cut and sew apparel employment the 3rd and 4th quarters of last year. The current level of 57,000 payroll employees is lower than 59,000 payroll employees of a year ago and 60,000 payroll employees of two years ago. Nevertheless, the Los

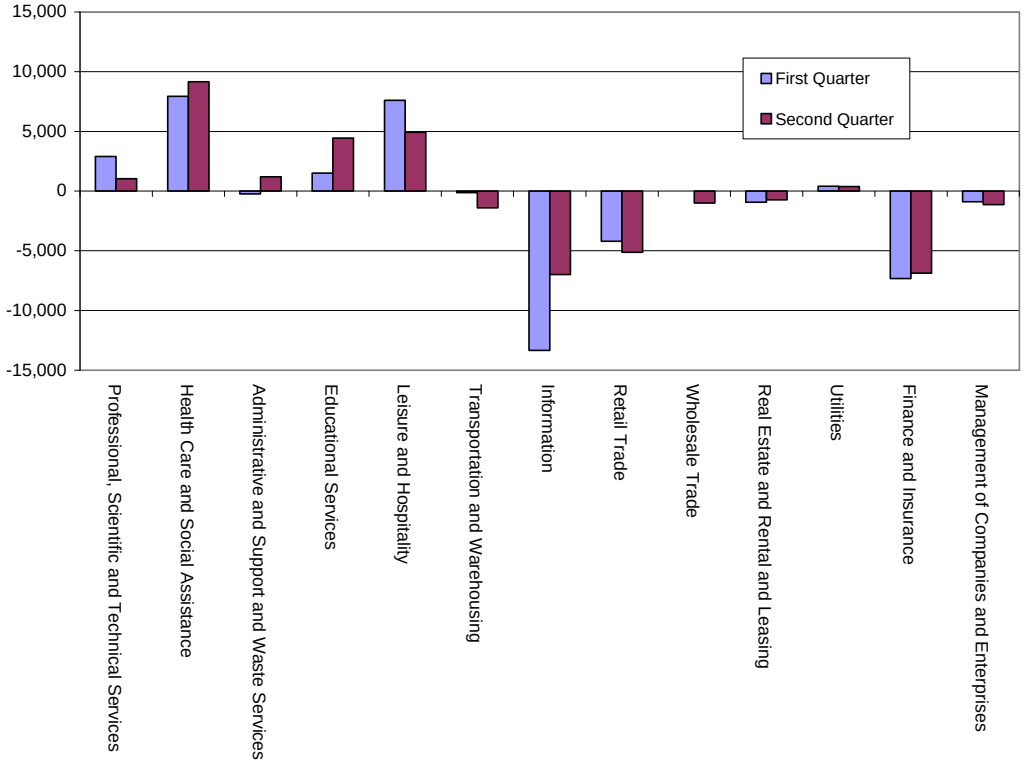
Angeles Apparel Industry continues to show strength not seen in other parts of the country as "flash fashion," "the California Casual fashion," and Hollywood keep demand high for firms which can provide a rapid turnaround of the latest trends in apparel.

Employment in Manufacturing, Los Angeles



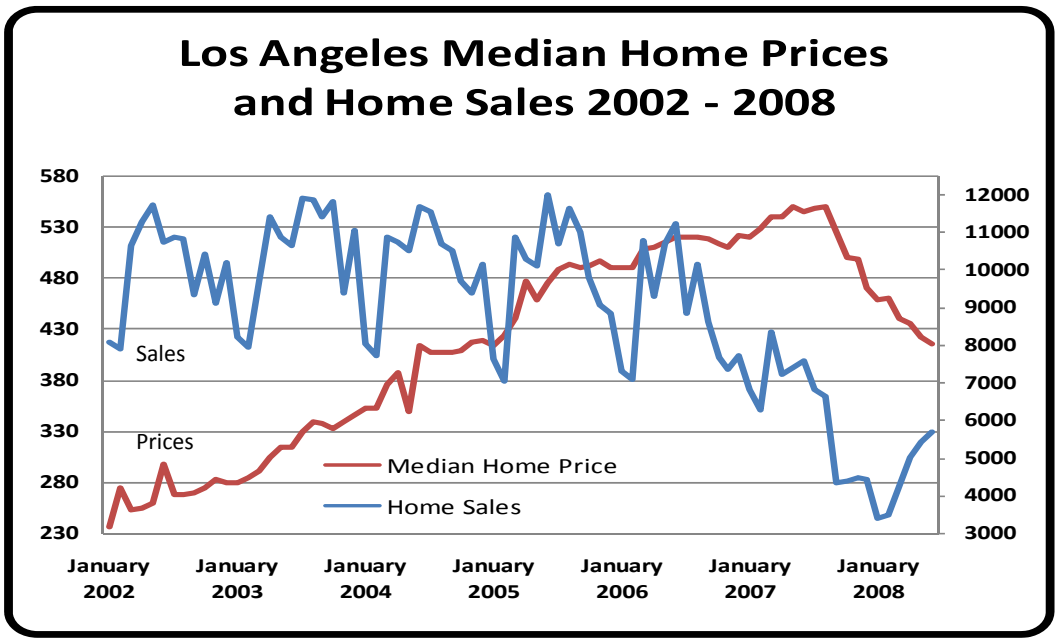
Employment in the service sectors showed a slight improvement in the 2nd quarter. Gains in the leisure and hospitality, information, and health care and social assistance sectors offset the contraction in finance, and retail trade sectors. Finance is clearly a home mortgage finance and real estate derived decline. The demise of IndyMac Bank portends more of the same in the future as this industry adjusts to the new, lower volume transactions of the post bubble housing market. Orange County, being more dependent upon this industry for economic growth than L.A., will fare much worse in the balance of the year. The decline in retail trade employment may be associated with the pull back of consumers in fitting out remodeled or new homes, or it could be related to a structural change in retail services as the internet forces off-line establishments to seek new ways to deliver products at competitive costs. The jury is still out on this and will not come back in until a more normal housing market returns to Los Angeles.

Growth in Service Sector Jobs, Los Angeles (YoY, Q1 & Q2 2008)



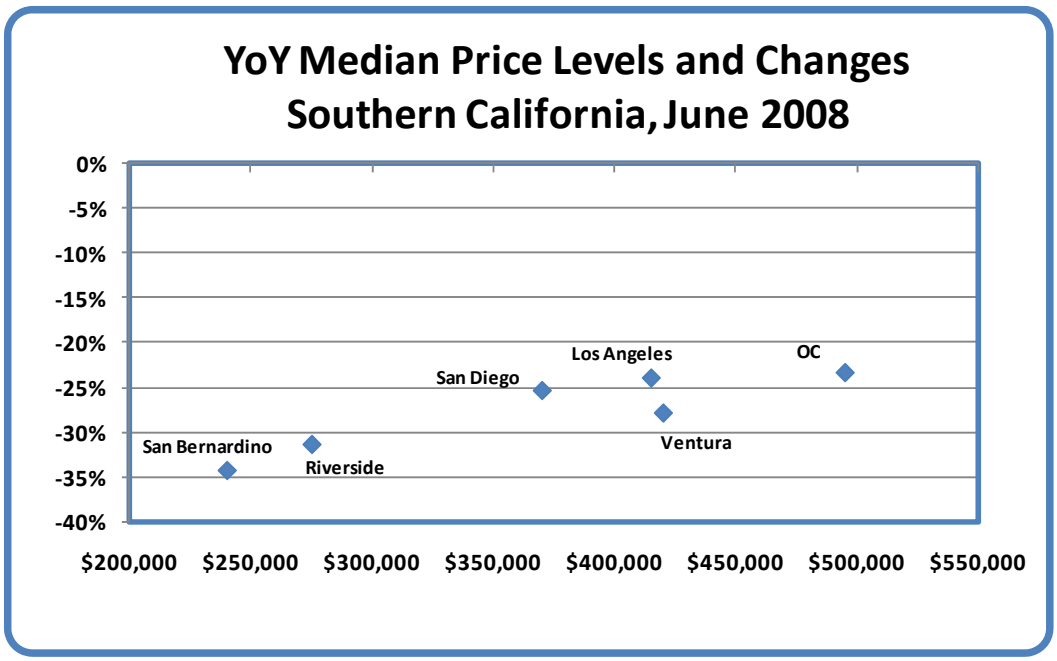
The Same Housing Story: Down, Down, Down

The decline in housing prices in Los Angeles continues unabated. However, we are finally seeing indications that the downslide is coming to an end. If that happens, it would be good news for L.A. economic growth as the bottom in home prices is the first step towards the recovery of residential construction activity. The sequence is; prices falling to such an extent that new buyers are induced to come into the market, home sales firm up and buyers show a willingness to purchase the inventory overhang at the new, lower prices, and finally, builders begin to build or remodel houses to fit the new price reality. If the first part of this is behind us by the end of the year, 2009 will see some very moderate hiring in real estate and residential construction.

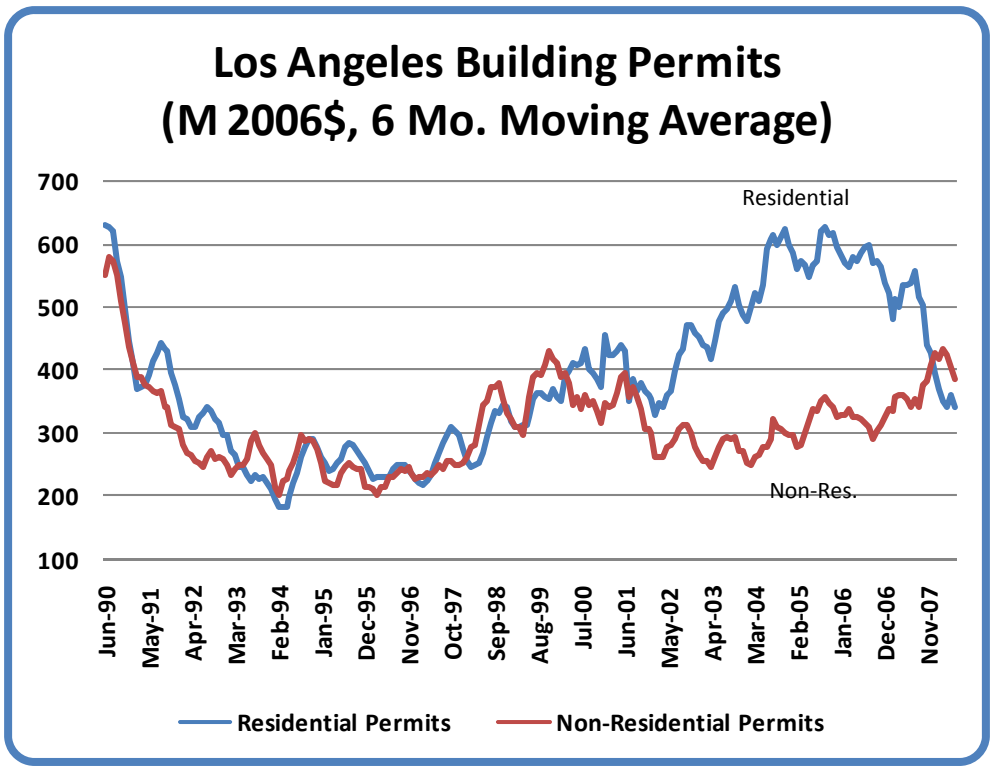


Looking at the first of the elements required to end the housing downturn we find that since the middle of 2007 home prices have been falling in L.A. The total price decline over the last 4 quarters is just about 25% based on the median home prices reported by DataQuick. Other measures of home prices show similar declines. The Case-Shiller L.A. Index fell -27.5% since the peak in 2006 (inclusive of Orange County), and the OFHEO index, which typically shows more modest gains and losses and includes re-financings, fell -8.4% from Q1 2007 to Q1 2008. No matter how it is measured, the drop in home prices in L.A. has been dramatic and unlike our experience in past real estate cycles. This does not mean that the market is perforce worse than the past as some pundits would have you believe, only that it is adjusting faster than before. A combination of the information age – people have access to better data on the market values – and the rash of bank owned property sales have sped the adjustment of this market since prices began their fall.

To understand this let's do an exercise. Home prices adjusted for inflation need to increase on average each year in order to induce homeowners and landlords to make the investment in residential structures. For California this is historically about 1.5% per year. Los Angeles with its limited land and desirable proximity to the Pacific Ocean tends to be at a slightly higher rate. Taking a 2% annual real appreciation rate and the inflation rate from 2002 through 2007 (3.5% as measured by the CPI) we find that June's median price of housing is about 11% higher than the underlying fundamentals. At the rate at which prices are falling, the market should be at the right price in November. But 2002 was the tail end of a recession. So if we use 2003 instead we find that the June median price is right at the level that the required long run appreciation would dictate. So, something on the order of 5% - 10% more in price declines is probably warranted before the market turns. That means that the end appears to be in sight.



Comparing L.A. to other local communities we find that L.A.'s price declines are in line with what would be expected. San Bernardino and Riverside were hit hard by the downturn in the housing market as they had a larger proportion of entry level buyers purchasing their homes with 100% sub-prime financing. As a consequence, a larger proportion of the 2008 sales in the Inland Empire are bank owned, builder owned or short sales and Inland Empire prices have fallen faster. In the more expensive coastal counties, prices have not fallen as fast on average, but then they did not run up as fast either. The neighborhoods with the most housing distress tend to be the lower cost neighborhoods in the inland part of these counties. The pressure on more expensive homes is less as these homeowners are more likely to have substantial equity to protect and be more resistant to reductions in price. This would make them less likely to default in the absence of job loss or other personal income issues. So, things seem right on track for a quick dose of pain and the beginnings of a recovery. But, the uneven impact of the price declines in Los Angeles portends an uneven recovery with prices achieving the new equilibrium levels in the more affluent neighborhoods later than in the balance of the county.

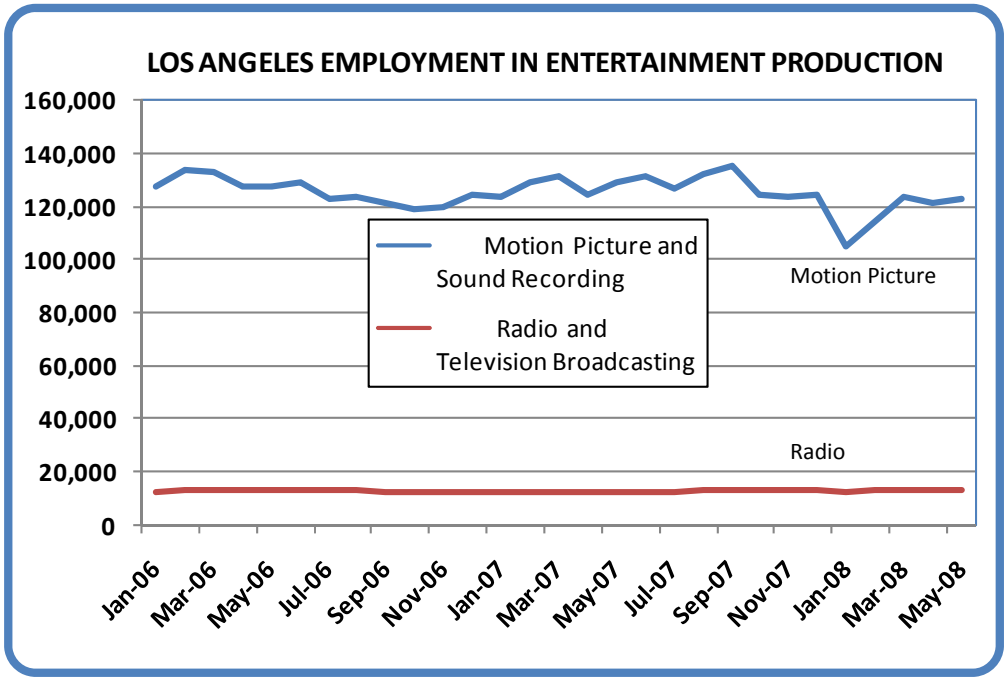


Now turning to residential construction, which more than real estate activity in existing homes, is a driver of economic activity, we see the same story as last quarter; building permits for new homes are down substantially, and they remain at levels reminiscent of the early 90's. What is different this time is the rapid fall in home prices discussed earlier. Also unlike the 90's, non-residential and public works construction have picked up in L.A. This serves to mitigate some of the decline in employment in residential construction. We have discussed the results of the Allen Matkins / UCLA Anderson Forecast Survey of Office Space in Los Angeles in other venues, so suffice it to say that the evidence from rental rates, vacancy rates and the Survey show that this market remains robust and is not poised to collapse. The labor employed in each of these two types of construction are not perfect substitutes for each other, nor does commercial and residential construction use the same amount of labor per dollar spent, so increases in non-residential and public works construction spending do not exactly offset decreases in residential spending. Residential construction is much more labor intensive than commercial construction. Consequently, we still expect to lose more jobs in the construction trades this year.

The Ports and Hollywood: A Tale of Three Strikes

January and February were the time of the writer's strike. In spite of the histrionics of some analysts and commentators, the sky did not fall and billions were not lost. We argued in a previous Los Angeles Report that economics tells us preparation and substitution would characterize the strike as all parties involved try to protect themselves from economic damage.

The proof, of course, is in the data, and the data speak clearly. There was a reduction in employment of 20,000 jobs in January after a build-up in September of 15,000 jobs in preparation for the strike. In February the industry was down about 15,000 jobs and by March it was back to normal. Ignoring the September employment surge, this translates into an annual job loss equivalent of no more than 2,900 jobs,. This job loss represents about $150M in lost wages. It was counterbalanced by increased employment in internet and cable programming, live entertainment, video game production, and income from the sale of reruns and increased production before and after the 100 day strike. The amount of loss is increased by the independent contractors and service workers who support the industry and who could not stockpile their work nor obtain alternative employment, however there is no evidence that this amounts to a multiple which is more than a fraction of the wage loss, and for expected short term interruptions of employment these multiples tend to be very close to zero. So there is no evidence of an impact above $250M much less ten times that amount. But having said that, we looked at other careful studies of strikes in entertainment as well as other industries going all the way back to Chamberlain's seminal study in the 1950's and find that our results of a very modest impact of the WGA strike are consistent with the impact of virtually all other similar labor actions.



So what about the potential upcoming actors labor/management negotiations? First we should consider the situation between SAG and the AMPTP. The producers have already settled with most of the unions in the industry including SAG's rival AFTRA. SAG is in a weaker negotiating position than the WGA at present and while this does not preclude a strike, it lowers the probability of one occurring. Moreover, not all production would stop were there were to be a

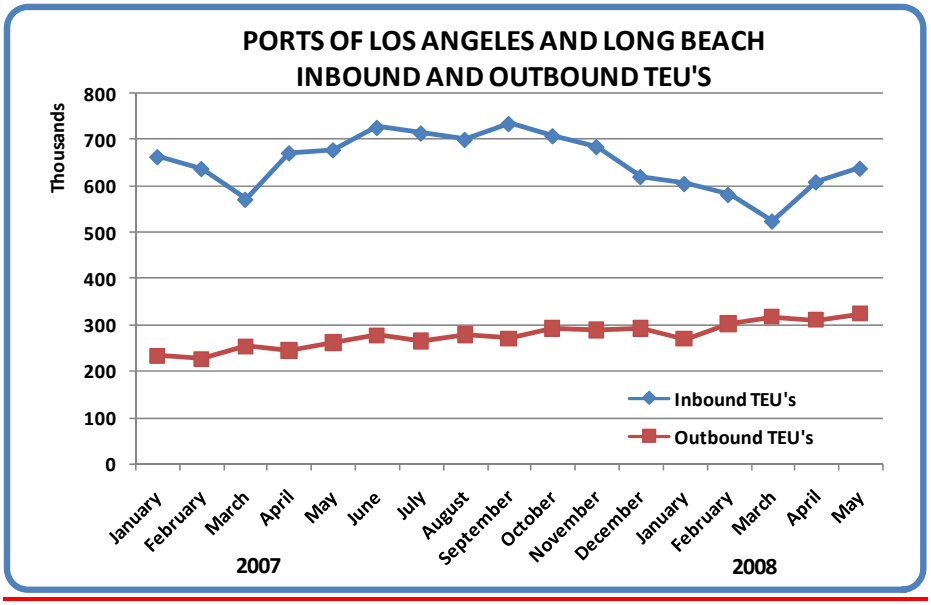
strike. AFTRA production and SAG production under specific waivers would continue. With this, the evidence from the WGA strike, and the evidence from economic studies of other strikes, we do not think the overall economic impact of a SAG strike or AMPTP lockout on the L.A. economy would be severe. However, a SAG strike or AMPTP lockout would hit this particular segment of the industry acutely. Back to back strikes will incentivize both consumers and producers of entertainment media into making use of alternatives; perhaps forever altering the constellation of entertainment choices available.

Superficially the threatened labor action at the ports seem to be a different case. The ILWU is negotiating with the Pacific Maritime Association over a new contract for all of the West Coast ports. As of the week of this report, it appears an agreement in principal has been reached between the ILWU and the PMA. Nevertheless, a protracted slowdown in protest of the contract or an outright rejection of the proposed contract could have an impact the local economy. Los Angeles and Long Beach represent 43% of all containers coming into the U.S. and are the largest ports in the U.S. Hueneme is a major port of entry for automobiles from Asia. With a strike there is very little contemporaneous substitution that can take place as the shipping must go through the Panama Canal to other smaller container ports on the East Coast and Gulf Coast. For high value items air cargo would present an alternative. There are three keys to understanding the impact of a potential port strike or other similar labor action. First, imported goods that are shipped by ocean going freighter typically are not very time sensitive. So a relatively short duration strike followed by increased flows to catch up would shift income from the time of the strike to a later time, but would not eliminate it. Second, exports of food products may be time sensitive but of a sufficiently low value to preclude air transport or surface transport to Gulf Ports for shipment to Asia. Third, there may be capacity constraints in the system which would prevent increased flows through the ports after a strike or lockout from occurring.

The ports of L.A. and L.B. are currently operating at less than capacity for imported goods. The sluggish growth of the U.S. economy and increased price of gasoline have depressed the market for the kinds of good that flow into the U.S. from the manufacturing powerhouses of Asia in containers. The number of TEU's, a standard container unit of measure for imports and exports, coming in through our ports is down this year by about 10%. Since the ports were not operating at capacity in 2007, this means that stepped up imports through additional shift work could pick up the slack from a short duration strike without a problem. Moreover, freight out of LAX is down 6.4% this year providing additional capacity in the event of a strike.

However, once the goods have arrived at the ports they have to get out to the distribution centers. The limitations of congestion, trucks and available warehouse space as well as protest actions by truckers to the Port Green Initiative could slow this process and diminish the economic benefit of sending some goods by sea to the U.S. We don't have a good fix on these capacity constraints, but will watch them in the event the current agreement does not end up as a firm contract.

Finally, what about exports? Aside from the wider issue of the impact of an extended strike on the ability of U.S. manufacturers to ship exports, there is the local issue of the impact on employment and income in L.A. Among the top exports through L.A.'s seaports are cotton and feed grains and scrap metal and paper. These are low value bulk items which require inexpensive transportation to be marketable in Asian markets. We should look for an acceleration of the export of these items if a strike appears to be more likely. Because unprocessed agricultural goods may be time sensitive, they may end up being sold in the U.S. market rather than shipped overseas if a closure of the ports precludes timely delivery to Asian markets. So once again, a strike will have an immediate impact, but most of the impact will be defrayed by substitution of activity to before and after the strike. The real economic pain of this or any other strike comes when one or both parties perceive that a continuation of the strike will result in too much cost, and then, to avert that, they settle. It is the threat of cost rather than actual cost that drives strikes to their conclusion.

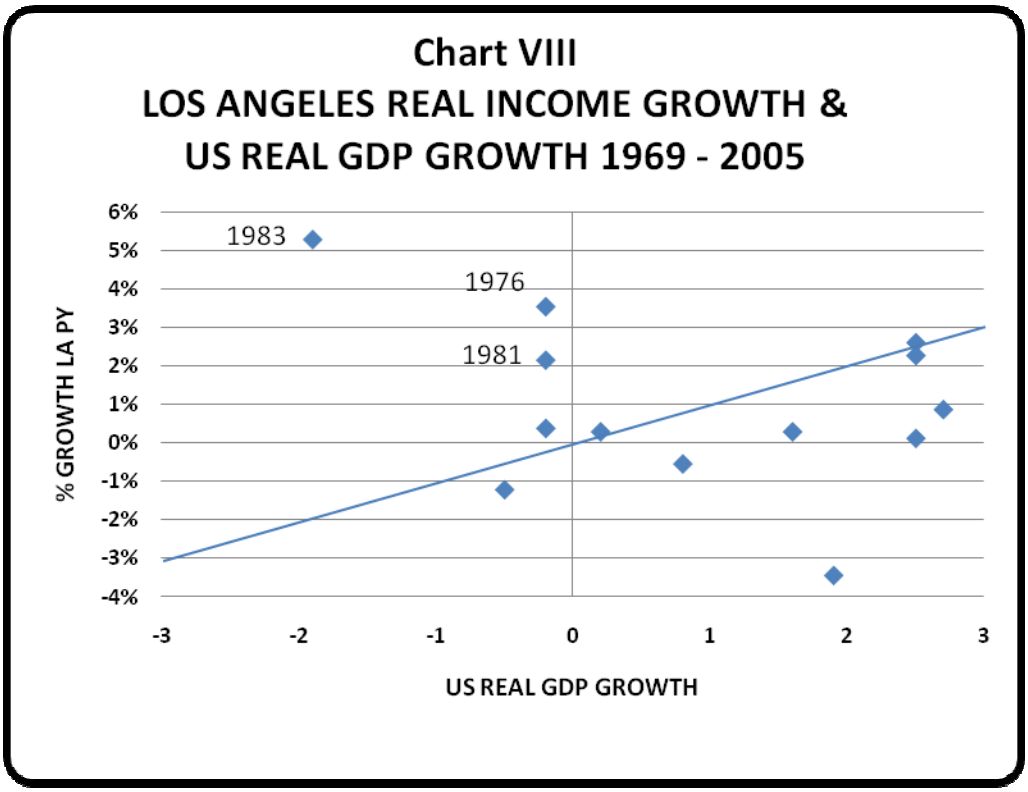


Near Term Los Angeles Forecast

Our short term forecast of personal income growth reflects the continued slowing of the U.S. economy. Real Personal Income will grow at an anemic rate of 0.2% during 2008, increasing to 2.5% in 2009 with a return to normal growth of around 3% after the end of 2009. This sub-normal performance is due almost entirely to the weak U.S. and local housing market. Inflation has been elevated to over 3% for 2008 due to the run up in petroleum and food, but is expected to moderate to about 2% for 2009 and thereafter. Taxable Sales for the county then will drop slightly by -0.2% this year rising to 1.6% and 4.8% in 2009 and 2010 respectively. What this does not reveal is that taxable sales are not going to grow at the same rate through each of the four quarters of the 2008/2009 Fiscal Year. In particular the end of 2008 and the

beginning of 2009 will see real taxable sales decline and this means that revenue collections in the latter part of the 2008/2009 fiscal year and to some extent into the next will be weak. Construction will shed nearly 6% of its jobs this year and finance about 3%. This combined with more sluggish U.S. growth should result in flat payroll job growth in 2008 and an uptick to 1.2% in 2009. Unemployment will remain high in 2009 as new job creation in the building trades and in alternatives for lower skilled manufacturing are not going to materialize rapidly.

When the U.S. economy is growing at less than long run potential, 3% per annum, Los Angles Real Personal Income almost always grows at an even slower rate. The slowdown in the growth of imports and substitution away from imports normally shipped in containers by consumers has had a negative impact on both Los Angeles and the Inland Empire. Unlike the Bay Area, L.A.'s logistics industry is more oriented toward the movement of imported goods and this slowdown in imports will be a drag on the Southern California economy. Additionally, the more diversified manufacturing base in L.A. has contended with two opposing forces, a downturn in demand for housing related manufactured goods and an uptick in demand for exported goods of machinery and computers. Overall, manufacturing shows some real weakness in L.A. and economic growth should be flat in the first half of the year.

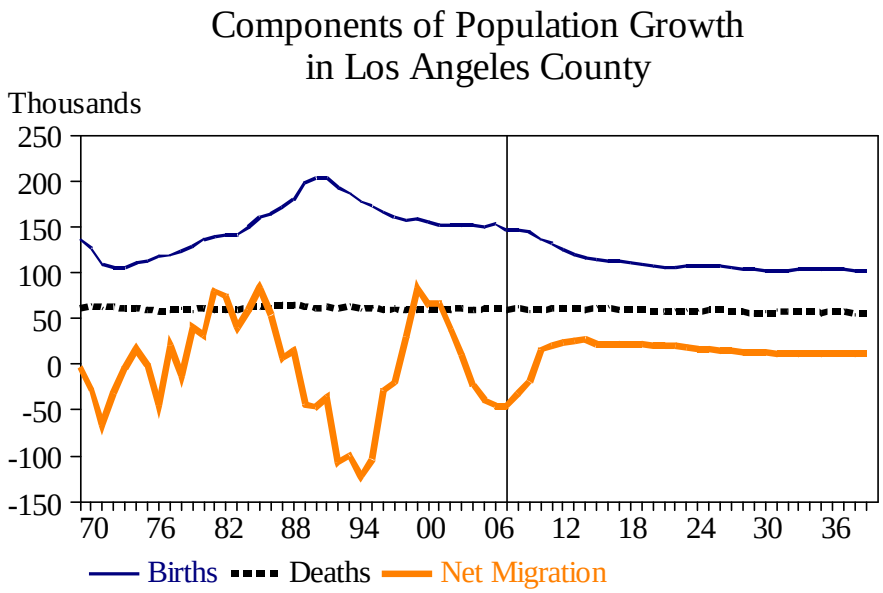


Long Term Los Angeles Forecast

Each July we update our long term Los Angeles Forecast. As the underlying factors affecting the very long term, 5 years out and more, change slowly, the annual revision ties current economic conditions, which can differ by quite a bit year to year, to the more stable long run fundamentals. The first element of the forecast is the underlying near term L.A. income growth. As discussed above, our forecast is for weak growth over the next two years with recovery to the long run growth rate in 2010. This will generate a slightly weaker long term forecast than last year. The second important fundamental is Long run U.S. GDP growth. This factor is not much changed from last year and therefore, it will not generate a change from last year's forecast. The other important underlying fundamental is demographics. Changes in the cost of housing, the size of families and the disposition of different cultures to labor force participation are important components of our forecast. In this section we will discuss the demographic factors in more depth.

Concurrent with the update of the Long Term Forecast is the UCLA Anderson Forecast update of the Los Angeles population forecast using the latest historical estimates from the Department of Finance's Demographic Research Center. According to the latest release (December 2007), Los Angeles County has grown more slowly than previously believed. The two principal components of population are (1) natural increase (births less deaths) and (2) net migration. We did an accurate job of forecasting natural increase, but overestimated the amount of net in-migration, thereby overestimating total population growth in the area by 103,000 in 2007. As a result, we have lowered our population forecast throughout the duration of the nearer-term to be in line with the more pessimistic forecast for the nation and slower growth in the overall outlook we envision for California and Los Angeles.

Results of the recent revisions show that natural increase remained virtually unchanged, leaving all the downward change in total population stemming from the other category, net migration. Total population in 2007 is down 103,000 from what UCLA forecast a year ago. However, 94,000 of the 103,000 discrepancy is on a count of the downward revision of population for 2006.

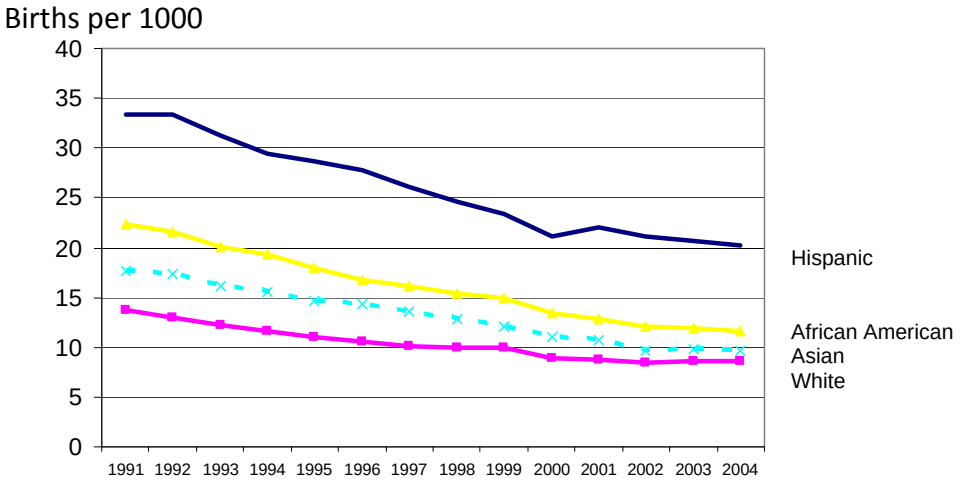


Historically, foreign migration in Los Angeles has been a steady source of population growth, averaging 75,000 each year in the current decade. This comes as no surprise given Los Angeles' close proximity to the border and location on the Pacific Rim. Domestic migration on the other hand, has been a source of population loss, as Angelinos have left the area virtually every year the DoF has tracked the series, beginning in 1991. The sole exception was 2000 when Los Angeles managed to eke out positive domestic migration growth (approximately 2,000 new residents) at the peak of the Internet Boom. For several years, the accelerated rate of domestic out-migration has outnumbered foreign in-migration, thus, pulling total net migration into negative territory. Overall migration has measured -23,000, -39,000 and -45,000 in 2005, 2006 and 2007, respectively.

Lately, the source of population growth has been in natural increase (measured as births less deaths). When looking at sources of population growth, the real story here is what's been happening in births since the incidence of deaths has been remarkably stable since the 1970s. Angelinos on average are living longer due to the medical advances and healthier lifestyle changes made over the past decades. Case in point, the number of deaths in the county measured 60,800 in 2007, basically at the 40-year average mortality rate of 60,000 per annum.

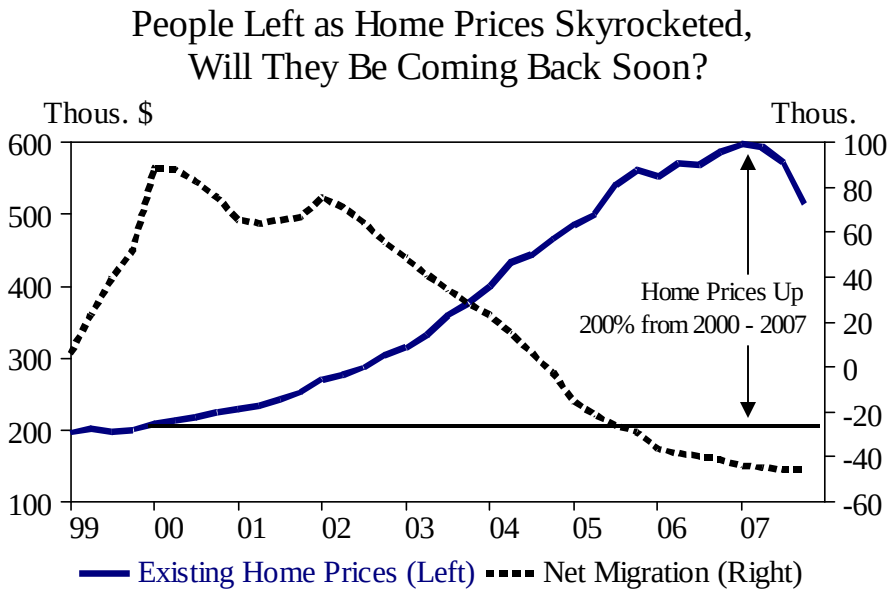
Since peaking at 200,000 in 1992, births have consistently fallen to the roughly 150,000 mark registered in 2007. This is due to the steady and dramatic fall in the gross birth rate in the county. Since 1990, birth rates have fallen from 23 (per thousand) down to 15 (per thousand) in 2004. Furthermore, birth rates have fallen accordingly for each of the major ethnic groups in Los Angeles as well as for the state.

Los Angeles County Birth Rates by Ethnicity



Discussion of fertility rates of immigrants has returned to the forefront, especially for countries in Europe and Asia that are experiencing aging population and below replacement fertility. In Los Angeles, because Mexican migration dominates the migration flow in the area, the impact of the high and earlier fertility of Mexican-origin women is of particular interest looking forward. As mentioned earlier, the birth rates of all ethnic groups have fallen substantially over the years, yet Hispanic birth rates are still considerably higher at 20 per thousand than the overall rate for the county, 15 per thousand in 2004.

As a result on the current housing induced economic slowdown, total population in the area grew a mere 0.5%, adding roughly 48,000 residents in 2007. Our near-term forecast assumes continued out-migration through 2010 before finally turning positive in 2011. It is not unusual for people to continue to leave an area several years after an economy has rebounded from a slowdown or contractionary period.



Looking out over the 30-year horizon, by 2040, Los Angeles is expected house over two million new residents. Roughly 1.6 million of those will come from natural increase, while 480,000 will be from migration. By 2020, Hispanics will comprise the majority of all ethnic groups for the first time at 52% of all Angelinos. Whites will be 23% and falling, African Americans 7% and falling while Asians will be 15% and rising according to recent forecasts from the DoF. All trends are predicted to continue so that by year 2040, Hispanics will grow to 61%, Whites: 16%, African Americans: 5% and Asians 16%. These trends, to a larger population and to larger average families are built into our forecast including the increased demand for residential structures, and the increased consumption of public services.

Los Angeles County Snapshot of Population Estimates by Decade
Data in Thousands, Unless Otherwise Noted

Year	1990	1990%	2000	2010	2020	2030	2040	2040%
Population	8,864		9,547	10,464	11,270	11,927	12,502	
10-yr. Ave. Ann. Ch.	1.68%		0.80%	0.97%	0.73%	0.57%	0.47%	
Births	198		158	144	108	103	102	
Deaths	63		60	60	59	56	56	
Nat. Increase	135		98	84	50	47	46	
Net Migration	-43		84	-19	21	13	11	
Ethnicity		1990 Share						2040 Share
White	3,609	41%	3,046	2,909	2,626	2,302	1,938	16%
Hispanic	3,368	38%	4,277	5,085	5,906	6,762	7,576	61%
African Am.	939	11%	907	879	834	751	663	5%
Asian	919	10%	1,212	1,454	1,657	1,837	2,025	16%
Other	30	0%	105	136	248	274	300	2%

Appendix

Guide to California Model Variable Names

AHEM@CA	AVG. HOURLY EARNINGS OF MANUFACTURING
BNTV@CA	BLDG. PERMITS VALUE, NONRESIDENTIAL
BNTVR@CA	BLDG. PERMITS VALUE, NONRESIDENTIAL IN 2000 DOLLARS
BRMU@CA	BLDG. PERMIT UNITS, MULTIPLE DWELLINGS
BRSU@CA	BLDG. PERMIT UNITS, SINGLE DWELLINGS
BRTU@CA	BLDG. PERMIT UNITS, TOTAL DWELLINGS
CONS	CONSUMPTION EXPENDITURES, TOTAL
CPI	CONSUMER PRICE INDEX - ALL URBAN CONSUMERS
CPIU@CA	CONSUMER PRICE INDEX
EA@CA	EMPLOYMENT IN AGRICULTURE
EC@CA	EMPLOYMENT IN CONTRACT CONSTRUCTION
EEA	EMPLOYMENT - NONAGRICULTURAL ESTABLISHMENTS
EEA@CA	EMPLOYMENT IN NONAGRICULTURAL ESTABLISHMENTS
EEHS@CA	EMPLOYMENT IN EDUCATION & HEALTH SERVICES
EENRM	EMPLOYMENT - NATURAL RESOURCES & MINING
EFA@CA	EMPLOYMENT IN FINANCIAL ACTIVITIES
EG@CA	EMPLOYMENT IN TOTAL GOVERNMENT
EGF@CA	EMPLOYMENT IN FEDERAL GOVERNMENT
EGOODS@CA	EMPLOYMENT IN GOODS PRODUCING
EGSL@CA	EMPLOYMENT IN STATE & LOCAL GOVERNMENT
EHH@CA	EMPLOYED HOUSEHOLD SURVEY
EI@CA	EMPLOYMENT IN INFORMATION
ELH@CA	EMPLOYMENT IN LEISURE & HOSPITALITY
EM@CA	EMPLOYMENT IN MANUFACTURING
EMD@CA	EMPLOYMENT IN DURABLE MANUFACTURED GOODS
EMF	EMPLOYMENT - MANUFACTURING
EMN@CA	EMPLOYMENT IN NONDURABLE MANUFACTURED GOODS
ENRM@CA	EMPLOYMENT IN NATURAL RESOURCES & MINING
EPBS@CA	EMPLOYMENT IN PROFESSIONAL BUSINESS SERVICES
ERESID@CA	RESIDUAL BETWEEN TOTAL PAYROLL & HOUSEHOLD EMPLOYMENT
ESV@CA	EMPLOYMENT IN SERVICES INDUSTRIES
ESVOTH@CA	EMPLOYMENT IN OTHER SERVICES
ET@CA	EMPLOYMENT IN WHOLESALE & RETAIL TRADE
ETR@CA	EMPLOYMENT IN RETAIL TRADE
ETW@CA	EMPLOYMENT IN WHOLESALE TRADE
ETWU@CA	EMPLOYMENT IN TRANSPORTATION, WAREHOUSING & UTILITIES

@CA = California endogenous variables

All others are U.S. exogenous variables

Guide to California Model Variable Names

GDP	GROSS DOMESTIC PRODUCT
GDPR	GROSS DOMESTIC PRODUCT IN 2000 DOLLARS
GFAIDSL	FEDERAL GRANTS IN AID TO STATE & LOCAL GOVTS IN $
GFMLR	FEDERAL GOVERNMENT PURCHASES - NATIONAL DEFENSE IN 2000 DOLLARS
GSP@CA	ESTIMATE OF GROSS STATE PRODUCT
GSPR@CA	ESTIMATE OF GROSS STATE PRODUCT IN 2000 DOLLARS
HUSPS	HOUSING STARTS, TOTAL
HUSPS1	HOUSING STARTS, SINGLE UNIT
IFNRESR	GROSS INVEST IN PRIVATE NONRES STRUCTURES IN 2000 DOLLARS
JPC	IMPLICIT PRICE DEFLATOR - CONSUMPTION EXPENDITURES
JPGDP	IMPLICIT PRICE DEFLATOR - GROSS DOMESITC PRODUCT
JPIFNRES	IMPLICIT PRICE DEFLATOR - PRIVATE NONRES STRUCT INVEST
JWSSNF	COMPENSATION PER HOUR - NONFARM BUSINESS SECTOR
LC@CA	CIVILIAN LABOR FORCE
LFPR@CA	LABOR FORCE PARTICIPATION RATE
NINMIG@CA	NET INMIGRATION
NJULY@CA	TOTAL POPULATION AS OF JULY 1
NLFC	CIVILIAN LABOR FORCE
NNATINC@CA	NATURAL INCREASE
NP16A	TOTAL POPULATION AGE 16 & OVER
PC@CA	ESTIMATE OF IMPLICIT PRICE DEFLATOR OF PERSONAL CONSUMP. EXP.
PGSP@CA	IMPLICIT PRICE DEFLATOR OF GROSS STATE PRODUCT
REGAUTON@CA	REGISTERED NEW VEHICLES
RESADJF@CA	RESIDENCE ADJUSTMENT
RU@CA	UNEMPLOYMENT RATE
RW@CA	DERIVED AVG. ANNUAL SALARY TOTAL
RWC@CA	DERIVED AVG. ANNUAL SALARY IN CONSTRUCTION
RWEHS@CA	DERIVED AVG. ANNUAL SALARY IN EDUCATION & HEALTH SERVICES
RWFA@CA	DERIVED AVG. ANN SALARY IN FINANCIAL ACTIVITIES
RWG@CA	DERIVED AVG. ANNUAL SALARY IN GOVERNMENT, TOTAL
RWI@CA	DERIVED AVG. ANNUAL SALARY IN INFORMATION
RWLH@CA	DERIVED AVG. ANNUAL SALARY IN LEISURE & HOSPITALITY
RWM@CA	DERIVED AVG. ANNUAL SALARY IN MANUFACTURING
RWNRM@CA	DERIVED AVG. ANN SALARY IN NATURAL RESOURCES & MINING

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All others are U.S. exogenous variables

RWPBS@CA	DERIVED AVG. ANN SALARY IN PROFESSIONAL BUSINESS SERVICES
RWSVOTH@CA	DERIVED AVG. ANNUAL SALARY IN OTHER SERVICES
RWT@CA	DERIVED AVG. ANNUAL SALARY IN TRADE, TOTAL
RWTWU@CA	DERIVED AVG. ANNUAL SALARY IN TRANSPORTATION, WAREHOUSING & UTILITIES
ST@CA	TAXABLE SALES
STR@CA	REAL TAXABLE SALES
SUVA	RETAIL SALES, NEW CARS, TOTAL
TAXBASE	PERSONAL INCOME TAX BASE
TAXBASEF@CA	PERSONAL INCOME TAX BASE
TP@CA	ESTIMATE OF PERSONAL TAX & NONTAX PAYMENTS
TWPERF@CA	PER CONTR. FOR SOCIAL INSURANCE NEG. PLACE OF WORK
TXPGF	FEDERAL GOV'T PERSONAL TAX & NONTAX RECEIPTS
TXPGSL	STATE & LOCAL GOVT PERSONAL TAX & NONTAX RECEIPTS
TXSIWC	PERSONAL CONTRIBUTIONS FOR SOCIAL INSURANCE
UHH@CA	UNEMPLOYED HOUSEHOLD SURVEY
VF@CA	TRANSFER PAYMENTS, PLACE OF RESIDENCE
WSDAFF@CA	WAGE & SALARY DISTRIB. IN FARM
WSDCF@CA	WAGE & SALARY DISTRIB. IN CONSTRUCTION
WSDEHSF@CA	WAGE & SALARY DISTRIB. IN EDUCATION & HEALTH SERVICES
WSDF@CA	WAGE & SALARY DISTRIB., PLACE OF WORK
WSDFAF@CA	WAGE & SALARY DISTRIB. IN FINANCIAL ACTIVITIES
WSDGF@CA	WAGE & SALARY DISTRIB. IN GOVERNMENT, TOTAL
WSDIF@CA	WAGE & SALARY DISTRIB. IN INFORMATION
WSDLHF@CA	WAGE & SALARY DISTRIB. IN LEISURE & HOSPITALITY
WSDMF@CA	WAGE & SALARY DISTRIB. IN MANUFACTURING
WSDNRMF@CA	WAGE & SALARY DISTRIB. IN NATURAL RESOURCES & MINING
WSDPBSF@CA	WAGE & SALARY DISTRIB. IN PROFESSIONAL BUSINESS SERVICES
WSDSVOTHF@CA	WAGE & SALARY DISTRIB. IN OTHER SERVICES
WSDTF@CA	WAGE & SALARY DISTRIB. IN TOTAL TRADE
WSDTWUF@CA	WAGE & SALARY DISTRIB. IN TRANSPORTATION, WAREHOUSING & UTILITIES

@CA = California endogenous variables

All others are U.S. exogenous variables

XEEA	PRODUCTIVITY - NONAGRICULTURAL
XEEA@CA	PRODUCTIVITY IN NONAGRICULTURAL
XR	EXPORTS OF GOODS & SERVICES IN 2000 DOLLARS
YDF@CA	DISPOSABLE PERSONAL INCOME
YDFR@CA	DISPOSABLE PERSONAL INCOME TOTAL IN 2000 DOLLARS
YENTAFF@CA	PROPRIETOR'S INCOME, FARM
YENTEAFF@CA	PROPRIETOR'S INCOME, NONFARM
YOLF@CA	OTHER LABOR INCOME
YP	PERSONAL INCOME
YPADIV	DIVIDEND PAYMENTS TO INDIVIDUALS
YPAINT	PERSONAL INTEREST INCOME
YPCOMPSUPPAI	OTHER LABOR INCOME
YPCOMPWSD	WAGE & SALARY DISBURSEMENTS
YPF@CA	PERSONAL INCOME TOTAL
YPFR@CA	PERSONAL INCOME TOTAL IN 2000 DOLLARS
YPPROPADJF	PROPRIETOR'S INCOME WITH IVA &CCADJ - FARM
YPPROPADJNF	NONFARM PROPRIETORS' INCOME WITH INVENTORY & CAPITAL CONS. ADJS.
YPPROPF@CA	PROPERTY INCOME
YPRENTADJ	RENTAL INCOME OF PERSONS WITH CCADJ
YPTRFGF	TRANSFER PAYMENTS TO PERSONS BY FEDERAL GOVT
YPTRFGSL	STATE & LOCAL GOVT TRANSFER PAYMENTS TO PERSONS

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Table 1. Summary of the UCLA Forecast for California

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
					Personal Income, Taxable Sales, and Price Inflation (%Change)					
Personal Income (Bil.$)	662.7	696.7	707.9	730.5	765.8	810.4	860.5	936.0	999.2	1103.8
Calif. (% Ch)	2.2	5.1	1.6	3.2	4.8	5.8	6.2	8.8	6.8	10.5
U.S.(% Ch)	3.5	6.2	3.7	5.1	5.3	6.0	6.1	7.3	5.1	8.0
Pers. Income (Bil. 2000$)	780.4	793.6	791.2	808.8	839.4	877.8	918.2	985.4	1027.2	1103.8
Calif. (% Ch)	-1.3	1.7	-0.3	2.2	3.8	4.6	4.6	7.3	4.2	7.5
U.S. (% Ch)	-0.1	3.2	1.3	2.9	3.1	3.8	4.3	6.4	3.4	5.4
Taxable Sales (Bil.$)	270.8	272.4	272.1	285.9	300.7	321.0	340.8	358.6	394.2	441.6
(% Ch)	-3.9	0.6	-0.1	5.1	5.2	6.7	6.2	5.2	9.9	12.0
(Bil. 2000$)	318.9	310.3	304.1	316.5	329.6	347.7	363.7	377.5	405.1	441.6
(% Ch)	-7.3	-2.7	-2.0	4.1	4.1	5.5	4.6	3.8	7.3	9.0
Consumer Prices (% Ch)	4.2	3.5	2.6	1.4	1.7	2.0	2.2	2.0	2.9	3.7
					Employment and Labor Force (Household Survey, % Change)					
Employment	-2.5	-0.4	-0.5	1.1	0.8	1.7	3.3	2.9	2.4	2.9
Labor Force	-0.4	1.4	-0.3	0.0	-0.0	1.1	2.3	2.4	1.6	2.6
Unemployment Rate (%)	7.8	9.4	9.5	8.6	7.9	7.3	6.4	6.0	5.3	4.9
U.S.	6.9	7.5	6.9	6.1	5.6	5.4	4.9	4.5	4.2	4.0
Total Nonfarm					Nonfarm Employment (Payroll Survey, % Change)					
Calif.	-1.1	-1.7	-0.9	1.0	2.1	2.6	3.0	3.6	2.9	3.5
U.S.	-1.0	0.3	2.0	3.1	2.6	2.0	2.6	2.6	2.4	2.2
Construction	-12.8	-11.9	-7.4	3.6	5.1	3.4	7.5	10.6	11.3	7.1
Manufacturing	-3.8	-5.2	-5.2	-0.6	1.9	3.4	2.8	1.7	-1.4	0.9
Nondurable Goods	0.3	-1.7	-2.8	1.5	2.0	1.5	1.0	-0.2	-0.7	-0.0
Durable Goods	-5.7	-7.1	-6.4	-1.9	1.8	4.5	3.8	2.7	-1.8	1.3
Trans. Warehousing & Util	3.1	-0.1	0.7	1.5	2.8	2.0	2.0	3.9	2.3	1.8
Trade	-2.6	-1.4	-1.0	0.5	1.8	2.2	2.8	2.5	2.4	3.2
Information	1.0	-2.1	-0.3	2.6	5.1	4.1	6.6	4.5	7.2	11.3
Financial Activities	-1.7	-2.5	-0.5	-2.2	-3.8	-0.0	1.8	4.6	2.4	0.3
Professional Busi. Serv.	-0.4	-0.3	2.3	3.0	5.0	5.7	6.9	7.8	4.0	6.5
Edu. & Health Serv.	3.3	2.4	1.2	1.5	2.2	2.1	2.1	2.9	2.9	2.2
Leisure & Hospitality	1.4	-0.5	0.9	1.8	3.3	3.6	0.9	2.2	2.7	2.8
Other Services	0.7	-1.3	-0.4	2.0	2.4	2.0	1.3	3.3	2.9	2.9
Federal Gov't	-4.0	-0.5	-2.8	-3.3	-4.0	-5.1	-3.8	-4.2	-0.9	1.0
State & Local Gov't	1.8	0.4	-0.3	1.4	1.5	1.3	2.1	2.0	4.0	3.8
					Nonfarm Employment (Payroll Survey, Thous.)					
Total Nonfarm	12362	12154	12042	12160	12421	12743	13129	13595	13992	14488
Construction	563	496	459	476	500	517	556	615	685	733
Manufacturing	1895	1796	1703	1693	1724	1782	1833	1864	1837	1853
Nondurable Goods	643	632	614	624	637	646	653	652	647	647
Durable Goods	1252	1164	1089	1069	1088	1136	1180	1212	1190	1206
Trans. Warehousing & Util	439	438	441	448	460	470	479	498	509	518
Trade	1945	1917	1899	1908	1943	1986	2041	2092	2141	2209
Information	396	388	387	397	417	434	463	484	518	577
Financial Activities	808	788	784	767	738	738	751	786	805	807
Professional Busi. Serv.	1493	1489	1524	1570	1648	1742	1861	2007	2086	2222
Edu. & Health Serv.	1155	1183	1197	1214	1241	1268	1294	1332	1371	1401
Leisure & Hospitality	1121	1115	1126	1146	1184	1227	1238	1265	1299	1335
Other Services	420.3	414.7	413.1	421.3	431.5	440.3	446.0	460.7	474.0	487.8
Federal Gov't	347.6	345.9	336.1	325.0	312.0	295.9	284.6	272.6	270.1	272.9
State & Local Gov't	1743.3	1749.7	1743.9	1768.5	1795.0	1817.5	1856.1	1893.7	1969.4	2045.2
					Population and Migration					
Net Inmigration(Thous)	234	131	-45	-146	-149	-68	181	114	263	379
Population (Thous)	30468	31006	31325	31526	31708	31938	32463	32849	33407	34095
(% Ch)	2.1	1.8	1.0	0.6	0.6	0.7	1.6	1.2	1.7	2.1
					Construction Activity					
Residential Building Permits (Thous. Un.)	105.3	98.0	84.2	96.3	85.6	94.1	111.7	125.2	139.8	149.0
Nonres.Const. (Mil.2000$)	12824	10838	9746	9825	9710	11172	13681	15904	17236	18573

Table 1. Summary of the UCLA Forecast for California

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Personal Income, Taxable Sales, and Price Inflation (%Change)										
Personal Income (Bil.$)	1135.3	1147.7	1187.0	1266.0	1348.3	1436.4	1519.5	1582.4	1648.4	1726.3
Calif. (% Ch)	2.9	1.1	3.4	6.6	6.5	6.5	5.8	4.1	4.2	4.7
U.S.(% Ch)	3.5	1.8	3.2	6.2	5.9	6.6	6.2	4.2	3.5	4.7
Pers. Income (Bil. 2000$)	1099.1	1083.7	1096.5	1129.9	1165.8	1200.5	1233.5	1252.0	1275.0	1308.3
Calif. (% Ch)	-0.4	-1.4	1.2	3.1	3.2	3.0	2.7	1.5	1.8	2.6
U.S. (% Ch)	1.4	0.4	1.2	3.4	2.9	3.8	3.5	0.7	1.4	3.2
Taxable Sales (Bil.$)	441.7	440.8	459.8	499.8	536.4	559.5	562.6	563.2	587.9	617.9
(% Ch)	0.0	-0.2	4.3	8.7	7.3	4.3	0.5	0.1	4.4	5.1
(Bil. 2000$)	427.6	416.2	424.8	446.1	463.7	467.6	456.7	445.6	454.7	468.3
(% Ch)	-3.2	-2.7	2.0	5.0	3.9	0.8	-2.3	-2.4	2.1	3.0
Consumer Prices (% Ch)	4.0	2.4	2.3	2.6	3.7	3.9	3.3	3.3	2.1	1.8
Employment and Labor Force (Household Survey, % Change)										
Employment	1.2	-0.2	0.1	1.3	2.0	1.7	1.1	0.2	0.9	1.1
Labor Force	1.7	1.1	0.3	0.7	1.1	1.2	1.6	0.9	0.7	0.9
Unemployment Rate (%)	5.4	6.7	6.8	6.2	5.4	4.9	5.4	6.1	5.9	5.7
U.S.	4.7	5.8	6.0	5.5	5.1	4.6	4.8	4.8	4.6	5.0
Total Nonfarm **Nonfarm Employment (Payroll Survey, % Change)**										
Calif.	0.8	-1.0	-0.5	1.0	1.8	1.8	0.7	0.1	0.8	1.1
U.S.	0.0	-1.1	-0.3	1.1	1.7	1.8	1.1	0.1	0.1	0.9
Construction	6.4	-0.8	2.9	6.7	6.4	3.2	-4.4	-8.3	-0.8	2.4
Manufacturing	-4.0	-8.3	-5.5	-1.4	-1.2	-1.0	-1.7	-1.1	0.3	0.3
Nondurable Goods	-4.6	-5.2	-3.2	-1.5	-2.1	-0.6	-1.3	-1.3	-0.1	0.2
Durable Goods	-3.7	-9.9	-6.7	-1.3	-0.7	-1.2	-1.9	-0.9	0.5	0.4
Trans. Warehousing & Util	-0.8	-4.5	-2.1	0.4	0.9	1.8	1.8	1.3	1.6	2.7
Trade	1.2	-0.0	0.2	1.6	2.7	2.0	1.0	-0.0	1.2	1.8
Information	-4.3	-9.9	-4.3	1.3	-1.8	-1.6	1.5	-2.8	0.9	1.1
Financial Activities	3.6	2.0	3.8	1.9	2.8	0.9	-3.1	-3.2	0.1	0.5
Professional Busi. Serv.	-1.6	-3.1	-1.6	0.6	3.0	3.8	1.0	1.4	1.7	1.7
Edu. & Health Serv.	3.3	3.5	2.5	1.5	1.7	1.7	3.1	2.4	1.6	1.4
Leisure & Hospitality	2.2	1.3	1.3	2.8	2.5	3.0	2.2	1.4	1.3	1.5
Other Services	2.4	1.3	-0.3	-0.1	0.3	0.3	1.3	0.9	0.4	0.8
Federal Gov't	-6.8	-0.2	0.6	-1.7	-0.3	-0.7	-0.8	0.5	0.6	0.9
State & Local Gov't	4.0	3.1	-1.0	-1.1	1.1	1.6	2.1	1.5	-0.7	-0.9
Nonfarm Employment (Payroll Survey, Thous.)										
Total Nonfarm	14603	14458	14393	14532	14800	15060	15164	15172	15286	15452
Construction	781	775	797	850	905	934	893	819	812	831
Manufacturing	1779	1632	1543	1521	1503	1488	1463	1448	1452	1457
Nondurable Goods	617	585	566	557	546	543	535	528	528	529
Durable Goods	1161	1047	976	964	957	945	928	919	924	928
Trans. Warehousing & Util	514	491	481	483	487	496	505	512	520	534
Trade	2235	2234	2238	2273	2335	2382	2406	2405	2435	2479
Information	552	497	476	482	474	466	473	460	464	469
Financial Activities	836	853	886	902	927	935	907	877	878	883
Professional Busi. Serv.	2187	2119	2085	2097	2160	2241	2263	2296	2334	2373
Edu. & Health Serv.	1448	1499	1536	1560	1586	1614	1664	1705	1733	1757
Leisure & Hospitality	1365	1382	1400	1439	1475	1519	1553	1574	1594	1618
Other Services	499.2	505.7	504.3	503.8	505.4	507.0	513.6	518.2	520.4	524.6
Federal Gov't	254.4	253.8	255.4	251.0	250.4	248.6	246.8	247.9	249.5	251.9
State & Local Gov't	2127.8	2193.3	2170.6	2146.7	2169.7	2203.7	2250.7	2284.7	2268.4	2248.5
Population and Migration										
Net Inmigration(Thous)	375	301	279	209	127	121	111	93	94	112
Population (Thous)	34775	35361	35951	36461	36897	37333	37775	38187	38603	39030
(% Ch)	2.0	1.7	1.7	1.4	1.2	1.2	1.2	1.1	1.1	1.1
Construction Activity										
Residential Building Permits (Thous. Un.)	148.7	167.8	197.3	213.3	209.3	163.1	113.0	68.1	80.7	98.3
Nonres.Const. (Mil.2000$)	15984	13237	12256	12944	13511	14013	14537	14510	15188	15416

Table 1. Summary of the UCLA Forecast for California

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Personal Income, Taxable Sales, and Price Inflation (%Change)										
Personal Income (Bil.$)	1818.8	1921.9	2033.4	2153.6	2277.5	2409.6	2546.6	2693.9	2831.0	2968.1
Calif. (% Ch)	5.4	5.7	5.8	5.9	5.8	5.8	5.7	5.8	5.1	4.8
U.S.(% Ch)	5.6	6.0	5.3	4.9	4.9	4.7	4.6	4.8	4.9	5.0
Pers. Income (Bil. 2000$)	1352.0	1400.9	1451.3	1506.3	1560.2	1618.2	1675.5	1736.0	1788.4	1839.5
Calif. (% Ch)	3.3	3.6	3.6	3.8	3.6	3.7	3.5	3.6	3.0	2.9
U.S. (% Ch)	3.8	4.1	3.5	3.0	3.0	2.8	2.6	2.8	2.9	3.1
Taxable Sales (Bil.$)	652.8	691.0	733.6	779.5	828.2	878.8	926.9	970.2	1020.9	1074.0
(% Ch)	5.7	5.9	6.2	6.3	6.2	6.1	5.5	4.7	5.2	5.2
(Bil. 2000$)	485.3	503.7	523.6	545.2	567.3	590.1	609.8	625.2	644.9	665.7
(% Ch)	3.6	3.8	3.9	4.1	4.1	4.0	3.3	2.5	3.2	3.2
Consumer Prices (% Ch)	1.9	2.0	2.1	2.0	2.1	2.0	2.0	2.0	2.0	1.9
Employment and Labor Force (Household Survey, % Change)										
Employment	1.9	1.9	1.5	1.4	1.3	1.3	1.0	1.0	1.0	0.9
Labor Force	1.2	1.4	1.5	1.6	1.5	1.4	1.3	1.1	1.1	1.0
Unemployment Rate (%)	5.1	4.6	4.6	4.8	5.0	5.1	5.4	5.5	5.6	5.7
U.S.	5.2	5.2	5.0	4.9	4.8	4.8	4.7	4.7	4.7	4.7
Total Nonfarm										
Nonfarm Employment (Payroll Survey, % Change)										
Calif.	1.8	1.9	1.5	1.3	1.2	1.2	1.0	1.0	1.0	0.8
U.S.	1.6	1.7	1.2	0.9	0.8	0.7	0.6	0.6	0.7	0.8
Construction	2.7	2.1	1.0	1.1	1.3	1.7	1.5	1.4	1.4	1.4
Manufacturing	0.9	0.1	-0.1	-0.5	-0.7	0.5	-0.2	-0.3	-0.8	-1.4
Nondurable Goods	0.7	0.1	-0.1	-0.4	-0.5	0.3	-0.3	-0.4	-0.7	-1.2
Durable Goods	0.9	0.2	-0.1	-0.6	-0.8	0.5	-0.2	-0.3	-0.8	-1.6
Trans. Warehousing & Util	3.3	3.1	2.8	2.8	2.7	2.6	2.0	2.2	2.4	2.2
Trade	2.4	2.2	1.9	1.8	1.7	1.8	1.2	1.0	1.0	1.1
Information	1.9	2.0	1.4	0.8	0.5	0.7	0.7	0.5	1.3	0.1
Financial Activities	0.4	0.6	0.6	0.6	0.7	0.6	0.9	0.3	0.2	0.3
Professional Busi. Serv.	2.7	3.2	2.3	1.7	1.3	0.9	0.8	0.5	0.5	0.7
Edu. & Health Serv.	2.2	2.1	1.8	1.8	1.8	1.7	1.5	1.8	2.1	1.9
Leisure & Hospitality	1.6	1.5	1.3	1.4	1.6	1.6	1.4	0.8	0.4	-0.0
Other Services	1.6	1.7	1.6	1.6	1.6	1.5	0.9	1.3	1.6	1.4
Federal Gov't	2.5	1.4	1.4	1.3	1.1	0.9	0.4	0.5	0.4	0.7
State & Local Gov't	0.8	1.7	1.5	1.2	1.1	0.7	0.8	1.4	1.7	1.5
Nonfarm Employment (Payroll Survey, Thous.)										
Total Nonfarm	15737	16034	16274	16490	16696	16903	17070	17236	17406	17554
Construction	853	872	880	890	901	916	930	942	956	969
Manufacturing	1469	1472	1470	1463	1453	1460	1457	1452	1441	1420
Nondurable Goods	533	533	533	531	528	530	529	527	523	516
Durable Goods	937	938	937	932	925	930	928	925	918	903
Trans. Warehousing & Util	552	569	585	601	618	634	646	661	677	692
Trade	2539	2594	2642	2689	2736	2785	2819	2848	2877	2909
Information	478	488	494	498	501	504	508	511	517	518
Financial Activities	886	891	896	901	907	913	921	924	926	928
Professional Busi. Serv.	2438	2515	2572	2615	2648	2670	2691	2705	2718	2736
Edu. & Health Serv.	1796	1834	1866	1899	1933	1965	1995	2031	2074	2112
Leisure & Hospitality	1645	1670	1693	1717	1744	1772	1796	1811	1818	1817
Other Services	533.2	542.5	551.1	560.0	568.9	577.6	582.7	590.3	599.9	608.1
Federal Gov't	258.0	261.7	265.4	268.9	271.9	274.5	275.6	277.0	278.2	280.1
State & Local Gov't	2265.4	2303.1	2336.5	2364.8	2391.8	2409.3	2427.6	2462.4	2505.3	2543.5
Population and Migration										
Net Inmigration(Thous)	146	186	224	254	274	284	286	282	276	270
Population (Thous)	39484	39977	40509	41076	41668	42275	42884	43489	44084	44667
(% Ch)	1.2	1.2	1.3	1.4	1.4	1.5	1.4	1.4	1.4	1.3
Construction Activity										
Residential Building Permits (Thous. Un.)	114.4	118.5	120.4	122.1	123.8	125.6	127.4	129.2	131.0	132.7
Nonres.Const. (Mil.2000$)	15805	16317	16858	17481	18233	19004	19720	20318	20679	21027

Table 1. Summary of the UCLA Forecast for California

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
					Personal Income, Taxable Sales, and Price Inflation (%Change)					
Personal Income (Bil.$)	3100.3	3235.6	3372.9	3520.6	3667.2	3821.3	3993.8	4166.8	4342.2	4521.4
Calif. (% Ch)	4.5	4.4	4.2	4.4	4.2	4.2	4.5	4.3	4.2	4.1
U.S.(% Ch)	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.8	4.7	4.8
Pers. Income (Bil. 2000$)	1885.8	1934.5	1985.9	2043.3	2096.6	2149.5	2208.2	2259.2	2308.1	2357.0
Calif. (% Ch)	2.5	2.6	2.7	2.9	2.6	2.5	2.7	2.3	2.2	2.1
U.S. (% Ch)	3.0	3.0	2.9	2.9	2.9	2.9	2.8	2.7	2.7	2.7
Taxable Sales (Bil.$)	1124.0	1171.3	1220.1	1274.4	1333.4	1391.7	1451.6	1514.4	1579.9	1646.7
(% Ch)	4.6	4.2	4.2	4.4	4.6	4.4	4.3	4.3	4.3	4.2
(Bil. 2000$)	683.7	700.3	718.4	739.6	762.3	782.9	802.6	821.1	839.8	858.4
(% Ch)	2.7	2.4	2.6	3.0	3.1	2.7	2.5	2.3	2.3	2.2
Consumer Prices (% Ch)	1.9	1.7	1.5	1.4	1.5	1.6	1.7	1.9	1.9	1.9
					Employment and Labor Force (Household Survey, % Change)					
Employment	1.5	1.9	1.8	1.7	1.7	1.6	1.5	1.5	1.5	1.4
Labor Force	1.4	1.7	1.7	1.6	1.5	1.5	1.6	1.6	1.5	1.5
Unemployment Rate (%)	5.6	5.4	5.3	5.1	5.0	4.9	5.0	5.1	5.2	5.2
U.S.	4.7	4.7	4.7	4.7	4.7	4.8	4.8	4.8	4.8	4.8
Total Nonfarm					Nonfarm Employment (Payroll Survey, % Change)					
Calif.	1.3	1.7	1.6	1.5	1.5	1.4	1.4	1.4	1.4	1.4
U.S.	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Construction	0.6	0.5	0.9	1.4	1.3	1.2	1.7	1.8	1.7	1.6
Manufacturing	0.3	1.3	0.8	0.6	0.8	0.7	0.7	0.7	0.7	0.7
Nondurable Goods	0.2	1.0	0.3	0.2	0.6	0.3	0.1	0.1	0.1	0.1
Durable Goods	0.3	1.4	1.1	0.9	0.9	1.0	1.0	1.0	1.0	1.0
Trans. Warehousing & Util	2.6	3.0	2.8	2.6	2.3	1.7	1.2	1.5	1.5	1.5
Trade	1.6	1.8	1.6	1.5	1.5	1.3	1.0	1.2	1.3	1.3
Information	0.6	0.7	1.0	2.2	2.8	3.1	2.9	3.0	2.5	2.4
Financial Activities	0.8	1.1	1.2	1.3	1.3	1.2	1.3	1.2	1.2	1.2
Professional Busi. Serv.	1.1	1.4	1.3	1.3	1.2	1.2	1.4	1.2	1.3	1.4
Edu. & Health Serv.	2.4	2.9	2.7	2.5	2.1	1.9	2.0	1.8	1.8	1.8
Leisure & Hospitality	0.4	0.8	0.6	0.5	0.5	0.6	0.6	0.8	0.8	0.8
Other Services	1.9	2.5	2.2	2.0	1.7	1.5	1.6	1.9	2.0	1.9
Federal Gov't	1.2	1.0	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4
State & Local Gov't	1.9	2.3	2.2	2.0	1.8	1.9	1.7	1.6	1.6	1.6
					Nonfarm Employment (Payroll Survey, Thous.)					
Total Nonfarm	17791	18096	18384	18667	18940	19206	19465	19734	20006	20282
Construction	975	980	989	1003	1016	1028	1046	1064	1083	1100
Manufacturing	1424	1442	1454	1463	1474	1485	1495	1505	1515	1525
Nondurable Goods	517	522	524	525	528	530	530	531	532	532
Durable Goods	906	919	930	938	946	955	965	974	983	993
Trans. Warehousing & Util	710	731	751	771	789	802	811	823	835	847
Trade	2956	3009	3058	3104	3150	3192	3225	3265	3306	3348
Information	521	525	530	542	557	574	590	608	624	639
Financial Activities	936	947	958	970	983	994	1007	1020	1032	1044
Professional Busi. Serv.	2766	2803	2838	2874	2910	2946	2986	3022	3061	3103
Edu. & Health Serv.	2163	2226	2287	2343	2393	2439	2488	2533	2578	2623
Leisure & Hospitality	1825	1839	1850	1859	1868	1880	1891	1906	1922	1938
Other Services	619.8	635.0	649.3	662.6	673.8	683.9	694.6	707.8	721.7	735.7
Federal Gov't	283.4	286.1	288.2	289.9	291.5	293.0	294.4	295.7	296.9	298.1
State & Local Gov't	2591.7	2652.4	2710.3	2765.2	2813.8	2867.8	2915.7	2963.0	3011.0	3059.7
					Population and Migration					
Net Inmigration(Thous)	266	266	268	270	266	263	263	259	251	247
Population (Thous)	45239	45800	46352	46896	47425	47935	48430	48907	49372	49837
(% Ch)	1.3	1.2	1.2	1.2	1.1	1.1	1.0	1.0	0.9	0.9
					Construction Activity					
Residential Building Permits (Thous. Un.)	133.6	134.3	134.9	133.5	134.6	134.6	138.1	139.4	138.7	138.2
Nonres.Const. (Mil.2000$)	21392	21914	22602	23463	23999	24938	26103	27268	28433	29598

Table 1. Summary of the UCLA Forecast for California

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Personal Income, Taxable Sales, and Price Inflation (%Change)										
Personal Income (Bil.$)	4708.7	4901.5	5095.9	5291.9	5489.5	5688.7	5889.6	6092.2	6296.3	6500.8
Calif. (% Ch)	4.1	4.1	4.0	3.8	3.7	3.6	3.5	3.4	3.4	3.2
U.S.(% Ch)	4.7	4.6	4.5	4.5	4.5	4.5	4.5	4.6	4.5	4.3
Pers. Income (Bil. 2000$)	2408.4	2459.2	2507.3	2552.8	2595.3	2635.5	2673.1	2709.5	2747.1	2781.7
Calif. (% Ch)	2.2	2.1	2.0	1.8	1.7	1.5	1.4	1.4	1.4	1.3
U.S. (% Ch)	2.6	2.5	2.5	2.5	2.4	2.4	2.4	2.5	2.5	2.3
Taxable Sales (Bil.$)	1713.2	1778.7	1844.2	1909.7	1975.1	2040.6	2106.0	2171.5	2237.0	2302.5
(% Ch)	4.0	3.8	3.7	3.6	3.4	3.3	3.2	3.1	3.0	2.9
(Bil. 2000$)	876.3	892.4	907.4	921.3	933.8	945.4	955.9	965.8	976.0	985.3
(% Ch)	2.1	1.8	1.7	1.5	1.4	1.2	1.1	1.0	1.1	0.9
Consumer Prices (% Ch)	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.0	1.9	1.9
Employment and Labor Force (Household Survey, % Change)										
Employment	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.1
Labor Force	1.4	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1
Unemployment Rate (%)	5.2	5.2	5.1	5.1	5.1	5.1	5.1	5.1	5.0	5.0
U.S.	4.8	4.8	4.8	4.8	4.9	4.9	4.7	4.7	4.7	4.7
Total Nonfarm				**Nonfarm Employment (Payroll Survey, % Change)**						
Calif.	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2
U.S.	1.0	1.0	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Construction	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.4	1.4	1.4
Manufacturing	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Nondurable Goods	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Durable Goods	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Trans. Warehousing & Util	1.5	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.2
Trade	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1
Information	2.4	2.4	2.4	2.3	2.2	2.2	2.1	2.1	2.0	2.0
Financial Activities	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0
Professional Busi. Serv.	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.1
Edu. & Health Serv.	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.5
Leisure & Hospitality	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Other Services	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.7	1.6
Federal Gov't	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
State & Local Gov't	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.4	1.3
Nonfarm Employment (Payroll Survey, Thous.)										
Total Nonfarm	20559	20837	21115	21393	21670	21948	22226	22504	22782	23051
Construction	1118	1136	1153	1171	1188	1206	1224	1241	1259	1277
Manufacturing	1535	1545	1555	1565	1575	1585	1594	1604	1614	1624
Nondurable Goods	533	533	534	534	535	536	536	537	537	538
Durable Goods	1002	1011	1021	1030	1040	1049	1058	1068	1077	1087
Trans. Warehousing & Util	860	872	885	897	909	922	934	947	959	971
Trade	3390	3432	3473	3515	3557	3599	3641	3683	3724	3766
Information	654	669	685	701	716	732	747	763	778	794
Financial Activities	1055	1067	1079	1091	1102	1114	1126	1138	1149	1161
Professional Busi. Serv.	3143	3183	3223	3263	3303	3343	3384	3424	3464	3501
Edu. & Health Serv.	2670	2717	2764	2811	2858	2905	2952	2999	3046	3093
Leisure & Hospitality	1954	1971	1987	2004	2021	2037	2054	2071	2087	2104
Other Services	749.9	764.2	778.4	792.7	806.9	821.1	835.4	849.7	863.9	878.2
Federal Gov't	299.3	300.5	301.6	302.8	304.0	305.1	306.3	307.5	308.6	309.8
State & Local Gov't	3109.1	3158.8	3208.4	3258.0	3307.5	3357.0	3406.5	3456.1	3505.6	3550.7
Population and Migration										
Net Inmigration(Thous)	251	256	259	262	264	267	270	273	276	279
Population (Thous)	50307	50784	51265	51748	52234	52723	53215	53709	54207	54708
(% Ch)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Construction Activity										
Residential Building Permits (Thous. Un.)	137.6	137.1	136.6	136.1	135.6	135.0	134.5	134.0	133.5	133.0
Nonres.Const. (Mil.2000$)	30763	31928	33093	34258	35423	36588	37753	38918	40083	41248

BNTV@LA	BLDG. PERMITS VALUE, NONRESIDENTIAL
BNTVR@CA	BLDG. PERMITS VALUE, NONRESIDENTIAL IN REAL DOLLARS
BNTVR@LA	BLDG. PERMITS VALUE, NONRESIDENTIAL IN REAL DOLLARS
BRTU@CA	BLDG. PERMIT UNITS, TOTAL DWELLINGS
BRTU@LA	BLDG. PERMIT UNITS, TOTAL
CD	CONSUMER SPENDING ON DURABLE GOODS
CN	CONSUMER SPENDING ON NONDURABLE GOODS
CPI	CONSUMER PRICE INDEX
CPIU@CA	CONSUMER PRICE INDEX
CPIU@LA	CONSUMER PRICE INDEX
EC@LA	EMPLOYMENT IN CONSTRUCTION
EEA@LA	EMPLOYMENT IN NONAGRICULTURAL ESTABLISHMENTS
EEHS@CA	EMPLOYMENT IN EDUCATIONAL & HEALTH SERVICES
EEHS@LA	EMPLOYMENT IN EDUCATIONAL & HEALTH SERVICES
EFA@CA	EMPLOYMENT IN FINANCIAL ACTIVITIES
EFA@LA	EMPLOYMENT IN FINANCIAL ACTIVITIES
EG@LA	EMPLOYMENT IN TOTAL GOVERNMENT
EGF@CA	EMPLOYMENT IN FEDERAL GOVERNMENT
EGF@LA	EMPLOYMENT IN FEDERAL GOVERNMENT
EGOODS@LA	EMPLOYMENT IN GOODS PRODUCING SECTORS
EGSL@LA	EMPLOYMENT IN STATE & LOCAL GOVERNMENT
EHH@LA	EMPLOYED HOUSEHOLD SURVEY
EI@CA	EMPLOYMENT IN INFORMATION
EI@LA	EMPLOYMENT IN INFORMATION
ELH@CA	EMPLOYMENT IN LEISURE & HOSPITALITY
ELH@LA	EMPLOYMENT IN LEISURE & HOSPITALITY
EM@LA	EMPLOYED IN MANUFACTURING
EMD@CA	EMPLOYMENT IN DURABLE MANUFACTURED GOODS
EMD@LA	EMPLOYMENT IN DURABLE MANUFACTURED GOODS
EMN@CA	EMPLOYMENT IN NONDURABLE MANUFACTURED GOODS
EMN@LA	EMPLOYMENT IN NONDURABLE MANUFACTURED GOODS
ENRM@CA	EMPLOYMENT IN NATURAL RESOURCES & MINING
ENRM@LA	EMPLOYMENT IN NATURAL RESOURCES & MINING
EPBS@CA	EMPLOYMENT IN PROFESSIONAL & BUSINESS SERVICES
EPBS@LA	EMPLOYMENT IN PROFESSIONAL & BUSINESS SERVICES
ERESID@LA	RESIDUAL BETWEEN TOTAL PAYROLL & HOUSEHOLD EMPLOYMENT
ESV@LA	EMPLOYMENT IN SERVICES INDUSTRIES
ESVOTH@CA	EMPLOYMENT IN OTHER SERVICES
ESVOTH@LA	EMPLOYMENT IN OTHER SERVICES
ET@LA	EMPLOYMENT IN WHOLESALE & RETAIL TRADE
ETR@LA	EMPLOYMENT IN RETAIL TRADE
ETW@LA	EMPLOYMENT IN WHOLESALE TRADE

@LA = L.A. County endogenous variables
@CA = California exogenous variables
All others are U.S. exogenous variables

ETWU@CA	EMPLOYMENT IN TRANSPORTATION, WAREHOUSING & UTILITIES
ETWU@LA	EMPLOYMENT IN TRANSPORTATION, WAREHOUSING & UTILITIES
JPIFNRES	CHAINED PRICE INDEX--NONRESIDENTIAL CONSTRUCTION\2000=1.00
LC@LA	CIVILIAN LABOR FORCE
LFPR@CA	LABOR FORCE PARTICIPATION RATE
LFPR@LA	LABOR FORCE PARTICIPATION RATE
NINMIG@CA	NET INMIGRATION
NINMIG@LA	NET INMIGRATION
NJULY@CA	TOTAL POPULATION AS OF JULY 1
NJULY@LA	TOTAL POPULATION AS OF JULY 1
NNATINC@CA	NATURAL INCREASE
NNATINC@LA	NATURAL INCREASE
PC@CA	ESTIMATE OF IMPLICIT PRICE DEFLATOR OF PERSONAL CONSUMP. EXP.
PC@LA	ESTIMATE OF IMPLICIT PRICE DEFLATOR OF PERSONAL CONSUMP. EXP.
RESADJ@LA	RESIDENCE ADJUSTMENT
RU@LA	UNEMPLOYMENT RATE
RW@CA	DERIVED AVG. ANNUAL SALARY TOTAL
RW@LA	DERIVED AVG. ANNUAL SALARY TOTAL
RWC@LA	DERIVED AVG. ANNUAL SALARY IN CONSTRUCTION
RWEHS@LA	DERIVED AVG. ANNUAL SALARY IN EDUCATION & HEALTH SERVICES
RWFA@LA	DERIVED AVG. ANN SALARY IN FINANCIAL ACTIVITIES
RWG@LA	DERIVED AVG. ANNUAL SALARY IN GOVERNMENT
RWI@LA	DERIVED AVG. ANNUAL SALARY IN INFORMATION
RWLH@LA	DERIVED AVG. ANNUAL SALARY IN LEISURE & HOSPITALITY
RWM@LA	DERIVED AVG. ANNUAL SALARY IN MANUFACTURING
RWNRM@LA	DERIVED AVG. ANNUAL SALARY IN NATURAL RESOURCES & MINING
RWPBS@LA	DERIVED AVG. ANNUAL SALARY IN PROFESSIONAL & BUSINESS SERVICES
RWSVOTH@LA	DERIVED AVG. ANNUAL SALARY IN OTHER SERVICES
RWT@LA	DERIVED AVG. ANNUAL SALARY IN TRADE
RWTWU@LA	DERIVED AVG. ANNUAL SALARY IN TRANSPORTATION, WAREHOUSING & UTILITIES
ST@LA	TAXABLE SALES
STR@LA	REAL TAXABLE SALES
TWPER@LA	PER CONTR. FOR SOCIAL INSURANCE NEG. PLACE OF WORK
TWPERF@CA	PER CONTR. FOR SOCIAL INSURANCE NEG. PLACE OF WORK
V@LA	TRANSFER PAYMENTS, PLACE OF RESIDENCE
VF@CA	TRANSFER PAYMENTS, PLACE OF RESIDENCE
WSD@LA	WAGE & SALARY DISBURSEMENTS - TOTAL
WSDC@LA	WAGE & SALARY DISTRIB. IN CONSTRUCTION

@LA = L.A. County endogenous variables
@CA = California exogenous variables
All others are U.S. exogenous variables

WSDEHS@LA	WAGE & SALARY DISTRIB. IN EDUCATION & HEALTH SERIVCES
WSDF@CA	WAGE & SALARY DISTRIB. PLACE OF WORK
WSDFA@LA	WAGE & SALARY DISTRIB. IN FINANCIAL ACTIVITIES
WSDG@LA	WAGE & SALARY DISTRIB. IN GOVERNMENT
WSDI@LA	WAGE & SALARY DISTRIB. IN INFORMATION
WSDLH@LA	WAGE & SALARY DISTRIB. IN LEISURE & HOSPITALITY
WSDM@LA	WAGE & SALARY DISTRIB. IN MANUFACTURING
WSDNRM@LA	WAGE & SALARY DISTRIB. IN NATURAL RESOURCES & MINING
WSDPBS@LA	WAGE & SALARY DISTRIB. IN PROFESSIONAL BUSINESS SERVICES
WSDSVOTH@LA	WAGE & SALARY DISTRIB. IN OTHER SERVICES
WSDT@LA	WAGE & SALARY DISTRIB. IN WHOLESALE & RETAIL TRADE
WSDTWU@LA	WAGE & SALARY DISTRIB. IN TRANSPORTATION, WAREHOUSING & UTIL.
YENT@CA	PROPRIETOR'S INCOME - TOTAL
YENT@LA	PROPRIETOR'S INCOME - TOTAL
YENTAFF@CA	PROPRIETOR'S INCOME, FARM
YENTEAFF@CA	PROPRIETOR'S INCOME, NONFARM
YP@LA	PERSONAL INCOME - TOTAL
YPF@CA	PERSONAL INCOME TOTAL
YPOTHER@LA	OTHER PERSONAL INCOME
YPOTHER@CA	OTHER PERSONAL INCOME
YPPROP@LA	PROPERTY INCOME
YPPROPF@CA	PROPERTY INCOME
YPR@LA	REAL PERSONAL INCOME - TOTAL

@LA = L.A. County endogenous variables
@CA = California exogenous variables
All others are U.S. exogenous variables

Summary of the UCLA Forecast for Los Angeles County by Quarter

	2008:2	2008:3	2008:4	2009:1	2009:2	2009:3	2009:4	2010:1	2010:2
Personal Income, Taxable Sales, and Price Inflation (%Change)									
Personal Income									
(Billion $)	404.3	408.7	413.3	417.4	422.8	427.6	432.3	437.4	442.6
(% Change)	3.2	4.4	4.6	4.1	5.2	4.6	4.4	4.8	4.9
Real Personal Income									
(Bil 2000$)	305.9	310.0	312.3	314.0	316.5	318.5	320.5	322.6	324.6
(% Change)	-5.2	5.5	3.0	2.3	3.1	2.6	2.6	2.6	2.5
Taxable Sales									
(Billion $)	137.9	138.8	139.1	139.2	140.1	141.4	143.2	145.0	146.8
(% Change)	-3.0	2.7	0.8	0.3	2.6	3.7	5.2	5.1	5.0
Real Taxable Sales									
(Bil 2000$)	104.3	105.3	105.1	104.7	104.9	105.3	106.2	106.9	107.6
(% Change)	-10.8	3.8	-0.8	-1.5	0.6	1.7	3.3	2.9	2.6
Consumer Prices (% Ch)	8.8	-1.0	1.5	1.8	2.0	2.0	1.8	2.2	2.3
Employment and Labor Force - (Household Survey, %Change)									
Employment	-3.5	2.2	1.1	1.1	1.4	1.5	1.8	1.5	1.6
Labor Force	0.4	1.5	0.4	1.0	1.1	1.2	1.2	1.1	1.2
Unemployment Rate (%)	6.5	6.4	6.2	6.2	6.1	6.0	5.9	5.8	5.7
Nonfarm Employment (Payroll Survey, %Change)									
Total Nonfarm	0.5	0.9	1.2	1.3	1.4	1.6	1.8	1.4	1.5
Nat. Resources & Mining	-6.2	3.3	3.5	5.6	7.4	3.3	2.7	2.9	2.2
Construction	-6.5	-2.9	-1.4	0.3	2.2	3.6	4.5	2.0	1.5
Manufacturing	-1.6	0.2	0.1	0.4	1.0	1.5	1.4	1.1	1.7
Nondurable Goods	-1.3	-1.1	-0.5	-0.2	0.5	0.8	0.9	0.2	0.3
Durable Goods	-1.8	1.2	0.6	1.0	1.5	2.0	1.8	1.9	2.9
Trans., Warehousing & Utl.	-0.3	0.7	0.4	4.1	2.2	0.8	1.5	1.8	1.3
Trade	-0.8	1.2	1.0	1.5	1.7	2.1	2.2	1.1	1.0
Information	17.7	5.1	8.4	2.5	2.3	2.6	3.0	1.7	1.2
Financial Activities	-1.8	-2.9	0.3	2.0	2.0	2.5	2.6	0.9	1.5
Professional & Busi. Srvc.	-2.0	2.0	1.9	1.6	1.3	1.0	0.4	0.0	0.9
Edu. & Health Services	3.2	1.8	1.8	0.6	1.1	0.8	2.0	2.2	2.2
Leisure & Hospitality	-0.3	1.7	1.8	1.6	1.5	2.4	2.3	2.5	2.4
Other Services	0.5	0.8	0.7	1.6	2.2	2.1	2.4	1.2	1.2
Federal Gov't	-1.1	-0.3	-0.7	2.5	3.4	4.9	4.4	3.0	2.9
State and Local Gov't	2.1	-0.1	-0.1	0.1	0.1	0.4	1.0	1.3	1.6
Nonfarm Employment (Payroll Survey, Thous.)									
Total Nonfarm	4101.1	4110.1	4122.7	4135.6	4150.0	4166.5	4185.3	4199.5	4215.6
Nat. Resources & Mining	4.4	4.4	4.5	4.5	4.6	4.6	4.7	4.7	4.7
Construction	148.1	147.0	146.5	146.6	147.4	148.7	150.3	151.1	151.6
Manufacturing	441.9	442.1	442.3	442.7	443.9	445.5	447.1	448.3	450.3
Nondurable Goods	197.8	197.2	197.0	196.9	197.1	197.5	198.0	198.0	198.2
Durable Goods	244.2	244.9	245.3	245.8	246.7	248.0	249.1	250.3	252.1
Trans., Warehousing & Utl.	165.5	165.8	166.0	167.6	168.6	168.9	169.5	170.3	170.9
Trade	648.4	650.3	651.9	654.3	657.1	660.5	664.1	666.0	667.7
Information	202.7	205.3	209.4	210.7	211.9	213.3	214.9	215.8	216.4
Financial Activities	238.6	236.9	237.0	238.2	239.4	240.9	242.4	243.0	243.9
Professional & Busi. Srvc.	600.4	603.3	606.1	608.5	610.4	611.9	612.5	612.6	614.0
Edu. & Health Services	499.0	501.2	503.5	504.2	505.6	506.6	509.1	511.9	514.7
Leisure & Hospitality	402.0	403.7	405.6	407.1	408.7	411.1	413.5	416.0	418.5
Other Services	148.7	149.0	149.3	149.9	150.7	151.5	152.4	152.8	153.3
Federal Gov't	49.3	49.3	49.2	49.5	49.9	50.5	51.0	51.4	51.8
State and Local Gov't	552.0	551.8	551.6	551.7	551.9	552.5	553.8	555.7	557.9
Construction Activity and Population									
Residential Building									
Permits (Thous. Units)	15.4	17.0	18.4	18.5	19.4	20.4	21.3	21.7	21.8
Nonresidential Construction									
Real (Mil. 2000$)	3043.0	3163.9	3164.7	3144.7	3128.4	3114.8	3092.1	3077.5	3064.3
Nominal (Mil. $)	4808.6	5015.3	5021.8	4986.3	4957.1	4937.8	4911.4	4907.4	4909.0
Net Inmigration (Thous.)	-48	-44	-41	-37	-34	-32	-28	-32	-24
Population (Thous.)	10351	10361	10372	10385	10398	10411	10425	10439	10454
(% Change)	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6

Summary of the UCLA Forecast for Los Angeles County by Calendar Year

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Personal Income, Taxable Sales, and Price Inflation (%Change)										
Personal Income										
(Billion $)	194.7	202.5	201.2	205.7	213.1	222.8	232.4	253.5	264.0	279.8
(% Change)	0.4	4.0	-0.6	2.2	3.6	4.5	4.3	9.1	4.1	6.0
Real Personal Income										
(Bil 2000$)	236.2	237.0	229.8	231.7	236.4	242.7	249.2	268.0	272.7	279.8
(% Change)	-3.6	0.4	-3.1	0.8	2.1	2.6	2.7	7.6	1.7	2.6
Taxable Sales										
(Billion $)	75.4	74.6	73.0	76.9	79.0	82.6	86.4	90.2	97.2	106.7
(% Change)	-6.1	-1.0	-2.2	5.3	2.8	4.5	4.5	4.4	7.8	9.7
Real Taxable Sales										
(Bil 2000$)	91.5	87.4	83.4	86.6	87.7	90.0	92.6	95.3	100.4	106.7
(% Change)	-9.8	-4.4	-4.6	3.8	1.3	2.6	2.9	2.9	5.3	6.2
Consumer Prices (% Ch)	4.1	3.6	2.5	1.4	1.5	1.8	1.6	1.4	2.3	3.3
Employment and Labor Force - (Household Survey, %Change)										
Employment	-3.7	-2.3	-2.4	-0.3	1.0	0.7	3.8	3.1	1.5	2.7
Labor Force	-1.4	-0.3	-2.3	-1.0	-0.3	1.0	2.3	2.8	0.7	2.1
Unemployment Rate (%)	8.0	9.9	10.0	9.3	8.0	8.3	6.9	6.6	5.9	5.4
Nonfarm Employment (Payroll Survey, %Change)										
Total Nonfarm	-3.7	-4.5	-2.5	-0.2	1.2	1.1	2.0	2.0	1.5	1.6
Natural Resources & Min.	-17.0	-12.2	-9.3	-21.9	-2.4	-6.6	-9.7	-0.2	-1.7	-1.5
Construction	-9.9	-14.0	-8.7	6.2	3.9	-4.0	1.7	7.6	6.6	3.8
Manufacturing	-7.4	-7.1	-6.8	-3.7	0.1	0.7	0.9	0.8	-2.9	-2.1
Nondurable Goods	-0.6	-1.2	-1.4	0.4	2.8	0.9	-0.2	-0.6	-2.4	-0.9
Durable Goods	-11.0	-10.5	-10.2	-6.5	-1.9	0.5	1.8	1.9	-3.3	-3.0
Trans., Warehousing & Ut	-0.5	-3.9	-1.9	0.3	2.2	1.0	2.9	4.5	2.6	1.3
Trade	-2.8	-4.9	-3.5	-0.8	1.1	1.0	2.1	1.2	1.4	2.0
Information	-2.8	-6.9	0.6	4.8	7.5	5.8	6.3	0.1	10.1	3.0
Financial Activities	-5.3	-6.4	-3.1	-3.6	-3.4	-3.0	1.5	1.7	1.2	-1.0
Professional & Busi. Srv	-5.5	-3.8	0.9	1.9	1.9	2.6	4.2	4.4	-0.2	1.4
Edu. & Health Services	-2.9	-2.7	-0.6	1.7	1.3	3.4	0.3	2.3	1.8	3.6
Leisure & Hospitality	0.6	-1.8	-0.4	1.1	1.5	2.5	2.9	1.5	1.3	2.6
Other Services	0.2	-3.1	-1.4	-2.7	3.2	-0.5	0.2	3.2	1.3	2.3
Federal Gov't	-4.3	0.5	-3.5	-2.7	-2.2	-3.5	-5.4	-2.9	1.7	1.5
State and Local Gov't	0.7	-0.2	-1.2	0.9	0.7	-0.1	1.4	1.3	4.1	3.7
Nonfarm Employment (Payroll Survey, Thous.)										
Total Nonfarm	3982.4	3804.2	3707.6	3702.0	3746.8	3788.7	3865.1	3943.6	4003.0	4067.9
Natural Resources & Min.	6.8	6.0	5.4	4.2	4.1	3.9	3.5	3.5	3.4	3.4
Construction	130.7	112.4	102.6	109.0	113.3	108.7	110.6	119.0	126.9	131.7
Manufacturing	751.7	698.5	651.2	627.4	628.2	632.6	638.5	643.7	625.2	612.2
Nondurable Goods	277.2	273.9	270.0	271.1	278.7	281.2	280.7	278.9	272.3	269.9
Durable Goods	474.6	424.6	381.2	356.3	349.4	351.4	357.8	364.7	352.8	342.3
Trans., Warehousing & Ut	160.2	154.0	151.1	151.4	154.7	156.3	160.8	168.0	172.4	174.5
Trade	616.0	585.8	565.1	560.5	566.5	571.9	583.9	591.0	599.3	611.4
Information	180.9	168.4	169.4	177.6	190.9	201.9	214.8	214.9	236.6	243.7
Financial Activities	265.2	248.2	240.5	231.8	223.9	217.3	220.5	224.2	226.8	224.6
Professional & Busi.Serv	512.0	492.6	497.0	506.4	516.0	529.7	552.0	576.4	575.4	583.7
Edu. & Health Services	373.5	363.5	361.4	367.5	372.2	385.1	386.3	395.0	402.3	416.7
Leisure & Hospitality	308.4	303.0	301.9	305.3	309.9	317.7	326.9	331.9	336.2	344.8
Other Services	136.9	132.6	130.7	127.2	131.3	130.6	130.9	135.1	136.8	140.0
Federal Gov't	68.7	69.1	66.7	64.9	63.4	61.2	57.9	56.2	57.1	57.9
State and Local Gov't	471.1	470.2	464.7	468.8	472.2	471.8	478.5	484.9	504.6	523.3
Construction Activity and Population										
Residential Building										
Permits (Thous. Units)	16.3	12.0	7.5	7.4	8.6	8.9	10.3	11.6	14.2	17.2
Nonresidential Construction										
Real (Mil. 2000$)	3652.7	2861.8	2791.2	2831.3	2364.4	2463.6	2515.3	3325.5	3848.3	3294.4
Nominal (Mil. $)	2752.7	2155.7	2164.9	2276.0	1982.3	2120.3	2249.0	3108.3	3708.2	3292.6
Net Inmigration (Thous.)	-47	-36	-107	-100	-122	-104	-29	-19	30	84
Population (Thous.)	8956	9066	9113	9138	9141	9137	9194	9270	9379	9547
(% Change)	1.0	1.2	0.5	0.3	0.0	-0.0	0.6	0.8	1.2	1.8

Summary of the UCLA Forecast for Los Angeles County by Calendar Year

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Personal Income, Taxable Sales, and Price Inflation (%Change)										
Personal Income										
(Billion $)	294.5	301.0	309.8	326.4	346.4	369.2	391.5	406.9	425.0	445.3
(% Change)	5.3	2.2	2.9	5.4	6.1	6.6	6.0	3.9	4.5	4.8
Real Personal Income										
(Bil 2000$)	284.9	283.4	284.3	289.8	294.4	300.9	309.0	309.6	317.4	325.5
(% Change)	1.8	-0.6	0.3	1.9	1.6	2.2	2.7	0.2	2.5	2.6
Taxable Sales										
(Billion $)	107.4	108.7	113.6	122.5	130.6	136.1	139.0	138.7	141.0	147.8
(% Change)	0.7	1.2	4.5	7.8	6.6	4.2	2.1	-0.2	1.6	4.8
Real Taxable Sales										
(Bil 2000$)	103.9	102.3	104.3	108.8	111.0	111.0	109.7	105.5	105.3	108.0
(% Change)	-2.5	-1.6	1.9	4.3	2.1	-0.0	-1.1	-3.8	-0.3	2.6
Consumer Prices (% Ch)	3.4	2.8	2.6	3.3	4.5	4.3	3.3	3.7	1.9	2.1
Employment and Labor Force - (Household Survey, %Change)										
Employment	1.3	-0.8	-0.5	0.8	2.2	1.3	1.2	-0.4	1.1	1.6
Labor Force	1.6	0.4	-0.2	0.2	0.9	0.7	1.5	0.9	1.0	1.2
Unemployment Rate (%)	5.7	6.8	7.0	6.5	5.3	4.7	5.0	6.2	6.1	5.7
Nonfarm Employment (Payroll Survey, %Change)										
Total Nonfarm	0.0	-1.2	-1.1	0.3	0.7	1.7	0.6	-0.1	1.3	1.5
Natural Resources & Min.	13.1	-2.7	2.7	-0.9	-2.2	9.1	9.9	0.3	4.0	2.7
Construction	3.9	-1.7	0.1	4.1	6.1	6.0	-0.2	-5.9	0.1	2.7
Manufacturing	-5.6	-7.5	-6.5	-3.3	-2.5	-2.1	-3.2	-1.0	0.5	1.3
Nondurable Goods	-6.4	-6.8	-5.0	-3.6	-3.5	-1.9	-2.7	-0.6	-0.1	0.5
Durable Goods	-5.0	-8.0	-7.7	-3.0	-1.6	-2.3	-3.5	-1.4	1.0	2.0
Trans., Warehousing & Ut	0.6	-4.8	-3.4	-0.3	0.4	2.2	0.7	-0.4	1.8	1.4
Trade	0.5	0.2	-0.3	1.2	2.1	2.4	0.7	-0.5	1.4	1.5
Information	-7.2	-8.4	-2.4	4.7	-2.0	-0.9	1.8	-3.0	4.8	1.9
Financial Activities	2.0	1.6	3.1	0.8	1.0	2.0	-1.5	-2.8	0.9	1.7
Professional & Busi. Srv	0.0	-2.3	-2.8	0.3	2.5	4.0	1.2	0.6	1.2	0.6
Edu. & Health Services	3.7	4.2	2.2	1.4	0.9	1.6	2.0	2.3	1.3	1.9
Leisure & Hospitality	1.1	1.6	2.4	2.8	1.3	2.9	2.3	1.5	1.7	2.3
Other Services	2.3	1.7	-0.1	-0.5	-0.3	0.7	1.3	1.2	1.5	1.6
Federal Gov't	-6.2	-0.4	2.5	-2.0	-1.6	-2.1	-3.5	-2.4	1.9	3.2
State and Local Gov't	3.9	1.5	-1.5	-2.0	-0.5	1.3	1.3	1.3	0.2	1.2
Nonfarm Employment (Payroll Survey, Thous.)										
Total Nonfarm	4069.6	4022.0	3977.3	3989.9	4017.5	4086.3	4109.8	4107.6	4159.4	4223.0
Natural Resources & Min.	3.8	3.7	3.8	3.8	3.7	4.0	4.4	4.4	4.6	4.7
Construction	136.9	134.5	134.6	140.2	148.7	157.5	157.2	148.0	148.2	152.2
Manufacturing	577.9	534.8	500.0	483.6	471.7	461.7	447.1	442.5	444.8	450.6
Nondurable Goods	252.5	235.5	223.8	215.7	208.2	204.3	198.7	197.6	197.4	198.3
Durable Goods	325.4	299.3	276.2	267.8	263.4	257.3	248.4	244.9	247.4	252.3
Trans., Warehousing & Ut	175.5	167.2	161.5	161.1	161.7	165.2	166.3	165.7	168.7	171.1
Trade	614.2	615.4	613.3	620.4	633.6	648.9	653.3	650.1	659.0	668.7
Information	226.3	207.3	202.3	211.9	207.6	205.6	209.2	203.0	212.7	216.7
Financial Activities	229.0	232.6	239.8	241.6	244.0	248.8	245.0	238.1	240.2	244.2
Professional & Busi.Serv	583.9	570.2	554.5	556.0	569.7	592.7	599.7	603.4	610.8	614.5
Edu. & Health Services	432.0	450.3	460.3	467.0	471.3	478.7	488.2	499.7	506.4	516.0
Leisure & Hospitality	348.5	354.3	362.6	372.8	377.8	388.5	397.3	403.4	410.1	419.7
Other Services	143.1	145.6	145.4	144.7	144.2	145.2	147.1	148.9	151.1	153.5
Federal Gov't	54.4	54.1	55.5	54.3	53.5	52.3	50.5	49.3	50.2	51.8
State and Local Gov't	543.9	551.9	543.7	532.7	530.2	537.1	544.3	551.1	552.5	559.2
Construction Activity and Population										
Residential Building										
Permits (Thous. Units)	18.4	19.1	21.4	27.1	26.1	26.0	20.4	16.0	19.9	21.9
Nonresidential Construction										
Real (Mil. 2000$)	3374.0	2641.0	2574.2	2611.8	2836.0	2593.3	3032.1	3111.0	3120.0	3057.5
Nominal (Mil. $)	3549.8	2907.2	2931.5	3159.9	3827.7	3908.8	4723.4	4918.5	4948.1	4914.2
Net Inmigration (Thous.)	65	67	38	10	-23	-39	-45	-46	-33	-19
Population (Thous.)	9715	9876	10018	10130	10211	10267	10315	10356	10405	10464
(% Change)	1.8	1.7	1.4	1.1	0.8	0.6	0.5	0.4	0.5	0.6

Summary of the UCLA Forecast for Los Angeles County by Calendar Year

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Personal Income, Taxable Sales, and Price Inflation (%Change)										
Personal Income										
(Billion $)	468.2	491.2	515.5	541.4	567.9	597.2	626.6	656.7	686.0	719.0
(% Change)	5.1	4.9	4.9	5.0	4.9	5.2	4.9	4.8	4.4	4.8
Real Personal Income										
(Bil 2000$)	333.0	342.8	352.5	363.2	373.3	385.0	396.1	406.9	416.8	428.7
(% Change)	2.3	2.9	2.8	3.0	2.8	3.1	2.9	2.7	2.4	2.9
Taxable Sales										
(Billion $)	155.2	164.3	175.0	186.4	197.2	208.1	218.6	229.7	241.1	252.8
(% Change)	5.0	5.8	6.5	6.5	5.8	5.5	5.1	5.1	4.9	4.9
Real Taxable Sales										
(Bil 2000$)	110.4	114.6	119.7	125.0	129.6	134.2	138.2	142.3	146.5	150.7
(% Change)	2.2	3.8	4.4	4.5	3.7	3.5	3.0	3.0	2.9	2.9
Consumer Prices (% Ch)	2.8	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9
Employment and Labor Force - (Household Survey, %Change)										
Employment	1.5	1.3	1.3	1.3	1.2	1.3	1.3	1.2	1.1	1.2
Labor Force	1.3	1.3	1.1	1.0	1.0	1.2	1.3	1.1	1.2	1.2
Unemployment Rate (%)	5.6	5.5	5.3	5.1	4.9	4.8	4.8	4.7	4.8	4.8
Nonfarm Employment (Payroll Survey, %Change)										
Total Nonfarm	1.5	1.3	1.3	1.3	1.3	1.3	1.4	1.2	1.2	1.2
Natural Resources & Min.	0.9	0.6	0.8	1.1	1.1	1.1	1.1	1.0	1.0	1.0
Construction	2.3	2.1	2.3	2.5	2.4	2.4	2.3	2.2	2.2	2.1
Manufacturing	0.9	0.3	-0.1	-0.1	0.1	0.3	0.4	0.5	0.6	0.7
Nondurable Goods	0.3	0.3	0.3	0.3	0.5	0.6	0.7	0.8	0.8	0.9
Durable Goods	1.4	0.4	-0.5	-0.4	-0.1	0.1	0.2	0.3	0.4	0.5
Trans., Warehousing & Ut	1.2	1.1	1.3	1.5	1.5	1.5	1.4	1.3	1.3	1.3
Trade	1.0	0.9	1.1	1.2	1.3	1.4	1.3	1.2	1.1	1.1
Information	2.1	2.1	1.9	1.4	1.0	1.0	1.2	1.4	1.2	1.3
Financial Activities	1.3	1.4	1.6	1.7	1.7	1.7	1.1	0.7	0.6	0.6
Professional & Busi. Srv	1.2	1.4	1.3	1.3	1.2	1.1	1.5	1.5	1.3	1.1
Edu. & Health Services	2.0	1.6	1.6	1.6	1.5	1.4	1.6	1.4	1.4	1.4
Leisure & Hospitality	2.2	1.9	1.8	1.8	1.7	1.6	1.7	1.5	1.2	1.2
Other Services	1.0	0.7	0.9	1.2	1.2	1.2	1.2	1.1	1.1	1.1
Federal Gov't	1.2	0.7	1.0	1.3	1.3	1.3	1.3	1.2	1.2	1.2
State and Local Gov't	1.7	1.3	1.1	1.1	1.2	1.5	1.3	1.1	1.1	1.2
Nonfarm Employment (Payroll Survey, Thous.)										
Total Nonfarm	4285.3	4341.1	4395.4	4451.9	4508.8	4567.9	4629.8	4687.6	4741.9	4796.5
Natural Resources & Min.	4.8	4.8	4.9	4.9	5.0	5.0	5.1	5.1	5.2	5.2
Construction	155.8	159.1	162.7	166.7	170.8	174.8	178.9	182.8	186.8	190.8
Manufacturing	454.6	456.1	455.4	455.1	455.7	457.2	459.2	461.6	464.4	467.7
Nondurable Goods	198.8	199.5	200.1	200.8	201.8	203.1	204.5	206.1	207.9	209.8
Durable Goods	255.8	256.7	255.3	254.3	253.9	254.1	254.6	255.5	256.6	257.9
Trans., Warehousing & Ut	173.2	175.1	177.5	180.1	182.7	185.3	188.0	190.5	193.0	195.6
Trade	675.1	681.4	688.9	697.3	706.4	716.2	725.9	734.7	742.8	751.1
Information	221.2	225.9	230.2	233.4	235.7	238.1	241.1	244.4	247.4	250.6
Financial Activities	247.3	250.9	254.9	259.3	263.7	268.2	271.2	273.1	274.7	276.3
Professional & Busi.Serv	621.8	630.7	638.8	647.1	654.9	661.8	671.9	681.9	690.6	698.0
Edu. & Health Services	526.6	535.1	543.6	552.3	560.8	568.8	578.1	586.4	594.4	602.5
Leisure & Hospitality	428.9	437.0	445.0	453.2	461.0	468.5	476.4	483.5	489.4	495.2
Other Services	155.1	156.1	157.6	159.4	161.3	163.3	165.2	167.0	168.9	170.7
Federal Gov't	52.4	52.8	53.4	54.1	54.8	55.5	56.2	56.9	57.6	58.3
State and Local Gov't	568.6	576.2	582.5	589.0	596.1	605.1	612.9	619.6	626.8	634.3
Construction Activity and Population										
Residential Building										
Permits (Thous. Units)	24.3	25.9	26.9	27.4	27.7	28.2	28.6	28.5	28.6	28.8
Nonresidential Construction										
Real (Mil. 2000$)	3055.7	3088.2	3117.1	3146.9	3192.6	3247.9	3290.6	3327.3	3342.9	3350.7
Nominal (Mil. $)	5037.8	5247.8	5465.9	5700.4	5979.4	6291.1	6595.8	6907.4	7174.9	7432.3
Net Inmigration (Thous.)	16	20	24	26	27	22	22	22	21	21
Population (Thous.)	10548	10640	10728	10815	10900	10978	11052	11126	11199	11270
(% Change)	0.8	0.9	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.6

Summary of the UCLA Forecast for Los Angeles County by Calendar Year

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Personal Income, Taxable Sales, and Price Inflation (%Change)										
Personal Income										
(Billion $)	753.9	788.2	823.8	860.8	898.0	935.9	976.5	1016.4	1055.2	1095.0
(% Change)	4.9	4.6	4.5	4.5	4.3	4.2	4.3	4.1	3.8	3.8
Real Personal Income										
(Bil 2000$)	441.4	453.8	467.3	481.7	495.3	508.3	521.7	533.0	542.9	553.0
(% Change)	3.0	2.8	3.0	3.1	2.8	2.6	2.6	2.2	1.9	1.9
Taxable Sales										
(Billion $)	265.8	279.1	292.5	306.2	320.2	334.2	348.0	362.4	377.0	391.7
(% Change)	5.1	5.0	4.8	4.7	4.6	4.4	4.1	4.1	4.0	3.9
Real Taxable Sales										
(Bil 2000$)	155.6	160.7	165.9	171.3	176.6	181.5	185.9	190.0	194.0	197.8
(% Change)	3.2	3.3	3.2	3.3	3.1	2.8	2.4	2.2	2.1	2.0
Consumer Prices (% Ch)	1.9	1.7	1.5	1.4	1.4	1.6	1.7	1.9	1.9	1.9
Employment and Labor Force - (Household Survey, %Change)										
Employment	1.0	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7
Labor Force	1.0	0.8	0.9	0.9	0.8	0.8	0.8	0.8	0.7	0.6
Unemployment Rate (%)	4.8	4.8	4.9	5.0	5.0	5.1	5.1	5.1	5.1	5.0
Nonfarm Employment (Payroll Survey, %Change)										
Total Nonfarm	1.1	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Natural Resources & Min.	0.9	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Construction	2.0	1.8	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6
Manufacturing	0.6	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6
Nondurable Goods	0.8	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.6	0.6
Durable Goods	0.5	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5
Trans., Warehousing & Ut	1.1	1.1	1.3	1.3	1.2	0.9	0.9	0.9	0.9	0.9
Trade	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Information	1.2	1.0	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8
Financial Activities	0.8	0.7	0.7	0.7	0.8	0.8	0.6	0.6	0.6	0.6
Professional & Busi. Srv	0.9	0.8	0.8	0.8	0.7	0.7	0.8	0.8	0.9	0.9
Edu. & Health Services	1.4	1.2	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0
Leisure & Hospitality	1.1	0.9	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Other Services	0.9	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7	0.7
Federal Gov't	1.0	0.8	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.7
State and Local Gov't	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9
Nonfarm Employment (Payroll Survey, Thous.)										
Total Nonfarm	4847.3	4892.6	4936.2	4980.2	5023.4	5066.8	5111.0	5155.0	5199.3	5243.6
Natural Resources & Min.	5.3	5.3	5.3	5.4	5.4	5.4	5.5	5.5	5.6	5.6
Construction	194.6	198.1	201.5	204.8	208.2	211.6	215.1	218.5	222.0	225.4
Manufacturing	470.6	472.8	475.1	477.5	480.0	482.7	485.7	488.7	491.6	494.4
Nondurable Goods	211.5	212.8	214.2	215.6	217.0	218.6	220.2	221.8	223.3	224.6
Durable Goods	259.1	260.0	260.9	261.9	263.0	264.2	265.5	266.9	268.4	269.8
Trans., Warehousing & Ut	197.8	200.0	202.5	205.0	207.5	209.5	211.4	213.3	215.2	217.1
Trade	758.8	766.0	773.0	780.0	786.9	793.9	801.1	808.2	815.3	822.3
Information	253.6	256.2	258.6	260.9	263.0	265.0	267.2	269.3	271.5	273.6
Financial Activities	278.5	280.5	282.4	284.5	286.6	288.9	290.8	292.4	294.1	295.8
Professional & Busi.Serv	704.4	710.2	715.7	721.1	726.4	731.8	737.4	743.3	749.8	756.6
Edu. & Health Services	610.6	618.2	625.0	631.8	638.5	645.2	652.2	658.9	665.6	672.2
Leisure & Hospitality	500.5	504.9	508.7	512.4	516.1	519.7	523.5	527.2	530.9	534.6
Other Services	172.3	173.6	174.7	175.9	177.0	178.3	179.6	180.8	182.0	183.2
Federal Gov't	58.9	59.4	59.8	60.2	60.7	61.1	61.6	62.0	62.5	62.9
State and Local Gov't	641.4	647.6	654.1	660.6	667.0	673.5	680.2	686.8	693.3	699.8
Construction Activity and Population										
Residential Building										
Permits (Thous. Units)	29.1	29.1	29.1	29.1	29.2	29.3	29.4	29.5	29.6	29.7
Nonresidential Construction										
Real (Mil. 2000$)	3359.2	3373.0	3386.1	3398.3	3437.4	3523.0	3627.0	3731.0	3835.0	3939.0
Nominal (Mil. $)	7700.7	7991.0	8292.4	8604.6	9003.2	9546.3	10163.6	10806.9	11480.6	12190.9
Net Inmigration (Thous.)	21	21	20	19	17	16	15	15	13	13
Population (Thous.)	11340	11410	11479	11547	11614	11679	11743	11806	11867	11927
(% Change)	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5

Summary of the UCLA Forecast for Los Angeles County by Calendar Year

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Personal Income, Taxable Sales, and Price Inflation (%Change)										
Personal Income										
(Billion $)	1135.2	1175.1	1216.1	1258.3	1302.5	1348.1	1394.7	1442.8	1493.0	1545.1
(% Change)	3.7	3.5	3.5	3.5	3.5	3.5	3.5	3.4	3.5	3.5
Real Personal Income										
(Bil 2000$)	563.1	572.1	581.0	589.9	598.8	607.7	616.2	625.0	634.9	644.8
(% Change)	1.8	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.6	1.6
Taxable Sales										
(Billion $)	405.8	420.3	435.3	450.8	466.9	483.9	501.7	519.3	536.9	555.4
(% Change)	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.5	3.4	3.5
Real Taxable Sales										
(Bil 2000$)	201.3	204.6	208.0	211.3	214.6	218.1	221.7	225.0	228.3	231.8
(% Change)	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5
Consumer Prices (% Ch)	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.0	1.9	1.9
Employment and Labor Force - (Household Survey, %Change)										
Employment	0.7	0.6	0.6	0.6	0.5	0.5	0.6	0.6	0.6	0.6
Labor Force	0.7	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5
Unemployment Rate (%)	5.0	5.0	5.0	5.0	5.0	5.1	5.1	5.0	5.0	5.0
Nonfarm Employment (Payroll Survey, %Change)										
Total Nonfarm	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7
Natural Resources & Min.	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Construction	1.4	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0
Manufacturing	0.5	0.4	0.4	0.4	0.3	0.3	0.4	0.4	0.4	0.4
Nondurable Goods	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.4
Durable Goods	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.4
Trans., Warehousing & Ut	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7
Trade	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Information	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6
Financial Activities	0.6	0.6	0.6	0.6	0.6	0.6	0.4	0.4	0.4	0.4
Professional & Busi. Srv	0.9	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7
Edu. & Health Services	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Leisure & Hospitality	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.6	0.6	0.6
Other Services	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Federal Gov't	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.6	0.6	0.6
State and Local Gov't	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.9	0.9
Nonfarm Employment (Payroll Survey, Thous.)										
Total Nonfarm	5286.7	5329.6	5371.7	5412.8	5451.5	5489.7	5529.0	5568.7	5609.4	5649.4
Natural Resources & Min.	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Construction	228.5	231.1	233.8	236.4	238.9	241.4	244.0	246.5	249.1	251.7
Manufacturing	496.7	498.8	500.8	502.7	504.4	506.1	507.9	509.8	511.7	513.6
Nondurable Goods	225.7	226.7	227.5	228.4	229.1	229.8	230.6	231.5	232.3	233.2
Durable Goods	271.0	272.1	273.2	274.3	275.3	276.2	277.2	278.3	279.4	280.5
Trans., Warehousing & Ut	219.0	220.9	222.8	224.6	226.3	228.1	229.8	231.7	233.5	235.2
Trade	829.7	837.1	844.3	851.3	858.0	864.5	871.3	878.2	885.3	892.4
Information	275.7	277.7	279.8	281.7	283.4	285.1	286.8	288.6	290.4	292.0
Financial Activities	297.5	299.2	300.9	302.7	304.4	306.2	307.5	308.6	309.8	311.1
Professional & Busi.Serv	763.1	769.3	775.5	781.5	787.2	792.8	798.6	804.5	810.5	816.2
Edu. & Health Services	679.1	686.6	694.0	701.2	708.1	714.9	721.8	728.9	736.0	743.1
Leisure & Hospitality	538.1	541.6	544.9	548.1	551.1	554.0	557.0	560.1	563.3	566.4
Other Services	184.4	185.6	186.9	188.1	189.2	190.3	191.5	192.7	193.8	195.0
Federal Gov't	63.3	63.8	64.1	64.5	64.9	65.2	65.5	65.9	66.3	66.7
State and Local Gov't	705.9	712.2	718.4	724.4	730.1	735.6	741.6	747.5	753.9	760.4
Construction Activity and Population										
Residential Building										
Permits (Thous. Units)	29.8	29.8	29.8	29.9	29.9	29.9	29.9	29.9	30.0	30.0
Nonresidential Construction										
Real (Mil. 2000$)	3972.0	3964.0	3956.0	3948.0	3940.0	3932.0	3924.0	3916.0	3908.0	3900.0
Nominal (Mil. $)	12712.0	13114.2	13519.4	13941.8	14383.4	14844.1	15317.4	15795.9	16272.3	16746.7
Net Inmigration (Thous.)	12	12	12	11	11	11	11	11	11	11
Population (Thous.)	11986	12044	12101	12158	12216	12273	12331	12388	12445	12502
(% Change)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

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An innovation and policy agenda for commercially competitive plug-in hybrid electric vehicles

D M Lemoine[1], D M Kammen[1,2,3] and A E Farrell[1,4,5]

[1] Energy and Resources Group, University of California, 310 Barrows Hall, Berkeley, CA 94720-3050, USA
[2] Richard and Rhoda Goldman School of Public Policy, University of California, Berkeley, USA
[3] Renewable and Appropriate Energy Laboratory, University of California, Berkeley, USA
[4] Transportation Sustainability Research Center, University of California, Berkeley, USA

E-mail: dlemoine@berkeley.edu, kammen@berkeley.edu and aef@berkeley.edu

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Abstract
Plug-in hybrid electric vehicles (PHEVs) can use both grid-supplied electricity and liquid fuels. We show that under recent conditions, millions of PHEVs could have charged economically in California during both peak and off-peak hours even with modest gasoline prices and real-time electricity pricing. Special electricity rate tariffs already in place for electric vehicles could successfully render on-peak charging uneconomical and off-peak charging very attractive. However, unless battery prices fall by at least a factor of two, or gasoline prices double, the present value of fuel savings is smaller than the marginal vehicle costs, likely slowing PHEV market penetration in California. We also find that assumptions about how PHEVs are charged strongly influence the number of PHEVs that can be charged before the electric power system must be expanded. If most PHEVs are charged after the workday, and thus after the time of peak electricity demand, our forecasts suggest that several million PHEVs could be deployed in California without requiring new generation capacity, and we also find that the state's PHEV fleet is unlikely to reach into the millions within the current electricity sector planning cycle. To ensure desirable outcomes, appropriate technologies and incentives for PHEV charging will be needed if PHEV adoption becomes mainstream.

Keywords: plug-in, hybrid, electric vehicle, battery, charging, present value, fuel savings, electricity, grid, fuel price

1. Introduction

Plug-in hybrid electric vehicles (PHEVs) have been proposed as a next step in the evolution of transportation technologies towards increased energy efficiency and less pollution (Romm and Frank 2006, Suppes 2006). They are similar to current hybrid electric vehicles (HEVs) but have larger batteries that can be charged from the electric grid. HEVs have proven popular as sales in the US have grown by over 80% annually since 2000, despite questions about the value of their fuel savings relative to the additional cost of the vehicles (see http://www.hybridcars.com and Lave and MacLean (2002)). Several companies now offer to convert HEVs (such as the Toyota Prius and Ford Escape models) into PHEVs and plan to sell retrofit kits, and several leading automobile manufacturers are developing and testing PHEVs.

PHEVs are intriguing because they combine the long range and accessible fueling infrastructure of gasoline-powered vehicles with the low emissions of battery-powered

[5] Author to whom any correspondence should be addressed.

vehicles, and by allowing stationary power sources to provide transportation energy, PHEVs offer a potential long-run substitute for petroleum. Because they introduce fuel competition into the transportation sector, PHEVs may play an important role in climate change and energy security strategies. Prior analyses of PHEVs have focused on vehicle design and made optimistic, best-case assumptions about vehicle charging (Romm and Frank 2006). We focus upon the interaction of PHEVs with energy markets and the electric grid, and we bound the possibilities by considering both optimistic and pessimistic assumptions about charging patterns. We study the area served by the California Independent System Operator (CAISO), which includes about 80% of California electricity demand. CAISO's high electricity prices and tight supply conditions should make on-peak charging less desirable there than in most other places in the US.

Prior analyses have examined the impact of battery electric vehicles (BEVs) on electricity markets (Ford 1994, Koyanagi and Uriu 1997), but PHEVs interact with the energy system in a fundamentally different way because drivers have more flexibility to choose if and when to charge their PHEVs. In a sense, PHEVs have two fuel tanks: they may use gasoline like an HEV, or they may charge their batteries from the electric grid and use this stored energy until low battery charge leads the vehicle to switch to the gasoline-fueled hybrid electric mode. PHEVs promise to link gasoline and electricity markets through the repeated marginal decisions of automobile fuel choice. PHEV owners should be more responsive than BEV owners to gasoline and electricity price signals, and, unlike BEVs, the loads PHEVs place on the electric power system are discretionary because a PHEV can operate on liquid fuels such as gasoline or biofuels.

There has been considerable interest in the use of vehicles, especially those with fuel cells, to provide energy or energy services to the electric grid (Williams 1997, Kempton and Tomic 2005). For simplicity, and because it would involve a far greater change from current practices, we ignore this application. We also ignore distribution-level constraints on the quantity and pattern of PHEV charging. A prior analysis found that these constraints could be important for BEVs (Rahman and Shrestha 1993), but the anticipated effects of BEV charging on the distribution system were mainly due to the assumed method and duration of charging. Their charging method used high charging loads in the first two hours and then charged the batteries at a decreasing rate for another six hours. Rahman and Shrestha used this charging cycle because it would protect the lead-acid batteries. The long charging time restricted their ability to shift BEV charging into late-night hours, and the high initial charging loads created excessive system load when the BEVs began charging. PHEVs will likely use more advanced batteries such as lithium-ion batteries, and these more advanced batteries need not use the lead-acid batteries' charging method and may not need to charge for as long (Linden and Reddy 2002). Further, PHEVs would need smaller batteries than would BEVs because they can have shorter all-electric ranges without sacrificing functionality, which would again mean that PHEVs may not need to charge for as long. PHEVs should therefore have fewer effects on the distribution system than would BEVs.

We will answer five questions. Would PHEV owners prefer to charge from the grid with recent electricity tariffs and gasoline prices? If subject to real-time electricity pricing, how many PHEVs could economically charge from the grid before the price of electricity rose above the equivalent price of gasoline? What charging patterns and PHEV fleet sizes would create a need for new generation capacity? What sorts of PHEV adoption pathways could produce potentially problematic fleet sizes in the near term? If PHEV adoption depends upon expected fuel savings compensating vehicle owners for the additional battery cost, do current battery costs make rapid adoption pathways likely? The future of PHEVs is uncertain: innovation, marketing, government policies, fuel prices, consumer preferences and behavior, and even moral suasion may all play an important role in determining PHEV adoption and charging patterns. This renders the development of probabilities for different adoption and charging scenarios speculative and not very meaningful. Instead, we use a bounding analysis with robustness checks to examine the range of possible outcomes. We find that millions of PHEVs could economically charge during peak hours with real-time pricing and that California PHEVs are unlikely to require new generation capacity unless there are more than 1 million of them and their charging is not directed away from peak hours. Barring potential pro-PHEV policies or technological developments, it is unlikely that the California fleet will contain 1 million PHEVs in the near term of electric power system planning because current battery prices do not provide the economic incentives that could sustain such a rapid adoption pathway.

2. Methods

We adopt performance parameters from EPRI (2002): a compact car PHEV with an all-electric range of 20 miles has gasoline-fueled efficiency of 52.7 miles/gallon and all-electric efficiency of 4.010 miles/kWh, compact car HEV efficiency is 49.4 miles/gallon, and compact car conventional vehicle (CV) efficiency is 37.7 miles/gallon.[6] The all-electric efficiency includes losses from charging (EPRI 2001). A charging rate of 1 kWh/h can be obtained by using ordinary 120 V technology with a charger efficiency of 82% and a charger size of 1.2 kW, and higher charging rates may be obtained by investing in infrastructure such as 240 V chargers. Each compact car PHEV will use 4.1 kWh of stored energy if it drives its entire all-electric range and will require 4.1 h to fully recharge, and each full-size sport utility vehicle (SUV) PHEV will use 7.1 kWh of stored energy if it drives its entire all-electric range and will require 7.1 h to fully recharge[7]. If PHEVs have all-electric ranges that are less than 20 miles so as to reduce initial costs,

[6] The performance parameters in EPRI (2002) assume that the PHEVs use their grid-supplied electricity to run in an all-electric mode that uses only the electric motor, but another option is blended operation in which grid-supplied electricity and gasoline fuel the vehicle at the same time or in intervals. Blended operation would allow for better sizing of the electric motor. Also, we focus on PHEVs for residential use, but commercial and off-road PHEVs may be adopted first and may have significantly different characteristics.

[7] We corrected two inconsistencies in table 2-6 of EPRI (2002) when we determined the length of time that a PHEV would need to fully charge from the grid. The charger should be rated at 1.2 kW and the SUV rated battery pack size should be 7.1 kWh.

Table 1. Gasoline prices and equivalent wholesale and retail electricity rates for PHEVs.

Gasoline price ($/gal)	Equivalent electricity rate ($/kWh)[a]	Equivalent wholesale electricity price ($/MWh)[b]
$1.50	$0.114	$36
$2.00	$0.152	$74
$2.50	$0.190	$112
$3.00	$0.228	$150
$3.50	$0.266	$188
$4.00	$0.304	$226

[a] Fuel prices are equivalent if they yield the same cost per mile of PHEV operation. PHEV efficiency is 52.7 miles/gallon and 4.010 miles/kWh (EPRI 2002).

[b] Non-generation costs of electricity are $0.07816/kWh (Pacific Gas and Electric Company 2006).

then each PHEV would require less electricity to fully charge but may charge more often.

We calculate the retail electricity prices that would be equivalent to various retail gasoline prices in terms of PHEVs' fuel cost per mile driven, and we subtract non-generation costs to obtain the implied wholesale electricity prices (table 1). We also calculate the gasoline prices that are equivalent to May 2006 Pacific Gas and Electric Company (PG&E) electricity rates for the standard residential tariff (E-1) and for the residential time-of-use tariff for electric vehicle (EV) owners (E-9) (table 2). The EV tariff is currently required for EV owners who charge their vehicles at home. Both the standard tariff and the EV tariff have inclined block structures whereby prices rise with consumption.

Next, we evaluate the marginal fuel decisions of PHEV drivers under the assumption that they pay a real-time electricity price based on wholesale prices plus constant non-generation costs. We only use the real-time pricing assumption to derive the PHEV electricity demand curves; we do not use this assumption anywhere else in our analysis. The price history of the day-ahead electricity market from California's restructured period and the supply and demand bids offered to the California Power Exchange are available at the web site for The Center for the Study of Energy Markets at the University of California Energy Institute (http://www.ucei.berkeley.edu/). We use these data to investigate how large the PHEV fleet could have become in the short run before the cost per mile of all-electric operation rose above the cost per mile of gasoline-fueled hybrid electric operation. For simplicity, we assume that all other electricity demand is fixed so that increased prices due to PHEV demand do not decrease non-PHEV electricity use. Relaxing this assumption would increase the supply of electricity available to PHEVs at a given price and so also the number of PHEVs that could economically charge. We use 1999 wholesale price data and supply bids from California's former restructured electricity market because the most recent publicly posted supply bids date from 2000 and because in 1999 the California electricity market had yet to exhibit serious problems.

To bound the marginal fuel decision, we select the highest-priced hour and the lowest-priced hour for Tuesday 2 March 1999 and for Tuesday 3 August 1999. March and August are among the California electric power system's lowest and highest demand times, and using Tuesdays should capture typical workday patterns. Neither day seems anomalous with respect to the days around it. The lowest-priced hour for each day is 4 AM. The highest-priced hour for 2 March is 7 PM, and the highest-priced hour for 3 August is 4 PM.

Residual supply curves for PHEV electricity come from the supply bids and the market-clearing electricity demand in that hour. The residual supply curves show the supply of electricity in excess of actual day-ahead demand at each price, which is also the supply of electricity that would have been available to PHEVs at each price. Using the demand bids instead of the actual market-clearing demand would increase the electricity available to PHEVs at prices higher than the actual market-clearing price.

The analysis above suggests that more than 5 million PHEVs might economically charge in some hours, so we next examine the grid impacts of 1, 5, and 10 million PHEVs under three plausible charging pattern scenarios (described in section 3.2). Note that we do not evaluate the worst-case situation in which PHEVs inevitably charge during the peak electric load. Because PHEVs represent new demand in the electric power system, this peak-charging case would obviously result in higher peak loads and would quickly create a need for more generation and transmission capacity. The charging pattern scenarios described below seem more likely than inevitable on-peak charging because they match typical commute patterns. However, PHEVs are not yet available so we do not know how consumers will behave if they obtain PHEVs. For consistency, we use system load data for 1999, but repeating the analysis with 2005 CAISO load data does not substantially change the results. In 1999, CAISO peak load was 35 GW, and in 2005, CAISO peak load was 45 GW.

We next assess what assumptions about PHEV adoption and use are necessary for PHEVs to become a significant issue for the electricity system within the near term as defined by electricity system planning. It often takes five or more years to plan, finance, construct, and commission new electricity generation, so we use twice this period, or 10 years, as a rough definition of the near term. We develop three simple cases to place an upper bound on the possibilities for PHEV adoption and to investigate the assumptions under which PHEVs would add sufficient demand to affect near-term operation of the electric power system. In each case, we assume that PHEVs are first sold in the next model year (MY 2008), that vehicles are retired after 15 years, that 1.8 million new vehicles are sold in California each year, and that the CAISO contains 75% of the state's vehicle fleet. The first case assumes that all HEV sales in California become PHEV sales from MY 2008 on and that these sales increase by 20% per year, the rate of growth forecast for HEVs (J D Power and Associates 2006). Because the adoption pathways of new technologies often follow S-shaped logistic growth curves (Geroski 2000), the second and third cases apply logistic growth curves to PHEV sales: the second models an aggressive 25 year transition to 100% market share for PHEVs, and the third models an extreme transition to 100% PHEV market share in 12 years, or about two product

Table 2. Pacific Gas and Electric Company May 2006 residential electricity tariffs and equivalent gasoline prices for PHEVs.

Standard residential tariff	Electricity rate ($/kWh)	Equivalent gasoline price ($/gal)[a]		
Baseline usage[b]	$0.11430	$1.50		
101%–130% of baseline	$0.12989	$1.71		
131%–200% of baseline	$0.21981	$2.89		
201%–300% of baseline	$0.30292	$3.98		
Over 300% of baseline	$0.34648	$4.55		
	Peak[c]		Off-peak[c]	
Electric vehicle summer tariff	Electricity rate ($/kWh)	Equivalent gasoline price ($/gal)[a]	Electricity rate ($/kWh)	Equivalent gasoline price ($/gal)[a]
Baseline usage[b]	$0.28368	$3.73	$0.04965	$0.65
101%–130% of baseline	$0.28368	$3.73	$0.04965	$0.65
131%–200% of baseline	$0.38323	$5.04	$0.14920	$1.96
201%–300% of baseline	$0.47525	$6.25	$0.24122	$3.17
Over 300% of baseline	$0.52348	$6.88	$0.28945	$3.80

[a] The gasoline prices yield the same cost per mile of PHEV operation as do the electricity rates. PHEV efficiency is 52.7 miles/gallon and 4.010 miles/kWh (EPRI 2002).

[b] Baseline allowances range from 8–19 kWh per day, depending upon climatic zone and time of year, and they may be even higher for households with electric heating.

[c] The summer peak hours are from 2 to 9 PM on weekdays, the summer off-peak hours occur during non-evening weekend hours and during the night and early morning on weekdays, and the part-peak hours occur in the remaining hours and have rates similar to the standard tariff rates. Customers may opt for slightly lower peak rates and slightly higher off-peak rates if they have a separately metered EV battery charger.

cycles. We compare the predicted PHEV fleet sizes from these cases with the results of the grid impact analyses. These three cases probably overestimate PHEV adoption and so provide upper bounds for possible residential PHEV charging in the near term.

The final step in our analysis is to calculate the present value of fuel savings due to PHEV use as well as the implied break-even battery cost, which is the fuel savings divided by the additional battery kWh required for the vehicle. If vehicle buyers are willing to spend no more than their expected fuel savings on the extra vehicle cost of a PHEV, and if the battery cost represents the entire marginal vehicle cost, then the break-even battery cost is that which would make cost-conscious consumers indifferent between purchasing a PHEV and purchasing a comparable HEV or CV. However, PHEVs will likely include additional components that could contribute to marginal vehicle cost, which makes these results more like an upper bound for break-even battery costs with vehicle efficiencies as in EPRI (2002). Since no PHEVs have been mass-produced, we do not know how much of the marginal vehicle cost would be due to batteries. While other factors such as aesthetics, symbolism, manufacturer reputation, environmental benefits, and independence from oil consumption may be important in consumer choice of vehicles, we ignore them in this analysis. As discussed below, we assume that fuel prices are constant over the lifetime of the vehicle and are known with certainty at the time of purchase.

3. Results

3.1. To charge or to pump?

Tables 1 and 2 show that PG&E electricity customers paying the standard baseline rate would be indifferent (on a pure energetic basis) between using gasoline and electricity if gasoline prices were $1.50/gallon. Higher gasoline prices would lead them to drive as many of their miles in all-electric mode as possible, and lower gasoline prices would lead them to always drive in gasoline-fueled hybrid electric mode. Consumers would never want to recharge during peak EV electricity rates unless gasoline cost more than $3.73/gallon, and consumers would always want to recharge at off-peak EV electricity rates unless gasoline prices fell below $2.00/gallon or they were using more than 200% of their baseline electricity allowance.

Figure 1 shows the relationship between electricity supply for PHEVs and wholesale electricity prices in the two peak hours and the two off-peak hours. As expected, each of the four residual supply curves is flat at low levels of supply and becomes steeper with greater levels of supply. The gasoline price lines are marked at the wholesale electricity price for which the corresponding retail price would have the same cost per mile of travel. These gasoline price lines can be interpreted as the PHEV electricity demand curves, which are perfectly elastic at the equivalent wholesale price because higher electricity prices would cause a total switch to gasoline and lower electricity prices would cause the maximum feasible switch to electricity within the limitation of a 20 mile all-electric range.

If gasoline cost $3.00/gallon, then even with real-time electricity pricing it would be economical to charge over 6 million PHEVs during each of the off-peak hours and over 3 million PHEVs during each of the peak hours. As there are about 17 million vehicles in the CAISO region, this analysis suggests that a substantial fraction of vehicles could be PHEVs charging from the grid with 1999 electricity supply and

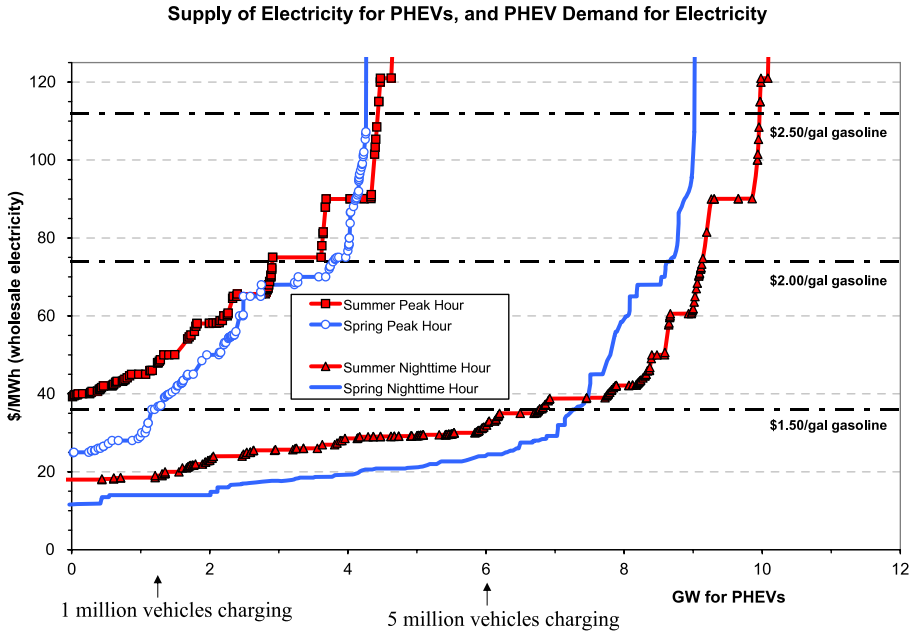


Figure 1. The quantity of electricity beyond observed demand available at each price, as determined by the supply bids given to the California Power Exchange in 1999. Also, the number of PHEVs that would need to charge during the hour to use that much electricity with a charge rate of 1 kWh/h (or a charger size of 1.2 kW). The gasoline price lines provide the same cost per mile as the retail electricity rates that correspond to the marked wholesale prices. The gasoline price lines can be read as the PHEV demand for electricity with a given price of gasoline, assuming that gasoline and grid-supplied electricity are perfect substitutes, that consumers see real-time electricity prices with constant non-generation costs of \$0.07816 per kWh (Pacific Gas and Electric Company 2006), and that vehicle efficiencies are as in table 1. Households in the CAISO region own approximately 17 million vehicles (US Department of Transportation 2001).

demand conditions and recent gasoline prices (US Department of Transportation 2001).

Using efficiencies for full-size SUVs instead of compact cars leads to similar results for tables 1 and 2 because the ratio of energy efficiency in all-electric mode to energy efficiency in hybrid electric mode is similar for both vehicle classes (EPRI 2002). Because we assume SUV PHEVs charge at the same rate as compact car PHEVs, the results associated with the demand curves in figure 1 are identical for both vehicle types.

One cautionary note about the potential of real-time electricity pricing to lead to socially efficient PHEV charging outcomes is that gasoline taxes in the US currently adjust not only for gasoline-specific externalities but also for road maintenance. The electric power system may not discriminate between PHEV load and other load to apply this charge, even as PHEVs' lower fuel cost of driving would encourage more vehicle use. Table 3 shows the equivalent tax rates for the different vehicle types based on cost per mile of operation. In 2006, California state and federal gasoline taxes totaled \$0.364/gallon (California State Board of Equalization 2006). PHEVs would require taxes of \$0.51/gallon and \$0.04/kWh in order to recover the tax revenue provided by a CV. If these taxes are not applied, PHEV all-electric operation would appear artificially cheaper, and owners of other vehicle types would bear more of the burden of road maintenance.

Table 3. Gasoline tax rates for CVs and equivalent tax rates for HEVs and PHEVs.

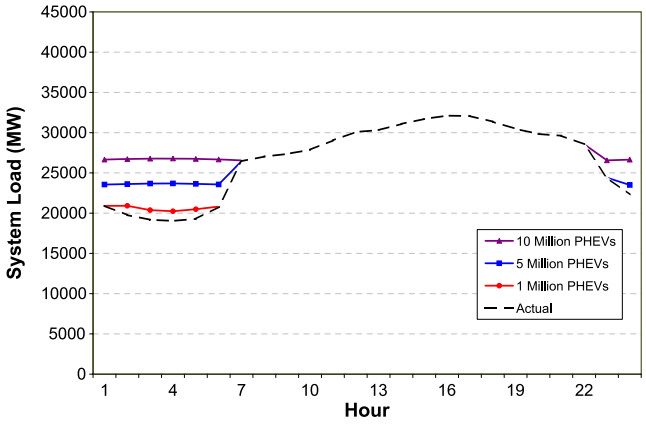
Gasoline tax for CV[a] (\$/gal)	Equivalent HEV tax[b] (\$/gal)	Equivalent PHEV tax[b] (\$/gal)	(\$/kWh)
\$0.10	\$0.13	\$0.14	\$0.011
\$0.30	\$0.39	\$0.42	\$0.032
\$0.50	\$0.66	\$0.70	\$0.053

[a] In 2006, the US federal gasoline tax was \$0.184/gallon, the California state gasoline tax was \$0.18/gallon, and the California state underground storage tank fee was \$0.014/gallon (California State Board of Equalization 2006). Sales tax rates vary by city and county.

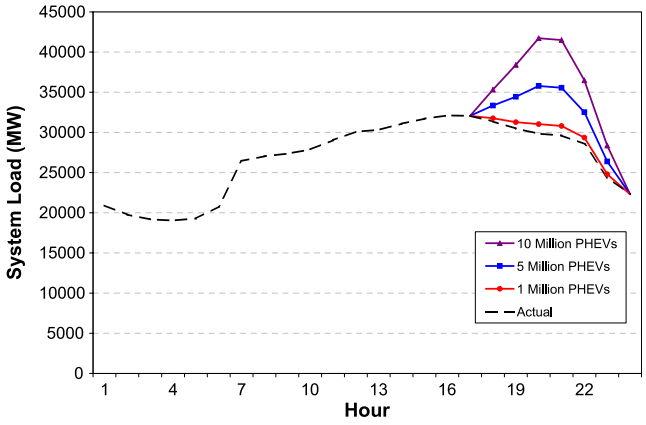
[b] Tax rates are equivalent if they yield the same cost per mile of vehicle operation. PHEV efficiency is 52.7 miles/gallon and 4.010 miles/kWh, HEV efficiency is 49.4 miles/gallon, and CV efficiency is 37.7 miles/gallon (EPRI 2002).

3.2. System load curves under 3 charging scenarios

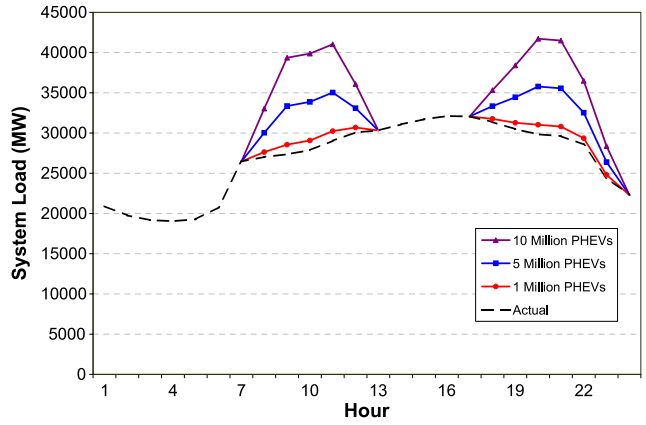
Because it may be economical to charge millions of PHEVs rather than combust gasoline in hybrid electric mode, it is worth exploring the implications of PHEVs for the electricity system's load characteristics. We are interested in the charging patterns and fleet sizes that increase the 1999 CAISO system peak load of 35 GW, which occurred at 4 PM on August 26. For illustration and compatibility with the real-time pricing results, figure 2 shows the daily load curve for 3 August 1999 with 1, 5, and 10 million PHEVs charging according to the three scenarios described below. We assume in the first two scenarios that each PHEV fully charges once each day and we assume in the third scenario that each PHEV fully charges twice each day, which means that each vehicle drives 20 all-electric miles per day in the first two scenarios and 40 all-electric miles per day in the third. Each PHEV draws 1.2 kWh



(a) Optimal Charging



(b) Evening Charging



(c) Twice Per Day Charging

Figure 2. The 1999 CAISO system daily load curve for 3 August 1999 with three compact car PHEV fleet sizes. (*a*) shows the daily load curve with optimal charging, (*b*) shows the daily load curve with evening charging, and (*c*) shows the daily load curve with twice per day charging. Compact car PHEVs charge at a rate of 1 kWh/h and require 4.1 kWh to recharge their batteries (EPRI 2002).

of grid electricity per hour of charging. Charger sizes greater than 1.2 kW would increase the grid impact of a fleet of PHEVs when they are charging but may also avoid some significant grid impacts by allowing the vehicles to fully charge in fewer hours.

The first scenario, called *Optimal Charging*, perfectly allocates each day's PHEV charging to flatten the system load

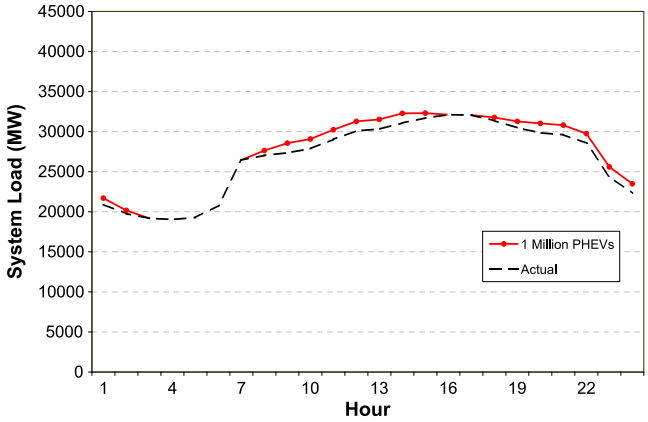


Figure 3. The 1999 CAISO system daily load curve for 3 August 1999 with a fleet of 1 million full-size sport utility vehicle (SUV) PHEVs in the *Twice Per Day Charging* scenario. SUV PHEVs charge at a rate of 1 kWh/h and require 7.1 kWh to recharge their batteries (EPRI 2002).

curve as much as possible. The vehicles charge during periods of lowest demand and need not charge continuously. This scenario bounds the possible beneficial load-leveling effects of PHEVs and would require technologies to monitor and control charging. The daily load curve in figure 2(*a*) shows that, with these assumptions, PHEV demand is typically confined to the nighttime hours. In this best case, generators that currently shut off at night could pick up PHEV demand, and PHEVs would not require additional generation, transmission, or distribution capacity.

In the *Evening Charging* scenario, PHEVs begin charging when their drivers return home from work between 6 and 8 PM (figure 2(*b*)). Each PHEV charges for 4 continuous hours. This and the next scenario are meant to provide examples of possible behavior that matches commute patterns and the use of simple chargers in the absence of price incentives. 1 million PHEVs have little effect on system load curves as they only raise the late evening load a bit, which is not a significant outcome because sufficient capacity already exists to meet this additional load. However, 5 million PHEVs do call for more capacity since the year's peak load grows by 4 GW, or 12%. The peak also now occurs later in the day. At 10 million PHEVs, the year's peak load grows by 10 GW, or 29%. However, PHEVs would account for over half of all vehicles in use in this case, a possibility that is many years away.

The *Twice Per Day Charging* scenario has those same evening-charging cars plugging in again in the morning when their owners arrive at work between 8 and 9 AM with drained batteries (figure 2(*c*)). This is a high demand scenario: we assume that each PHEV is plugged in to charge fully at the end of each commute leg. Adding 5 million or more PHEVs creates a very different load shape with two peaks per day and with potentially significant implications for electricity generation, but 1 million compact cars still do not affect the year's peak system load.

This analysis suggests that, as long as on-peak charging is avoided, PHEV fleets in the CAISO region may be able to reach 1 million vehicles before new generation or transmission

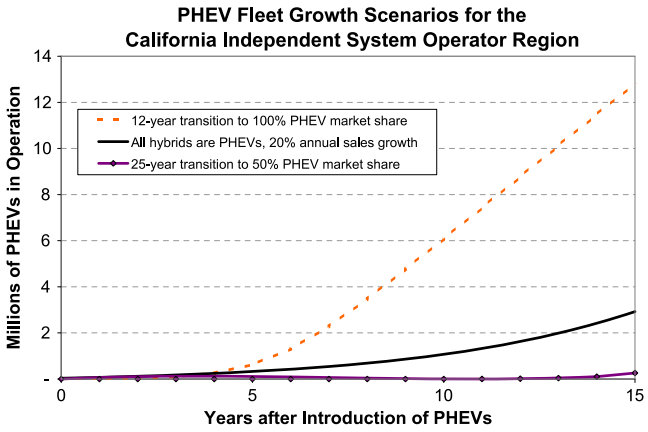


Figure 4. Three simple forecasts of the number of PHEVs operating in the CAISO region showing that obtaining a fleet size of 1 million PHEVs within 10 years may require extreme growth scenarios. One forecast assumes that all hybrid vehicles sold after model year 2007 are PHEVs and that state sales of these vehicles grow at 20% annually. The second models an ambitious transition to 100% market share over 25 years. The third shows an aggressive transition to 100% market share in 12 years, or about two product cycles. There are currently about 17 million vehicles in the CAISO region (US Department of Transportation 2001).

investments are needed. However, if PHEV fleets grow to several million vehicles and charging is not optimally timed, new investments would be required. The implications for other electricity systems depend upon the timing of their hours of peak load relative to the timing of probable PHEV charging.

Because the SUV PHEVs use the same chargers but have longer charging times, they will pose problems for the grid in any charging and fleet size scenario in which compact cars pose problems. However, it may be that SUVs raise the peak system load in scenarios in which compact cars do not. We check the robustness of our finding of insignificant grid impacts for fleet sizes of 1 million compact cars by running the worst-case charging pattern scenario with 1 million SUV PHEVs and their 7 hour charging times. We use the *Twice Per Day Charging* scenario because that one is the most likely to be affected by 7 hour charging times. Indeed, the longer charging times have a significant impact, as 1 million SUVs raise the year's peak load by 0.8 GW (or 2%) and so could require new capacity. As can be seen in the daily load curve in figure 3, the new peak load (like the old one) occurs on a summer afternoon because the longer charging times mean that some morning-charging PHEVs will still be drawing power in the afternoon.

3.3. PHEV fleet size

A fleet of PHEV compact cars with 20 mile all-electric ranges only poses problems for the electric grid when it reaches into the millions of vehicles. Might there be a fleet of millions of PHEVs in a time span shorter than that of the long-run grid planning horizon of about 10 years? If so, then the supply of electricity may not have time to adequately adapt and account for the new demand. We answer this question by assessing the assumptions needed to obtain such fleet numbers. Figure 4 shows three scenarios for the growth of the PHEV fleet (described in section 2). Only in the most extreme scenario with 100% PHEV market share in 12 years does the number of PHEVs in the CAISO region exceed 1 million within ten years of their introduction. The other two scenarios achieve fewer than 0.5 million PHEVs within ten years, and even these are probably overestimates. Obtaining a fleet of millions of PHEVs within 10 years would probably require strong pro-PHEV policies or substantial fuel savings from all-electric operation.

3.4. Present value analysis

While it appears to be economical for PHEVs to run in all-electric mode, would consumers purchase PHEVs with current and expected fuel prices? Many factors affect consumer choices about vehicles, and PHEVs may have desirable attributes other than fuel savings that are excluded from this analysis (Heffner *et al* 2007), but promised fuel savings may be important in achieving large numbers of sales. Table 4 explores the price conditions under which the decision to purchase a PHEV may be economical. With gasoline prices of \$3/gallon and electricity prices of \$0.10/kWh, compact car PHEVs with a 20 mile all-electric range may save \$409 annually relative to a CV and \$202 annually relative to an HEV, which the vehicle purchaser may value at \$2126 and \$1048 respectively. Individual packages to convert HEVs to PHEVs are currently offered at \$5000 to \$10 000, although it is not clear how many (or if any) such packages have been purchased to date. The incremental cost of PHEVs produced by the original manufacturer should be lower with economies of scale and technological innovation, but the cost of additional electronics and battery capacity will still create a premium. Considering vehicle purchase and fuel costs only, consumers may require battery prices below \$400/kWh if they are to purchase compact car PHEVs instead of HEVs. Current battery prices for PHEV applications are difficult to determine reliably, but they are expected to be over \$600 per kWh for a 5.1 kWh battery even after substantial mass production (Kalhammer *et al* 2007, table 3-13). Because battery costs increase less than linearly with battery size, larger batteries would have a lower cost per kWh, but fuel savings may also scale less than linearly with battery size: the cost-effectiveness of larger batteries depends upon driving habits since greater all-electric ranges make it more likely that many PHEV owners will not drive enough to use their entire all-electric range each day. The break-even battery costs for full-size SUV PHEVs with efficiencies as in EPRI (2002) are generally about 1.5 times the values for compact car PHEVs, suggesting that SUV PHEVs may become economical first. This effect occurs because the SUV PHEVs' all-electric operation saves more gallons of gasoline per mile driven.

4. Discussion

Because well over 1 million PHEVs could economically charge in California even during peak hours with real-time electricity pricing, PHEVs could allow electricity sector climate policies to affect transportation sector greenhouse gas emissions. However, current battery costs probably make

Table 4. Annual and present value of PHEV fuel savings and break-even PHEV battery costs relative to comparable hybrid electric vehicles (HEVs) and to comparable conventional vehicles (CVs).

Annual fuel savings from PHEVs[a]						
	Gasoline price ($/gal)					
	$2		$3		$4	
Electricity price ($/kWh)	HEV	CV	HEV	CV	HEV	CV
$0.05	$155	$294	$264	$471	$373	$649
$0.10	$93	$231	$202	$409	$311	$587
$0.15	$31	$169	$139	$347	$248	$525
$0.20	−$32	$106	$77	$284	$186	$462
$0.25	−$94	$44	$15	$222	$124	$400
$0.30	−$156	−$18	−$48	$160	$61	$338
Present value of fuel savings from PHEVs			16% discount rate over 12 years[b]			
	Gasoline price ($/gal)					
	$2		$3		$4	
Electricity price ($/kWh)	HEV	CV	HEV	CV	HEV	CV
$0.05	$807	$1525	$1372	$2450	$1938	$3375
$0.10	$483	$1201	$1048	$2126	$1614	$3051
$0.15	$159	$877	$724	$1802	$1290	$2727
$0.20	−$165	$553	$400	$1478	$966	$2403
$0.25	−$489	$229	$77	$1154	$642	$2079
$0.30	−$813	−$95	−$247	$830	$318	$1755
Break-even PHEV battery cost ($/kWh)[c]			16% discount rate over 12 years[b]			
	Gasoline price ($/gal)					
	$2		$3		$4	
Electricity price ($/kWh)	HEV	CV	HEV	CV	HEV	CV
$0.05	$277	$298	$472	$479	$666	$660
$0.10	$166	$235	$360	$416	$555	$597
$0.15	$55	$172	$249	$353	$443	$534
$0.20	−$57	$108	$138	$289	$332	$470
$0.25	−$168	$45	$26	$226	$221	$407
$0.30	−$279	−$19	−$85	$162	$109	$343

[a] PHEV efficiency is 52.7 miles/gallon and 4.010 miles/kWh, HEV efficiency is 49.4 miles/gallon, and CV efficiency is 37.7 miles/gallon (EPRI 2002). Each vehicle travels 11 000 miles per year (US Department of Transportation 2001). PHEVs drive 20 all-electric miles during each of the 250 workdays in the year; the rest of their miles are gasoline-fueled.

[b] The 16% discount rate corrects for vehicle depreciation and declining vehicle usage over a 12 year vehicle lifetime and is based on an interest rate of 6% (Greene and DeCicco 2000).

[c] Accounting for an 80% depth-of-discharge limitation, the HEV battery pack size is 2.2 kWh and the PHEV battery pack size is 5.1 kWh (EPRI 2002). We take the additional battery cost to represent the entire marginal vehicle cost, we do not include battery replacement, we treat future fuel prices as constant and certain, and we assume that the purchase of a PHEV does not change the cost of other household electricity consumption.

PHEVs uneconomical with 20 mile all-electric ranges because the fuel savings do not pay back the vehicle price premium. Even with gasoline dear at $4.00/gallon and electricity cheap at $0.05/kWh, vehicle purchasers may only find a compact car PHEV economical if its cost premium relative to an ordinary hybrid vehicle were under $2000 and if its cost premium relative to a conventional vehicle were under $3500. Such price premiums may require battery pack costs (including electronics, etc) under $650/kWh, while current battery pack prices for PHEV applications may well be in excess of $1000/kWh.

All these calculations ignore other factors that influence vehicle purchase decisions. We believe PHEVs can be introduced successfully into the market because these non-financial factors are very important, including the symbolism of using a green vehicle and of promoting independence from

oil consumption. However, with current technologies and policies, PHEVs are only likely to occupy a small niche of vehicle sales. For the large volume sales needed to make PHEVs significant in California energy and environmental markets, technological, financial, and/or policy innovation must lower the cost premium incurred by their larger batteries.

Two other considerations could make it even harder for PHEVs to compete in the marketplace. First, our analysis assumes that battery packs last the lifetime of the vehicle. If batteries need to be replaced, PHEVs would require still cheaper batteries or alternative business models. Second, since buying the more expensive PHEV is a partially irreversible investment in efficiency technology and since fuel prices over the lifetime of a vehicle are uncertain, an option value premium would further lower the acceptable cost difference between a PHEV and other types of vehicles, also suggesting a need for still cheaper batteries (Dixit and Pindyck 1994). The more volatile are fuel prices, the greater will be the value of delaying this investment to obtain more information about future fuel prices. (On the other hand, this same volatility could provide a hedging value if PHEVs help drivers avoid gasoline price spikes.) Therefore, assuming that efficiencies are close to those reported in EPRI (2002) and barring policies that provide substantial incentives for PHEV ownership, we find it unlikely that current economic incentives would lead enough consumers to buy PHEVs to create the need for expanded electricity generation or transmission capacity in the CAISO region in the near term (i.e., within a decade).

However, there are some conditions under which residential PHEVs could affect peak grid capacity. First, any on-peak charging would add to currently forecasted peak loads. Second, if the adoption pathway for PHEVs does prove to be logistic, then long-run electric power planning could still fail to correctly account for future numbers of PHEVs because the middle portions of logistic curves can be quite steep. This is true even if widespread adoption takes decades. Third, if PHEV adoption becomes concentrated in specific markets, even low aggregate fleet sizes could stretch local transmission and distribution resources. This suggests that the electricity and automobile industries might need to coordinate, at least in terms of sharing PHEV market growth expectations.

If PHEVs do start to reach into the millions, what is the best approach to optimally directing their charging? Real-time electricity pricing would encourage charging at night, but it may be insufficient: figure 1 shows that millions of consumers with real-time pricing in 1999 may have chosen to charge even during peak hours. If the government or utilities deem such peak-hour charging undesirable, then they would need to implement new pricing structures or technical means to coordinate PHEV charging and electric power system operation. For example, utilities might offer time- and use-differentiated rates, home PHEV chargers might have timers or could be wired to supply power only during certain times determined by the utility, or charging could be controlled by a sophisticated meter and control unit onboard the vehicle. The current EV tariffs are a step in the first direction, but it remains to be seen how consistently they would be applied. Finally, many vehicle owners do not own a garage with their own outlet. These owners may require access to dedicated charging infrastructure before they purchase PHEVs, and their charging patterns could adversely affect the electric grid if dedicated charging infrastructure is most accessible during the workday.

In the absence of special PHEV pricing structures or charging interfaces, subsidizing PHEVs could raise the system peak since peak-hour charging would likely be economical for PHEV owners. The extent to which PHEVs would raise the system peak depends upon the timing of the system peak and the as-yet-unknown charging behavior of PHEV owners. Crucially, we do not yet know how vehicle choice, fuel pricing, and the choice of fuels for multi-fuel vehicles interact. An important research program would be to investigate how consumers who buy PHEVs tend to operate them so that effective technologies and fair, efficient tariffs for charging can be devised, tested, and implemented in time for possible large-scale PHEV deployment.

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Morgan Stanley

MORGAN STANLEY RESEARCH
NORTH AMERICA

Morgan Stanley & Co. Incorporated

Jonathan Steinmetz, CFA
Jonathan.Steinmetz@morganstanley.com
+1 (1)212 761 7719

Ravi Shanker
Ravi.Shanker@morganstanley.com
+1 (1)212 761 6350

March 11, 2008

Industry View
Cautious

Autos & Auto-Related

Plug-in Hybrids: The Next Automotive Revolution

Conclusion: We believe Plug-in Hybrid Electric Vehicles (PHEV) have the potential to revolutionize the auto industry, over the next decade. This is because PHEVs could provide a cost-effective, practical solution to improving automotive fuel-economy and emissions. Plug-in hybrids are vehicles that are powered by an on-board engine and a battery / electric motor that can be charged by plugging into the electric grid. This gives PHEVs an extended 20 - 40 mile all-electric driving range vs. current hybrids plus the ability to drive long-distances like a regular car. ***We see lithium-ion PHEVs today, as akin to MP3 players in 1998. They are likely to revolutionize the automobile as we know it, but it is still unclear as to who will develop the equivalent of the iPod.***

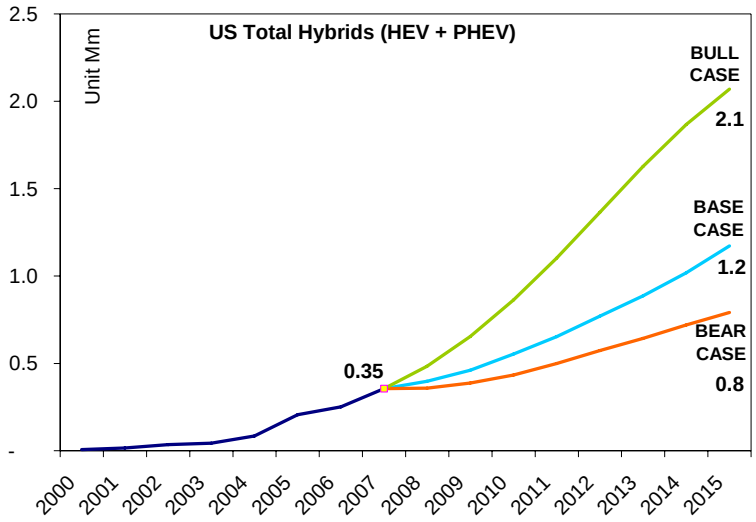
Where we differ: Our proprietary hybrid demand model has demand for hybrid vehicles in the US growing from approx. 355K units in 2007 to about 1.2 mm units by 2015. We see PHEVs being introduced gradually into the market in 2010-11 and eventually growing to 250K units in the US and 325K units worldwide, by 2015.

What's next: There are still several challenges to widespread adoption of PHEVs, however, mostly related to availability of commercially viable lithium-ion batteries for automotive use. We believe a consensus solution could emerge by the end of this decade.

Ways to Invest: Despite the attractive market potential of PHEVs, it is hard to tie direct investment action to this opportunity, in the near term. Nevertheless, there could be five ways to gain investment exposure to the growth in PHEVs. (1) invest in battery suppliers like JCI (OW, PT $42), (2) invest in traditional OEMs most likely to benefit from PHEV growth like Toyota (OW), (3) identify pure-play winners from among several small / private start-up firms currently working on lithium-ion / PHEV battery development or niche OEMs (4) invest in the lithium commodity itself (5) invest in food-chain beneficiaries like electric utilities.

Risk-Reward Snapshot: Plug-In Hybrids Could be a Significant Opportunity

Risk-Reward View: Successful Launch and Rapid Adoption of PHEVs Should Drive US Hybrid Vehicle Demand



Total US Hybrid Vehicle (HEV + PHEV) Demand by 2015 (million units)		
Bull Case 2.1 MM	10 - 12% of annual sales	Growth rate of hybrid demand does not moderate from 2007 levels due to sustained high levels of gasoline prices (above $4/gal), quick early adoption of PHEVs and high imitation adoption, OEM/government economic incentives.
Base Case 1.2 MM	6 - 8% of annual sales	Following strong growth between 2004 - 2007, HEV growth rate will moderate in 2008 and 2009 as consumers get accustomed to gasoline prices at $3/gal, economic/macro headwinds hurt auto demand and few new major launches serve as an offset to jumpstart demand. HEV demand is likely to be aided in 2H09/2010, by several new launches. PHEVs will gain gradual acceptance with consumers and capture an increasingly larger share of HEV sales and total sales between 2010 and 2012.
Bear Case 0.8 MM	4 -5% of annual sales	Drop off in hybrid demand growth until 2010, much slower ramp-up / acceptance rate for PHEVs, moderated incremental demand for HEVs as OEMs regulate supply to reduce losses per unit in the face of higher raw material prices driving up HEV battery costs.

Five ways to gain investment exposure to the growth in PHEVs

- **Invest in battery suppliers** – Johnson Controls (OW, PT $42)
- **Invest in traditional OEMs most likely to benefit** – Toyota (OW)
- **Identify emerging pure-play winners** – from among several small / private start-up firms working on PHEV batteries or niche OEMs.
- **Invest in the lithium commodity itself** – Lithium Suppliers
- **Invest in Food Chain beneficiaries** – Electric Utilities

Investment Thesis

- Plug-in hybrid electric vehicles (PHEV) could revolutionize the auto industry over the next decade as they provide a cost - effective, practical solution to improving automotive fuel-economy and emissions.
- Our proprietary model has demand for all hybrid vehicles in the US growing from approx. 355K units in 2007 to about 1.2 mm units by 2015. We see PHEVs introduced gradually into the market in 2010-11 and eventually growing to 250K units in the US and 325K units worldwide, by 2015.
- Still several challenges to widespread adoption of PHEVs mostly related to availability of commercially viable lithium-ion batteries for automotive use.
- Upfront cost estimate unclear at this time as battery chemistry and manufacturing techniques are still evolving.

Key Value Drivers

- No gasoline use over extended range: Unlike today's hybrids, a PHEV can have a potential all-electric range of 20 - 40 miles, allowing the average commuter to use no gasoline at all.
- Favorable economics even vs. regular hybrids: We estimate PHEVs can be 25-50% cheaper to operate than today's hybrids and one-half to one-third the cost of non-hybrids.
- PHEVs could be best option for OEMs to meet CAFE as they provide the greatest net improvement in fuel economy and emissions while balancing practicality and cost considerations, of all the currently available solutions.

Potential Catalysts

- Successful development of battery technology that meets all performance, safety and practicality requirements at a reasonable cost.
- Economic incentives for PHEVs from the government/OEMs

Investment Case

Summary & Conclusions

We believe plug-in hybrid electric vehicles (PHEV) have the potential to revolutionize the auto industry, over the next decade. This is because PHEVs could provide a cost-effective, practical solution to improving automotive fuel-economy and emissions. Plug-in hybrids are vehicles that are powered by an on-board engine and a battery / electric motor that can be charged by plugging into the electric grid. This gives PHEVs an extended 20 - 40 mile all-electric driving range vs. current hybrids plus the ability to drive long-distances like a regular car.

We see lithium-ion PHEVs today, as akin to MP3 players in 1998. They are likely to revolutionize the automobile as we know it, but it is still unclear as to who will develop the equivalent of the iPod.

Our proprietary hybrid demand model has demand for hybrid vehicles in the US growing from approx. 355K units in 2007 to about 1.2 mm units by 2015. We see PHEVs being introduced gradually into the market in 2010-11 and eventually growing to 250K units in the US and 325K units worldwide, by 2015.

There are still several challenges to widespread adoption of PHEVs, however, mostly related to availability of commercially viable lithium-ion batteries for automotive use. Questions still linger around performance issues, safety concerns and practically of mass-adoption of Li-Ion batteries. Extensive R&D by several constituents including OEMs, battery suppliers, university research labs and government institutions is in progress to find a solution to these concerns. We believe a consensus solution could emerge by the end of the decade.

Despite the attractive market potential of PHEVs, it is hard to tie direct investment action to this opportunity, in the near term. Nevertheless, there could be five ways to gain investment exposure to the growth in PHEVs –
(1) invest in battery suppliers
(2) invest in traditional OEMs most likely to benefit from PHEV growth
(3) identify pure-play winners from among several small / private start-up firms currently working on lithium-ion / PHEV battery development or niche OEMs
(4) invest in the lithium commodity itself
(5) invest in food-chain beneficiaries like electric utilities.

Plug-In Hybrids: What is the Attraction?

No Gasoline Use Over Extended Range: Unlike today's hybrids, a PHEV can have a potential all-electric range of 20 - 40 miles, allowing the average commuter to use no gasoline at all.

Favorable Economics Even vs. Regular Hybrids: We estimate PHEVs can be 25-50% cheaper to operate than today's hybrids and one-half to one-third the cost of non-hybrids. The upfront cost premium of PHEVs is difficult to determine at this time, but ultimately could be in the range of $3,000-5,000 over an equivalent non-hybrid. Government / OEM subsidies could further improve economics.

PHEVs Could be Best Option for OEMs to Meet CAFE: PHEVs provide the greatest net improvement in fuel economy and emissions while balancing practicality and cost considerations, of all the currently available solutions.

Little Collateral Impact from PHEVs on Food Chain: PHEVs seem to have little collateral impact on other industries or other parts of the resource food chain (unlike ethanol impact on food prices, for example). PHEV use can even improve the efficiency of power plants through overnight charging.

The potential PHEV opportunity further underlines our thesis on **Johnson Controls** (Rated OW, PT $42) that Battery and Building growth together with margin improvement in Auto Interiors can drive growth. The size of the PHEV opportunity (we est. $750 mm-$1 bln by 2012) is attractive, though not large enough to make an impact at the $35 bn in revenue company.

Despite its cautious attitude toward Li-Ion PHEVs thus far, we believe **Toyota** (rated OW) has an opportunity to capitalize on hybrid/PHEV growth. We see **General Motors** (rated E-W, PT $30) as also being in a position to gain from hybrid/PHEV growth though it will likely not be enough to offset share/mix deterioration in other products. We hesitate to advocate an investment in GM at this time, on this opportunity alone.

PHEV a potential game-changer

Plug-in Hybrids are different from the hybrids of today

Hybrid vehicles can be broadly classified into two types –

- **HEV (Hybrid Electric Vehicles)** use an electric motor powered by a battery pack as a supplement to a gasoline / diesel / ethanol internal combustion (IC) engine. These are most of the hybrids of today. The engine is the primary source of motive power with the battery acting as a backup. The vehicle may or may not be able to run independently on battery power. The batteries are charged using regenerative braking and cannot be directly charged through a power outlet. HEVs could be either "light" / "parallel" hybrids, where the battery only aids the engine or "full" hybrids where the battery can propel the vehicle independently of the engine for a short distance in stop/start situations (2 – 5 miles).

- **PHEV (Plug-in Hybrid Electric Vehicles)** use an electric motor powered by a battery, which can be directly charged off the electric grid using an electric socket as the primary source of motive power. PHEVs typically also have a small internal combustion engine or fuel cell as a backup/range extension power source. The engine either can work in conjunction with the battery (as in parallel HEVs of today) or can be used to charge the battery, which will continue to solely power the vehicle. The vehicle can typically run for about 20 - 40 miles on the battery pack alone before the engine kicks in.

Exhibit 1
Plug-in Hybrid Electric Vehicle: Chevrolet Volt

Source. General Motors

Li-Ion PHEVs will likely be a superior fuel-economy solution vs. hybrids of today. Today, all hybrid vehicles use a battery based on the Nickel Metal Hydride (NiMH) chemistry. The next generation of hybrid vehicles, however, is expected to have plug-in capability powered by Lithium Ion (Li Ion) batteries, which offer several advantages in performance and practical application over NiMH batteries. Most li-Ion PHEVs also offer significantly improved operating economics over non-hybrid vehicles as well as current HEVs. (See Exhibit 4)

Lithium Ion is only one of several battery chemistries currently available on the market. Lithium Ion batteries are commonly used today in a variety of applications including personal electronics (laptops and cellular telephones etc), power tools and industrial applications. Li-Ion batteries for automotive applications are still in the development phase but are likely to see commercial application in 2H08/1H09.

Li-Ion batteries for HEVs have been in development for a few years already and are close to seeing serial production. JCI has indicated that it will launch the world's first mass produced, non-specialized Li-Ion battery on the Mercedes-Benz S400 Hybrid sometime in 2H08/1H09. Li-Ion batteries for PHEVs however are still at least a few years away from mass production and in fact are still in the R&D phase. The main difference between Li-Ion batteries for HEVs and PHEVs are in the higher performance requirements for the PHEV batteries given that the battery is the primary motive source.

PHEVs present the best opportunity to meet CAFE

Global auto OEM's are faced with several alternative techniques and technologies to improve fuel economy and reduce emissions. These include methods to improve the efficiency of current gasoline engines (such as forced induction and direct injection), alternative fuels (such as diesel, ethanol and other renewable fuels) and alternative propulsion techniques including hybrids/electric cars and fuel cells.

Of all the available alternatives however, we believe hybrid electric vehicles powered by a combination of Lithium Ion (Li-Ion) batteries and an internal combustion engine, are likely to be the most widely adopted solution to meeting fuel economy and emissions goals in the near to medium term. These Li-Ion powered hybrids are likely to be in the form of regular two-mode or mild hybrids (HEVs) like the Toyota Prius or Saturn Aura Hybrid in the near term and plug-in hybrid electric vehicles (PHEVs) in the medium term (3-5 years).

We believe adoption of PHEVs is the best way OEMs can meet the challenging new CAFE norms, as they provide the largest incremental fuel economy and emissions improvement at a realistic economic cost, of all the available technology/fuel alternatives.

We believe PHEVs will emerge as the most viable fuel-economy/emissions technology for the following reasons:

1. **Internal combustion (IC) engine development can only deliver incremental economy gains:** OEMs and customers will be looking to new technology / alternative fuels that can provide a step-function improvement in levels of gasoline consumption, emissions and dependence on fossil fuels, to meet tough new fuel economy standards,.

   Advances in IC engine technology are likely to further improve the fuel economy and emissions levels of IC engines but not to the extent required to meet legislation-mandated targets. OEMs can possibly achieve incremental improvements in fuel economy for current gasoline engines by adopting techniques like forced induction (turbo-charging, supercharging), direct fuel injection, variable displacement and HCCI (homogenous charge compression ignition) but not the almost 30-40% improvement in fuel economy from current levels, now mandated by CAFE.

2. **PHEVs are closely related to currently available hybrid technology.** PHEVs are only an incremental developmental step from currently available HEVs. The familiarity of the technology reduces time to market and ensures superior reliability, safety and customer acceptance. This is unlike hydrogen fuel cells, which are also a promising fuel/emissions saving solution in the long term but currently are not well understood, prohibitively expensive and need new infrastructure to be erected.

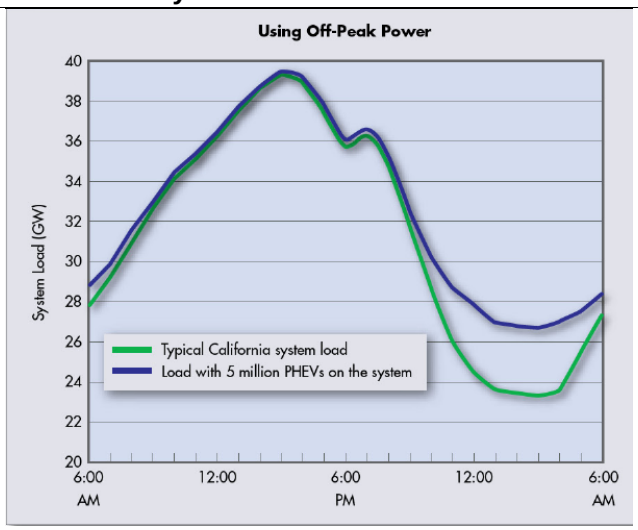
3. **Little collateral impact from PHEV use.** We see little collateral impact on other industries or on other parts of the resource food-chain with use of PHEVs. Unlike ethanol, which in its current form, impacts food supply or diesel / hydrogen / CNG fuel use, which could transfer carbon emissions up the supply chain to power plants, PHEV use seems to have no apparent negative collateral impact.

   Overnight charging for PHEVs, in fact, is expected to *improve* the efficiency of existing power plants by increasing loads during off-peak hours. (See exhibit 2) This could also lead to lower electricity prices, especially for dedicated PHEV charge outlets.

   A recent study by the Pacific Northwest National Laboratory concluded that existing power infrastructure could support charging almost 200 million PHEVs (approx 84% of current US light vehicle parc). Given the economic and social benefits (lower emissions, lower fossil fuel usage and more efficient power generation) of PHEVs, we foresee that the government might offer economic incentives (either in the form of a highly discounted electricity rate for PHEV charging or a rebate on purchase price) to encourage their use. We note that several electric utilities are actively supporting and financially contributing to PHEV R&D.

Exhibit 2

PHEV Use of Off-Peak Power Could Improve Power Plant Efficiency



Source. EPRI

4. **No need for major new infrastructure.** PHEVs can be charged using electrical sockets at home (heavy duty plug may be needed) or commercial establishments, unlike diesel, ethanol or fuel cells, which require installation of a new distribution infrastructure. The only real infrastructure needed for successful implementation of PHEVs is development of “charging stations” at gas stations, parking lots and highway stops. Residences or charging stations could also be required to install a dedicated power consumption meter in the event that the government provides subsidies for PHEV use and overnight charging. According to the 2005 American Housing Survey, over 60% of occupied housing units had a garage or carport.

In essence, we believe PHEVs represent the best path for OEMs to achieve the almost 30-40% improvement in fleet fuel economy by 2020 as mandated by CAFE. This alone is likely to spur OEMs, suppliers and government institutions to accelerate the development, subsidize the cost and promote the use of PHEVs. Lithium-ion PHEV batteries can also be used for other non-automotive applications including industrial, agricultural, aviation and mining use.

Economic Benefits of PHEVs Could Be Better than Today's Hybrids

PHEVs also translate into better economics vs. conventional hybrids and non-hybrid vehicles. Today's hybrids have not achieved widespread acceptance primarily because of a cost-benefit disadvantage and the disparity between advertised fuel economy and real world achieved fuel economy. PHEVs, with their ability to commute short distance using no fuel at all, considerably improve the cost benefit equation. The average person commutes approx. 30 miles a day (US Census 2002 stats average commute 29 miles, ABC news National Poll 32 miles). ***A PHEV, which can travel on electric power alone for a distance of 30 – 40 miles, would translate to almost no use of gasoline during a commute.***

The Chevrolet Volt, for example, is expected to use a 16kWh Li-Ion battery. The national average price of electricity is $0.11 per kWh for residential use, with much lower levels for non-peak hour usage. This works to $1.76 to fully recharge the battery (though true cost is likely to be lower as the battery will not be completely drained before each charge and non-peak / overnight charge costs are much lower).

The 16 kWh battery provides a 40-mile electric-only range on a full charge. A standard mid-size car that returns 25 mpg will cost $4.80 to travel the same distance (assuming gas at $3 per gallon). A conventional hybrid that returns 45 mpg will cost $2.67 over the same distance. Based on our conservative estimates, this translates to a PHEV being 2.75x cheaper to operate than a conventional mid size car and 1.5x cheaper than a conventional hybrid.

Under alternative scenarios (commute only, gasoline at $5/gallon, lower overnight charge cost etc.) the operating cost savings between PHEVs and HEVs and non-hybrid cars rise further.

Please see Exhibit 4.

Exhibit 3

Product Comparison: PHEV vs. HEV vs. Electric Car

Feature	PHEV	HEV	EV
On-board IC Engine	Yes	Yes	No
On-Board Battery / Motor	Yes	Yes	Yes
Can Run on Battery Alone	Yes	Yes/No	Yes
Battery Can be Charged Off Grid	Yes	No	Yes
Battery Can be Closed Cycle Charged*	Yes	Yes	Yes
Electric Only Range	10-40 mi	2-5 mi	25-200 mi

Source: Morgan Stanley Research *Regenerative braking. Includes stop/start

Exhibit 4

Economics of a PHEV vs. HEV vs. Non-Hybrid Mid-size car

Individual + Family

Travel Per Week	=	15 (miles commute) x 2 (round trip) x 5 (days work week) + 60 (miles trip) x 2 (round trip per weekend)
	=	270 miles per week
Travel Per Year	=	14,000 approx. miles

	PHEV-30	HEV	Gasoline car
Gasoline used per week (gal.)	2.7	6.0	11.5
Gasoline cost	$8.00	$18.00	$34.50
Other costs	$6.16	$ -	$ -
Total Cost per Week	$14.16	$18.00	$34.50
Annual Cost	**$ 736.32**	**$ 936.00**	**$ 1,794.00**
Difference vs. PHEV		*27%*	*144%*

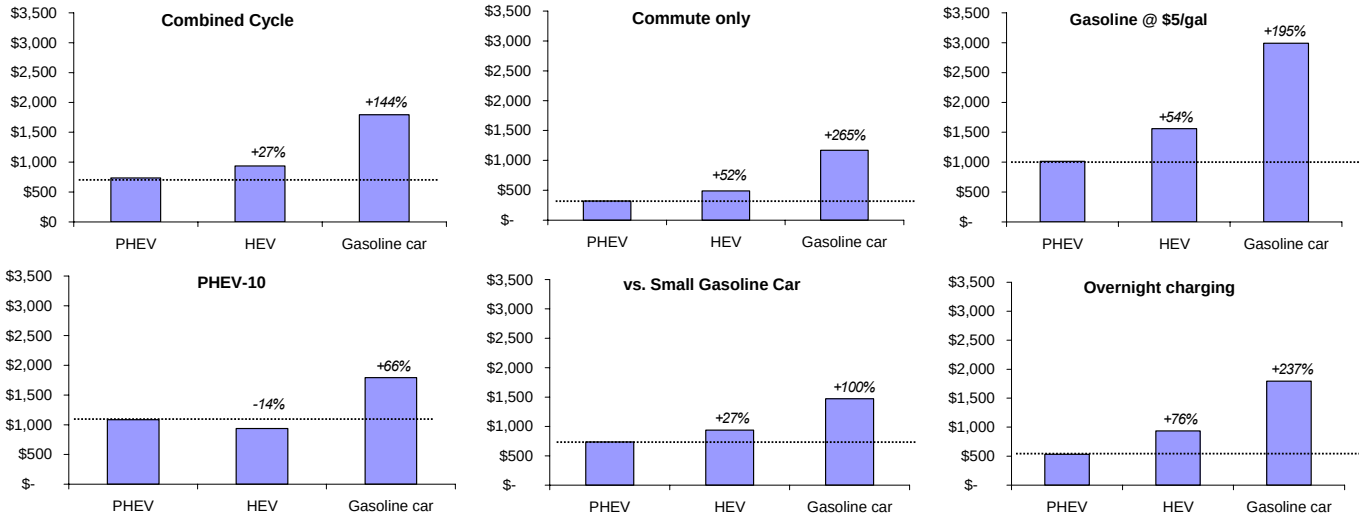
Incremental Savings / Year over Gasoline Car	$	1,058	$ 858
PV of Life Cycle Savings / Break Even Price Premium	**$**	**7,270**	**$ 5,898**

If upfront incremental cost vs. non-hybrid car is lower than this amount, hybrids can make economic sense

Vehicle Specifications

PHEV	30 miles range on battery alone (16KWh battery) 45 mpg with engine/battery propulsion
HEV	48 mpg city/ 45 mpg highway
Gasoline car	Standard mid size car returning 20 city / 30 highway mpg

Cost per Year Scenarios based on example above (by altering one variable in above example)



Source: Company data, Morgan Stanley Research. ***% number shown is cost increase vs. PHEV***

Assumptions

- *Gasoline cost = $3/gallon*
- *Electricity cost = $0.11/KWh*
- *Average Life Cycle of HEV and PHEV = 8 years*
- *PHEV battery can only be discharged to 30% of capacity to prevent deep cycle discharge.*
- *PHEV electricity cost assumed as 16 (KWh battery) x 70% (max charge possible) x electricity rate per kWh*
- *Resale value not considered*

Upfront cost of a PHEV lithium ion battery

The exact cost of developing, manufacturing and installing a Li-Ion PHEV battery is difficult to determine at this time. Battery technology continues to evolve and decisions regarding packaging and manufacturing are still in a state of flux. The cost of the battery will become clearer once a consensus / breakthrough solution is reached to resolve the performance, safety and manufacturing issues facing PHEV batteries.

Lithium ion PHEV batteries, today, are cost-prohibitive to be used commercially. One major OEM estimates that a PHEV battery with Li-Ion battery technology, in its current state, could cost $700-1,000 per kWh. This means a 5 kWh PHEV-10 battery (which can propel the vehicle on electric power for 10 miles) could cost $3,500-5,000 while a 16 kWh PHEV-40 battery (which can propel the vehicle on electric power for 40 miles) could cost more than $15,000.

The cost of Li-Ion PHEV batteries, however, is likely to decline with more development. Early estimates seem to indicate that lithium-ion PHEV batteries, on average, are likely to cost between $5,000-8,000 when they start to go on sale around 2010 and moderate to $3,000-5,000 as the technology matures and production ramps up.

Based on independent studies and our conversations with industry experts, we believe the raw materials alone could be in the range of $2,000-2,500 for a large PHEV-40 battery, today. We caution that this is only a rough estimate, as raw material cost will depend on the specific chemical makeup of the battery. This is very difficult to estimate at this time because 1) each battery maker has a different chemical / structural composition which is proprietary 2) many of the raw materials are sold OTC and do not have a spot market making prices difficult to determine 3) some of the raw materials can be substituted for cheaper ones fairly easily, in case of extreme raw material cost inflation.

The Department of Energy EERE Vehicle Technologies Program, which oversees development of alternative fuel / powertrain technologies, has laid a draft goal of reducing cost of PHEV batteries to $300/kWh by 2014 and $200/kWh by 2016. This means a 16kWh PHEV-40 Li-Ion battery, as proposed in the Chevrolet Volt, will cost $4,800 in 2014 and $3,200 in 2016 as per DoE target specifications. A PHEV with a lower range (PHEV-10 like the proposed Saturn Vue plug-in for example) will need a smaller 5-6 kWh battery pack projected to cost $1,500-1,800.

We believe the DoE targets will be met even earlier than targeted due to intensive battery development / R&D and OEMs need to bring down the cost of batteries. During the initial years of the technology however, OEMs will likely carefully balance the cost vs. range trade-off for PHEVs depending on the application.

We also expect costs of PHEV batteries to decline quickly as production ramps up. A recent study by the California Air Resources Board (CARB), based on cost estimates provided by several battery makers and its own independent assessment, concluded that a PHEV-20 battery would cost approx. $5,190 per unit at an assembly level of 20,000 units per year and $4,025 at a rate of 100,000 units per year. ***(See Exhibit 5)***

The price of a PHEV, however, is more than just about the battery cost. Electrical systems / accessories like HVAC, audio, lighting, wipers etc. currently run off engine power. In a PHEV, these systems could draw power from the battery and the parasitic losses could degrade battery performance. PHEV's will likely be equipped with advanced electronics as well as redundant controls and systems, to prevent this. These workarounds are likely to add cost at first, but become more efficient / cheaper as the technology matures.

Given the over $7,000 savings (before any government incentives/rebates) we estimate over the life of a PHEV vs. a non-hybrid mid size car, even an upfront cost increase of $3,000-5,000 works out to favorable economics for a PHEV.

We do believe however, that rapid, early adoption of PHEVs will require consumers to be enticed with economic incentives to sweeten the operating cost equation further. This case for economic incentives is also strengthened by …

- The need to offset impact of higher cost pass-through to customers from large initial fixed cost investments, which will be amortized over relatively few units
- There will likely be political pressure to encourage use of fuel-efficient vehicles
- Uptake of PHEVs will spur further research in the field to develop more efficient batteries
- PHEV adoption also helps power utilities, reduces emissions and is beneficial to other areas of society

These incentives could be in the form of a tax rebate provided by the government to PHEV owners, attractive lease/finance deals provided by the OEMs or a subsidized electricity rate for PHEV charging provided by electric utilities. Given the significance of the PHEV toward facilitating all three entities

(the government, auto OEMs and suppliers and electric utilities) achieve their energy goals, we believe these economic incentives will be available at launch to draw consumers into PHEVs.

On March 3, 2008, the House passed the Renewable Energy and Energy Conservation Tax Act of 2008 (HR.5351), which allows a tax credit for PHEV owners of $4,000 plus $200 / kW above 5 kWh up to a max of $2,000. This means a 16kWh PHEV-40 like the Chevrolet Volt is likely to carry a $6,000 tax credit while a smaller 5-6 kWh PHEV-10 like the Saturn Vue PHEV could carry a $4,000-$4,500 tax credit, subject to certain conditions.

.

Exhibit 5

CARB Estimates of PHEV Battery Initial Cost

Vehicle Type	Battery Capac. (kWh)	Cell Capac. (Ah)	500MWh/year 20k Batteries/year			2500 MWh/year 100k Batteries/Year		
			Product. Rate (MWh/y)	Module Cost ($/kWh)	Battery Cost ($)	Product. Rate (MWh/y)	Module Cost ($/kWh)	Battery Cost ($)
FPBEV	40	120	500 800	285 255	13,680 12,240	2500 4000	195 175	9,285 8,395
Small EV	**25**	**45**	**500 20**	**380**	**11,875**	**2500 100**	**260**	**8,150**
PHEV-40	14	45	500 280	380 435	7,075 8,350	2500 1400	260 300	4,850 5,585
PHEV-20	7	30	500 140	435 595	4,305 5,190	2500 700	295 405	2,750 4,025
PHEV-10	4	15	500 80	575 880	3,265 4,990	2500 400	395 605	2,240 3,445
Full HEV	2	7	500 40	805 1,465	2,420 4,395	2500 200	550 1,010	1,650 3,025

Source. CARB, Morgan Stanley Research .

- *Vehicle Type: FPBEV = Full Electric Car, Small EV = small Electric Car, PHEV-40 = Plug-in Hybrid that can do 40 miles on battery power alone, Full HEV = Conventional two mode (parallel hybrid like Toyota Prius)*

- *Battery manufacturing capacity is represented in the unit of total MWh. Number of units will depend on capacity of each battery being assembled in kWh. For a 14kWh PHEV-40 for example, 500 MWh/year of assembly capacity equals a maximum capacity of approx. 35,700 units. (500/14*1,000). For a 25kWh battery needed for a small EV, 500 MWh/year of capacity equals 20,000 units per year (500/25*1,000)*

- *Columns D, E, F represent cost structure for a total installed capacity of 500MWh and an assembly rate of 20,000 units per year. For a PHEV-40 for example, full capacity assembly rate of 500MWh will yield 35,700 units at $380 per kWh or $7,075 per battery. On the other hand, assembling 20,000 battery units will take up 280MWh of available capacity at $435 per kWh or $8,350 per unit.*

Lithium-ion Technology / Cost is a key roadblock today but issues can be solved

Lithium ion batteries are better suited for hybrid vehicle application than the existing NiMH battery technology, primarily due to their higher energy capacity (power to energy ratio), which allows for more efficient packaging. This is particularly important in the case of PHEVs, which need large capacity batteries to propel the vehicle through its extended all-electric range. Li-Ion batteries also have a low "memory effect" allowing them to be discharged and recharged quickly and efficiently, compared with other battery technologies. For a full comparison of the various chemistries available for batteries, please see exhibit 19.

The first HEVs powered by Li-Ion batteries are likely to be launched in 2H08/1H09. Li-Ion batteries for PHEVs, however, are not yet ready for mainstream application due to unresolved issues surrounding performance, safety, packaging and manufacturing for the larger capacity PHEV batteries.

Performance Issues
Lithium ion batteries are currently not ready for mainstream automotive PHEV applications primarily due to performance constraints related to restricted number of charge cycles, level of charge depletion (deep discharge) and charge loads. Li-Ion batteries in their current form can only withstand approx. 3,000 charge cycles before performance deteriorates which means they can only effectively work for approx. 8 years if recharged daily. Li-Ion batteries are also susceptible to higher levels of self-discharge (where the battery loses charge over time even if it is not being used) due to deterioration of the carbon anode over time.

Safety Concerns
The main benefit of using lithium ion batteries is the ability to store more energy per cell than a NiMh battery of the same size. The higher level of energy per cell also increases the risk of a short circuit within the battery, which causes a tendency for the battery to overheat and sometimes ignite or explode (thermal runaway). Batteries can also ignite/explode on hard impact. This is the key concern around PHEV lithium ion batteries preventing widespread adoption. (Li-Ion batteries for HEVs do not face as severe an overheating problem due to their smaller size and energy requirements).

New technology being developed seeks to address this safety issue through the use of…

- different chemistries (using lithium iron phosphate instead of lithium cobalt oxide, using non carbon anodes),
- cell structures (using advanced materials to separate the anode and cathode which offer greater heat resistance and lower electrical resistance)
- cell design (JCI for example, uses a special design for its Li-Ion cell which, in the event of a cell explosion, ejects the material out of the bottom of the cell canister in a controlled manner).

Packaging Issues
A PHEV battery comprises of several individual cells within an overall package. Finalizing an appropriate the cell chemistry that meets performance and safety requirements alone is not enough - packaging it in a small, safe, serviceable way is also a challenge.

Engineering / packaging issues that need to be overcome are:

- Finding a suitable location to install the battery that does not eat into cargo/passenger volume or skew weight distribution in the vehicle,
- Fitting adequate plumbing that can maintain a safe operating temperature for the battery,
- Adding mechanical/electronic systems that can effectively transfer power from the battery to the driven wheels
- Integrating the battery with the vehicle's electrical system,
- Implementing safety mechanisms in case of a battery fire/explosion
- Designing redundant electrical/control systems (like HVAC, stereo, lighting) that can run independently of battery power

Manufacturing Complexity
Many of the proposed new technologies / chemistries, which improve the performance and safety characteristics of Li-Ion batteries could be expensive to manufacture and difficult to scale up. These include development of advanced nanotechnology materials, which require precious metal catalysts in their manufacturing process and complicated manufacturing procedures to install the battery unit in the vehicle.

While these challenges mean Li-Ion batteries are not yet ready for volume PHEV use, our discussions with industry constituents and battery experts indicate progress is being made toward understanding and solving these problems. Researchers believe they now have a better grasp of the packaging and safety issues involved and research is now focused on finding the battery chemistry with the best cost-to-performance ratio and reducing parasitic losses from electrical / accessory systems.

Lithium Supply Could Be a Potential Bottleneck

Supply of lithium as a raw material is also a potential catalyst that will determine the cost effectiveness of PHEVs. A typical Li-Ion battery today uses Lithium Carbonate (Li_2Co_3) as a source of lithium. A Li-Ion PHEV battery is estimated to contain approximately 400 grams of elemental lithium per kWh (which translates to about 1.5 kg of lithium carbonate per kWh). Lithium carbonate is then used to create the cathode material, which is typically in the form of Lithium Cobalt Oxide compound.

The exact price of lithium and lithium compounds is hard to determine as it is mostly sold in negotiated contracts with no real spot market. Sharp spikes in lithium prices have been reported recently, however, increasing to as much as $7,000-8,000 per ton of lithium carbonate, driven by increasing demand for battery use. Cobalt price has also spiked recently, driving lithium compound prices up to an estimated $57-75/kWh (approx. $900-1,200 of lithium for a 40-mi range PHEV battery, approx. $285-375 for 10-mi range PHEV battery).

Lithium (or lithium compound) is typically mined from salt lakes or hard deposits (spodumene). According to the U.S. Geological Survey, global lithium metal equivalent production was 25,000 tons in 2007. Latin America is the leading global source of lithium carbonate production and reserves with Chile, Argentina, Brazil and Bolivia being the leading sources. The US, China Australia and Russia are also believed to have large lithium reserves. The USGS estimates total reserves of lithium metal content at 4.1 mm tons with a reserve base of 11 mm tons (reserve base represents reserves that exist but are currently not economically recoverable). ***This means the existing reserves can supply between 500-800 mm PHEV batteries, depending on the capacity.*** Not all the lithium production / reserves can be used for hybrid battery production, however. The leading end uses of lithium today are for glass / ceramics (21%), rechargeable batteries (20%), lubricants (17%) and pharma / polymers (9%). Up to 98% of lithium in PHEV batteries can also be recovered through recycling.

Lithium supply for PHEV batteries undoubtedly faces many challenges. These include constrained current production of lithium compounds, inaccessibility of some salt lake locations impacting logistics and processing costs, unsuitability of some lithium deposits for PHEV use and tremendous growth in lithium demand. Still, we believe lithium supply issues will not adversely impact the cost-effective supply and growth of PHEV batteries. There are also other material substitutes for lithium carbonate and lithium cobalt oxide (including nickel, iron and zinc based compounds) currently being researched, which can further reduce dependency on lithium carbonate and bring down cost.

Exhibit 6

Mining Lithium – Atacama Desert Deposits & Evaporation Process

Source. EVWorld, Meridian Research

Exhibit 7

Lithium Metal Content - Production and Reserves

(metric tons)

	Mine production 2006	Mine production 2007e	Reserves4	Reserve base4
United States	W	W	38,000	410,000
Argentina e	2,900	3,000	NA	NA
Australia e	5,500	5,500	160,000	260,000
Bolivia	—	—	—	5,400,000
Brazil	242	240	190,000	910,000
Canada	707	710	180,000	360,000
Chile	8,200	9,400	3,000,000	3,000,000
China	2,820	3,000	540,000	1,100,000
Portugal	320	320	NA	NA
Russia	2,200	2,200	NA	NA
Zimbabwe	600	600	23,000	27,000
World total (rounded)	23,500	25,000	4,100,000	11,000,000

Source. USGS. US data withheld for competitive reasons (only one supplier reporting). US production is estimated at approx $1,700 MT according to Meridian Research e = estimate.

PHEV Market Opportunity could be significant

The world market for hybrid cars can be divided into three main markets : United States, Europe and Japan & Rest of the World. Since the Toyota Prius first went on sale in Japan in 1997, world hybrid car sales have grown every year to touch over 300K units in 2006 and an estimated 515K units in 2007.

We have built a proprietary demand model for hybrid car demand for each region. Our model is based on the Bass Diffusion curve, which predicts demand uptake for new high-tech products based on the estimated rate of early adopters followed by rate of mass adoption (imitators). We have slightly modified the results of the model to reflect our assumptions of where market forces / new launches / other demand catalysts will cause demand to deviate from the trendline. *For more details on our methodology, please see page 18.*

United States Hybrid Demand

We estimate that **Base Case demand** for hybrid vehicles in the US will grow from approx. 355K units in 2007 to ~400K units in 2008, and then at a 18-20% CAGR between 2009 – 2012. We see hybrid vehicle sales growing to almost 2 mm units (or almost 10-12% of annual SAAR) by 2020.

Following strong growth between 2004 - 2007, we believe HEV growth rate will moderate in 2008 and 2009 as consumers get accustomed to gasoline prices at $3/gal, economic/macro headwinds hurt auto demand and few new major launches serve as an offset to jumpstart demand.

We believe HEV demand is likely to be aided in 2H09/2010 by new launches, as Honda is scheduled to launch two new HEVs (CRZ coupe, new Prius-fighter), GM is scheduled to launch its BAS-II intermediate hybrids and Toyota is expected to expand the Prius lineup with additional variants including a Lexus-branded Prius and a PHEV Prius. We expect GM will also launch its first PHEVs in 2010 in the form of the Saturn Vue PHEV and the Chevrolet Volt *(see box, page 14)*.

We believe PHEVs will gain gradual acceptance with consumers and capture an increasingly larger share of HEV sales and total sales between 2010 and 2012. We see PHEV sales of a few thousand units upon launch in 2010, growing to 100K units in 2012 and 250K units in 2015. PHEV penetration will be driven by regular hybrids adding on plug-in capability. As PHEV penetration increases, we see HEV growth moderating.

Our **Bull Case** model for hybrid demand assumes that growth rate of hybrid demand *does not* moderate from 2007 levels. Sustained high levels of gasoline prices (above $4/gal) could precipitate this scenario. Our bull case also assumes quick early adoption of PHEVs and high imitation adoption, possibly driven by OEM/government economic incentives, which could present highly attractive operating economics for consumers.

Our **Bear Case** model also assumes a drop off in hybrid demand growth until 2010 and a much slower ramp-up / acceptance rate for PHEVs. We also assume moderated incremental demand for HEVs as OEMs regulate supply to reduce losses per unit in the face of higher raw material costs driving up HEV battery costs (lithium, cobalt, nickel prices).

International Hybrid Demand

Hybrid penetration in **Europe** is likely to lag the US, as diesel is already well established as an effective alternative to gasoline. Nevertheless, increased pressure from stricter emissions/CO2 legislation and higher taxation (congestion charge) could see OEMs pushing hybrids, as diesels reach their limit of their cleanliness. Still, we believe hybrids will eventually replace V-8 and V12 engines in non-specialist applications (high performance / super luxury vehicles) in Europe.

We are estimating European hybrid demand growth of 25% in 2008 (similar to 2007) driven by new model introductions moderating to 20% per year until 2010. We see hybrid demand increasing to over 200K units/year by 2020.

We believe PHEVs should be reasonably well received in **Japan** given the extremely tough fuel economy standards, short driving distances and the high share of small cars. We see total hybrid sales growing from approx. 100K units in 2007 to almost 300K units in 2015.

RoW hybrid demand growth will continue to be dominated by Canada. We see slow uptake of hybrids and PHEVs in the rest of the world due to cost considerations, electric grid bottlenecks, availability of diesel fuel and durability concerns.

Significant revenue opportunity for OEMs, Suppliers

If we assume an average cost of $4,000 per PHEV battery and $2,500 per HEV battery by 2012, this translates to a base-case market opportunity of over $2 bln in the US and approx $3 bln internationally, by 2012. We believe the market for hybrid batteries will be shared between three or four large Tier-1

battery suppliers. Assuming each supplier has an equal share, this works to an approx. $750 mm to $1 bln revenue opportunity for each supplier in 2012. This could increase to a $2-3 bln revenue opportunity for each supplier by 2020.

Exhibit 8

Morgan Stanley US Hybrid Vehicle Demand Forecast

US Hybrid Sales Year	Units	% Growth
2000	6,401	
2001	15,556	*143%*
2002	34,527	*122%*
2003	43,435	*26%*
2004	84,199	*94%*
2005	206,250	*145%*
2006	251,803	*22%*
2007	354,993	*41%*
2008e	397,592	*12%*
2009e	461,207	*16%*
2010e	553,448	*20%*
2012e	770,621	*18%*
2015e	1,172,019	*15%*
2020e	1,974,920	*11%*

Source: Company data, Morgan Stanley Research

Exhibit 9

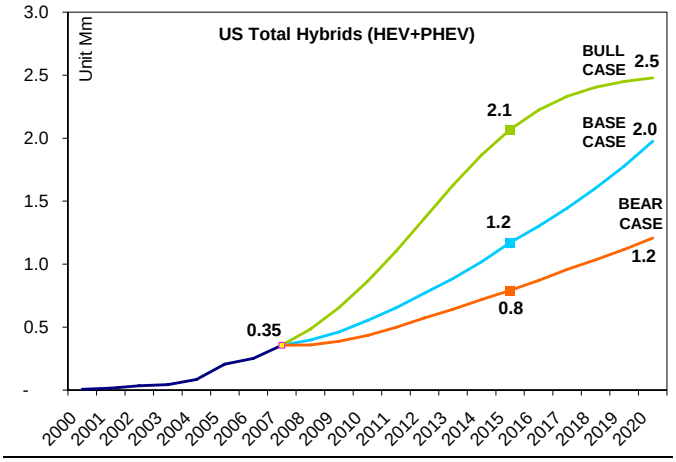
MS US Hybrid Vehicle Demand Forecast - Scenarios

est.	BASE	*growth*	BULL	*growth*	BEAR	*growth*
2008e	397,592	*12%*	483,932	*36%*	358,543	*1%*
2009e	461,207	*16%*	654,422	*35%*	387,226	*8%*
2010e	553,448	*20%*	862,384	*32%*	433,694	*12%*
2012e	770,621	*18%*	1,364,636	*24%*	573,560	*15%*
2015e	1,172,019	*15%*	2,069,250	*15%*	791,421	*11%*
2020e	1,974,920	*11%*	2,478,344	*4%*	1,206,324	*9%*

Source: Morgan Stanley Research

Exhibit 10

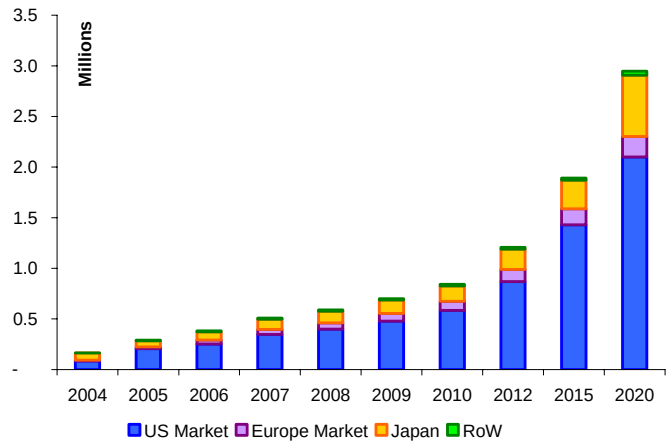
Morgan Stanley US Hybrid Demand Model



Source: Company data, Morgan Stanley Research

Exhibit 11

Morgan Stanley Global Hybrid Demand Estimate



Source: Company data, Morgan Stanley Research

Exhibit 12

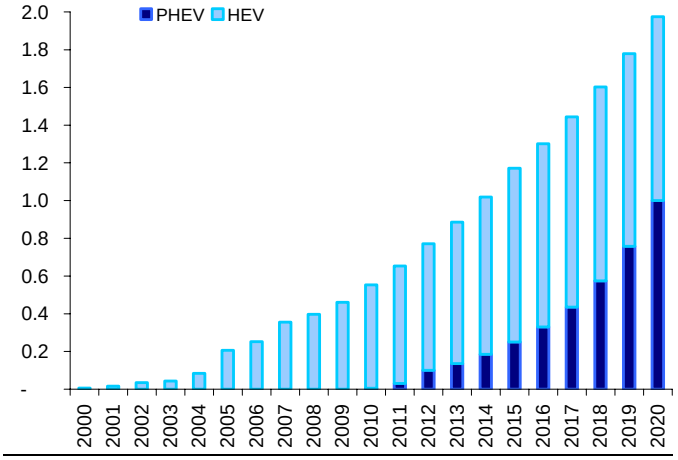
Morgan Stanley US PHEV Demand Forecast

US PHEV Sales year	Units
2010	5,000
2011	30,000
2012	100,000
2013	135,721
2014	184,202
2015	250,000
2016	329,877
2017	435,275
2018	574,349
2019	757,858
2020	1,000,000

Source: Morgan Stanley Research

Exhibit 13

Morgan Stanley US PHEV Demand Estimate



Source: Company data, Morgan Stanley Research

Early movers could benefit from lead time

As with any new technology, early movers in the space who have a head start with developing PHEVs are likely to benefit the most from successful adoption of PHEVs. Being early to market is probably more important then being first to market, however, as Li-Ion battery technology will take some time to mature. We believe companies at all stages of the PHEV food chain stand to benefit, including OEMs, Tier-1 suppliers, Tier-2 suppliers, auto dealers, electric utilities and raw material suppliers.

OEMs

Several OEMs including Nissan, Daimler, BMW, Volkswagen, Hyundai and some Chinese OEMs are scrambling to add conventional HEVs to their product lineup in the next few years – several powered by Li-Ion batteries. A few OEMs are better positioned than others, however, to be first to market with PHEVs. Development of PHEVs for volume commercial implementation is being led mostly by General Motors and Toyota with several small, private automakers like Tesla Motors, Fisker Automotive etc. also investing in the technology.

General Motors (Equal-weight, PT $30)
GM has arguably been the most vocal in its support for and development of PHEVs. GM's PHEV R&D is running on two parallel streams. GM has announced that it will launch the Saturn Vue PHEV-10 in 2010 and is also scheduled to launch the Chevrolet Volt PHEV-40 in 2010 (the battery for the Volt is still under development by a consortium of battery companies including Continental, A123 Systems and LG).

Even if GM does meet its launch target of having both these vehicles on the road by 2010, PHEVs are likely to have little impact on GM's North American market share, in the near to medium term. GM has targeted production of 10,000 units for the Volt in its initial year, it is likely to cost between $30,000 - 40,000 at launch, and GM will is unlikely to break even on the project for a few years at least.

Successful launch of the Volt, however, is likely to help GM from a marketing perspective and allow it to "out green" other competitors, especially if it is first to market with a PHEV. In the medium to long-term, increased PHEV penetration in its product range will allow GM to meet new CAFE standards and possibly sustain sales of larger, less fuel-efficient SUVs. Successful uptake of PHEVs can also help GM recover share in the small/mid-size car segments.

At this time, however, we do not see even a successful launch of PHEVs doing enough to offset share/mix deterioration in other products at GM. We hesitate to advocate an investment in GM at this time, on this opportunity alone.

The Chevrolet Volt

Much of the debate about PHEV viability has so far centered around GM's public commentary indicating that the Chevrolet Volt PHEV will be on sale toward the end of 2010. The Chevrolet Volt was first unveiled in concept form at the North American International Auto Show in 2007. The Volt was the first car to be based on GM's E-Flex PHEV architecture, which has also spawned the Opel/Saturn Flextreme and the Cadillac Provoq concepts. While specifications have not yet been finalized, the E-Flex in the Volt is expected to be powered by a 16kWh lithium ion battery, a 120 kW electric motor and a 1.0L gasoline IC engine. This should give the E-Flex an estimated 40-mile all-electric range and return about 45-60 mpg on IC power. Other variants of E-Flex are powered by Li-Ion batteries of various capacities and either a diesel/ethanol IC engine or a hydrogen fuel-cell, as the range-extender.

GM has awarded battery development contracts for the Volt to two groups - A123 Systems/Continental and LG Chemical. A123 recently revealed its first battery prototype for the Volt with a prismatic design, which is well suited for the Volt's unique T-shaped battery layout. LG Chemical has also begun testing its battery offering for the Volt. Further development and testing for the Volt battery and powertrain is still underway.

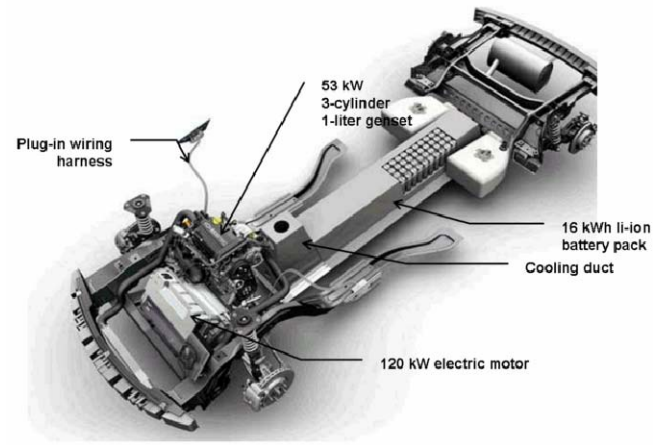
GM has committed to launching the Volt toward the end of 2010 though Chairman and CEO Rick Wagoner has also said that the target would be "a stretch". We note that the Chevrolet Camaro will have taken 3 years from initial concept to launch when it goes on sale in early 2009, despite being based on an existing platform with mostly existing powertrains. Given that the Volt powertrain is based on a nascent technology, which is still in development and is being built on a new platform (Delta 2), we believe the Volt's time to market will be much longer than 3 years, which will push its commercial launch well into 2011.

We do believe, however, that GM can still have initial prototypes of the Volt on trial sale to select retail customers or fleets for test purposes toward the end of 2010 (similar to what Honda is doing today with the FCX Clarity Fuel Cell car in California). GM has dedicated an entire engineering team and a complete design studio just for the Volt. Reports indicate that GM has already commenced initial tests on internal prototypes of the Volt battery system.

Exhibit 14
A123 Systems Prismatic Lithium Ion PHEV Battery

Source.A123 Systems

Exhibit 15
Layout of General Motors' E-Flex PHEV Architecture



Source: General Motors

Despite being pioneers in HEV development, Toyota and Honda have publicly maintained that they are thus far unconvinced about the viability of lithium ion batteries for automotive use (but Toyota has shown commitment to PHEV development). Both companies, however, continue to research lithium ion battery technology both in-house and in conjunction with battery suppliers

Toyota (7203.T, ¥5,200, Rated Overweight, PT ¥7,250 by our Japanese Analyst Noriaki Hirakata)
The pioneer of hybrid vehicles has been a little cautious to embrace Li-Ion plug in hybrids citing reliability and safety concerns with current battery technology. After initially stating that the third generation Toyota Prius (which was to be launched in 2008) would be a Li-Ion powered HEV, Toyota has now postponed its lithium ion plans for the Prius until battery technology matures. The second generation Prius will continue in its current form of a NiMH battery powered HEV while the third generation Prius (now scheduled for launch in 2010) will likely by a PHEV. However, current PHEV Prius prototypes continue to be powered by a NiMH battery, which will theoretically leave it at a performance and range disadvantage compared with other Li-Ion powered PHEVs. While Toyota has not publicly committed to a launch schedule for Li-Ion PHEVs, it continues to develop the technology in-house. We see Toyota eventually launching a Li-Ion hybrid, perhaps even as soon as the third generation Prius in 2010.

Suppliers

On the supplier front, a few major Tier-1 suppliers are leading the race for Li-Ion PHEV battery development, many of whom have development partnerships with OEMs. These include, Johnson Controls/Saft, A123 Systems, Cobasys Technologies, Continental, LG Chemical, Panasonic and Toshiba. Several non-traditional players including private start-ups, universities, government research labs and even oil companies like ExxonMobil Chemical are also spearheading the development of PHEV / Li-Ion technology.

We believe the supplier environment for PHEV Li-Ion batteries will continue to remain fragmented until one or two breakthrough solutions emerge for design, construction, assembly and manufacture of Li-Ion batteries. This is then likely to be followed by a period of rapid consolidation in the industry, as smaller suppliers with promising new technologies are likely to be absorbed by larger tier-1 suppliers with supply contracts with OEMs.

Johnson Controls (Overweight, PT $42)
We believe JCI is one of the companies best positioned to capitalize on the growth of lithium ion battery powered hybrids. JCI, with its JV partner Saft, is likely to be first to market with volume Li-Ion HEVs on the Mercedes Benz S400 Hybrid early next year. JCI/Saft has already started serial production of Li-Ion batteries for HEVs at its factory in Nersac, France. JCI is also a partner with GM to develop and supply batteries for the Saturn Vue Plug-in Hybrid set for launch in 2010.

We retain our OW rating and $42 PT on JCI. JCI's strong position and early mover advantage within what we believe is a significant market/growth opportunity in the medium to long term, adds yet another leg to our thesis that JCI can show growth in the building and battery businesses together with margin improvement in Autos and value creating strategic acquisitions. While the potential opportunity (we est. $750 mm -1 bln by 2012) is attractive for JCI, it is probably not large

enough to make a significant impact at the $35 bln in revenue (2007 actual) company.

Exhibit 16

Johnson Controls/Saft Cylindrical PHEV Battery

Source. Johnson Controls

Magna (Equal-weight)

Magna has spoken about plans to enter assembly of Li-Ion batteries for HEV and PHEV applications. Magna does not plan to develop and manufacture the battery cells themselves but will likely assemble cells made by another supplier into an installable battery module. The assembly of battery cells into a battery module is a significantly value added process and not merely a pass-through procedure. Magna has not revealed much detail on its hybrid battery plans and has yet to choose an appropriate battery technology or supplier to partner with. We believe, however, that this could be a reasonably profitable / high growth business for MGA.

Exhibit 17

PHEV Opportunity Attractive but Probably Not Large Enough to Make an Impact

2007 $mm	Revenue	Op. Income
JCI	$34,624	$1,888
MGA	$26,067	$1,124

We est. PHEV revenue opportunity of $750 mm -$1 bln per supplier by 2012

Source: Company data, Morgan Stanley Research

Other Suppliers

Several other suppliers have PHEV battery programs that are in an advanced stage of development. These include large Tier-1 suppliers like Panasonic, Hitachi and Toshiba. Some like Continental are specializing in electronic integration of batteries. Many smaller suppliers are also working on proprietary PHEV battery technologies. These include A123 Systems, EEStor, Altairnano, Quantum Technologies, EnerDel, among others. Many of these smaller suppliers have been announced as suppliers / partners on OE battery programs – A123 with the Chevrolet Volt and Altairnano and EEStor have won significant military battery contracts.

Dealers

Auto dealers can benefit from PHEV penetration on the Parts and Service front, aside from the bigger picture benefit of being able to sell more fuel-efficient cars to customers. We could see PHEV owners being mandated / induced into servicing their cars at authorized dealers only, given the highly technical nature of a PHEV battery and the cost, safety and environmental considerations involved in servicing it. We can also envision OEMs offering lease-only deals on PHEVs in the early years or even separately leasing the PHEV battery to customers, independent of the car (to maintain greater control over servicing and end-of-life processing of batteries). This could be beneficial to auto dealer F&I. Indeed, Auto Nation CEO Mike Jackson recently commented that of all the different alternative fuel / powertrain technologies available, he sees PHEVs as the one with the most potential. We also see the Smart car as being well-suited for a PHEV application, which could benefit PAG in the long-term, if the car is ever developed.

Some small, private OEMs may get a head start

While the traditional OEMs like GM and Toyota continue to develop PHEV Li-Ion batteries for commercialization, several small, private OEMs including Tesla Motors, Fisker, Th!nk and ZENN may be close to having Li-Ion powered electric cars / PHEVs on the road, albeit in limited volumes.

Tesla Motors

Tesla Motors will probably be the first OEM to sell a Li-Ion powered vehicle to the public in North America with its $100,000 Tesla Roadster scheduled to go on sale in March 2008. The Roadster is powered by a 53 kWh lithium-ion battery, which comprises more than 6,800 individual cells, similar to laptop batteries. The Roadster does not have a backup IC engine to extend the car's range (advertised at 200+ miles on battery power) and thus is an electric car rather than a PHEV. The two-seat Roadster is built on a platform based on the Lotus Elise (the car is build by Lotus in England and is shipped to California, where the battery is installed before sale) and has received positive reviews from the automotive press. Despite some initial hiccups including transmission problems on the car, certification delays and management changes, the Roadster now looks set for commercial sale. Tesla has plans for expansion with two more models under development (the $50,000 WhiteStar sedan and the $30,000 BlueStar).

Appendix

Lithium Ion Battery Technology

Lithium ion batteries work by initiating the movement of ions between the positive and negative electrodes of the battery. The battery pack as we see it actually comprises several individual cells that are connected together to generate the power required to propel the vehicle. The number of cells required depends on the size of the vehicle, the power required and the type of battery application. For example, the NiMH battery powered Escape HEV uses 250 cells, the upcoming Li-Ion powered Mercedes Benz S400 Hybrid HEV is estimated to use 50 cells while a typical PHEV is expected to use approximately 90-100 cells. The chemistry of a Li-Ion battery thus refers to the chemistry within each cell.

A Li-Ion battery cell is typically cylindrical shaped (like a regular AA battery) or prismatic (flat shaped). Cylindrical cells are easier to design / manufacture, safer and performance characteristics are well understood. Prismatic batteries, however, are more compact / space-efficient and theoretically have a slight performance advantage, making them well suited to small/mid-size car applications.

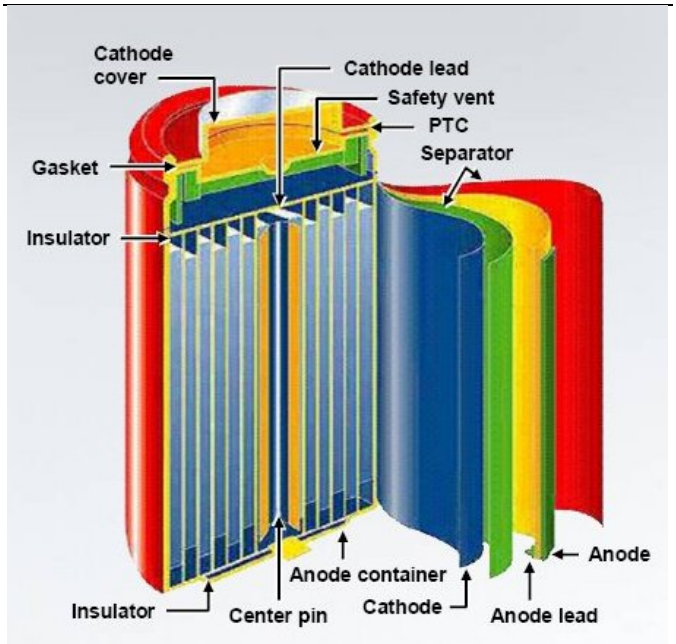
The battery structure within a cylindrical cell is shown in Exhibit 18. The cell comprises a metal canister, which contains coiled sheets of a positive electrode (cathode) and a negative electrode (anode) divided by a separator material, all immersed in an electrolyte (catalyst). The cells may also contain safety systems including sensors to detect overheating and safety valves to de-pressure the battery in the event of a short circuit. The battery works using a chemical reaction when ions move from the positive electrode to the negative electrode through the separator during charge and in the reverse direction during discharge. The separator is used to facilitate ion exchange and as a safety mechanism to prevent overheating.

The advantage of Li-Ion batteries vs. other chemistries is that it has a very high energy density allowing for smaller / high performance batteries. The disadvantage is that the chemistry is also quite volatile and is prone to overheating / exploding when the ion transfer accelerates (thermal runaway). The carbon anode also tends to deteriorate with time / charge cycles, reducing battery performance (self discharge).

The key debate surrounding Li-Ion battery technology is the choice of materials used to construct the cathode and anode. Researchers are looking for materials that contain the maximum energy density with least self discharge and overheating properties. A typical Li-Ion battery uses a $LiCoO_2$ (Lithium Cobalt Oxide) cathode, a crystallized carbon anode and ether as an electrolyte. New research attempts to substitute $LiCoO_2$ for other sources of lithium (Lithium Iron Phosphate or $LiFePO_4$ for example has better safety characteristics than $LiCoO_2$ but slightly lower energy density). Scientists are also working on alternatives for cathode construction (using a non-carbon cathode for example, can reduce combustibility and cycle deterioration).

A consensus / breakthrough solution that can make Li-Ion technology ready for commercial PHEV use will likely come in the form of ideal materials that can be used to construct a high performing but safe and long-lasting battery that can be manufactured in an easy and cost-effective manner. The use of nanotechnology in particular, has shown early promise in making Li-Ion batteries safer and more durable.

Exhibit 18
Cylindrical Lithium Ion Battery Cell Construction



Source: General Motors, AutoblogGreen, Morgan Stanley Research

Exhibit 19
Alternative Battery Chemistries

	NiCd	NiMH	Lead Acid	Li-Ion	Li-Ion polymer
Gravimetric Energy Density (Wh/kg)	45-80	60-120	30-50	110-160	100-130
Internal Resistance (includes peripheral circuits) in mW	100 to 200[1] 6V pack	200 to 300[1] 6V pack	<100[1] 12V pack	150 to 250[1] 7.2V pack	200 to 300[1] 7.2V pack
Cycle Life (to 80% of initial capacity)	1500[2]	300 to 500[2,3]	200 to 300[2]	500 to 1000[3]	300 to 500
Fast Charge Time	1h typical	2-4h	8-16h	2-4h	2-4h
Overcharge Tolerance	moderate	low	high	very low	low
Self-discharge / Month (room temperature)	20%[4]	30%[4]	5%	10%[5]	~10%[5]
Cell Voltage (nominal)	1.25V[6]	1.25V[6]	2V	3.6V	3.6V
Load Current - peak - best result	 20C 1C	 5C 0.5C or lower	 5C[7] 0.2C	 >2C 1C or lower	 >2C 1C or lower
Operating Temperature (discharge only)	-40 to 60°C	-20 to 60°C	-20 to 60°C	-20 to 60°C	0 to 60°C
Maintenance Requirement	30 to 60 days	60 to 90 days	3 to 6 months[9]	not req.	not req.
Commercial use since	**1950**	**1990**	**1970**	**1991**	**1999**

Source. Technick.net. ***Generic comparison – not necessarily applicable for automotive use***

Morgan Stanley US Total Hybrid Demand Forecast Model

Our proprietary demand forecast model is based on the Bass Diffusion Curve model. The Bass Diffusion model was developed by Frank Bass in 1969 and is used to predict the rate of adoption of a new product/technology among users and market penetration. The Bass Diffusion model has been successfully used to predict the uptake of high technology products including satellite TV, MP3 players etc.

There are several variants of the model one of which is represented by the formula N(t-1) + [p + qN(t-1)/m] x [m - N(t-1)]. Here **N(t-1)** refers to the cumulative number of users in time (t-1), **m** refers to the total prospective market size, **p** refers to the coefficient of innovation (how rapidly the product is adopted by new users without external stimulus) and **q** refers to the coefficient of imitation (how rapidly the product is adopted by word-of-mouth after it is adopted by innovators).

The sales ramp forecasted by the model thus depends on assumptions of p and q. The average observed value over time for p is 0.03 (though it is often less than 0.01) and for q is 0.38 (range between 0.3-0.5).

Our bass diffusion model for HEVs assumes p = 0.007 and q = 0.42. This is similar to observed values for cell-phone adoption (p = 0.008, q = 0.42) with relatively lower innovation coefficient and high imitation coefficient as the technology becomes cheaper. Our bass diffusion model for PHEVs assumes p = 0.11 and q = 0.28, which is similar to internet penetration (p = 0.13 and q = 0.3) with high innovation coefficient once new users learn the benefits and moderate imitation coefficient.

We have used the bass-diffusion model as a trendline base for our own sales model. Our model also reflects real-world deviations from the trend-line to reflect new model introductions, macro factors and competitive forces.

Valuation and Risks

Johnson Controls (OW, PT $42)
Our DCF backed price target is $42. We have used Risk Free rate of 4.7%, Risk Premium of 4.5%, Beta of 1.1 and after-tax cost of debt of 4.6% (WACC of 7.8%) and a terminal growth rate of 1.5%. We also estimate fair value for JCI to be roughly 16x times our FY08/09 earning estimate. We believe JCI merits a valuation premium vs. other OE suppliers (peer group average 14x our 2008e), due to its over 60% non-automotive OEM EBIT exposure. Risks to our estimate include lower NA auto production, rising commodity costs, currency exposure and the possibility that York acquisition revenue synergies will not be achieved.

General Motors (EW, PT $30)
We established a price target of $30 with weighted average probabilities of our bull, base and bear case scenarios, which were achieved through a four-year DCF model using free cash flow to equity holders of $4 billion (bullcase), $1.5 billion (base case), and $1.2 billion (bear case) using a 12% discount rate (risk free rate of 4.5%, beta of 1.5, and risk premium of 5%). Risks: GM is still burning cash near the peak of its product cycle. Product cycle is good for now, but 2H08 will likely be difficult; Capacity additions by competition will make it tough to stop the loss of market share in the US.

Disclosure Section

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Global Stock Ratings Distribution

(as of February 29, 2008)

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	Coverage Universe		Investment Banking Clients (IBC)		
Stock Rating Category	Count	% of Total	Count	% of Total IBC	% of Rating Category
Overweight/Buy	**1039**	**44%**	**322**	**45%**	**31%**
Equal-weight/Hold	**974**	**41%**	**300**	**42%**	**31%**
Underweight/Sell	**356**	**15%**	**100**	**14%**	**28%**
Total	**2,369**		**722**		

Data include common stock and ADRs currently assigned ratings. An investor's decision to buy or sell a stock should depend on individual circumstances (such as the investor's existing holdings) and other considerations. Investment Banking Clients are companies from whom Morgan Stanley or an affiliate received investment banking compensation in the last 12 months.

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Overweight (O). The stock's total return is expected to exceed the average total return of the analyst's industry (or industry team's) coverage universe, on a risk-adjusted basis, over the next 12-18 months.
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Unless otherwise specified, the time frame for price targets included in Morgan Stanley Research is 12 to 18 months.

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The Americas
1585 Broadway
New York, NY 10036-8293
United States
Tel: +1 (1) 212 761 4000

Europe
25 Cabot Square, Canary Wharf
London E14 4QA
United Kingdom
Tel: +44 (0) 20 7 425 8000

Japan
4-20-3 Ebisu, Shibuya-ku
Tokyo 150-6008
Japan
Tel: +81 (0) 3 5424 5000

Asia/Pacific
Three Exchange Square
Central
Hong Kong
Tel: +852 2848 5200

Industry Coverage:Autos & Auto-Related

Company (Ticker)	Rating (as of)	Price (03/10/2008)
Jonathan Steinmetz, CFA		
Aftermarket Technology (ATAC.O)	E (02/19/2004)	$18.72
American Axle and Mfg. (AXL.N)	E (05/01/2007)	$21.01
ArvinMeritor (ARM.N)	E (03/18/2002)	$10.29
AutoNation Inc. (AN.N)	E (02/08/2007)	$13.71
BorgWarner Inc. (BWA.N)	E (03/16/2005)	$40.42
Cooper Tire & Rubber (CTB.N)	U (09/24/2003)	$16.57
Cummins Inc. (CMI.N)	E (10/19/2006)	$45.8
Ford (F.N)	++	$5.6
General Motors (GM.N)	E (01/24/2007)	$20.89
Genuine Parts Co. (GPC.N)	O (07/20/2005)	$39.26
Goodyear Tire & Rubber (GT.N)	E-V (02/07/2003)	$25.35
Group 1 Automotive (GPI.N)	O (03/26/2007)	$23.72
Johnson Controls (JCI.N)	O (07/21/2006)	$31.05
Lear Corp. (LEA.N)	E (03/02/2005)	$25.34
Lithia Motors Inc. (LAD.N)	E (02/22/2005)	$9.07
Magna Intl Inc. (MGA.N)	E (11/06/2006)	$71.97
PACCAR Inc. (PCAR.O)	E (07/25/2007)	$41.45
Penske Automotive Group, Inc (PAG.N)	E (06/29/2004)	$17.7
Snap-on Inc. (SNA.N)	O (08/23/2007)	$47.25
Standard Motor Products (SMP.N)	U (03/18/2002)	$7.52
Stoneridge Inc. (SRI.N)	U (07/25/2002)	$11.06
Superior Industries (SUP.N)	U (08/01/2005)	$17.9
TRW AUTOMOTIVE (TRW.N)	E (03/31/2004)	$22.47
Tenneco (TEN.N)	E (03/18/2002)	$24.19
Visteon Corporation (VC.N)	NA-V (05/26/2005)	$3.53

Stock Ratings are subject to change. Please see latest research for each company.

OCTOBER 2008 RETAIL ENERGY AND DEMAND FORECAST

ELECTRICITY SALES BY CUSTOMER CLASS AND SYSTEM PEAK DEMAND

UNMITIGATED FORECAST

	SECTOR SALES				Total Sales to Ultimate	LOSSES		Net Energy		Service	Peak		Service
	Residential	Commercial	Industrial	Miscellaneous*	Customers	Total	DC Line	for Load	Cogen	Area Load	Demand	Cogen	Area Peak
Year	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(MW)	(MW)	(MW)
1990	6,836	11,338	3,079	523	21,776	2,895	337	24,671	1,019	25,690	5,312	117	5,429
1991	6,615	11,289	3,002	526	21,432	2,634	350	24,066	1,179	25,245	5,100	138	5,238
1992	7,000	11,475	2,860	481	21,816	2,593	139	24,409	1,107	25,516	5,279	151	5,430
1993	6,726	11,372	2,590	443	21,131	2,671	287	23,802	1,137	24,939	4,650	146	4,796
1994	6,708	10,830	2,365	492	20,395	2,603	69	22,998	1,498	24,496	4,958	193	5,151
1995	6,768	11,086	2,484	469	20,808	2,270	139	23,078	1,588	24,666	4,863	206	5,069
1996	6,916	11,266	2,568	518	21,268	2,984	653	24,252	1,531	25,783	5,111	210	5,321
1997	7,104	11,534	2,629	536	21,803	3,206	756	25,009	1,686	26,695	5,492	209	5,701
1998	7,183	11,389	2,601	523	21,696	2,886	600	24,582	1,656	26,238	5,630	209	5,839
1999	7,139	11,539	2,603	591	21,873	3,188	610	25,061	1,535	26,596	5,368	209	5,577
2000	7,514	12,186	2,644	519	22,863	3,067	420	25,930	1,535	27,465	5,299	187	5,486
2001	7,314	11,884	2,645	531	22,373	2,685	217	25,058	1,052	26,110	4,805	180	4,985
2002	7,345	11,957	2,455	535	22,290	3,011	513	25,301	1,061	26,362	5,185	180	5,365
2003	7,792	12,228	2,477	547	23,044	3,066	361	26,110	1,061	27,171	5,410	180	5,590
2004	7,925	12,409	2,449	567	23,350	3,170	213	26,521	1,061	27,582	5,418	180	5,598
2005	7,939	12,487	2,427	548	23,401	3,016	374	26,417	1,061	27,478	5,667	180	5,847
2006	8,467	12,905	2,394	547	24,313	3,156	448	27,469	1,061	28,530	6,102	180	6,282
2007	8,399	12,951	2,385	582	24,317	3,161	404	27,478	1,061	28,539	6,071	130	6,201
2008	8,647	13,193	2,312	575	24,727	3,465	416	28,191	1,061	29,252	6,006	180	6,186
2009	8,531	13,103	2,312	584	24,530	3,150	416	27,680	1,061	28,741	5,803	180	5,983
2010	8,600	13,201	2,297	586	24,684	3,170	416	27,854	1,061	28,915	5,839	180	6,019
2011	8,676	13,362	2,290	587	24,915	3,200	416	28,115	1,061	29,176	5,894	180	6,074
2012	8,771	13,519	2,278	589	25,157	3,302	416	28,459	1,061	29,520	5,951	180	6,131
2013	8,886	13,682	2,270	591	25,428	3,267	416	28,695	1,061	29,756	6,015	180	6,195
2014	9,000	13,853	2,263	592	25,708	3,304	416	29,012	1,061	30,073	6,082	180	6,262
2015	9,139	14,022	2,262	594	26,017	3,344	416	29,360	1,061	30,421	6,155	180	6,335
2016	9,282	14,191	2,260	595	26,328	3,454	416	29,783	1,061	30,844	6,229	180	6,409
2017	9,420	14,368	2,262	597	26,647	3,426	416	30,073	1,061	31,134	6,304	180	6,484
2018	9,579	14,536	2,273	598	26,987	3,470	416	30,457	1,061	31,518	6,385	180	6,565
2019	9,735	14,695	2,277	600	27,307	3,511	416	30,818	1,061	31,879	6,460	180	6,640
2020	9,893	14,852	2,280	602	27,627	3,623	416	31,249	1,061	32,310	6,536	180	6,716
2021	10,052	15,004	2,281	603	27,941	3,594	416	31,534	1,061	32,595	6,610	180	6,790
2022	10,211	15,148	2,281	605	28,245	3,633	416	31,879	1,061	32,940	6,683	180	6,863
2023	10,371	15,288	2,281	606	28,545	3,672	416	32,218	1,061	33,279	6,754	180	6,934
2024	10,531	15,428	2,280	608	28,847	3,781	416	32,629	1,061	33,690	6,825	180	7,005
2025	10,694	15,567	2,279	610	29,149	3,751	416	32,900	1,061	33,961	6,897	180	7,077
2026	10,859	15,707	2,279	611	29,457	3,791	416	33,247	1,062	34,309	6,970	180	7,150
2027	11,027	15,849	2,280	613	29,768	3,831	416	33,599	1,063	34,662	7,043	180	7,223
2028	11,198	15,990	2,282	614	30,084	3,942	416	34,026	1,064	35,090	7,118	180	7,298
2029	11,370	16,133	2,283	616	30,403	3,914	416	34,316	1,065	35,381	7,194	180	7,374
2030	11,545	16,277	2,284	618	30,723	3,955	416	34,679	1,066	35,745	7,270	180	7,450

Table updated through September 2008.

Annual Percent Change

1990-2000	0.95%	0.72%	-1.51%	-0.08%	0.49%			0.50%		0.67%	-0.02%		0.10%
2000-07	1.60%	0.87%	-1.46%	1.65%	0.88%			0.83%		0.55%	1.96%		1.77%
2007-12	0.87%	0.86%	-0.92%	0.25%	0.68%			0.70%		0.68%	-0.40%		-0.23%
2007-17	1.15%	1.04%	-0.53%	0.26%	0.92%			0.91%		0.87%	0.38%		0.45%
2007-27	1.37%	1.01%	-0.23%	0.26%	1.02%			1.01%		0.98%	0.75%		0.77%

*'Miscellaneous' includes Streetlighting, Owens Valley, and Intra-Departmental.

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1. Executive Summary

The world's leading scientists predict that climate change will have a serious impact on the environment, economy and public health in the coming decades. For Los Angeles, this could mean that summers will be even hotter with double the number of heat wave days per year; we will see 75-85% more days with poor air quality and high ground-level ozone concentration, which could result in more heat-related deaths and strain on those with respiratory and cardiovascular disease; rainfall patterns could change, increasing the number of severe droughts and decreasing the snowmelt that is our primary source of potable water; and sea level rise could impact low-lying coastal neighborhoods and facilities at the Port of Los Angeles.

In order to protect our changing climate and safeguard a more secure future, every city must take responsibility for its contributions to climate change. With four million residents and more than four hundred square miles, Los Angeles emitted more than fifty million metric tons of carbon dioxide (the most prevalent greenhouse gas (GHG)) in 2004, which is about the same amount of carbon dioxide that the country of Sweden emitted. Mayor Antonio Villaraigosa and the City of Los Angeles developed a bold response to the challenge of climate change, promising to reduce carbon dioxide emissions 35% below 1990 levels by 2030.

In May of 2007 the City published "Green LA: An Action Plan to Lead the Nation in Fighting Global Warming," which included more than fifty actions to reduce the City's greenhouse gas emissions as well as measures to adapt to the effects of climate change. The plan directed City departments, led by the Environmental Affairs Department, to compile a set of actions that will meet the City's greenhouse gas goals and targets. Since its publication, City departments have been working hard to respond to the challenge set forth in the plan. The result is this Climate Change Implementation Report, which will introduce readers to the "departmental action plans" that provide detailed information about the steps departments will take to reduce carbon dioxide emissions from municipal facilities and operations.

Priority Actions

The actions in the departmental plans are categorized by the focus areas in "Green LA": energy, water, transportation, land use, waste, open space and greening, green economy and proprietary departments. Many of the plan's highlights focus on energy, including **greening the power from the largest municipal utility in the United States**, **helping Angelenos be energy misers** and **making Los Angeles a worldwide leader in green buildings**. To achieve these ambitious goals, the Los Angeles Department of Water and Power (LADWP) will increase renewable resources to 20% by December 31, 2010 and 35% by 2020. LADWP is focused on developing new renewable energy projects in southern California and the transmission lines needed to bring the power to Los Angeles. While greening the power supply, the City also has goals to help residents conserve energy in homes and office spaces. LADWP will distribute two compact fluorescent (CFL) lightbulbs to each of the 1.4 million households in the City and offer even more customer rebates for energy efficient appliances, windows, lighting and heating and cooling systems. Furthermore the City will present a comprehensive set of green building policies to guide and support private sector development. Effective in November 2008, projects of 50,000 square feet or more, or residential projects with 50 units or more, will have to meet the US Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) certified standard or better.

To reduce both harmful air pollution and greenhouse gas emissions, transportation is another important highlight of the "Green LA Departmental Action Plans". The City will **lower the environmental impact and carbon intensity of transportation** by requiring 85% of the City fleet to be powered by

alternative fuels. The City will also convert its Commuter Express diesel buses to alternative fuel and CityRide diesel vehicles to ultra low-emission gasoline. Since the City adopted its Clean Fuel Policy in 2000, the City's alternative fuel fleet has grown by more than 20% per year on average.

Decreasing per capita water use will reduce the amount of electric energy used for pumping and treating water, thus leading to reduced greenhouse gas emissions from fossil-fueled electric power plants. The City plans to meet all additional demand for water resulting from growth through water conservation and recycling. Water recycling is a reliable, economically feasible and environmentally sensitive method for augmenting the City's water supply. Through recycling and conservation efforts, LADWP intends to reduce per capita water consumption by 20%. LADWP and the Bureau of Sanitation (BoS) will also implement the innovative water and wastewater integrated resources plan that will increase conservation and maximize use of recycled water, including capture and reuse of stormwater.

One of the region's largest polluters is the Port of Los Angeles (POLA). With the adoption of the Strategic Plan for the Port of Los Angeles in 2007, however, the Port will become the world's greenest port by raising environmental standards and protecting public health. To **green the port**, POLA and LADWP will work together to complete a strategic growth plan, including sustainable and green growth options. A few of the environmental initiatives in the Strategic Plan are implementing the Clean Air Action Plan (CAAP), incorporating a sustainability ethic into all Port activities and cleaning and protecting the water, soil and local habitat.

The end goal of "Green LA" is to **create a more livable city** that offers a healthy and robust environment and economy for all Angelenos. Transit-oriented development (TOD) is a land use strategy used to accommodate new growth efficiently and strengthen neighborhoods by allowing people to work, shop and recreate near home. Promoting and implementing transit-oriented development (TOD) will create cohesive, vibrant, walkable communities where fragmented, auto-dependent corridors now exist.

Summary of Actions

Energy

Green the power from the largest municipal utility in the United States

- Meet the goal to increase renewable energy from solar, wind, biomass, and geothermal sources to 20% by 2010.
- Increase use of renewable energy to 35% by 2020.
- Reduce the use of coal-fired power plants.
- Increase the efficiency of natural gas-fired power plants.
- Increase biogas co-firing of natural gas-fired power plants.

Make Los Angeles a worldwide leader in green buildings

- Present a comprehensive set of green building policies to guide and support private sector development.

Transform Los Angeles into the model of an energy efficient city

- Reduce energy use by all City departments to the maximum extent feasible.
- Perform energy efficient retrofits on 497 City-owned buildings to continuously reduce energy consumption.
- Install the equivalent of 50 "cool roofs" on new or remodeled City buildings.

- Install solar heating for all City-owned swimming pools.
- Improve energy efficiency at drinking water treatment and distribution facilities.
- Maximize energy efficiency of wastewater treatment equipment.

Help Angelenos be energy misers

- Distribute two compact fluorescent light (CFL) bulbs to each of the 1.4 million households in the City.
- Increase the level and types of customer rebates for energy efficient appliances, windows, lighting, and heating and cooling systems.
- Increase the distribution of energy efficient refrigerators to qualified customers.
- Create a fund to "acquire" energy savings as a resource from LADWP customers.

Water

Decrease per capita water use

- Meet all additional demand for water resulting from growth through water conservation and recycling.
- Reduce per capita water consumption by 20%.
- Implement the City's innovative water and wastewater integrated resources plan that will increase conservation, and maximize use of recycled water, including capture and reuse of stormwater.

Transportation

Lower the environmental impact and carbon intensity of transportation

- Require 85% of City fleet to be powered by alternative fuels.
- Convert 100% of City refuse collection trucks and street sweepers to alternative fuels.
- Convert 100% of Metropolitan Transportation Authority (MTA) buses to alternative fuels.
- Convert Commuter Express Diesel Buses to Alternative Fuel and CityRide Diesel Vehicles to Ultra Low-Emission Gasoline (DOT).

Focus on mobility for people, not cars

- Complete the automated traffic signal synchronization and control system (ATSAC).
- Expand FlyAway shuttles serving Los Angeles International Airport (LAX) and other regional airports, and convert existing FlyAway buses to alternative fuels.
- Make transit information easily available, understandable, and translated into multiple languages.
- Increase the City employee participation in the rideshare program and increase subsidy for use of mass transit.
- Promote walking and biking to work, within neighborhoods, and to large events and venues.
- Expand the regional rail network.

Land Use

Create a more livable city

- Promote high-density housing close to major transportation arteries (same as Action Items LU3 and LU6).

- Promote and implement transit-oriented development (TOD).
- Make available underutilized City land for housing and mixed-use development.
- Make available underutilized City land for parks and open space.
- Clean up brownfields sites for community economic revitalization projects and open space.
- Make available underutilized City land within 1,500 feet of transit for housing and mixed-use development.

Waste

Switch from waste disposal to resource recovery

- Reduce or recycle 70% of trash by 2015.

Open Space and Greening

Unpave paradise/Create new paradises

- Create 35 new parks.
- Revitalize the Los Angeles River to create open space opportunities along the 32-mile corridor within the City of Los Angeles.
- Plant 1 million trees throughout Los Angeles.
- Identify opportunities to "daylight" streams.
- Identify and develop promising locations for stormwater infiltration to recharge groundwater aquifers.
- Collaborate and partner with schools to create more parks in neighborhoods.

Green Economy

Create demand and catalyze growth of the green economic sector

- Leverage City policy, purchasing, and regulation, and deepen local university partnerships, to promote local research, development, and production of green technology and products.
- Strengthen global economic relationships to promote investment in Los Angeles' green sector and help local environmentally focused companies penetrate both local and foreign markets.
- Identify and promote locations for green businesses.
- Develop targeted programs to train residents of low and middle income communities for jobs in the green economy.
- Collaborate with the private sector to offer effective incentives for the growth of local green businesses.
- Collaborate with local educational institutions such as universities, community colleges, and adult education programs to create more curricula that provide City residents with the skills and knowledge to work for competitive green businesses.

Proprietary Departments

Green the Port

- Fully implement the San Pedro Bay Ports Clean Air Action Plan (CAAP).

- Complete strategic plan for the Port of Los Angeles, including sustainable and green growth options.
- Complete economic development plan for the port, identifying opportunities to link the port's investment in green growth to new economic opportunities in the green sector.

Green Airports

- Fully employ the Sustainability Performance Improvement Management System to track and improve sustainability initiatives.
- Develop and implement comprehensive policies to green Los Angeles airports to meet green building specifications, improve recycling, use alternate fuel sources, use recycled water, employ water conservation methods, reduce energy requirements, and reduce GHG emissions.
- Evaluate options to reduce aircraft-related GHG emissions.

Citywide Climate Change Education Program

- City will partner with community, environmental justice, and environmental organizations to develop educational materials and reach out to Angelenos with steps they can take to reduce their own emissions.
- Conduct multi-lingual outreach to all neighborhoods, with emphasis on those with environmental justice challenges, to inform them of climate action.
- Convene a series of at least 20 community workshops to engage public input into the climate plan.
- Develop a program to challenge all Angelenos to reduce their individual/household carbon footprint.

Five-Year Rollout Plan

Achieving the goals set out in the “Departmental Action Plans” and reducing LA’s carbon footprint will take coordination across departments and the ability to act immediately while maintaining long-term vision. Many of the plan’s goals are already underway, like purchasing alternative vehicles for the City’s fleets and greening LADWP’s power. Figure 1 maps the actions that will take place over the next five years.

	Focus Area	Action No.	Measure	Milestone
2008	Energy	E3	Reduce the use of coal-fired power plants	Final draft feasibility study on reducing IPP's carbon footprint
		E4	Increase the efficiency of natural gas-fired power plants	Completion of the SHARE study
		E5	Increase biogas co-firing of natural gas-fired power plants	Terminal Island Fuel Cell (November - tentative)
		E6	Present a comprehensive set of green building policies to guide and support private sector development	Process 100 new buildings (December)
		E7	Reduce energy use by all city departments to the maximum extent feasible	Complete installation of pilot solar lighting (June)
				Installation of LEDs - expand program (June)
		E8	Perform energy efficient retrofits on 497 city-owned buildings to continuously reduce energy consumption	Replace a minimum of 10 HVAC rooftop units with SEER rating of 13 or better and/or EER of 11.3 or better (June)
		E12	Maximize energy efficiency of wastewater treatment equipment	Launch a pilot program to determine the feasibility of processing food waste from Santa Monica and Los Angeles area restaurants (September)
		E13	Distribute two compact fluorescent light (CFL) bulbs to each of the 1.4 million households in the city	distribute bulbs (June)
		E14	Increase the level and types of customer rebates for energy efficient appliances, windows, lighting and heating and cooling systems	Implement the thermal energy storage (TES) rebate program (July)
		E16	Create a fund to acquire energy savings as a resource from LADWP customers	Issue RFP for demand side management (DSM) (July)
				evaluate RFPs for viability and cost (October)
				Submit new DSM programs to LADWP Board for approval (December)
	Land Use	LU1	Promote high-density housing close to major transportation arteries	Update housing element (July)
				Adopt city-wide density bonus ordinance (December)
		LU2	Promote and implement transit-oriented development (TOD)	conduct public outreach including workshops (September)
		LU3/4/5	Make available underutilized city land for housing and mixed-use development/parks and open space/housing and mixed-use development (within 1500 feet of transit)	Establish city working group to identify and evaluate publicly owned land (June)
				Prioritize opportunities to transform underutilized land (December)
	Waste	WsT1	Reduce or recycle 70% of trash by 2015	Conduct at least 290 business waste assessments (June)
				Implement recycling for at least 125,000 multi-family households (June)
				Recruit at least 305 schools to participate in the LAUSD school recycling program (June)
				Develop a centralized data system to track the recycling activities in the city in order to meet the city's legal requirements (FY07/08)
	Education	Ed1/Ed2/ Ed3/Ed4	Citywide Climate Change Education Program	Provide training for staff (September) and implement public participation activities (December)
2009	Energy	E5	Increase biogas co-firing of natural gas-fired power plants	Landfill gas to energy projects (June)
		E6	Present a comprehensive set of green building policies to guide and support private sector development	Process 300 new buildings (December)
		E7	Reduce energy use by all city departments to the maximum extent feasible	Acquire funding for further installation of solar lighting and LEDs (June)
		E9	Install the equivalent of 50 "cool roofs" on new or remodeled city buildings	Install an additional 16 new cool roofs, retrofit 20 existing roofs as cool roofs and install 1 green roof (June)
				Green roofs opportunity analysis for Arroyo-Seco Cornfields Specific Plan area private-sector buildings (June)
	Land Use	LU2	Promote and implement transit-oriented development (TOD)	Approve station area plans (March)
		LU5	Clean up brownfields sites for community economic revitalization projects and open space	Remove environmental barriers to development at 25 or more underutilized properties
	Airport	AIR3	Evaluate options to reduce aircraft-related GHG emissions	Complete GHG inventory, determine 1990 baseline and establish 2030 goal (December)
2010	Energy	E1	Meet the goal to increase renewable energy from solar, wind, biomass, and geothermal sources to 20% by 2010.	
		E8	Perform energy efficient retrofits on 497 city-owned buildings to continuously reduce energy consumption	Replace a minimum of 35 HVAC rooftop units with SEER ratings of 16 SEER, 12 EER and .56 kWh/ton or better (December)
		E12	Maximize energy efficiency of wastewater treatment equipment	Improve lighting efficiency: replace Na lights with fluorescent T5 light equipped with motion sensors in the galleries at HTP (December)
	Transportation	T1	Require 85% of the fleet to be powered by alternative fuels	Port of Los Angeles will have 50% alt fuel or hybrid fleet
				100% passenger sedans (FY09/10)
		T3	Convert 100% of Metropolitan Transit Authority (MTA) buses to alternative fuel	100% alt fuel MTA buses (FY09/10)
	Land Use	LU3/4/5	Make available underutilized city land for housing and mixed-use development/parks and open space/housing and mixed-use development (within 1500 feet of transit)	Develop one to three city properties (December)
	Waste	WsT1	Reduce or recycle 70% of trash by 2015	Expand mutli-family recycling program to 50% of the city's multi-family units
				Implement alternative technology facility to process post source-separated municipal solid waste for renewable energy generation
	Open Space and Greening	OS/G1 & OS/G6	Create 35 new parks or joint-use sites by 2010	
2011	Energy	E7	Reduce energy use by all city departments to the maximum extent feasible	Conversion of final 902 signaled intersections to incandescent lamps
2012	Energy	E7	Reduce energy use by all city departments to the maximum extent feasible	Installation of new solar lighting equipment (June)
		E8	Perform energy efficient retrofits on 497 city-owned buildings to continuously reduce energy consumption	Design and construct a district cooling plant and distribution system to supply chilled water to downtown Los Angeles buildings for space cooling applications
	Transportation	T1	Require 85% of the fleet to be powered by alternative fuels	85% entire fleet powered by alt fuel (FY11/12)

Conclusion

Mayor Villaraigosa and the City of Los Angeles have dared to imagine LA as the greenest big city in the nation, and are working to achieve this vision by leading the fight against climate change. Los Angeles can and will meet its goal to reduce greenhouse gas emissions by 35% below 1990 levels. Shrinking our carbon footprint will take unprecedented public and private partnerships to achieve the necessary reductions in energy consumption and investments in renewable energy, infrastructure and clean technology. Facing these challenges, however, will result in a more livable city with cleaner air, a more robust public health and a new green economy.

2. Introduction/Purpose

"Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level."

—Intergovernmental Panel on Climate Change, Fourth Assessment Report, November 17, 2007

"Here in Los Angeles, climate change will likely mean longer and hotter summers, longer droughts, more devastating wildfires, and shortages of water that threaten public health and our economy."

—Mayor Antonio Villaraigosa, Green LA Climate Change Action Plan, May 2007

"Continued greenhouse gas emissions at our above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century."

—IPCC Fourth Assessment Report

"Our goal is to reduce greenhouse gas emissions 35% below 1990 levels by 2030."

—Mayor Antonio Villaraigosa, Green LA Climate Change Action Plan.

2.1 Taking Responsibility for an Urgent Problem

Every city and country must take responsibility for its contributions to climate change. With four million residents and more than four hundred square miles, Los Angeles emitted in 2004 more than fifty million metric tons of carbon dioxide, the primary greenhouse gas (GHG), representing approximately 0.2% of worldwide emissions. By way of comparison, Los Angeles emits about the same amount of carbon dioxide as the country of Sweden.

Mayor Antonio Villaraigosa and the City of Los Angeles have joined with the US Conference of Mayors, the Clinton Climate Initiative, and the C40 Large Cities Climate Leadership Group to develop a forceful response to the challenge of climate change, the umbrella term that encompasses all climate impacts attributable to human activities, including global warming. The Mayor's goal of reducing greenhouse gas emissions to 35% below 1990 levels is one of the most ambitious commitments announced by a major international city.

To reach this goal, we, as a city, will need to lower emissions to thirty-five million metric tons by the year 2030. Reaching this goal will require ongoing effort and ingenuity by city government, businesses, and residents.

2.2 Potential Impacts of Climate Change on Los Angeles

The world's leading atmospheric scientists predict that climate change will have serious environmental, economic, and public health consequences in the coming decades. For Los Angeles, scientists predict that summers will be even hotter, with a doubling or more in the number of heat wave days per year. In addition, Los Angeles will see a 75-85% increase in the number of days with poor air quality and high ground-level ozone concentrations. Hotter, smoggier days mean more stress on electricity and water supplies, more heat-related deaths, and more strain on those with respiratory and cardiovascular diseases.

Changing rainfall patterns could make severe droughts routine, and one of our primary sources of potable water, snow melt in the eastern Sierra Nevada Mountains, could be drastically reduced. Sea level rise could impact low-lying coastal neighborhoods and facilities at the Port of Los Angeles. Los Angeles intends to act now—not only to reduce our contribution to climate change, but also to learn to adapt to its inevitable consequences.

2.3 Urgent Action—the City's Plan

The City of Los Angeles has arrived at that moment when consideration of climate impacts has become integrated into the policy development and decision making process. In May of 2007, the City published "Green LA: An Action Plan to Lead the Nation in Fighting Global Warming," which included more than fifty specific actions designed to reduce the City's contributions to climate change, and to prepare a response to the changes that have already begun to occur. Since its publication, City departments have been working together to respond to the challenge set forth in the Plan.

The result is this Climate Change Implementation Report, which provides detailed information about each action item discussed in the Green LA Climate Action Plan. Action items range from harnessing wind power for electricity production and energy efficiency retrofits in City buildings, to converting the City's fleet vehicles to cleaner and more efficient models, and reducing water consumption. Information about proposed and/or ongoing programs, opportunities for achieving the City's goals, specific challenges, and a list of milestones is provided for each action item. The scope of these actions range from those impacting only municipal facilities—such as retrofitting City Hall with high efficiency lighting systems—to those facilitating changes in the private sector—such as rebates for the purchase of energy-efficient appliances.

This Implementation Report is a living document, reflecting a process of ongoing learning and continuous improvement as technology advances and City departments develop expertise in the methods of lowering greenhouse gas emissions.

2.4 Policy Principles and Community Values

All City actions to reduce greenhouse gas (GHG) emissions are guided by a set of policy principles and community values. First and foremost, we aim to achieve real, measurable reductions in carbon dioxide (CO2) emissions[1] by City government (municipal) operations and facilities, the business sector, and residential households. We will begin with our own operations, and, through continued investments in our buildings, facilities, infrastructure, vehicles, and programs, achieve efficiencies that will reduce the associated emissions. We intend for the City to serve as an example for the greater community—the businesses, residents, nonprofits, and other governments that comprise Los Angeles. Our actions will also facilitate emission reductions by community members. An active public participation process is key to our efforts. Without community support, we will not reach our goals.

The City's municipal efforts in responding to the Mayor's call to action are detailed in this Implementation Report. Note that as we work to reduce GHG emissions from municipal operations, we do not intend to invest in out-of-area projects to offset carbon emissions, because there is much work we can do here. The actions described in this document will move us toward our goal.

Because of the diversity of facilities owned and operated by the City of Los Angeles, we will gain experience and knowledge that can be used by others. For example, by constructing fifty LEED-certified new buildings over the past four years, the City has helped create a highly-skilled workforce of architects, engineers, and

contractors who have become experts in Green Building. These professionals are now applying their expertise to other sustainable projects in this region and beyond.

The City will create incentives for all sectors of our community to reduce their own emissions, by making carbon reduction a smart economic choice. Federal policies that assign a value to emissions are anticipated, as part of a national program that caps (limits) GHG emissions. Today's City policies and incentives will help the public and private sectors prepare for a challenging future in which CO2 efficiency directly affects the bottom line. As we have seen from prior efforts, when we reduce consumption of fossil fuels, electricity and water, we also reduce our impacts and create a healthier and more sustainable environment.

Throughout this process, we will invite public input on how City government can best facilitate emission reductions throughout our community while reducing the impacts of municipal operations. Public input is also critical to ensure that City policies and programs reflect the concerns of Los Angeles' diverse communities. The Environmental Affairs Department (EAD), the Environmental Affairs Commission (EAC), and other departments will conduct public participation, outreach, and educational activities, in collaboration with on-going environmental efforts whenever possible. City staff will also be educated about climate change, mitigation, and adaptation, so they carry this message in their daily work activities.

We will chart our progress in reducing emissions against our 1990 baseline. Although not yet required by state law, the City will begin publishing an annual CO2 emissions inventory for municipal operations—including emissions from energy use for buildings, facilities, and vehicles owned and/or operated by the City of Los Angeles government—starting in 2008. Data for calendar year 2004 have been collected, and collection of data for calendar years 2005 through 2007 will begin in Spring 2008. Of the City's proprietary departments, the Los Angeles Department of Water and Power (LADWP) and the Port of Los Angeles (POLA) have already published annual greenhouse gas inventories, and the Los Angeles World Airports will publish its inventory soon.

A community-wide inventory of greenhouse gas emissions will also be prepared, building upon the preliminary assessment prepared for the Green LA Climate Action Plan. We will coordinate these efforts with the California Air Resources Board, California Climate Action Registry, ICLEI, and other organizations and agencies involved in the development a protocol or methodology for measuring community-wide emissions.

2.5 Mandatory Reporting for Selected Municipal Entities

Beyond the City's voluntary plan to reduce GHG emissions, specified City-owned facilities will be mandated per state law to report their emissions. In December 2007, the California Air Resources Board approved regulations that require certain California facilities to report their greenhouse gas emissions on an annual basis, pursuant to the state's landmark climate change legislation, the Global Warming Solutions Act (Assembly Bill 32). LADWP, the City-owned (municipal) utility, will be required to report emissions associated with its electrical power generation and distribution activities each year. Other specified facilities, including the co-generation facility at the Los Angeles World Airport, may also be required to submit emissions reports or inventories.

2.6 Sources of CO_2 Emissions in 2004

Community-wide Emissions

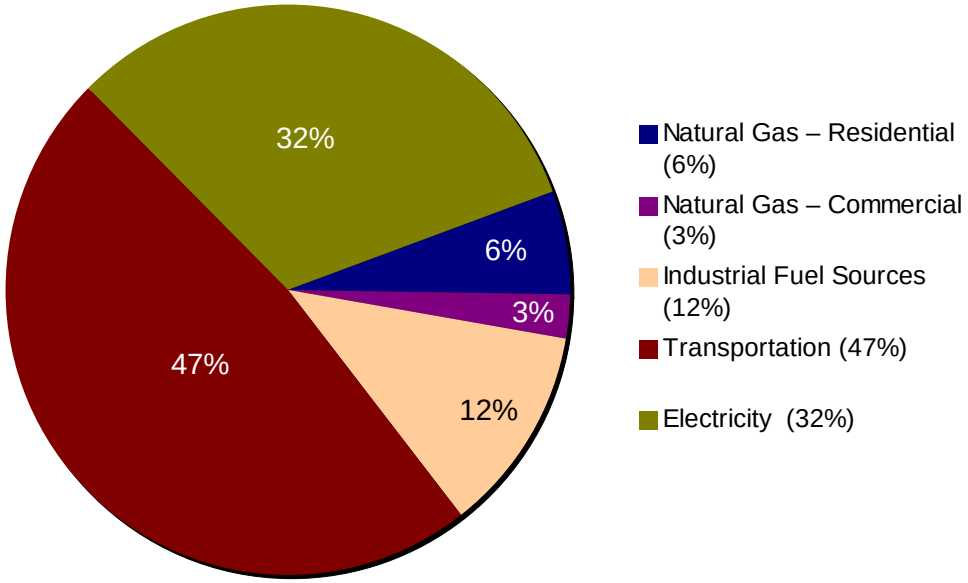
To give us a sense of the magnitude of greenhouse gas emissions resulting from activities that occur within the geographic boundaries of the City of Los Angeles, we have compiled a preliminary estimate of carbon dioxide (CO2) emissions from the generation of electricity, industrial fuels, natural gas, and transportation fuels by all

sectors (government, business, and residential) in the City. This estimate uses electricity consumption figures from the LADWP; CO2 emissions from other fuels are derived from statewide figures. We have estimated a total of 51.6 million metric tons of CO2 resulting from all activities in the City, given the limited information available.

As noted in the figure below, emissions from electricity use represent 32% of CO2 emissions generated within the City; 47% is from transportation sources, natural gas use generates 9% of emissions, and the balance of 12% is from burning other industrial fuels. As noted, nearly half of citywide CO2 emissions in 2004 came from privately operated cars and trucks. Because our electricity is generated and provided by the LADWP, for the purposes of this document, we are considering CO2 emissions from electricity as a "municipal" activity. In reality, emissions from electricity use come from the generation of electrical power—coal or natural gas-fired power plants—not the use of electricity. To reduce these emissions, the City government and utility must partner with all sectors of the community to provide cleaner sources of electricity and to use less electrical power.

We have also compiled a very detailed inventory of CO2 emissions from facilities and operations of the municipal government, which are needed to deliver the wide range of City services to a population of four million residents. This "municipal CO2 inventory" is further described in Appendix B to this report.

Figure 1. Citywide CO_2 Emissions—All Sectors 2004



2.7 A Word about Double-Counting

As we refine the community GHG inventory, we must carefully consider electricity. The amount of GHG emissions resulting from electricity generation and use are directly related to the source of that electricity. Coal and natural gas-fired power plants produce CO2 emissions as they generate electricity; wind and solar-powered facilities do not. The demand for electric power dictates the amount of power that must be generated. As we compile the inventory, we must not count emissions from the same kilowatt of electricity twice (once for generating it, called "direct emissions," and again for using it, called "indirect emissions"). The methodology used will clearly define how we will account for emissions from electricity.

2.8 Effective Strategies to Do Our Part

As noted in the policy principles above, we begin our strategy to reduce emissions by looking at our municipal government activities. How can we make our operations cleaner? What can we do differently to reduce our impact on the climate? The following departmental action plans provide details on many actions that reduce our burden on the climate. But because government operations and programs exist actions to provide services to the community of Los Angeles, many of our emission reduction strategies involve offering opportunities to the community, businesses and residents alike, to reduce their own impact on the climate. s

Following are highlights of several strategies that are detailed later in this report.

Renewable Energy

Nearly half of LADWP's energy is generated by from relatively low cost coal-fired power plants, which emit more CO2 per megawatt than other kinds of power generation. Replacing coal-fired power with renewable energy is the most significant action the City can take to reduce overall CO2 emissions.

The Mayor has set an aggressive goal of increasing LADWP's use of renewable energy to 20% by 2010 and 35% by 2020. Renewable energy has already become a significant part of LADWP's generation portfolio over the past few years, rising from 3% in 2003 to 7% in 2006. Major new projects using wind power, solar power, biomass, geothermal and small hydro will come online in future years, displacing coal power and reducing CO2 emissions from energy generation.

Energy Efficiency

In order to reach our emissions goal, the entire community will need to learn how to use electricity more efficiently. City government is taking a lead role, setting an example with its own facilities and creating incentives for businesses and households to use less electricity. By some measures, Los Angeles is already a leader in this crucial area, having upgraded over 50 existing City-owned buildings with energy-efficient lighting and heating systems.

At the same time as City departments reduce their energy consumption, LADWP will continue to invest in helping businesses and households save energy. In fiscal year 2007-2008, LADWP will double its investment in energy efficiency programs from the previous year. In late 2008, LADWP will distribute 2.4 million compact fluorescent light (CFLs) bulbs to Los Angeles households at no charge. If most of these are installed, the program could reduce CO2 emissions from power generation by 70,000 metric tons.

Green Building

Having paved the way by constructing 49 new LEED-certified or higher level municipal buildings, the City is rolling out a green building policy for private development. This policy will have two parts: baseline requirements for all new buildings, and incentives for projects to go beyond the baseline. The US Green Building Council's LEED standards will be used, accompanied by carefully selected changes in the building code.

City Vehicle Fleets

Over the last several years, the City has been moving rapidly to bring new alternative-fueled and advanced technology vehicles into the City fleets. These efforts are reducing both CO2 emissions and emissions of

traditional pollutants such as particulate matter. The City already owns and operates more than 2,400 such vehicles, including hundreds of natural gas fueled refuse collection trucks, DASH buses and street sweepers.

Land Use

The growing impact of CO2 emissions has created another powerful motivator for City policies that promote vibrant, walkable, transit-accessible neighborhoods. When housing, jobs and retail are located together in a pedestrian-oriented community, people tend to reduce car trips, significantly reducing emissions. The City is working closely with Metro (the Metropolitan Transportation Authority) to identify development opportunities at current and planned rail stations and is in the process of revising twelve community plans to create a more livable city.

Tracking and Reporting

To underscore our commitment to meeting the City's emissions goals, we will put into place a tracking and reporting process. The Environmental Affairs Department, as lead for the interdepartmental working group charged with implementing the Green LA Climate Action Plan, will propose a reporting schedule for all departments with action items noted in this report. All departments will track progress made and goals achieved; this information will become part of an ongoing report for the Mayor and City Council. The reporting process will allow departments the flexibility to add new measures, redesign measures that are not working well, and replace measures that cannot be implemented. All the while, as inventories are prepared and program benefits calculated, we will track the City's progress toward our goal.

3. Departmental Action Plans

Green LA: An Action Plan to Lead the Nation in Fighting Global Warming, released in May 2007, directs City departments, lead by the Environmental Affairs Department, to compile a set of actions to be taken to support the City's greenhouse gas goals and targets. These "departmental action plans" follow, and describe the steps identified to date to reduce carbon dioxide (CO2) emissions from municipal facilities and operations, and, in some cases, from private activities that occur within the City limits.

The action plans are arranged according to the Focus Areas in the Green LA Climate Action Plan, which are Energy, Water, Transportation, Land Use, Waste Open Space and Greening, Green Economy, efforts by the Proprietary Departments, and Climate Change Education. In the near future, we will also address Adaptation; namely how can the City government adapt, and assist our residents and businesses in adapting, to changes in our climate that are already occurring.

The departmental action plans below focus on current and future steps to achieve the identified goals. In many cases, the text notes accomplishments from past programs and policies, several of which are also listed in the Green LA Climate Action Plan.

The plans represent the departments' current proposals for moving ahead with actions, but specific actions and timelines are subject to change. We will soon begin an extensive public participation process that will help refine the actions listed here and new measures that might be feasible. We will proceed with actions that are funded or ongoing, but the action plans will not be finalized until public input is received and incorporated.

This compilation of action plans is a flexible, "living document" that will be amended as departments continue to refine measures, replace those that have proven ineffective, add new measures to reflect new information or the development of new technologies, and modify timelines as a result. We will develop a monitoring process to track our progress on each measure and in reducing greenhouse gases emissions in the City.

While the Green LA Climate Action Plan directs us to reduce "greenhouse gas emissions," we will initially track only carbon dioxide (CO2) emissions. CO2 is the most prevalent greenhouse gas and the one that is tracked in most voluntary reporting schemes. Emissions of the additional five GHGs, as identified by the United Nations, will be beginning in our fourth year of reporting.

Action Plans

Each action plan below contains a description of the action, the lead and partner agencies responsible for implementation, associated opportunities and challenges, implementation steps and timelines, and a brief evaluation of the GHG reduction potential of the action, when available.

Please note that some action items support City environmental goals (water quality, greening, etc.) other than GHG reductions. GHG reductions from these actions may be a secondary or indirect benefit, such as the benefits from transit-oriented districts. In many cases, standardized methods for calculating such reductions have not yet been developed. Therefore, the emission reduction potential of each action may not included.

3.1 Focus Area: Energy

GOAL: Green the power from the largest municipal utility in the United States

Action No.	Measure	Page
E1	Meet the goal to increase renewable energy from solar, wind, biomass, and geothermal sources to 20% by 2010.	17
E2	Increase use of renewable energy to 35% by 2020.	17
E3	Reduce the use of coal-fired power plants.	21
E4	Increase the efficiency of natural gas-fired power plants.	23
E5	Increase biogas co-firing of natural gas-fired power plants.	25

GOAL: Make Los Angeles a worldwide leader in green buildings

Action No.	Measure	Page
E6	Present a comprehensive set of green building policies to guide and support private sector development.	27

GOAL: Transform Los Angeles into the model of an energy efficient city

Action No.	Measure	Page
E7	Reduce energy use by all City departments to the maximum extent feasible.	29
E8	Complete energy efficiency retrofits of all City-owned buildings to maximize energy efficiency and reduce energy consumption.	36
E9	Install the equivalent of 50 “cool roofs” on new or remodeled City buildings.	39
E10	Install solar heating for all City-owned swimming pools.	41
E11	Improve energy efficiency at drinking water treatment and distribution facilities.	42
E12	Maximize energy efficiency of wastewater treatment equipment.	43

GOAL: Help Angelenos be energy misers

Action No.	Measure	Page
E13	Distribute two compact fluorescent light (CFL) bulbs to each of the 1.4 million households in the City.	45
E14	Increase the level and types of customer rebates for energy efficient appliances, windows, lighting, and heating and cooling systems.	47
E15	Increase the distribution of energy efficient refrigerators to qualified customers.	49
E16	Create a fund to “acquire” energy savings as a resource from Los Angeles Department of Water and Power (LADWP) customers.	50

In addition to the above measures, The City will continue to evaluate emerging issues and strategies for reducing GHG emissions relating to energy and will incorporate findings into future versions of this document. This includes cool pavements, proven carbon sequestration strategies, energy-use feedback mechanisms, feed-in tariffs, and innovative market-based incentives.

GOAL: Green the power from the largest municipal utility in the United States

Action E1	**Meet the goal to increase renewable energy from solar, wind, biomass, and geothermal sources to 20% by 2010.**
Action E2	**Increase use of renewable energy to 35% by 2020.**

The Los Angeles Department of Water and Power's (LADWP's) Renewable Portfolio Standard (RPS) goal is one example of the Department's environmental leadership. This goal calls for an increase in the supply of electricity from eligible renewable resources to 20% by December 31, 2010, and 35% by 2020. Reducing the amount of electricity generated by fossil fueled power plants will result in direct, real reductions in greenhouse emissions.

To meet these renewable energy goals, LADWP is focused on developing new renewable energy projects in southern California, and the associated transmission lines needed to bring the renewable power to Los Angeles. LADWP has issued three major Requests for Proposals (RFPs) for renewable energy projects, and has identified over 30 projects that will assist it in meeting the 2010 and 2020 RPS goals. In addition, to provide the necessary transmission capacity, LADWP is simultaneously moving forward with the planning and environmental assessment activities for two new transmission lines.

Over the last three years, LADWP has made considerable progress on increasing the amount of renewable energy, as illustrated in the following tables:

Table 1. E1/E2 Percent Renewable Sales to Customers

Year	Percent Renewable Power
2006	7%
2005	6%
2004	5%
2003	3%

Source: Power Content Label

www.ladwp.com

Table 2. E1/E2 Existing Renewable Projects

Project	Technology	Acquisition	In-Service Date	Capacity (MW)	Annual Energy Production (GWH)
Powerex, Pacific Northwest	Small hydro		2007	50	430
Pleasant Valley, Wyoming	Wind		2006	82	230
Penrose Landfill	Landfill gas		2005	6	45
Bradley Landfill	Landfill gas		2005	6	36
Solar Rooftop Photovoltaics (PV)	Solar		2000	10	18
Lopez Canyon Landfill	Landfill gas		2000	2	5
Hyperion Treatment Plant	Digester gas		1995	22	143
Aqueduct Hydro Plants	Small hydro	1908 -	1987	166	670
Totals				**344**	**1,577**

Lead Agency	Los Angeles Department of Water and Power (LADWP)
Other Agencies	Bureau of Sanitation (BOS) of the Los Angeles Department of Public Works (LADPW); (see Action Item E5 - Increase biogas firing of natural gas-fired power plants)
	The Harbor Department (Port of Los Angeles, or POLA)

Opportunities

LADWP is developing renewable resources including wind (Tehachapi), geothermal (Salton Sea), and from such resources already in hand, the City is in a unique position to lead the country, if not the world, in the shift to renewable energy sources. Furthermore, because these resources are so close at hand, LADWP can ensure that the jobs and economic devel

opment that result from its critical investment stay at home. Beyond a reduction in GHG emissions, the use of these renewable resources will also confer air quality benefits through the avoidance of increased criteria pollutant emissions (e.g. nitrogen oxide or NOx emissions). Because the renewable "fuel" from the wind and sun and the earth is "free" and locally produced, the addition of significant renewable resources to LADWP's generation portfolio insulates our customers from the volatile prices and potential supply disruptions associated with conventional fuels.

As stated in the Energy Efficiency-Related action items (Action Items E11, E16), LADWP offers a variety of Demand Side Management (DSM) programs to encourage customers to implement energy efficiency technologies and strategies. The DSM programs are designed to influence the time, pattern, and magnitude of the participating customers' electrical loads. Thus, customer participation in DSM programs also represents an opportunity for lower customer bills and for LADWP to use less fossil fuel to serve the City's needs.

Challenges

As LADWP's shifts to increased reliance on renewable energy sources, one of the primary challenges will be the transition of the remaining fossil fuel power plants from a role of supplying "base load" energy to one of filling in the "gaps" for periods when the sun is not shining or the wind is not blowing. As we implement Action E4 to increase the efficiency of in-basin natural gas-fired power plants, LADWP must also ensure that these plants have the flexibility for quick start and stop capabilities, in order to fill in such "gaps." In addition, in order to prepare for the efficient utilization of this new renewable energy generation mix, LADWP must also increase the efficiency and flexibility of Castaic Power Plant, which is the principal existing energy storage facility; reconfigure and improve the efficiency of the in-basin transmission and distribution infrastructure; and upgrade our "command and control" capability.

The other critical issue is LADWP's ability to construct two new transmission lines that are needed to bring renewable energy resources to the Los Angeles Basin. Barren Ridge Castaic, the first transmission line project, will bring new wind, solar and geothermal resources from locations in the Tehachapi/High Desert region. The Pine Tree Wind Development Project, which will be the largest municipally owned wind farm in the United States, is the first of many projects that will utilize this critical "transportation corridor" for a 21st Century LADWP. However, construction of the transmission line must precede the significant expansion of additional renewable generation in the area. Without this transmission line, LADWP will be forced to compromise on location, cost, and ownership possibilities by accessing remote, out-of-state renewable energy sources. Therefore, timing is absolutely critical to achieving the City's broader goals.

Green Path North, the second transmission line project, is directly tied to development of the specific and significant geothermal opportunities in the Salton Sea/Imperial Valley area. The two principal challenges for this project are determining an environmentally, politically, and financially acceptable route from the Imperial Valley; and ensuring that the generation and transmission projects develop together, in time to meet the City's goals.

The successful execution of measure E3 is contingent upon the successful implementation of measures E2 and E4. The latter two call for replacing coal for serving our load, and in order to hold down the cost of this radical shift in the City's generation portfolio, extracting the maximum value from the disposition of these coal assets,

Implementation Steps

LADWP is proceeding with the engineering and environmental studies needed to site the new transmission line projects. In addition, LADWP is in the negotiation and contract development phase for proposed renewable resources resulting from its Requests For Proposal. The RPS are summarized in the following table:

Table 3. E1/E2 Planned Renewable Projects

Technology	Number of Projects	Total Capacity (MW)	Estimated Annual Energy Production (GWH)
Biomass	3	12	83
Geothermal	4	287	2,291
Small Hydro	3	17	102
Solar	7	1,000*	2,394
Waste-to-Energy	4	100	800
Wind	10	1,159	3,255
Totals	**31**	**2,575**	**8,925**

The Bureau of Sanitation (BOS) is also in the process of evaluating proposals for Alternative Technology Facilities that would process post-source separated municipal solid waste. The Mayor has set the goal of having the City's first Alt Tech facility operational by 2010. The syngas (or synthesis gas, which is composed primarily of carbon monoxide and hydrogen) generated by the Alt Tech treatment process will be used as a renewable energy source.

The Board of Water and Power Commissioners and the Board of Harbor Commissioners of the City of Los Angeles formed a committee, the Electrification of Los Angeles Harbor Committee, to discuss innovative ways to produce and utilize renewable energy, both within the Harbor Department and among Port tenants. As a result of this collaboration, on December 7, 2007, the Port of Los Angeles announced that it will construct a solar photovoltaic (solar PV) system within the port's footprint to provide POLA with ten megawatts (10 MW) of zero-emission electricity. This system will help offset future incremental load or increased electricity demand that will result from port electrification. POLA staff has compiled an inventory of potential solar PV sites within the Port.

Measure Evaluation

The ability to meet the RPS goals in 2010 and 2020 is critical to meeting the City's overall greenhouse gas emission reduction targets.

LADWP will provide an annual report to its customers of the resource mix used to serve its retail customers by fuel type, the status in implementing an RPS and progress toward attaining the standard. LADWP will also provide a quarterly Power Content Label Report to its customers. For purposes of attaining RPS goals, given that there may be significant fluctuations from year to year in the amount of energy generated, particularly from hydroelectric, wind and solar resources due to weather conditions, LADWP RPS goals may report energy that would have been generated in an average year from individual projects utilizing these technologies.

Preliminary Calculations: An increase in use of renewable energy to 20% by 2010 and 35% by 2020 will reduce GHG emissions by about 1.5 and 4.5 million metric tons CO_2, respectively, compared to 2008. The 35% level will provide a savings of 153,000 metric tons of CO_2 per year from *indirect* GHG emissions originating from Council controlled departments. There would be an indirect savings from Proprietary departments amounting to 109,000 MT CO_2/yr. Thus, for all departments, a savings of 262,000 MT CO_2/yr of indirect emissions will be achieved. The calculations assume no growth in the baseline inventory (2004) and no changes in the LADWP emissions factor.

Tons GHG (CO2) Reduced (compared to 2008)	**2010**	**2020**
	1.5 million	**4.5 million**

Action E3	Reduce the use of coal-fired power plants.

Reducing the amount of electricity produced by coal, the most greenhouse gas intensive of the fossil fuels, will reduce the CO_2 intensity of LADWP's power mix.

Lead Agency Los Angeles Department of Water and Power (LADWP)

Mohave Generating Station

In 2001, LADWP sold one half of its 20% interest in the coal-fired Mohave Generating Station, thus reducing LADWP's ownership share to 10%. On December 31, 2005 the entire Mohave plant was shut down. The sale of half of LADWP's share reduced our annual CO_2 emissions by 1.1 million short tons. The plant's closure further reduced LADWP's CO_2 emissions by an additional 1.1 million short tons per year.

Navajo Generating Station

LADWP has a 21.2% entitlement share in the coal-fired Navajo Generating Station, which is equivalent to approximately 3.8 million short tons of CO_2 emissions per year. It is assumed that LADWP's agreement with Navajo Generating Station will expire on December 31, 2019.

Intermountain Power Plant

LADWP's agreement with coal-fired Intermountain Power Project (IPP) began on February 1, 1983, and will end on June 15, 2027. Per the agreement, LADWP is entitled to receive approximately 44% of the plant's generation (equivalent to approximately 6.2 million short tons of CO_2 emissions per year). LADWP also purchased a 4% entitlement share of the plant from Utah Power and Light (UP&L) equivalent to approximately 0.5 million short tons of CO_2 emissions per year.

In addition, LADWP has been able to purchase up to an additional 18% of the plant's generation from other IPP participants, under the Excess Power Sales Agreement. LADWP anticipates that all of IPP's excess power will be recalled by the other IPP participants by the end of 2012. This recall would result in a projected decrease in LADWP's CO_2 emissions of 2.1 million short tons per year.

The Intermountain Power Agency (IPA) and the Southern California Public Power Authority (SCPPA) are evaluating options to reduce IPP's greenhouse gas emissions, including efficiency improvements, reduction in coal consumption, use of renewable fuels, and the capture and sequestration of carbon. The latter refers to the use of technologies to capture, utilize, and store CO_2 that's generated by large stationary sources. Through this evaluation, IPA and SCPPA seek to understand the technical, economic, and legal risks of each option available to reduce greenhouse gas emissions from IPP, and to identify areas for further research and study.

Opportunities

LADWP's ongoing efforts to transition from coal-fired power plants to lower emitting CO_2 sources will enable the City to significantly reduce its GHG footprint. LADWP may be able to further reduce its carbon footprint as new sources of reliable, clean base load generation are developed. It is also possible that innovation in clean coal technologies will result in reduced IPP carbon emissions.

Challenges

- Since approximately 47% of LADWP's energy comes from relatively low cost coal-fired power plants, LADWP needs to identify and procure alternative, lower carbon power sources to replace its coal generation.
- Carbon capture and sequestration technology has not been tested or demonstrated on a commercial scale.
- Policies to site, construct, license and ensure the environmental integrity of CO_2 pipelines and sequestration methods remain unresolved at this time.

Partnerships

LADWP has partnered with the other IPP participants (e.g., municipal utilities, electric cooperatives, and investor-owned utilities) in funding and participating in the feasibility study to evaluate ways to reduce the carbon emissions from IPP. The initial feasibility study has been completed and LADWP, as the operating agent, is moving forward with more detailed analysis of some of the recommendations from the initial feasibility study.

Table 4. E3 Implementation Steps

Milestone	Completion Date
Final draft feasibility study on reducing IPP's carbon footprint.	Spring 2008

Measure Evaluation

The percentage of coal in LADWP's power mix is reported on LADWP's Power Content Label, which is provided to the City Council, Board of Water and Power Commissioners and all retail customers, and published on its Web site. See Section 3.8 for LADWP's forecast CO2 emissions and emission reductions resulting from the combination of Actions E1, E2, E3 and E4.

Action E4	Increase the efficiency of natural gas-fired power plants.

The Los Angeles Department of Water and Power (LADWP) plans to replace four steam boiler electric generating units with advanced gas turbines. Steam boiler units 5 and 6 at the Haynes Generating Station (HGS) are to be replaced with simple cycle turbines. Units 1 and 2 at Scattergood Generating Station (SGS) will be replaced with combined cycle turbines and/or simple cycle turbines.

Replacing old generating units with more efficient generating units will reduce the amount of natural gas burned per unit of electric energy produced, and will therefore reduce greenhouse gas emissions from the combustion of natural gas.

Lead Agency Los Angeles Department of Water and Power (LADWP)

Other Agencies Los Angeles Department of Public Works (LADPW)

Opportunity

The use of gas turbines, which are about 15% more fuel efficient at generating electricity than steam boilers, will reduce electricity costs for LADWP customers.

Challenges

The combined cycle gas turbines proposed for SGS are about 35% more fuel efficient than existing steam boilers, but they require a significant amount of cooling water. The use of ocean cooling water has been linked to population declines of several marine species. The alternative, wet cooling towers, requires large amounts of land and can produce large plumes of evaporate under certain meteorological conditions.

Given the small amount of space available at SGS, it may be necessary to build the new units in the same location as the units they are replacing. This would require shutting down the existing units for about 2 years. However, the Hyperion Treatment Plant (Hyperion), which treats wastewater (sewage), constantly produces digester gas, which currently is combusted in Units 1 and 2 which also supply steam to Hyperion for the sewage treatment process. If the existing units are shut down during construction, an alternative means of burning Hyperion's digester gas and supply steam must be found. A proposed joint SHARE (Scattergood-Hyperion Alternative Renewal Energy) project calls for the Los Angeles Department of Public Works (LADPW) and LADWP to build and operate gas turbines at Hyperion to consume all of the digester gas and supply steam.

Table 5. E4 Implementation Steps

Milestone	Completion Date
4/07 - Approval of Memorandum of Understanding (MOU) between LADPW and LADWP to study the feasibility of building electric generating units at Hyperion Treatment Plant.	4/2007
Approval of LADWP's 2007 Integrated Resource Plan by the Board of Water and Power Commissioners, which recommends repowering projects at Haynes and Scattergood Generating Stations.	1/8/2008
Completion of the SHARE study.	Spring 2008

Measure Evaluation

A schedule with critical milestones will be developed for the Haynes and Scattergood repowering projects. The progress on meeting each milestone will be reported on an ongoing basis to the Board of Water and Power Commissioners. See Section 3.8 for LADWP's forecast CO2 emissions and emission reductions resulting from the combination of Actions E1, E2, E3 and E4.

Action E5	Increase biogas co-firing of natural gas-fired power plants.

The combustion of biogas will displace a portion of natural gas usage at power plants, thus reducing greenhouse gas emissions. The following represent the City's major projects to more fully utilize biogas emissions:

- Transition the 1 MegaWatt (1 MW) Terminal Island Fuel Cell at the Terminal Island WastewaterTreatment Plant from natural gas to digester gas.
- Inject bio-solids underground into abandoned/depleted oil and gas reservoirs as part of the 4 MW Terminal Island Renewable Energy Project (TIRE). The earth's natural heat will digest the bio-solids, resulting in the production of methane gas. The methane gas will be recovered and used in fuel cells to produce electricity.
- Approve power purchase contracts on two landfill gas-to-energy projects (3 MW and 5 MW) within the City of Los Angeles.
- Increase the amount of digester gas combusted at natural gas fired electric power plants. Units 1 and 2 at Scattergood Generating Station (SGS) burn pipeline natural gas as well as digester gas from the nearby Hyperion Treatment Plant. The digester gas currently generates about 22 MW of electricity.

Lead Agency

Terminal Island Fuel Cell: Bureau of Sanitation (BOS) of the Los Angeles Department of Public Works (LADPW)
Terminal Island Renewable Energy: Los Angeles Department of Water and Power (LADWP) and Bureau of Sanitation (BOS)
Two Landfill Gas-to- Energy Projects: LADWP
Scattergood Generating Station, Digester Gas: LADWP & LADPW)

Grant money from the California Energy Commission (CEC) is being used to offset the costs of the two Terminal Island projects.

Opportunity

Biogas is considered GHG neutral because it is not of fossil origin. Biogas firing reduces natural gas consumption, thus reducing greenhouse gas emissions.

Challenges

Units 1 and 2 at Scattergood are scheduled for replacement by 2013. If the existing units need to be taken out of service during construction, the Hyperion digester gas will need to be diverted to another generating unit. See the discussion of the SHARE project under Action E3.

Table 6. E5 Implementation Steps

Milestone	In-Service Date
Terminal Island Fuel Cell.	11/2008 (tenative)
Two landfill gas-to-energy projects: The first project already exists and the LADWP expects to begin receiving the power by 6/2008. The second project has a 6/2009 in-service date.	6/2008; 6/2009
Terminal Island Renewable Energy: Begins with a 5-year proof of concept demonstration project.	2013 (tentative)
Scattergood/Hyperion SHARE project: The amount of digester gas is expected to increase gradually over time due to natural population increases and process optimization. The SHARE project will increase the conversion efficiency of the digester gas to electricity and process heat by 35%.	

Measure Evaluation

Progress on increasing the amount of electricity generated from biomass will be reported as part of the Measure Evaluation of

Actions E1 and E2.

GOAL: Make Los Angeles a worldwide leader in green buildings

Action E6	**Present a comprehensive set of green building policies to guide and support private sector development.**

GHGs associated with energy usage have already been significantly reduced by the City's green building initiative for its own facilities. 49 City projects (that have been completed or are underway) will meet the US Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) certified standard or better. The City recently embarked on an effort to establish green building requirements, paired with incentives, for some private projects. The Green Building policy, which was adopted by the City Council on Earth Day 2008, and will be administered by an interdepartmental Green Building Team, consists of a Standard of Sustainability and Standard of Sustainable Excellence. Effective in November 2008, the Standard of Sustainability will require projects of 50,000 square feet or more, or residential projects with at least 50 units, to comply with the LEED Certification program. The City has proposed Silver LEED as the Standard of Sustainable Excellence. All new projects that demonstrate Certification at LEED Silver Level or higher are eligible for priority and expedited services, where, and to the extent, available.

Lead Agency	Department of City Planning (Planning)
Other Agencies	Department of Building and Safety (DBS); Bureau of Engineering of the Los Angeles Department of Public Works (BOE); Environmental Affairs Department (EAD); Los Angeles Department of Water and Power (LADWP); Port of Los Angeles (POLA)

The City has adopted the USGBC's LEED standards for its own facilities, and recently adopted these for private buildings. The City will also coordinate with CalEPA as resources become available through its programs. On August 16, 2007, the Board of Harbor Commissioners approved the Port of Los Angeles Green Building Policy, which requires the achievement of a minimum LEED Gold Rating for developments 7,500 square feet or greater. In addition to meeting LEED standards, all new Port buildings must incorporate solar power to the maximum feasible extent, as well as the best available technology for energy and water efficiency.

Opportunity

Buildings account for a majority of electricity use. Each building site is a microcosm of the environmental issues faced by the City, so addressing each site in a comprehensive manner will provide a myriad of environmental benefits. From a public policy viewpoint, the most encouraging aspect of green buildings is their relatively short payback period. In addition, recent studies have shown that such high performing buildings can not only be quite profitable, but also create more productive working and learning environments.

Challenges

Few outside programs fund green building efforts, so the City must identify revenue sources for support staff and facilities. The City's private sector requirements are already perceived as onerous, so it is important that any new green building requirements be integrated as seamlessly as possible.

Current and proposed policies primarily address new construction, but new buildings are greatly outnumbered by existing buildings. Many programs (i.e., LADWP rebate programs) already offer

incentives for retrofitting existing buildings for greater energy and water efficiency, but a more comprehensive outreach program may be necessary to increase awareness of such programs.

Table 7. E6 Implementation Steps

Now that the Green Building Program has been approved, outreach is very important to prepare developers for the revised procedures and requirements. The Planning Department will hire staff to process the green building submittals.

Milestone	Completion Date
Receive approval from Planning Commission, Council, and Mayor.	4/22/2008
Provide outreach materials to developers.	5/2008-ongoing
Process 100 new buildings.	12/2008
Process 300 new buildings.	12/2009
Implement process for existing buildings.	TBD

Measure Evaluation

Buildings, as the largest electricity users, represent a prime opportunity for the reduction of GHGs. Since most LEED certified or silver level buildings can be built for little or no additional cost, and the buildings become profitable in a relatively short period, the economics of this measure are outstanding. The extent to which other programs address existing buildings needs to be more comprehensively evaluated, and may lead to additional policy development.

GHGs Reduced

Quantification of this measure was calculated using building energy intensities from the 2000-03 CBECS inventory to estimate the LEED savings over buildings with Title 24 standards. The City will work to better characterize growth versus replacement square footage in future calculations as well as quantify other CO2 reduction benefits from LEED features.

Electric Energy Intensity for newest buildings in Pacific region (kWh/sq-ft)	11.0
Estimated electric energy consumption for a 50,000 sq-ft, Title-24 building (kWh)	550,000
Natural Gas Energy Intensity for newest buildings in Pacific region (cubic feet/sq-ft)	19.9
Estimated natural gas energy consumption for a 50,000 sq-ft, Title-24 building (therms)	10,219
Minimum Energy Savings for new construction projects registered after June 26,2007 (new buildings)	14%
Electricity Savings from each retrofit (kWh/yr)	77,000
Natural Gas Savings from each retrofit (therm/yr)	1,431
2004 Emissions Avoided by retrofitting 400 buildings (MT CO_2/yr)	**22,000**

GOAL: Transform Los Angeles into the model of an energy efficient city

Action E7	**Reduce energy use by all City departments to the maximum extent feasible.**

This section contains a few key examples of departmental energy reduction measures. Other measures are still being evaluated and will be added to future versions of this report.

-To reduce energy use associated with the operation of streetlights with solar-powered lighting and other energy-efficient lighting sources-

Lead Agency	Bureau of Street Lighting (BSL) of the Department of Public Works (LADPW)
Other Agencies	Los Angeles Department of Water and Power (LADWP)

Opportunity

Installation of more efficient light sources that will reduce the consumption of energy from the power grid system is ongoing. A five-year program to convert the City's approximately ~~10~~9,000 incandescent lights to an induction system is underway. Induction lamps do not use electrodes, and the induction lighting system uses a high-frequency generator with a power coupler. The generator produces a radio frequency magnetic field that excites the gas-filled bulb. Since it has no electrodes, the lamp has been shown to last longer. An induction lamp will last up to 100,000 hours and will still produce 70% of its maximum light output after 60,000 hours of use. An induction lamp's rated life is 5-13 times longer than that of a metal halide, and about seven times longer than fluorescent. Of the 9,000 incandescent lamps remaining in the City's system, 2,800 are funded and undergoing construction for conversion. The remaining 6,200 lamps require approximately $35 million for conversion. A funding allocation of $7 million per year for 5 years would allow completion of this project.

Street Lighting has also been evaluating several types of solar lighting equipment for approximately seven years. The City continues to test solar powered systems to verify the reliability of the batteries used in each system.

An existing pilot program testing LEDs (light-emitting diodes) in roadway fixtures will be expanded in approximately 6 months. LEDs have been shown to cut energy use by 40%, compared to conventional bulbs.

New streetlights will be equipped with a remote monitoring system that signals which bulbs have burned out ~~bulbs~~, and which lights have failed to automatically turn off at the appointed time. The monitoring system will assist the City in achieving its GHG reduction goals by decreasing electricity usage by streetlights.

Challenges

Funding for the pilot project is available and the costs are reasonable, when compared to standard streetlights that are powered by grid electricity. Funding for future projects has not been identified at this time.

Solar lighting systems use batteries, which contain high levels of lead. Battery handling and disposal costs must be evaluated when calculating the overall benefit and impact of solar lighting systems.

Table 8. E7 Implementation Steps

Install solar power lighting fixtures for the purposes of evaluating performance and energy efficiency. Evaluate the performance of more energy-efficient light sources such as induction lamps and light emitting diodes (LED). The preliminary evaluation is currently underway.

Milestone	Completion Date	Quantity of Measure
Complete installation of pilot solar lighting.	June 2008	Number of lights installed, funding allocated.
Installation of LEDs – expand program.	June 2008	
Acquire funding for further installations.	June 2009	
Installation of new solar lighting equipment.	June 2012	
Convert incandescent to induction.	June 2013	

Measure Evaluation

Incandescent Lamps - It is estimated that the replacement of all 9,000 incandescent lamps will save the City a minimum of $1million per year. The savings will be realized through a reduction in electricity costs, elimination of the need to relamp (re-place) incandescents every 6 months, and through the more efficient allocation of maintenance staff resources. The decreased use of maintenance vehicles will also lower direct GHG emissions.

GHGs Reduced

Expected energy savings (kWh)	49,621,933
Estimated emissions eliminated (Approx. MT CO_2/yr)	**31,000**

Solar ~~and Energy Efficient~~ Lighting - This measure will be evaluated by the reduction in the amount of electricity required to operate streetlights that is achieved through the use of solar ~~and energy-efficient lighting~~. There was approximately 137,000 metric tons of CO_2 from the City's street lighting based on the 2004 Council-Controlled inventory. For this measure, the approximate amount of CO_2 emissions that could be eliminated by successful conversion of 1%, 5% and 10% of the City's streetlights to solar power was calculated. The 2004 LADWP CO_2 emission factor was used for these calculations. For the purposes of this calculation, the solar powered streetlights were assumed to result in zero CO_2 emissions.

GHGs Reduced

2004 Streetlight electricity consumption (kWh)	221,781,608
Emissions eliminate by **1%** conversion (Approx. MT CO_2/yr)	**1,000**
Emissions eliminated by **5%** conversion (Approx. MT CO_2/yr)	**7,000**
Emissions eliminated by **10%** conversion (Approx. MT CO_2/yr)	**14,000**

~~**Lead Agency**~~ ~~Bureau of Street Lighting (BSL) of the Los Angeles Department of Public Works (LADPW)~~

~~**Other Agencies**~~ ~~Los Angeles Department of Water and Power (LADWP)~~

~~Opportunity~~

~~By using more energy-efficient lights and circuitry, overall electricity consumption will be reduced. The reduced maintenance requirements associated with the energy-efficient lights will allow crews to service other lights in the system; GHG emissions from the operation of maintenance vehicles will also be reduced.~~

~~**Incandescent lamps are less efficient than newer technology lamps and require replacement every six months, compared to 6 to 10 years for the latter. The higher maintenance levels associated with old, decaying, series circuit wires and transformers required that BSL and LADWP have a high number of maintenance trucks on the road.Challenges**~~

~~Of the 9,000 incandescent lamps remaining in the City's system, 2,800 are funded and undergoing construction for conversion. The remaining 6,200 lamps require approximately $35 million for conversion. A funding allocation of $7 million per year for 5 years would allow completion of this project.~~

~~**Table 9. E7 Implementation Steps (3)**~~

~~Implementation is ongoing and contingent upon funding.~~-Replace incandescent bulbs in traffic signal lights with energy-efficient LEDs (light-emitting diodes)-

The Los Angeles Department of Water and Power (LADWP) and the City's Department of Transportation (DOT) have a joint pilot project to replace energy-intensive incandescent bulbs in traffic signal lights with highly efficient LEDs. The project is expected to reduce energy use by 95% and reduce maintenance requirements, as LEDs need to be replaced much less frequently than incandescent bulbs. In addition, innovations such as battery backup systems using solar photovoltaics (PV) will be incorporated.

Lead Agency Los Angeles Department of Water and Power (LADWP); Department of Transportation (DOT)

Opportunity

Both energy consumption and maintenance time will be reduced. GHGs will decrease as a result of a reduction in the amount of electricity consumed and the number of maintenance vehicles on the road; the vehicles' total hours of operation may also be reduced.

Challenges

By 2011, the number of signaled intersections converted will total 4,608. The challenge will be to retrofit approximately 922 intersections per year on average. The number of signalized intersections is expected to increase about 10 per year.

Table 9. E7 Implementation Steps

Implementation is ongoing and contingent on available funding.

Milestone	Completion Date	Quantity of Measure
Begin conversion of first 820 intersections.	7/07	Number of intersections completed.
Conversion of first 948 intersections.	7/08	
Conversion of first 948 intersections.	7/09	
Conversion of first 948 intersections.	7/10	
Conversion of final 944 intersections.	7/11	

Measure Evaluation

Significant electricity and emission reductions are expected upon full replacement of all 4,608 intersections. Savings will be realized through a reduction in energy costs, elimination of frequent light bulb changes, and reduced maintenance requirements. GHGs may also be addionally reduced through the decreased use of maintenance vehicles.

GHGs Reduced

Expected energy savings (mWh)	52,045
Emissions eliminated (MT CO_2/yr)	**27,075**

-Solar power conversion at Sun Valley Metrolink station-

Lead Agency Department of Transportation (DOT)

Other Agencies Los Angels Department of Water and Power (LADWP); South Coast Air Quality Management District (AQMD)

DOT is partnering with LADWP and AQMD for rebates and funding. All costs will be covered by LADWP and AQMD.

Opportunity

The DOT is proposing installation of a 12-kiloWatt solar photovoltaic electric system that will generate an estimated 18,815 kiloWatt hours each year, resulting in about $2,000 annual savings in electricity costs.

Challenges

The primary challenge of this goal is implementing a cost-effective demonstration of solar use that will encourage further use in future applications.

Table 11. E7 Implementation Steps

Develop an implementation plan with the construction contractor.

Milestone	Completion	Quantity of

	Date	Measure
12 Kilowatt solar photovoltaic (PV) system.	March 2008	kWhours of electricity produced.

Measure Evaluation

This measure can be evaluated by the amount of electricity produced by the solar power system, and the resulting reduced consumption of LADWP-provided electricity for Metrolink station operations.

GHGs Reduced: The Plan states that DOT is proposing a 12-kilowatt solar system to generate approximately 18,815 kilowatt-hours electricity per year. The 2004 LADWP CO_2 emission factor was used to obtain the amount of CO_2 reductions from this solar system. For the purposes of this calculation, the solar powered system was assumed to result in zero CO_2 emissions. Backup data is needed to confirm the amount of electricity that would be generated by this system. It appears this action will reduce community-wide emissions rather than City department emissions.

Expected energy savings (kWh)	18,815
Emissions eliminated (MT CO_2/yr)	**12**

-Reduce energy consumption by all City departments-

Lead Agency Department of General Services (GSD)

Other Agencies All City Departments

In response to the heat waves of Summer 2007, which set new records for daily electricity usage, the Governor ordered California state agencies, departments, boards, and commissions to implement energy conservation plans and reduce the state's use of electricity at peak hours by 25%. The Los Angeles City Council followed suit with a Motion (Council File 06-1723) that instructed the General Managers of all departments, including the three proprietary Departments (Los Angeles Department of Water and Power; Los Angeles World Airports; Port of Los Angeles), to immediately initiate power consumption reduction measures, whenever possible, to alleviate the record-setting electrical demand then underway. General Managers are also allowed to implement other energy conservation measures they deem appropriate.

Opportunity

Energy conservation is the most cost-effective and easily implemented measuring for reducing energy consumption.

Challenges

Other than measures being implemented by GSD, it's not known which additional measures are being implemented (using task versus overhead lighting), and how widely. Providing reinforcing feedback to divisions and employees may be challenging as targeted metering is typically not available.

Table 12. E7 Implementation Steps

Milestone	Completion Date	Quantity of Measure
Memo issued to all General Managers.	March 2008	kWh reductions per building
"Lights off" and water reduction reminder stickers placed in Council-Controlled buildings.	April 2008	
Office appliance policy	August 2008	
Evaluate opportunities for zoned controlling of interior temperatures.	August 2008	
Increase video conferencing use and capability	January 2009	

Measure Evaluation

Energy efficiency measures offer low cost quick impacts in terms of GHG reductions. Accurate measurement of behavioral changes can be difficult. For Council-controlled buildings, GSD can compare electricity consumption, on a building-wide basis, before and after implementation of these conservation measures, but other factors may obfuscate reductions caused by these measures. The proprietary departments can attempt similar assessments. Future versions of this document will provide any emissions reduction estimates made.

-Universally power manage City computers-

Lead Agency Information Technology Agency (ITA)

Other Agencies General Services Division (GSD)

This measure is highlighted due its immediate impact potential and the fact that it was proposed by a department in response to the initial coordination of the GreenLA program. City staff use an estimated 31,000 computers in the course of their day-to-day work. Currently, based on individual staff preferences, some computers are turned off between use, some are put into a standby mode and some are left running full time. To create energy savings and greenhouse gas reductions, the City will institute energy savings power management for all of its computers.

Opportunity

The City has the ability to quickly implement this measure through its relatively centralized control over 31,000 computers. This will achieve an immediate substantial energy savings.

Challenges

The City must ensure that no productivity losses occur due with shutdown and standby settings for the computers. Initial experience has shown incompatibilities of standby modes and network software resulting in the recommendation for computer shutdown instead.

Table 12. E7 Implementation Steps

Milestone	Completion Date	Quantity of

		Measure
Instructions to all General Managers for employees to shut down computers after work	July 2008	31,000 computers managed
Assess effectiveness and spot verify settings	January 2008	
Instructions to all General Managers for IT staff to set sleep setting on monitors	February 2008	
Continue to work with network vendor on standby mode incompatibilities	ongoing	

Measure Evaluation

This is a feasible measure with significant short term impacts. Since the City has not collected its own shut down rate data, a 36% rate will be assumed based upon the 2004 Lawrence Berkeley National Lab Report of shut down rates for offices. The City will follow the Energy Star recommendation of 15 minutes until monitor sleep mode and 30 minutes until system standby mode.

Number of desktop computers	31,000
Current shut down rate	36%
Energy savings from 100% after-work shutdown (kWh/yr):	17,000,000
Energy savings from monitor sleep mode (kWh/yr):	2,000,000
Total Annual Energy Savings (kWh/yr)	19,000,000
Emissions avoided (MT CO_2/yr)	**11,900**

Action E8	**Perform energy efficient retrofits on 497 City-owned buildings to continuously reduce energy consumption.**

For several years, the City has been meeting aggressive environmental standards for its new construction program, but has now also identified energy saving opportunities for 497 of the existing Council-controlled buildings that it owns and operates.

Lead Agency Department of General Services (GSD)

Other Agencies Los Angeles Department of Water and Power (LADWP); City Administrative Officer (CAO); Community Redevelopment Agency (CRA)

Over a 7-month period in 2007, LADWP surveyed 497 City-owned, Council-controlled facilities to identify the main energy-using equipment and offer recommendations for reducing energy consumption. LADWP staff identified opportunities that could produce annual energy savings of up to 53.8 million kiloWatt hours, which could, in turn, equal as much as $6 million in cost savings each year. Upon further, review, GSD realized that certain measures were either already being implemented or were unfeasible. The City has therefore embarked on a program to implement the most time- and cost-effective energy retrofits. For Port and LAWA energy retrofits, please refer to Section 3.8 covering the proprietary departments.

Opportunity

LADWP staff identified lighting and limited mechanical system retrofits and modernization as the most cost-effective energy-saving opportunities for the 497 buildings. GSD will be responsible for retrofitting HVAC (heating, ventilation, and air conditioning) and other equipment; LADWP will provide technical advise, assistance, and financial incentives. LADWP will also construct a district cooling plant for City-owned buildings located in downtown Los Angeles.

Challenges

Ongoing maintenance needs and the opportunities for energy-efficiency upgrades often "compete" for budget allocations and staff. The current funding programs for energy efficient equipment replacement/retrofits must continue if the City is to make its buildings as energy-efficient and climate-friendly as possible.

Table 13. E8 Implementation Steps

The City has surveyed its facilities for energy saving opportunities and has identified upgrading HVAC and refrigeration equipment and energy management systems as high benefit measures.

Milestone	Completion Date	Quantity of Measure
Replace a minimum of 10 HVAC rooftop units with SEER rating of 13 or better and/or EER of 11.3 or better.	6/2008	# of HVA units replaced.
Replace a minimum of 35 HVACR units with ratings of 16 SEER, 12 EER, and kWh/ton of .56, or better.	12/2010	
Continuous lifecycle replacement of HVAC equipment with the most energy-efficient equipment and technology available.	2011-2027	
Design and construct a district cooling plant and distribution system to supply chilled water to downtown Los Angeles buildings for space cooling applications.	2011	

Measure Evaluation

A few key sub-measures are being evaluated for their actual energy savings potential including additional HVAC preventative maintenance, T8 32W to 25W conversions, LED exit signs, and occupancy sensors. Five staff positions are being requested by GSD to help implement the program. If such resources aare made available, 16 buildings will be completed as a pilot followed on by a target of 100 buildings each year. Future versions of this document will provide more detailed energy savings and emissions reduction estimates.

Total Annual Energy Savings (kWh/yr)	19,000,000
Potential Emissions avoided (MT CO_2/yr)	**18,000**

The approximate amount of kWh that could be saved by successful conversion of 10 rooftop units was estimated using the ENERGY STAR Central Air Conditioner savings calculator. It was assumed that the old units do not have programmable thermostats and the new units do. The full-load cooling for the Los Angeles area was assumed to be 1,000 hours. Only the cooling benefits are quantified here. An email from GSD Building Maintenance District Supervisor on 3/7/2008 stated that the old rooftop units range from 14 to 16 years old, ranging from 2-ton to 10-ton cooling capacity. It was assumed that this age class corresponds with a SEER rating of 9. The calculation was done with both cooling capacity sizes and their results averaged. The 2004 LADWP CO_2 emission factor was used to convert the kWh to Council-Controlled CO_2 emissions.

Old units S.E.E.R. rating	9
New units S.E.E.R. rating	13
Energy Star savings from 2-ton unit replacement (kWh/yr):	1,116
Energy Star savings from 10-ton unit replacement (kWh/yr):	5,579
Average of 2-ton and 10-ton unit replacement savings (kWh/yr):	3,348
10 RTUs Savings (kWh/yr)	33,475
Emissions avoided (MT CO_2/yr)	**21**

The estimate for replacement of 35 HVACR units was done as above, using the ENERGY STAR Central Air Conditioner savings calculator. The assumptions are the same with the exception that the old HVACR units are 15+ years old and they are assumed to have an 8 SEER rating. These units range from 2-ton to 5-ton cooling capacity.

Old Units SEER	8
New Units SEER	16
EnergyStar savings from 2-ton unit replacement (kWh):	1,740
EnergyStar savings from 5-ton unit replacement (kWh):	4,350
Average of 2-ton and 5-ton unit replacement savings (kWh):	3,045
35 HVACRs Savings (kWh/yr)	106,575
Emissions avoided (MT CO_2/yr)	**66**

The benefits from continuous lifecycle replacement of HVAC equipment were estimated by assuming 5 HVAC units would be replaced annually, and using the same ENERGY STAR savings calculator as described above. The calculations were carried forward assuming the old units are SEER 10 and the new units SEER 16. This estimate is uncertain, as the number and sizes of HVAC units replaced annually are unknown.

Old Units SEER	10
New Units SEER	16
EnergyStar savings from 2-ton unit replacement (kWh):	1,140
EnergyStar savings from 5-ton unit replacement (kWh):	2,850
Average of 2-ton and 5-ton unit replacement savings (kWh):	1,995
5 HVACs Savings (kWh/yr)	9,975
Emissions avoided (MT CO_2/yr)	**6**

Action E9	**Install the equivalent of 50 "cool roofs" on new or remodeled City buildings.**

In many parts of the world, cool and green roofs are common, but in the U.S., cities have only recently begun to recognize their environmental value. Designed with high albedo (reflectivity) to reflect the sun's heat, cools roofs can provide energy saving to buildings and also help reduce the urban heat island effect. Green or vegetated roofs provide the same benefits, with the additional benefits of green space and reduced stormwater runoff. There are two types of green roofs. Intensive green roofs are essentially conventional gardens that happen to be located on the roof of a building. Extensive greenroofs are designed primarily to achieve an array of environmental benefits, including: 1) increased thermal insulation of the roof, which promotes energy savings for heating and cooling; 2) to shield the roof's water-proof roofing membrane from the elements, thus greatly extending membrane life and generating potential savings on reroofing costs; 3) increased sound absorption resulting in less reflection of noise into the surrounding area and less penetration of noise into the building; and 4) creation of additional natural habitat for birds and insects in urban areas. The following discussion pertains to extensive green roofs.

Lead Agency	Existing buildings and roofs: Department of General Services (GSD) New Buildings and Major Renovations: The Bureau of Engineering (BOE) of the Los Angeles Department of Public Works (LADPW)
Other Agencies	Los Angeles Department of Water and Power (LADWP); Environmental Affairs Department (EAD)

GSD will be responsible for retrofitting existing roofs. BOE will be responsible for installing cool roofs on new buildings, where appropriate. EAD will coordinate and explore the opportunities and resources available, particularly for green roofs.

Opportunity

The City has more than 800 Council-controlled rooftop spaces; approximately 300 of these represent opportunities for energy-saving cool roofs, while only a few are suitable for use as green roofs. Both roof types extend the life of the roof membrane and lower energy costs. Since buildings account for a significant portion of the City's electricity use and associated CO_2 emissions, the costs savings and other beneficial environmental impacts make such roofs a worthwhile investment.

Challenges

With limited budgets, ongoing maintenance needs and cool or green roof opportunities often "compete" for allocations of dollars and staff. For existing buildings, engineering and fire safety considerations may make such roof retrofits unfeasible or cost-prohibitive. The City needs to identify the most cost-effective retrofit sites and then secure funding for implementation of this measure. Cool roofs are relatively easy for the City to install; green roofs are more difficult, especially on existing buildings, but offer additional environmental and community benefits.

Table 14. E9 Implementation Steps

Milestone	Completion Date
Install 7 new cool roofs; retrofit 7 existing roofs as cool roofs.	3/2008
Install an additional 16 new cool roofs, retrofit 20 existing roofs as cool roofs, and install 1 green roof. GSD plans to apply cool roof coatings to 12 –15 existing buildings annually as part of the "Major Roof Repair Capital Improvement Program."	6/2009
Green roofs opportunity analysis for Arroyo-Seco Cornfields Specific Plan area private-sector buildings.	6/2009
Install 3 new cool roofs; retrofit 20 existing roofs as cool roofs and 3 as green roofs. The GSD commitment is to install 12 –15 cool roof applications annually on existing buildings.	12/2010

Measure Evaluation

This is an achievable measure, which will provide a limited reduction of GHGs due to the limited number of suitable City controlled rooftops. Once EAD completes its target area analysis for private buildings, then the City will encourage cool/green roofs for private buildings.

GHGs Reduced - Studies have shown that the installation of a cool roof can achieve up to 40% cooling energy savings (eetd.lbl.gov/HeatIsland/CoolRoofs). For this measure, the amount of cooling energy used in each building was estimated by assuming an HVAC size and rating. This action is more beneficial if applied to larger buildings, so a larger, 10-ton unit was assumed for this calculation. The full-load cooling for the Los Angeles area was assumed to be 1,000 hours. Where the cool roof is retrofit to an existing building, the HVAC rating was assumed to be 8 SEER. Where the cool roof is installed on a new building, the HVAC rating was assumed to be 13 SEER. Once the total annual cooling energy was is estimated, the 40% energy reduction was applied to estimate the savings. The 2004 LADWP CO_2 emission factor was applied to the electricity savings.

For purposes of simplicity in this early stage of estimation, the green roofs are treated the same as cool roofs. Although the this action calls for 50 cool roofs in the title of the measure, the number of new cool/green roof installations targeted in the actual implementation plan is 30 and the number of retrofits targeted is 47. The emission reductions from new cool roofs will primarily impact growth in the GHG inventory, rather than reducing the existing inventory. As the Green LA Plan calls for some new cool roofs and some retrofit cool roofs, the two are evaluated separately. The actual savings benefits from this measure depend largely on the size, design and activities within the specific buildings being retrofit as well as the design of cool-roof being applied and the number of cool or green roofs successfully installed.

Energy usage for HVAC units with 10-ton cooling capacity (btu/hr)	120,000
Los Angeles area cooling load (hr)	1,000
SEER rating for new units (for new cool roof installation)	13
SEER rating for existing units (for cool roof retrofit)	8
Annual energy usage to run new units (kWh)	9,231
Annual energy usage to run existing units (kWh)	15,000
Potential cooling energy savings through cool/green roof installation	40%
Emissions Avoided by installing 30 new cool/green roofs (MT CO_2/yr)	**70**
Emissions Avoided by 47 cool roof retrofits (MT CO_2/yr)	**170**

Action E10	Install solar heating for all City-owned swimming pools.

Lead Agency Department of Recreation and Parks (RAP); Los Angeles Department of Water and Power (LADWP)

Opportunity/Challenges

With millions of square feet of facility space, the City is a significant energy consumer. Electricity used by City buildings and facilities accounts for much of the indirect greenhouse gas emissions associated with municipal operations.

At the direction of the Mayor, the Department Recreation and Parks (RAP) reviewed the amount of energy used to heat public pools under its jurisdiction. RAP operates approximately 60 public swimming pools, the majority of which are seasonal and therefore not heated. Of the 60, only a dozen are year-round, heated pools. LADWP does not currently offer rebates for the use of solar power equipment to heat pools, and solar power would reduce natural gas use, rather than electricity. In addition, RAP staff determined that the pools are currently covered to retain heat, which is the most cost-effective method for heating the pools. Further, the costs to retrofit the pools to operate on electricity would be extremely prohibitive.

Measure Evaluation

This measure was determined to be infeasible. A partnership with LADWP is not applicable, because using solar power to heat the pools would reduce natural gas usage rather than electricity.

Action E11	Improve energy efficiency at drinking water treatment and distribution facilities.

This action is intended to reduce the amount of electricity used for water pumping and water treatment, thus leading to reduced greenhouse gas emissions from fossil-fueled electric power plants.

Los Angeles Department of Water and Power (LADWP) Energy Efficiency staff are working with Water Supply and Operations Division staff, and with lighting and electric motor manufacturers, to develop a design specification for water treatment and distribution facilities that includes high efficiency motors, lighting and other measures.

Lead Agency Los Angeles Department of Water and Power (LADWP)

Opportunity

- Reduce the energy consumption of the Water System by increasing the energy efficiency of equipment at water treatment and pumping facilities.
- Maximize energy recovery from pressure reductions in the water distribution system.

Challenges

Water treatment and distribution operations require the use of large pumping motors. The magnitude of the energy efficiency improvements that can be achieved from installing high efficiency motors is less for larger motors than for smaller motors used in other applications, and as a result may not be as cost effective.

Table 15. E11 Implementation Steps

Milestone	Completion Date
Develop a scoping plan to determine the potential annual energy savings at selected water treatment and distribution facilities, including the payback times, cost/benefit ratios and GHG emission reductions.	12/2008
Install energy recovery devices in the water distribution system according to the survey conducted by the Power System.	12/2010

Measure Evaluation:

Future evaluations will be based on meeting the critical milestones for each project identified in the scoping plan, and on the associated energy savings and cost of each project.

Action E12	Maximize energy efficiency of wastewater treatment equipment.

Wastewater consists of water from sinks, washers, and toilets. The Bureau of Sanitation (BOS) is responsible for operating and maintaining one of the world's largest wastewater collection and treatment systems. Over 6,500 miles of sewers serve more than four million residential and business customers in Los Angeles, as well as 29 contracting cities and agencies. These sewers are connected to the City's four wastewater and water reclamation plants, which process a daily average of 550 million gallons.

Wastewater treatment operations (processes) are very energy intensive. Such operations and their related buildings consume the second largest amount of electricity among City departments, and generate 12.9% of all indirect greenhouse emissions. Wastewater operations and buildings are ranked fifth among City departments in natural gas usage.

Lead Agency Bureau of Sanitation (BOS) of the Department of Public Works (LADPW)

Opportunity

The BOS can employ direct action/s to reduce energy usage, including: a) investigate and test modifications to treatment *processes* that could reduce wastewater volume, electricity, and/or natural gas usage; or increase the production of biogas, which is used to produce electricity; and b) research the availability of more energy-efficient treatment equipment.

The Hyperion Treatment Plant (HTP) will begin a pilot project to determine the feasibility of processing food waste from Santa Monica and Los Angeles area restaurants. Initially 200-5,000 gallons per day of food waste will be injected into a digester and the resulting production of gas (biogas) will be monitored. Injection amounts will increase as more restaurants are brought on board. A test protocol will be developed in January 2008, and the six-month pilot project is tentatively scheduled to begin in September 2008. The City of Riverside is currently processing food waste, and has reported that with the same mass, grease produces 3 times more biogas than primary sewage sludge. If the HTP pilot project is successful, the existing gas handling facility may need to be expanded. The co-benefits of food waste processing include increased electrical production, landfill diversion, and shorter waste hauling trips.

Table 16. E12 Implementation Steps

BOS has begun replacing lights in the Hyperion Treatment Plant's galleries with more energy efficient fluorescent lights equipped with motion sensors.

Milestone	Completion Date	Quantity of Measure
Launch a pilot project to determine the feasibility of processing food waste from Santa Monica and Los Angeles area restaurants.	September 2008	Volume of biogas generated.
Replace Na (Sodium) lights with fluorescent T5 lights equipped with motion sensors in the galleries at HTP.	December 2010	

Measure Evaluation

Bulb replacement emissions reductions will be included in a future version of this document. The emission reductions can be estimated for the installation of motion sensors in the galleries. Assuming that 1,000 high-pressure sodium lamps at 177W each are equipped with motion sensors, and that the motion sensors reduce the daily usage of each bulb from 24 hours to 4 hours, the total energy saved can be estimated.3 The 2004 LADWP CO2 emission factor was used to estimate the associated Council-Controlled emissions that could be avoided. The result remains sensitive to the actual human motion (or lack thereof) in the galleries.

Quantity of bulbs	1,000
HPS Lamp Wattage	177
Total HPS Wattage	177,000
Usage of each bulb (hrs/day)	24
Usage with motion sensors installed (hrs/day)	4
Energy saved by installing motion sensors (kWh/yr)	1,292,100
Emissions avoided (MT CO2/yr)	**800**

The amounts of biogas that can be produced from these "fuels" were estimated by HTP at 1-2 and 6 cubic feet per gallon, respectively. The amount of power that can be produced from the biogas varies across different power generators. In 2007, Scattergood produced approximately 52 net kWh per 1,000 cubic feet of biogas4. Applying this factor to the volume of biogas provides a mechanism to estimate the annual electricity produced by the pilot project, which would be the amount of electricity displaced from the grid. Finally, the 2004 LADWP CO2 emission factor was used to estimate the associated Council-Controlled emissions that could be avoided. Similar calculations were made to estimate the amount of annual CO2 emissions avoided after increasing the food waste volumes to the maximum capacity of the pilot plant.

Food waste	FOG	
Initial waste volume (gal/day)	5,000	9,000
Potential Biogas Yield (cf/gal)	1.5	6
Potential Biogas Production (cf/day)	7,500	54,000
Potential energy production (kWh/day)	388	2,795
Electricity displaced at initial rate (MWh/yr)	141.7	1,020.2
Waste volume at maximum capacity (gal/day)	12,000	12,000
Electricity displaced at maximum capacity (MWh/yr)	340.1	1,360.3

Total electricity displaced by food waste and FOG, at initial rate (MWh/yr)	1,162
Total electricity displaced by food waste and FOG, at max. capacity (MWh/yr)	1,700
Emissions avoided, *initial rate* (MT CO2/yr)	**700**
Emissions avoided, *max. capacity* (MT CO2/yr)	**1,000**

GOAL: Help Angelenos be energy misers

Action E13	Distribute two compact fluorescent light (CFL) bulbs to each of the 1.4 million households in the City.

To reduce energy consumption and related carbon dioxide emissions, the Los Angeles Department of Water and Power (LADWP) will purchase 2.4 million compact fluorescent light bulbs (CFLs) and distribute two bulbs to each of the City's 1.2 million households. Each 20-watt CFL produces the same amount of light as a traditional 75-watt incandescent bulb. For further information, please refer to www.LADWP.com

Lead Agency	Los Angeles Department of Water and Power (LADWP)
Other Agencies	Bureau of Sanitation (BOS) of the Los Angeles Department of Public Works (LADPW)

LADWP has determined that manufacturing and distribution of the CFLs is best achieved by contracting with a producer and a distributor through a competitive bidding process. There may be significant opportunities for partnerships with nonprofits, neighborhood councils, and community groups in the public education effort pertaining to the installation and proper disposal of the bulbs. The Take it Back disposal plan could involve multiple retailers as partners.

Opportunity

Residential lighting is one of the largest energy consumption sectors in Los Angeles, and thus offers a major opportunity for energy efficiency. Everyone wins when consumers choose compact fluorescent bulbs over incandescent bulbs: the consumer saves money, the utility generates less power, and carbon emissions from power generation are reduced.

The LADWP has identified two distinct opportunities for a program that distributes free CFLs to City residents. Residents will use less energy by installing the LADWP provided bulbs, and will be more likely to purchase additional CFLs in the future. The end goal is nothing short of a market transformation in which CFLs replace incandescent bulbs as the majority of bulbs in use in Los Angeles. This goal will be facilitated by the implementation of a subsequent LADWP program that is designed to reduce the local retail price of CFLs.

Challenges

Three primary challenges must be confronted and mastered: the logistics of manufacturing and distribution; public education; and proper disposal of the bulbs. Regarding distribution, LADWP will need to ensure that a small bag containing two CFLs and the education brochure is hung on the doorknob of every house and apartment in Los Angeles. One particular challenge will be gaining access to secured apartment buildings. Another challenge will be limiting theft or diversion of the free bulbs, which will be labeled with the LADWP logo to prevent commercial re-sale.

The public education challenge encompasses two separate messages: encouraging both the installation of the bulb and its proper disposal. CFLs contain a trace amount of mercury and should therefore be separated from household trash in the same manner as batteries. This will require a shift in consumer behavior and collaboration with the California Take it Back Partnership.

BOS and LADWP are evaluating establishment of a "Take It Back" partnership capable of handling CFLs in this volume. Because CFLs can last several years, there will be adequate time to develop the necessary

partnership. The only retail stores known to take back CFLs at this time are IKEA and an ACE hardware in West Los Angeles that has previously partnered with BOS. If the CFLs are to be collected by BOS at its SAFE centers (for solvents, **a**utomotive and **f**lammable products, and **e**lectronics) and mobile collection events, BOS will incur a substantial cost.

Table 17. E13 Implementation Steps

If most residents install and use the free CFLs, the City will reduce energy consumption by 127 gigawatt-hours in the first year, reducing carbon emissions from power generation by 70,000 metric tons.

Milestone	Completion Date	Quantity of Measure
Award of contracts, manufacture of bulbs.	12/2007	Number of CFL bulbs distributed.
Public education campaign.	5/2008	
Distribution of bulbs.	6/2008	
Measurement and verification.	9/2008	
Take it-Back Plan implementation.		

Measure Evaluation

The near-term opportunity in energy savings is enormous and cost effective. While LADWP's entire suite of energy efficiency programs saved 67 gigawatt-hours of electricity in fiscal year 2006-2007, the CFL bulb program is projected to save 127 gigawatt-hours in the first year. Furthermore, the CFL bulb program will save energy at a very low cost per kilowatt-hour. While energy efficiency programs are considered cost effective at an expense of less than four cents per kilowatt-hour, the CFL bulb program will cost less than one cent per kilowatt-hour.

The program will be evaluated based on the meeting the milestones identified and a review of the actual unit cost of implementing the program per kilowatt-hour saved.

GHGs Reduced:

Calculations of potential greenhouse gas reductions for this program use 2004 LADWP electricity emissions factors. The emission reduction level is dependent on the assumptions for hours/per day of bulb use and thus calculating a range of use levels. The use level of approximately 2.25 hours/day corresponds to the stated electricity savings the City has cited. The Department of Energy calculates savings using a 6.7-hours/day savings. Using a 20 Watt CFL bulb over an incandescent bulb of 75 Watts, 55 Watts are saved per bulb.

Number of bulbs	2,800,000
DWP estimated daily use level (hrs)	2.25
DOE estimated daily use level (hrs)	6.7
Savings per bulb (W)	55
Range of Emissions avoided (MT CO_2/yr)	**78,000-232,000**

Action E14	**Increase the level and types of customer rebates for energy efficient appliances, windows, lighting, and heating and cooling systems.**

Through implementation and aggressive promotion of existing non-residential energy efficiency programs in LADWP's service territory, energy consumption and related GHG emissions will continue to be reduced.

The current rebate programs include Commercial Lighting Efficiency Offer (CLEO), Chiller Efficiency Program (CEP), Refrigeration Program, New Construction Program, Customer Performance Program (CPP), Small Business Direct Install (SBDI) program, and the Thermal Energy Storage (TES) program. The annual savings goal of these collective efforts is 25 megawatts of demand reduction and 140 gigawatt-hours of energy savings.

Lead Agency Los Angeles Department of Water and Power (LADWP)

Other Agencies Department of City Planning (Planning)

LADWP will work closely with professional organizations, chambers of commerce, contractors, and vendors to promote energy efficiency and encourage businesses to retrofit with new efficient technologies. Partnerships with national organizations such as the EPA's Energy Star Program and the U.S. Green Building Council (USGBC), which established the Leadership in Energy and Environmental Design (LEED) Green Building Rating System, will be critical in promoting efficiency. ADWP worked with the Department of City Planning and other City agencies to develop the Green Building Standards for new construction that will promulgate sustainable design in new private sector buildings meeting a size threshold. The Green Building Program was approved by the Mayor and City Council on April 22, 2008.

Opportunity

Non-residential customers consume over two-thirds of the electrical energy used in Los Angeles, and therefore represent an enormous opportunity for additional electricity conservation. Everyone wins when non-residential customers replace or retrofit to more energy-efficient equipment: the consumer saves money, and the utility generates less power, so GHG emissions from generation are reduced. Although some of these customers have already upgraded energy-using systems in their facilities, continued technology advancements offer additional savings opportunities for nearly all customers. Some of the upfront costs of efficiency upgrades can be offset by incentives provided through LADWP's Non-Residential Energy Efficiency Programs.

The LADWP has identified energy-saving opportunities for office buildings, grocery stores, industrial and manufacturing facilities, and other non-residential facilities. These savings can realized through programs that encourage the replacement of old, inefficient equipment with newer energy-efficient models. The CLEO program has been the most active, but all of the efficiency programs offer excellent rebates. The goal is to show non-residential customers that energy retrofits and replacements are cost-effective from a business perspective, and provide them with a better understanding of the beneficial environmental impacts that also result from energy savings.

Challenges

The primary program challenges are: adequate staff to meet with customers, vendors, and contractors in order to communicate the benefits of the programs; rebate amounts that are adequate to motivate customers to act; and the availability of vendors to perform the retrofit/installation work. New staff has been budgeted for the July 2007 through June 2008 fiscal year; upon hiring, they will be trained so they

can effectively market the various technologies and programs. Rebate levels have been increased and will continue to be evaluated for their effectiveness in motivating customer action. Also, LADWP will offer to small businesses, typically a historically hard-to-reach market sector, a direct installation program that provides easy access to vendors.

Table 10. E14 Implementation Steps

The CLEO, CEP, New Construction, CPP, and Refrigeration programs will continue to be offered to LADWP's non-residential customers. The SBDI, DSM Bid, TES, and RCx, will be launched, either as pilot or full programs, during the fiscal year.

Milestone	Completion Date	Quantity of Measure
CLEO	On-going	Reduced demand (in GWHr/year).
CEP	On-going	
New Construction	On-going	
CPP	On-going	
Refrigeration	On-going	
SBDI	2/2008	
TES	7/2008	

Measure Evaluation

The programs will be evaluated as identified milestones are met, and through a review of the actual unit cost per kilowatt-hour saved and the magnitude of GHG reductions from each program.

Milestone	Energy Savings (in GigaWatt Hours)
CLEO	67.6
CEP	3.7
New Construction	3.6
CPP	12.3
Refrigeration	11.2
SBDI	30.3
TES	TBD

Action E15	Increase the distribution of energy efficient refrigerators to qualified customers.

To facilitate energy conservation among customers who receive low-income rate assistance (Rates 06 and 86), LADWP intends to offer up to 50,000 new energy-efficient refrigerators, in exchange for the customers' older, less-efficient refrigerators. Expansion of the exchange program to Affordable Housing multi-family dwellings in Los Angeles is also being considered.

Lead Agency Los Angeles Department of Water and Power (LADWP)

Other Agencies SCPPA (Southern California Public Power Authority)

The LADWP has partnered with the SCPPA (the Southern California Public Power Authority, an association of municipally-owned utilities) for this initiative and was able to negotiate favorable rates with the vendor, the Appliance Recycling Company of America (ARCA), to implement the program.

Opportunity

As a general rule, and except for seasonal air conditioner use, the refrigerator is the largest energy-consuming appliance in the home. Today, all household appliance manufacturers offer very energy-efficient models. The Low Income Refrigerator Exchange Program is offering to assist the segment of LADWP's customer base that can least afford to replace old energy-guzzling appliances with more efficient ones. The projected energy savings yield from the distribution of the 50,000 units is 37.5 gigawatt hours. The Affordable Housing sector, where housing units are frequently equipped with refrigerators that are more than 10 years old, represents additional energy-saving opportunities.

Challenges

The public education component— effectively communicating the refrigerator exchange program to the targeted customer group— represents the biggest challenge.

Table 19. E15 Implementation Steps

Milestone	Completion Date	Quantity of Measure
LADWP Board approval of agreement.	4/2007	Number of refrigerators distributed.
Identify eligible LADWP customers.	4/2007	
Purchase inventory of refrigerators.		
Schedule mailing of notices.	On-going	
Schedule exchanges.		

Measure Evaluation

As milestones are reached, the program will be evaluated to determine the actual unit cost per each kilowatt-hour that is saved, and the magnitude of associated GHG reductions. An estimated 37.5 gigaWatts of electricity will be saved/50,000 refrigerators.

Action E16	Create a fund to "acquire" energy savings as a resource from LADWP customers.

To expand energy saving opportunities, the Green LA plan proposed the establishment of a fund that would reward LADWP customers for additional conservation efforts. Such efforts will reduce the amount of electric energy generated by fossil-fueled electric power plants, which will in turn reduce greenhouse gas emissions.

Lead Agency Los Angeles Department of Water and Power (LADWP)

Other Agencies Environmental Affairs Department (EAD)

During the Green LA community engagement, LADWP Energy Efficiency staff and EAD will identify partnership opportunities to engage customers in identifying new energy savings/DSM programs.

Opportunity

The intent of this action is the acquisition of energy efficiency savings through collaborative programs (with other local municipal agencies) and through a variant of the competitive bidding process, all at a cost below DWP's generating cost. Funding for these actions (the "fund") has been established in the FY 08-09 budget.

The collaborative programs will include efforts targeting residential and business customers. The bid program, often referred to as a DSM bid, typically consists of third parties identifying the replacement or upgrade of a specific end use within a particular customer segment and proposing a program to achieve the specified savings at a specified price. A DSM bid will often target opportunities outside of our existing energy efficiency programs or included in our program but using a different approach.

Overall costs are reduced because the savings are being acquired below the cost of generation. Participating customers' costs are reduced due to their purchase of less energy that would be the case had the energy savings measures not been undertaken in their facilities.

Challenges

The primary challenges are adequate staff to meet with customers and vendors and evaluate their energy saving ideas, and funding for rebates in amounts that would be sufficient to motivate customers to act—save energy.

Table 20. E16 Implementation Steps

Milestone	Completion Date(s)	Quantity of Measure
Program designs.	8/08, 9/08, 2/09	
Program approvals.	9/08, 10/08, 5/09	
Program implementation.	10/08, 11/08, 6/09	

Measure Evaluation

This measure will be evaluated by several criteria, including LADWP customer participation, compliance with identified milestones, and the type, cost effectiveness and magnitude of GHG reductions from any new demand-side efficiency programs.

3.2 Focus Area: Water

Goal: Decrease per capita water use

Action W1	**Meet all additional demand for water resulting from growth through water conservation and recycling.**
Action W2	**Reduce per capita water consumption by 20%.**
Action W3	**Implement the City's innovative water and wastewater integrated resources plan that will increase conservation, and maximize use of recycled water, including capture and reuse of stormwater.**

These actions will reduce the amount of electric energy used for water pumping and water treatment, thus leading to reduced greenhouse gas emissions from fossil-fueled electric power plants. In addition to the above measures, The City will continue to evaluate emerging issues and strategies for reducing GHG emissions relating to water and will incorporate findings into future versions of this document. This includes low-impact development measures and innovative market-based incentives.

Since 1902, LADWP has provided the residents and businesses of Los Angeles with a reliable and adequate supply of water. One of the greatest challenges is ensuring that water is available for all of the City's needs. Though Los Angeles' population and economy have grown steadily, its water supply has not. LADWP can help balance its commitment to the environment, and its mission to ensure a reliable water supply for its customers, by increasing water conservation and recycling, and enhancing partnerships with environmental groups and other water agencies.

To meet its goals and fulfill its obligations to the next generation of Angelenos, the Mayor's Office and LADWP developed the "*Securing LA's Water Future*" plan which is an aggressive, multi-faceted approach to developing a locally sustainable water supply. This includes a set of key short-term and long-term strategies to secure our water future, such as:

Short-Term Conservation Strategies

1. Enforcing prohibited uses of water – For the first time since the early 1990's, LADWP will begin levying fines and sanctions against water abusers to eliminate waste and increase awareness of the need to conserve water.
2. Expanding the list of prohibited uses of water – Possible new prohibited uses include:
    - Further restrictions on watering landscape
    - Prohibit landscape watering during rain
    - Prohibit washing/rinsing vehicles with a hose when the hose does not have a functioning self-closing nozzle attached or allowing the hose to run continuously.
3. Extending outreach efforts – Some activities include:
    - Step up communication with ratepayers to promote water conservation (e.g. bus placards, LADWP vehicles placards, newspapers, radio, television)
    - Outreach to Homeowner Associations and Neighborhood Councils

- Train LADWP field staff as well as field staff from Public Works, Recreation and Parks, and other appropriate City Departments in identifying and reporting prohibited uses of water
- Ramp up marketing of water conservation incentive and rebate programs.

4. Encouraging regional conservation measures – Work with MWD to encourage all water agencies in the region to adopt water conservation ordinances which include prohibited uses and enforcement.

Long-Term Strategies

1. Increasing water conservation through reduction of outdoor water use and new technology
2. Maximizing water recycling
3. Enhancing stormwater capture
4. Accelerating clean-up of the groundwater basin
5. Expanding groundwater storage

The long-term strategies listed above are in alignment with the Water/Wastewater Integrated Resources Plan (IRP) approved by the City Council and Mayor in November 2007. The IRP was a stakeholder driven process led by the Department of Public Works Bureau of Sanitation and LADWP. More detailed description of the long-term strategies is provided below.

Long-Term Strategy 1: Increasing Water Conservation through Reduction of Outdoor Water Use and Technology

Replacing water-guzzling hardware ensures the City can count on saving a predictable amount of water each year. LADWP's residential ultra low flush toilet (ULFT) replacement program enjoyed 16 productive years, resulting in an estimated conversion of 90% of toilets in LADWP's service area. Together, the Toilet Rebate Program and the Toilet Exchange Program replaced nearly 1.3 million water-wasting toilets with ULFTs, making the City's conservation effort one of the most successful in the nation.

The low-flush toilets alone continue to save Los Angeles more than 14 billion gallons of water each year—enough to fill the Rose Bowl about 56 times.

The residential toilet replacement programs were ended in December 2006 due to market saturation and the demonstrated effectiveness of the City's "retrofit on resale" ordinance, requiring ultra-low-flush toilets and low-flow showerheads in all residential properties prior to resale. With limited remaining indoor conservation opportunities, LADWP is focusing more resources on technology to reduce outdoor water use. Watering lawns and other outdoor water uses make up about 30% of all water used by all customers and 40% by single-family residential customers. From a long-term perspective, significant opportunities exist in cutting back on water that is wasted outdoors, including the installation of smart sprinkler systems and drought-tolerant landscaping.

Additional conservation programs will be aggressively pursued, such as programs to encourage planting with California native drought tolerant plants and expansion of gray water reuse systems. Stormwater capture and reuse can result in water savings with inclusion of rain barrels or cisterns through 2030.

Following are new and continuing water conservation programs as well as goals and benchmarks designed to measure their progress through 2030.

Residential Smart Sprinkler Systems

Smart sprinkler systems improve water efficiency on any landscape. They are already used in parks and golf courses around the City, and it is now time to extend this innovative technology to residences and homes throughout L.A.'s neighborhoods.

Goal: Install 5,250 smart sprinkler controllers per year, with a total of 63,500 by 2020.

Water Savings: 4,962 AFY by 2030

Action Plan: LADWP will begin to provide smart controllers and installation services free of charge to qualifying residential customers. Program plans include the installation of 2,500 controllers in the first year of program, moving to 5,250 controllers per year on a sustained basis. The program is scheduled to launch in early 2009.

Background: Weather-based Smart Irrigation Controllers ("smart sprinklers") represent new technology that adjusts irrigation schedules based on local weather conditions. They are the cornerstone of future residential conservation efforts to curb outdoor water use; they will save water, reduce runoff and cut green waste in the future.

Modeled on the successful toilet replacement program, the residential smart sprinkler initiative will employ local non-profit organizations – under LADWP management – to install these systems, educate customers on how to use the sprinklers and perform irrigation system assessments. They will also provide other services, such as property leak detection (via water meter check); installation of indoor water conservation devices (showerheads and aerators); and promotion of other LADWP conservation programs l such as the Clothes Washer Rebate and Energy Efficiency Programs.

Benchmarks:

Fiscal Year	Number of controllers per year	Cumulative Water Savings (AFY)
2008-09	2,500	112
2009-10	3,500	269
2010-11	5,000	493
2011-12	5,250	728
2012-15	5,250	1,434
2015-20	5,250	2,610
2020-25	5,250	3,786
2025-30	5,250	4,962

Conservation Rebates and Incentives

Goal: Increase participation in Water Conservation Rebate and Incentive Programs

Water Savings: 48,457 AFY by 2030

Action Plan: LADWP is continuing to expand rebates and incentives for homeowners and business owners to encourage them to purchase water-saving technology.

High Efficiency Clothes Washer Program. LADWP increased the rebate offered for residential high efficiency clothes washers from $150 to $250. LADWP will further expand the program through

"Point of Purchase" rebates, offering customers an instant rebate when they buy the appliance from a Los Angeles retailer. Since the program was launched in 1998, more than 60,000 water-saving clothes washers have been installed in Los Angeles residents' homes through the program.

Commercial Rebate Program: Water conservation rebates and incentives were increased significantly in 2007 to offset the costs of replacing water-wasting toilets and urinals with high efficiency models, among other measures. The current rebates offset most or all of the total replacement cost (including installation). LADWP will increase program promotion to raise awareness of these significant financial incentives, resulting in increased program participation.

Since this program's inception, more than 32,800 toilets have been replaced by commercial, industrial and institutional customers, and LADWP is working to implement a grant-funded Cooling Tower program for commercial customers.

Several examples of increased incentive amounts include:

- High efficiency toilet (from $205 to $300)
- High efficiency urinal (from $200 to $400)
- Cooling tower pH control (from $1,900 to $3,000)
- Smart irrigation controller (from $630 to $1,000 per acre controlled)
- Technical Assistance Program (TAP) incentives (from $1.25/ per thousand gallons saved/$50,000 cap to $1.50 per thousand gallons saved/$100,000 cap)

High Efficiency Urinal Programs: In June 2007, the Los Angeles Department of Building and Safety gave approval for the installation of certain models of water-free urinals. Offering perhaps the greatest potential for quick implementation is the replacement of standard urinals with high efficiency urinals (0.5 gallon per flush (gpf) or less, including no-flush). Recent changes in the Los Angeles Building Code now provide for the installation of completely water-free urinals. The following actions are designed to boost installation of these urinals:

- Rebates have been increased up to $400 for the retrofit of existing urinals with waterless urinals.
- LADWP has gained commitment from several high visibility customers who will be retrofitting with waterless urinals; promotion of these installations will help raise awareness in the business community.
- Retrofit of the existing urinals in LADWP's downtown headquarters, known as the John Ferraro Office Building.
- LADWP is marketing these rebate programs to increase participation.

Additional Water Saving Efficiency Measures and Programs: As part of our ongoing effort to encourage customers to adopt passive water conservation measures --measures that can help customers conserve water on a daily basis without thinking about it-- in their homes and businesses, LADWP will continue to distribute water-saving bathroom and kitchen faucet aerators and shower heads free-of-charge. LADWP also plans to add rebates for products such as high-efficiency dishwashers and synthetic turf for residential customers to help increase their daily conservation efforts.

LADWP is closely monitoring technological advancements in water conservation, such as the recent improvements in the irrigation industry. LADWP will add these new technologies to its menu of conservation information, services and rebates as more water-saving products become available.

Benchmarks:

- Commercial, Industrial, and Institutional Programs
    - o Rebates – Estimated Water Savings: 38,870 AFY by 2030
      Includes the following programs:

- o High Efficiency Toilets (includes dual flush)
- o High Efficiency Urinals (includes waterless)
- o High Efficiency Coin/Card Operated Clothes Washer
- o Smart Irrigation Controllers
- o Sprinklerhead Rotating Nozzle Retrofit
- o Water Brooms,
- o Pre-rinse Sprayhead
- o Cooling Tower pH and Conductivity Controllers
- o Steam Sterilizer Retrofit
- o Connectionless Food Steamer
- o X-Ray processor Recirculation System
- o Dry Vacuum Pump

Fiscal Year	Cumulative Water Savings (AFY)
2007-08	845
2008-09	1,820
2009-10	2,795
2010-15	9,620
2015-20	19,370
2020-25	29,120
2025-30	38,870

o Synthetic Turf – Estimated Water Savings: 708 AFY by 2030

Fiscal Year	Number of acres per year	Cumulative Water Savings (AFY)
2009-10	3	17
2010-15	6	52
2015-20	6	363
2020-25	6	536
2025-30	6	708

o Aerators – Estimated Water Savings: 257 AFY by 2030

Fiscal Year	Number of aerators per year	Cumulative Water Savings (AFY)
2007-08	500	2
2008-10	2,500	26
2010-15	2,500	83
2015-20	2,500	141
2020-25	2,500	199
2025-30	2,500	257

• Residential Programs

- High Efficiency Washers – Estimated Water Savings: 5,404 AFY by 2030

Fiscal Year	Number of washers per year	Cumulative Water Savings (AFY)
2007-08	6,800	229
2008-10	7,000	699
2010-15	7,000	1,875
2015-20	7,000	3,051
2020-25	7,000	4,227
2025-30	7,000	5,404

- Showerheads – Estimated Water Savings: 2,314 AFY by 2030

Fiscal Year	Number of showerheads per year	Cumulative Water Savings (AFY)
2007-08	1,500	25
2008-09	4,000	91
2009-10	5,000	173
2010-15	6,500	708
2015-20	6,500	1,243
2020-25	6,500	1,778
2025-30	6,500	1,314

- Aerators – Estimated Water Savings: 787 AFY by 2030

Fiscal Year	Number of aerators per year	Cumulative Water Savings (AFY)
2007-08	3,000	8
2008-09	8,000	31
2009-10	10,000	59
2010-15	13,000	241
2015-20	13,000	423
2020-25	13,000	605
2025-30	13,000	787

- High Efficiency Dishwashers – Estimated Water Savings: 52 AFY by 2030

Fiscal Year	Number of diswashers per year	Cumulative Water Savings (AFY)
2009-10	250	1
2010-11	500	2
2011-15	1,000	13
2015-20	1,000	26
2020-25	1,000	39
2020-30	1,000	52

- Synthetic Turf – Estimated Water Savings: 66 AFY by 2030

Fiscal Year	Number of square feet per year	Cumulative Water Savings (AFY)
2009-10	10,000	1
2010-11	15,000	3
2011-15	25,000	17
2015-20	25,000	33
2020-25	25,000	50
2020-30	25,000	66

Targeting City Parks and Large Landscapes

Goal: Retrofit three City parks per year over five years with smart irrigation controllers and upgraded distribution systems; and install smart irrigation controllers at City parks under a grant-funded program.

Water Savings: 70 AFY by 2011

Action Plan: LADWP has already begun targeting public parks for water use efficiency measures through the City Park Irrigation Efficiency Program. Kicking off this initiative, City officials identified three City parks with inefficient irrigation systems, leaks, and runoff problems. The City began work to repair and replace distribution systems and install smart sprinkler systems. The first parks include Victory Memorial Grove and Lilac Terrace in Elysian Park, Arroyo Seco Park, and Mt. Carmel Recreation Center. Work is expected to be completed at these parks in 2008.

> **Benchmark:** LADWP to work with Los Angeles City Recreation and Parks Department to retrofit 3 parks per year.

Proposition 50, Chapter 7, Los Angeles City Park Irrigation Efficiency Program

Funding Total: $1,140,970

Funding Source: State Department of Water Resources (DRP): $362,000

Funding Source: MWD, LADWP and DRP (in-kind services): $778,970

Description: Weather-based irrigation controllers will be installed in all designated parks. Four parks will have new irrigation systems installed and 11 parks will have sprinkler head replacements for the rotors.

CD-3 Reseda North New System
CD-4 Pan Pacific Park (South) Head Replacement
CD-5 Bad News Bears (Westwood Park) Head and Backflow Replacement
CD-5 Palms Rec Center New System
CD-6 Rhodes Greenbelt Head Replacement
CD-6 Slavin Park Head Replacement
CD-7 Carey Ranch Head Replacement
CD-8 Exposition Park Rose Garden Head Replacement
CD-11 Palisades Park (upper) New System
CD-12 Chatsworth Park South New System
CD-12 Dearborn Park Head Replacement
CD-12 Wilbur Tampa Park Head Replacement
CD-13 Elysian Valley Rec Center Head Replacement
CD-14 Evergreen Park Head Replacement
CD-14 Yosemite Park Head Replacement

Proposition 50, Chapter 7, Large Landscapes – 40 Controllers

Funding Total: $204,000

Funding Source: State Department of Water Resources: $101,000

Funding Source: LADWP and DRP (In-kind service): $103,000

Description: This project will install 40 smart irrigation controllers at the following parks by the fall of 2008.

CD-1 Sycamore Grove Park
CD-1 San Pasqual Park
CD-4 Griffith Park Recreation Center & Pool
CD-5 Cheviot Hills Recreation Center
CD-8 Martin Luther King Recreation Center
CD-9 Harvard Recreation Center
CD-10 Jim Gilliam Recreation Center
CD-11 Del Rey Lagoon
CD-15 Point Fermin Park and Lighthouse

Action by Public Agencies

Goal: Improving water efficiency at all City Department facilities. LADWP provides incentive funding and technical assistance to City Departments for the installation of high efficiency urinals and smart irrigation controllers, and helps them identify other opportunities to improve water use efficiency.

Water Savings: Estimated to save at least 10% from existing use, totaling as much as 1,888 AFY in water savings.

Action Plan: Government agencies in Los Angeles use approximately 50% of their water outdoors. LADWP will advise City Departments on reducing their outdoor water use through retrofitting inefficient sprinkler systems, checking timers, installing weather-based smart sprinklers at City facilities, and replacing inefficient indoor plumbing fixtures.

LADWP will assist City Departments and other public agencies in leveraging incentive funds to retrofit their facilities. The Public Sector Conservation Incentive Program, offered through MWD in conjunction with LADWP, provides up-front incentives for public agencies to purchase water-efficiency technology.

Large landscape customers can also better track outdoor water use and save money by installing a dedicated large landscape meter, which allows customers to more easily identify outdoor water efficiency. This will result in water savings by providing customers with water use information that is otherwise combined with domestic consumption.

Taking the lead in this effort, all urinals at LADWP headquarters have been retrofitted to reduce use no more than one-half gallon per flush.

Raising Awareness

Goal: Increase water conservation awareness to achieve water savings.

Action Plan: LADWP has proposed $2.3 million in the fiscal year 2008-09 budget for a general awareness campaign, water conservation program outreach, and school education programs and materials.

Background:

Ongoing conservation awareness is crucial to sustained conservation achievements.

In the past year LADWP has already taken a number of steps to heighten awareness of the critical water shortage and the need to conserve and reduce water use, including:

- Reinstated the "Drought Busters" to provide a visible presence in the community, respond to inquiries and complaints about wasting water, and educate the public regarding the prohibited uses. Drought Busters are equipped with door hangers, brochures and other water conservation literature, as well as water-saving hardware (including low-flow showerheads and faucet aerators) to provide to the public. Since Drought Busters was re-introduced, the program has responded to nearly 1,000 reports of water leaks or other prohibited water uses.
- Spent over $300,000 on radio and print advertisements promoting water conservation and publicizing prohibited water uses. Among other steps, this effort involved publishing four-page advertising inserts in the *Los Angeles Times*, the *Daily News*, and *La Opinion*, and placing ads in English, Spanish, Chinese, and Korean.
- Provided information on the LADWP website about water conservation programs currently available, those planned for the future, and tips for conservation.
- Printed messages to promote water conservation and programs on bill inserts.
- Displayed posters and banners promoting water conservation and water efficiency programs at all LADWP Customer Service Centers, as well as offered water saving hardware (i.e. low-flow shower heads and aerators for faucets) to walk-in customers at the centers.
- Provided training to Customer Contact Center and Commercial Resource Center employees to establish uniformity of information disseminated to ensure water conservation awareness and promotion of LADWP's efficiency programs.
- Promoted a toll-free phone number—1-800-DIAL DWP—for people to report water waste to the Customer Contact Center.

Additional water conservation actions will include:

- Conduct outreach to Neighborhood Councils to promote water conservation.
- Distribute table tent cards for Los Angeles area restaurants citing the importance of water conservation and indicating that water will only be served upon request.
- Produce door hangers for Los Angeles area hotel room restrooms encouraging water conservation and asking patrons to consider using their towels more than once.
- Develop static cling signage to be affixed upon bathroom mirrors in government and public buildings throughout Los Angeles, asking people to not let the water run unnecessarily.
- Update water conservation literature for website posting and for distribution at community events and public meetings.
- Increase water conservation promotion at community events, especially those involving LADWP.
- Expand water conservation awareness education programs for Los Angeles Unified School District students.
- Disseminate print and radio advertisements to heighten awareness about conservation measures and highlight funding incentives available to both residential and commercial customers.
- Place conservation awareness signage on LADWP vehicles.

Enhancing Conservation through Review of New Developments

Goal: Ensure specifications for the Los Angeles Green Building program include water efficiency measures.

Water Savings: The Green Building Program can yield significant water savings through water conservation measures.

Action Plan: LADWP will continue working with the City's Green Building Team to pursue desired changes in local codes and standards to promote water efficiency in new construction projects and major building renovations.

Potential measures include:

- Enhancing irrigation requirements (subject to the City's Landscape Ordinance). This may include smart irrigation controllers and landscaping using a specified plant palette.
- Improving plumbing fixture requirements. This would include high efficiency toilets (1.28 gallons per flush or less, includes dual flush) and urinals (0.5 gallons per flush or less, includes no flush urinals).
- Installing high efficiency restroom faucets (1.0 gallon or less per minute, public restrooms – 0.5 gallons or less per minute self closing faucet) and high efficiency showerheads (2.0 gallons or less per minute).
- Prohibiting multiple showerhead systems (multiple showerheads within a single shower stall).
- Requiring individual metering for all dwelling units and commercial spaces, along with separate metering or sub-metering for all landscapes of 5,000 square feet or more.

LADWP Green Building Policy: LADWP's Green Building Policy, approved in 2006, includes a water conservation element. In order to be eligible for energy efficiency incentives under LADWP's performance-based new construction incentive program, a project must achieve at least one LEED point for water conservation.

Review and Comment on Environmental Impact Reports: LADWP will begin reviewing and providing written comments on all Environmental Impact Reports (EIRs) for new development in the City. The comments will include LADWP's recommendations for incorporating water conservation measures, and identify existing available incentive programs. In addition, all developments of 500 units or more must demonstrate that they have an adequate water supply. LADWP will issue a water supply assessment for those large developments.

Strategy 2: Maximizing Water Recycling

Goal: Increase the total amount of recycled water used in the City of Los Angeles six-fold by 2019 – expanding from the current 1% to 6% of annual water demand.

Water Savings: 50,000 AFY by 2019

Background:

As the City's imported water supply becomes more critical, so does the need to develop local, sustainable water resources. LADWP, in partnership with the Department of Public Works Bureau of Sanitation (BOS), has long worked toward expanding the use of recycled, highly treated wastewater. The BOS is responsible for the City's wastewater treatment. Four plants produce a total of 463 million gallons per day (mgd), or 518,560 AFY, of highly treated wastewater.

Los Angeles has used recycled water since 1979 for irrigation and industrial purposes at locations such as Griffith Park, Mount Sinai and Forest Lawn Memorial Parks. Since the early 1990s, the City of Los Angeles has constructed numerous projects that replace potable water with treated wastewater for irrigation, industrial, seawater barrier, and environmental beneficial purposes. In the San Fernando Valley, the City uses recycled water from the Donald C. Tillman Water Reclamation Plant for golf courses, environmental beneficial reuse to the Los Angeles River, Lake Balboa, the Wildlife Lake, and the Japanese Gardens.

The 6.5-acre Japanese Garden at the Tillman Plant uses approximately 4,500 acre-feet of recycled water per year. In 1991, the Tillman Plant began serving recycled water to the adjacent 11-acre Wildlife Lake. The following year the 27-acre Lake Balboa opened when it was served with recycled water. Approximately 25,750 acre-feet of recycled water pass through these lakes annually. The recycled water from the Japanese Garden and the two lakes flow into the Los Angeles River where the water provides additional environmental benefits. These bodies of water are home to native plants and animals and over 200 bird species, including flocks of migrating geese.

On the Westside, recycled water from the Hyperion Treatment Plant provides irrigation and industrial uses in the City of Los Angeles and surrounding communities through sales to the West Basin Municipal Water District. Recycled water service to Loyola Marymount University was re-established in 2007, while Westchester Golf Course and the Playa Vista development are anticipated to come on-line in 2008.

In the Harbor area, the Terminal Island Water Reclamation Plant supplies recycled water to the Dominguez Gap Seawater Intrusion Barrier to protect drinking water aquifers and to LADWP's Harbor Generating Station for cooling the generators.

In the Los Angeles-Central City, the LA-Glendale Water Reclamation Plant supplies recycled water to Griffith Park, Forest Lawn Memorial Park, Mount Sinai Memorial Park, Universal Studios, and Lakeside Golf Course.

Retail sales of recycled water increased from 2,400 AFY to 4,300 AFY from fiscal years 2005-06 to 2006-07—an 80% increase. Much of the increase was due to the Terminal Island Advanced Wastewater Treatment Facility coming online in February 2006, providing 2,200 AFY of even higher level, advanced treated waste water as a seawater intrusion barrier for the Dominguez Gap Seawater Barrier.

2007-08 Fiscal Year Recycled Water Usage – City of Los Angeles

		Million Gallons per Day			Acre-Feet per Year		
		Sales	Environ-mental	Other	Sales	Environ-mental	Other
Hyperion							
	In-plant Use			7.5			8,400
	West Basin Municipal Water District			36			40,320
	DWP Customers	0.3			350		
Donald C. Tillman							
	In-plant Use			2.2			2,460
	Japanese Gardens		4			4,500	
	Lake Balboa and Wildlife Lake		23			25,750	
	LA River *(Sum of the above)*		27				
	DWP Customers	0.2			150		
Los Angeles-Glendale							
	In-plant Use			0.7			780
	DWP Customers	1.4			1,600		
	City of Glendale Irrigation & Power Plant			1.3			1,450
Terminal Island							
	In-plant Use			0.3			340
	Dominquez Gap Barrier	2.1			2,400		
	TOTALS:	4	27	48	4,500	30,250	53,750

NOTE: Values are approximate

The City of Los Angeles current potable water demand is approximately 670,000 AFY. About 520,000 AFY of wastewater is treated by the Bureau of Sanitation (BOS) four wastewater treatment plants: Hyperion, Donald C. Tillman, Los Angeles-Glendale, and Terminal Island. These wastewater treatment plants provide approximately 90,000 AFY, or 17% of their total output, of recycled water for beneficial uses. These include water sales to LADWP customers to displace the need for potable water (such as for irrigation and industrial uses, and for the Dominquez Gap Seawater Intrusion Barrier); environmental enhancements for lakes, gardens, and other wildlife areas; in-plant operations at the BOS wastewater plants; and regional uses through the West Basin Municipal Water District.

Action Plan:

Develop Recycled Water Master Plan: LADWP and BOS will prepare a detailed Recycled Water Master Plan that will outline the steps and costs of boosting our recycled water level to 6% of total demand for the City. The Master Plan will provide a blueprint for reaching this goal by expanding the existing recycled water pipeline system and using recycled water for groundwater replenishment.

Increase Recycled Water for Irrigation and Industrial Use

LADWP is aggressively working to expand recycled water for nonpotable uses. In fiscal year 2007-08, LADWP expects recycled water sales to increase to about 4,500 AFY. Woodley Golf Course and Loyola Marymount University began recycled water deliveries in October 2007. LADWP's Valley Generating Station and the Balboa, Encino and Westchester Golf Courses are expected to begin recycled water deliveries by July 2008.

LADWP's current Water Recycling Capital Budget provides funding for 21 projects that will increase recycled water deliveries from 4,500 AFY to 19,350 AFY by 2014, adding more than 106,300 feet of new pipe and saving potable water for nearly 31,000 households throughout the City.

Potential customers in future years include several parks (Taylor Yard, Elysian, Branford, Woodley, and Balboa parks); Harbor and Scattergood Generating Stations; Hansen Dam and Van Nuys golf courses; oil refineries in the Harbor area; LAX cooling towers; schools in the Sepulveda Basin, the Los Angeles Zoo, and the Playa Vista development. Under the City's Water/Wastewater Integrated Resources Plan, 30,250 AFY of treated water will continue to be used to support habitat in the Japanese Gardens, Lake Balboa, the Wildlife Lake and the Los Angeles River.

Use Recycled Water for Groundwater Replenishment

Advanced treated recycled water can be sent to spreading basins to percolate underground and become part of the City's groundwater system for later use. This process – also termed groundwater replenishment– is a proven alternative for expanding locally produced, safe, high-quality drinking water. The process has been successfully implemented in Orange County, Australia, and Singapore, and is being considered in other U.S. and worldwide locations.

In 1990, LADWP began developing what was known as the East Valley Water Recycling Project, designed to deliver tertiary treated recycled water from the Donald C. Tillman Water Reclamation Plant for groundwater replenishment in the Hansen Spreading Grounds located in the San Fernando Valley. The full project was never implemented and LADWP focused on using the Tillman Plant and related facilities to deliver recycled water for irrigation and industrial uses, rather than pursuing groundwater replenishment.

The critical water shortage facing Los Angeles today makes it imperative that the City revisit this strategy, understanding that this initiative will require extensive public education, as well as thorough discussion and vetting through a public process. The public acceptance and technological feasibility of Orange

County's groundwater replenishment program demonstrates that this is a viable, long-term water supply solution.

Initiate Stakeholder Planning Process*:* LADWP will engage stakeholders from the Water/Wastewater Integrated Resources Plan (IRP) process in analyzing alternatives necessary for maximizing recycled water. These alternatives include implementing groundwater recharge with advanced treatment in the San Fernando Valley as well as expanding the purple pipe system to supply recycled water for irrigation and industrial uses.

Upgrade Tillman Wastewater Treatment Plant: Groundwater replenishment will require upgrading the Tillman Plant with state-of-the-art, advanced treatment capability similar to the Orange County Water District's recently implemented Groundwater Replenishment System, which has received widespread support. Advanced treatment would be constructed at the Tillman Plant, and the highly treated wastewater would be piped to spreading basins for groundwater recharge.

Pursue All Possible Funding Sources: The City will actively seek all available sources of grant funding to offset costs from expanding its use of recycled water.

Benchmarks:

- Recycled Water Master Plan
    - Develop Scope of Work – Summer 2008
    - Award contract – early 2009
    - Complete Master Plan – Winter 2011
- Stakeholders Planning Process
    - Initiate stakeholder process – February 2009
- Recycled Water Pipeline Installation
    - 2007-08 – 10,400 feet
    - 2008-09 – 10,700 feet
    - 2009-10 – 27,900 feet
    - 2010-11 – 23,300 feet
    - 2011-12 – 22,600 feet
    - 2012-13 – 11,400 feet

  Total 106,300 feet of new pipe by 2013
- New Recycled Water Customers
    - 2007-08 – 6
    - 2008-09 – 8
    - 2009-10 – 1
    - 2010-11 – 10
    - 2011-12 – 2
    - 2012-13 - 10

Total 37 new customers by 2013

- Acre-Feet per Year of Recycled Water
    - 2007-08 – 4,500 AFY
    - 2008-09 – 8,000 AFY
    - 2009-10 – 8,750 AFY
    - 2010-11 – 9,250 AFY
    - 2011-12 – 9,650 AFY
    - 2012-13 – 15,350 AFY
    - 2013-14 – 19.350 AFY
    - 2014-15 – 22,480 AFY

- 2015-16 – 25,610 AFY
- 2016-17 – 28,740 AFY
- 2017-18 – 31,870 AFY
- 2018-19 – 50,000 AFY (15,000 AFY from groundwater replenishment)

Strategy 3: Enhancing Stormwater Capture

Goal: Increase groundwater recharge by retrofitting the Big Tujunga Dam and other large-scale projects through cooperative efforts with the Los Angeles County Flood Control District and other agencies.

Water Captured: Minimum of 20,000 AFY on average

Background:

The San Fernando Groundwater Basin is the City's primary local water source, providing approximately 11% of the total water supply. However, the Basin is experiencing a decline in groundwater levels that threaten its long-term sustainability. One of the key factors impacting the local groundwater supply is increased urbanization over the last several decades. As more and more pavement covers the Earth, urbanization decreases the amount of open land that provides natural groundwater recharge.

To address this situation, LADWP is moving forward with several stormwater capture projects with the goal of increasing long-term groundwater recharge by a minimum of 20,000 AFY. LADWP, in partnership with the Los Angeles County Flood Control District and other agencies, is in various stages of stormwater enhancement planning and projects. The following are the large-scale projects that are expected to be completed or in construction within the next five years:

Big Tujunga Dam – San Fernando Basin Groundwater Enhancement Project: On September 18, 2007, the LADWP Board approved Agreement No. 47717 to provide $9 million to the Los Angeles County Flood Control District for the construction of the Big Tujunga Dam Project – an effort to seismically retrofit the dam, increase its water storage capacity, improve its reliability as a supply source, enhance flood protection measures, and green the environment.

The restoration of the dam is conservatively estimated to result in the additional capture and recharge of 4,500 AFY at the Hansen and Tujunga Spreading Grounds, and more in wet years. The project will make structural improvements to Big Tujunga Dam to restore its historical retention capacity of 6,000 acre-feet; currently the dam is restricted to 1,500 acre-feet of storage capacity.

- Schedule: In construction; scheduled to be completed by December 2010
- Budget: $100 million of which LADWP is providing $9 million
- Resources: Los Angeles County Flood Control District is the project manager
- Potential Water Savings: Capture an additional 4,500 AFY of stormwater on average, up to 10,000 AFY or more in extremely wet years.

Sheldon-Arleta Project – Cesar Chavez Recreation Complex Project Phase I:

On December 19, 2006, the Board of Water and Power Commissioners approved Agreement No. 47448 to provide up to $5.25 million to the City of Los Angeles Department of Public Works for the construction of the project (the total project cost is about $9 million). The project will upgrade the methane gas extraction system and allow increased methane recovery at the Sheldon-Arleta Landfill that is necessary to allow the full use of the adjacent Tujunga Spreading Grounds. Currently, the spreading grounds are restricted to an operating capacity of 50 cubic feet per second (cfs) or 20% of the full operating capacity of 250 cfs.

- Schedule: In construction; scheduled to be completed by late-2008
- Budget: $9 million of which LADWP is providing $5.25 million

- Resources: Los Angeles Department of Public Works is the project manager
- Potential Water Savings: Capture of an additional 6,000 to 10,000 AFY of stormwater

Hansen Spreading Grounds Enhancement Project: LADWP has entered into Agreement No. 47739 to share the costs of the construction of the Hansen Spreading Grounds Project with the District. The project will increase the capacity and efficiency of the spreading grounds by: 1) combining and deepening the existing basins, and 2) installing and building a new rubber dam, intake structure, control house, and upgrading the telemetry system. The Los Angeles County Board of Supervisors approved the agreement on March 11, 2008, and the LADWP Board of Commissioners approved it on April 1, 2008.

The District has completed the design and specifications for the project and is prepared to move forward upon execution of this agreement. Construction is tentatively scheduled to commence in mid-2008 and be completed within 18 months. The project is conservatively estimated to result in the additional capture and recharge of approximately 1,200 AFY at the Hansen Spreading Grounds.

- Schedule: Scheduled to go into construction in summer 2008; completion expected within 18 months
- Budget: Up to $15 million; LADWP is providing up to $7.5 million, with remaining costs covered by the LA County Flood Control District
- Resources: Los Angeles County Flood Control District is the project manager
- Potential Water Savings: Capture of an additional 1,200 to 3,000 AFY of stormwater

Tujunga Spreading Grounds Enhancement Project: This project proposes to deepen the spreading basins, increase their storage capacity, replace the existing diversion structure with two diversion structures, and add remote automation of the operating structures.

- Schedule: Planning and design 2008-09; construction in 2010
- Budget: $1.3 million for design; $24 million for construction (LADWP funded)
- Resources: LADWP will be the project manager
- Potential Water Savings: Capture of an additional 8,000 to 12,000 AFY of stormwater

Pacoima Spreading Grounds Enhancement Project: This project proposes to deepen the spreading basins, increase their storage capacity, replace existing diversion structure, and add remote automation of the operating structures.

- Schedule: Planning and design 2008-09; construction in 2011
- Budget: $1.3 million for design; $20 million for construction (LADWP may provide some funding for this project)
- Resources: Los Angeles County Flood Control District will be the project manager
- Potential Water Savings: Capture of an additional 1,500 to 3,000 AFY of stormwater

Development of Additional Projects: LADWP is a participant in the proposed Sun Valley Neighborhood Retrofit Project led by the Los Angeles and San Gabriel Rivers Watershed Council and TreePeople. The project will enhance an entire block to capture stormwater, reduce flooding and water pollution, and add green space. Additional projects such as this will need to be considered to further enhance the capture of stormwater.

Strategy 4: Accelerate Clean-Up of the San Fernando Groundwater Basin

Goal: Clean up the contaminated San Fernando Groundwater Basin to expand groundwater storage and the ability to fully utilize the City's groundwater supplies

Reduction of Imported Water: Up to 87,000 AFY – LADWP's annual allocation of San Fernando Valley groundwater supplies.

Background:

Groundwater is the primary source of local water supply for the City of Los Angeles, historically providing as much as 107,000 AFY. In the past, groundwater supplied as much as 30% of the City's water supplies during drought years. While local groundwater has historically provided Los Angeles with a high-quality, reliable water supply, existing groundwater contamination in the San Fernando Basin has impacted LADWP's ability to fully utilize this valuable resource.

The primary contaminants of concern include trichloroethylene (TCE), perchloroethylene (PCE), nitrates, perchlorate, hexavalent chromium, and emerging contaminants. To date, over 47% of LADWP's production wells in the San Fernando Basin have been removed from service due to contamination issues. With the discovery of new contamination sites and the migration of existing contaminant plumes, it is expected that more of LADWP's production wells will be curtailed, thereby forcing LADWP to increase dependence on imported supplies.

LADWP is advocating strongly for the United States Environmental Protection Agency (EPA), Los Angeles Regional Water Quality Control Board, and the California Department of Toxic Substances Control to identify and hold the responsible parties accountable for cleaning up the Basin. LADWP is also pursuing a parallel track to explore other administrative or legal remedies available to expedite cleanup, including the pursuit of monetary compensation for water lost due to contamination and the resulting pumping limitations.

Recognizing the urgency and importance of this work, LADWP is working with government and elected officials to expedite the San Fernando Basin groundwater clean-up. This effort will be costly, and could reach $500 million to $1 billion. To fund clean-up activities, LADWP will need to hold polluters accountable, and actively seek state and federal funding.

Action Plan:

Cleaning up the San Fernando Groundwater Basin is a massive undertaking that will transform one of the City's key water sources. The effort will require investment and commitment from across L.A., and the LADWP will work to ensure that this Basin remains a consistent, stable and reliable resource for years to come.

Work with Regulatory Agencies and Governmental Officials: LADWP will continue to encourage the EPA to develop a long-term, comprehensive solution for existing and emerging contamination issues in the Basin. In addition to the EPA, LADWP will work with the Los Angeles Regional Water Quality Control Board and the California Department of Toxic Substances to find and hold polluters accountable for cleaning up the Basin.

Groundwater System Improvement Study (GSIS): LADWP will conduct a comprehensive groundwater study for the Basin. This study is a necessary step to evaluate the groundwater quality in the Basin and recommend treatment options to maximize the utility of the groundwater supply.

- Schedule: Contract award in mid-2008; contract term is 6 years
- Budget: $10 million (LADWP funded)
- Resources: LADWP will serve as contract manager and administrator
- Benefit: Will provide vital information to develop a long-term strategy to remediate groundwater contamination in the San Fernando Basin.

Monitoring Well Drilling Contract: LADWP will install up to 40 new monitoring wells throughout the Basin to provide vital water quality information necessary for the Groundwater System Improvement Study.

- Schedule: Construction contract award in mid-2009; contract term is 2 years

- Budget: $7.5 million (LADWP funded)
- Resources: LADWP will serve as contract manager and administrator
- Benefit: The monitoring wells can be routinely sampled during and after the GSIS to provide vital information on groundwater contaminants and their concentration levels

Interim Wellhead Treatment: LADWP will install interim treatment for select wellheads in the Tujunga Well Field in order to maintain groundwater pumping production. An amount of $3 million has been included in the budget for this work.

Strategy 5: Expanding Groundwater Storage

Goal: Pursue opportunities to expand groundwater storage.

Action Plan:

LADWP is investigating opportunities for increased storage of groundwater, creating a cost-effective, environmentally friendly reserve of water resources in case of extreme drought or other emergencies. Currently, the City has significant amounts of stored groundwater in the San Fernando Basin. However, contamination restricts the ability to effectively utilize this resource. As a result, it is critical for L.A. to invest in a long-term plan for expanding our storage capacity and ensuring a sustainable source for the future.

Explore Opportunities for Groundwater Storage Along the Los Angeles Aqueduct: As part of a proposed study of the impact of climate change on our water system, LADWP will examine opportunities for increased groundwater storage in the Owens Valley and the Antelope Valley. LADWP will also continue to engage in a groundwater rights adjudication process underway in the Antelope Valley.

Pursue Storage Project in Los Angeles County Water Basins: LADWP is investigating a groundwater conjunctive use storage project in the LA County groundwater basins. This project would enable LADWP to store significant amounts of water during periods of drought or emergency.

Los Angeles Aqueduct and California Aqueduct Interconnection: LADWP is planning to construct an interconnection between the Los Angeles Aqueduct and the California Aqueduct, located where the two aqueducts intersect in the Antelope Valley. The interconnection will allow for water transfers or exchanges, and could be used to help move water to facilitate groundwater storage opportunities. The design phase of the interconnection is almost complete. LADWP is waiting for a permit to build on land owned by the State Department of Water Resources (DWR). LADWP plans to begin construction in 2008. Note that this project will also result in net increase in renewable energy production through energy recovery facilities in the Los Angeles Aqueduct system.

Table 11. W1, W2, W3 Implementation Steps

Milestone	Completion Date	Quantity of Measure
See projects discussed above for milestones.		AFY Saved

Measure Evaluation

Reducing per capita water consumption by 20% would provide a significant savings in the electricity usage associated with residential supply services, and reduce associated greenhouse gas emissions. CO2 reductions will be calculated and reported on an annual basis. Future versions of this document will provide emissions reduction estimates from the water reduction milestones in this section.

3.3 Focus Area: Transportation

GOAL: Lower the environmental impact and carbon intensity of transportation

Action No.	Measure	Page
T1	Require 85% of City fleet to be powered by alternative fuels.	69
T2	Convert 100% of City refuse collection trucks and street sweepers to alternative fuels.	72
T3	Convert 100% of Metropolitan Transportation Authority (MTA) buses to alternative fuels.	76
	Convert 100% of City Department of Transportation (DOT) Commuter Express Diesel Buses to Alternative Fuel.	78

GOAL: Focus on mobility for people, not cars

Action No.	Measure	Page
T4	Complete the automated traffic signal synchronization and control system (ATSAC).	80
T5	Expand FlyAway shuttles serving Los Angeles International Airport (LAX) and other regional airports, and convert existing FlyAway buses to alternative fuels.	82
T6	Make transit information easily available, understandable, and translated into multiple languages.	85
T7	Increase the City employee participation in the rideshare program and increase subsidy for use of mass transit.	86
T8	Promote walking and biking to work, within neighborhoods, and to large events and venues.	88
T9	Expand the regional rail network.	

In addition to the above measures, The City will continue to evaluate emerging issues and strategies for reducing GHG emissions relating to transportation and will incorporate findings into future versions of this document. This includes parking and congestion pricing, biodiesel applications, taxi fleets, and other innovative market-based incentives.

GOAL: Lower the environmental impact and carbon intensity of transportation

Action T1	Require 85% of City fleet to be powered by alternative fuels.

To reduce both air pollution and greenhouse gas emissions, City Departments will continue to acquire alternative fuel and advanced technology vehicles to replace those powered by conventional fuels. Mayor Villaraigosa has set an 85% alternative fuel goal for the City's passenger sedan vehicle fleet excluding emergency response vehicles. Since 2000, when the City adopted its Clean Fuel Policy, the City's alternative fuel fleet has grown by an average of over 20% per year.

Lead Agencies
- Department of General Services (GSD)

Other Agencies
- Los Angeles Department of Water & Power (LADWP)
- Los Angeles World Airports (LAWA)
- Port of Los Angeles (POLA)
- Environmental Affairs Department (EAD)

Vehicle ownership and operational control varies on a departmental basis. Operational departments own and operate their own vehicles. The Department of General Services (GSD) procures and maintains vehicles for municipal (Council-controlled or non-proprietary) departments, except the Police and Fire departments. The proprietary departments (POLA, LAWA and LADWP) procure and maintain their own vehicles. The Environmental Affairs Department (EAD) chairs the Interdepartmental Alternative Fuel Taskforce (IAFT), which is a group of fleet managers from all City departments that have fleet vehicles. Through the IAFT, EAD provides technical information, identifies grant opportunities, and assists departments with grant applications for alt fuel vehicle projects. EAD also informs fleet managers as to developing regulatory requirements.

Opportunity

With the advent of alternative fuel and/or advanced technology vehicles, several City departmental fleets have been able to transition away from reliance upon conventionally-fueled vehicles, as described in the following section.

- **Passenger Sedans**: The City's sedan fleet has moved quickly to fuel-efficient vehicles. Based on a December 2007 survey, the City's sedan fleet now includes over 1,330 gasoline-electric hybrid cars, the predominant vehicle type in this fleet in both the municipal and proprietary departments.
- **Airport Vehicles**: The Los Angeles World Airports (LAWA) fleet at Los Angeles International Airport (LAX) is over 70% alternative fuel/advanced technology vehicles, and includes terminal shuttle buses, refuse collection vehicles, street sweepers, sedans, and other vehicle types. The overall airport fleet for all airports (LAX, Ontario, Van Nuys, Palmdale) is 63% alternative fuel/advanced technology vehicles.
- **Port of Los Angeles Vehicles:** Excluding emergency response vehicles, over 68% of the vehicles owned by the Port (POLA; also called the "Harbor Department") operate on CNG, electricity, or hybrid electric technology, including both heavy-duty and passenger vehicles.
- **Department of Water & Power Sedans:** The LADWP passenger sedan fleet numbers 435 vehicles. A total of over 285 sedans or 66% are alternative fuel or hybrid vehicles.

- **Police and Security Bicycle Patrols**: The patrol functions of six City departments (Police, Fire, Transportation, General Services, Recreation and Parks, and Los Angeles World Airports) have replaced approximately 330 conventional patrol vehicles with approximately 500 zero emission patrol bicycles. The bicycles are used by emergency medics, police officers, park rangers, parking enforcement officers, and airport, zoo and general security officers. Interest in bicycles is expanding to other City patrols.

In addition to the special fleets noted above, GSD is working with operational departments to test a new hybrid aerial truck, possibly diesel-electric, that is expected to be available in mid- to late-2008. The Los Angeles Department of Water and Power (LADWP) is also testing three demonstration plug-in hybrid vehicles, which are achieving an estimated maximum of 95 mpg (miles per gallon).

Challenges

There are several challenges associated with replacing conventional vehicles with alternative fuel and advanced technology models:

- Higher cost: The cost differential between a conventional vehicle and alternative fuel model ranges from $3,000 to $90,000 per vehicle, with the exception of heavy duty hybrids, which can have a cost differential of $225,000.
- Limited funds: While desirable, accelerating the routine vehicle replacement schedule of 7-9 years, and/or purchasing cleaner vehicles that exceed air quality standards, strains departmental budgets. The funding needed for the Department of General Services' (GSD) vehicle replacement program is approximately $30 million per year.
- Alternative fuel availability, affordability, and market fluctuations: There are limited supplies of liquefied natural gas fuel, and no local sources, leaving the City vulnerable to market fluctuations and subject to rising fuel transportation costs.
- Siting and development of maintenance facilities and fueling stations: Siting of these facilities within a cost-effective proximity to vehicle storage locations and work areas/routes is a challenge. Use of natural gas fuels requires special, more expensive, fueling stations, as well as substantial modifications to existing indoor maintenance buildings.
- Training: The need for specialized technical training to ensure safety for maintenance and fueling personnel and vehicle operators.
- Biofuels: Although biodiesel (which is derived from biogenic sources) and ethanol are classified as alternative fuels by the US Department of Energy (DOE), the benefits of their use are still being evaluated by California regulatory agencies. The South Coast Air Quality Basin, which encompasses all of the City of Los Angeles, and portions of Los Angeles, Riverside, and San Bernardino counties, and all of Orange County, consistently ranks highest in the nation for ozone levels above the federal health standards. According to state and regional air quality regulators, biofuels may contribute to ozone formation. Therefore, these agencies are extremely cautious with regard to new fuels. It should be noted that the City owns flexible fuel vehicles (primarily sedans) that can run on either gasoline or E85, which is a mixture of 85% ethanol and 15% gasoline. The flexibility of these vehicles will allow the City to respond quickly as these fuels, and associated fuel dispensing equipment, become more readily available and are approved for wide use in this area.

Table 12. T1 Implementation Steps

The following table identifies the vehicle purchase implementation schedules for vehicle types that currently have available alternative fuel/advanced technology models.

Vehicle types approaching 85% in next few years	Overall Fleet Size (on-road vehicles)	% Alternative Fuel/Adv. Technology *	Schedule (Fiscal Year basis)	Vehicles needed to reach 85% goal	Additional Goal
GSD passenger sedans	1,350	78%	85% in 2008/2009	94	100% in FY 2009/2010
LADWP passenger sedans	304	66%	85% in	82	-
All airport vehicles combined	1,034	63%	85% in 2011/2012	228	100% in FY 2015/2016 for LAX (subset of 772 vehicles)
Port non-emergency vehicles	114	68%	85% in 2011/2012	20	-

Measure Evaluation

Progress toward the 85% alternative fuel/advanced technology vehicle goal is tracked for vehicle types for which alternatives exist. As technology and fuel availability advance, new options will be considered for demonstration testing. Overall, the success of this goal can be measured by the number of applicable alternative fuel/advance technology vehicles purchased, and by quantifying the CO2 emissions reduced through the use of these vehicles.

GHGs Reduced

For 2006, tailpipe emission reductions resulting from use of the City's alternative fuel/advanced technology fleet were modeled by the University of California at Riverside in January 2007, and estimated to be 12,400 metric tons of C02. This represents an approximate 5 MT of CO2 reduced per vehicle per year. Using the 5MT C02 reduction per year per vehicle multiplied by the alternative fule vehicles needed to achieve the 85% goals results in the overall emissions reduction estimates below.

Alt fuel vehicles needed to reach 85% targets	424
Average annual MT Co2e reduction per alt fuel fleet vehicle	5
Emissions avoided (MT CO_2/yr)	**2,120**

Action T2	Convert 100% of City refuse collection trucks and street sweepers to alternative fuels.

To reduce the use of conventional diesel fuel, reduce greenhouse gas and toxic air pollutant emissions, the City will continue to acquire solid resource collection vehicles (for refuse and recyclables) and street sweeper vehicles that are fueled by natural gas, an alternative fuel. As of December 2007, there were more than 700 solid resources collection vehicles in the City's Bureau of Sanitation fleet. By the end of Fiscal Year 2007/2008 (July 1, 2008), 309 vehicles (or about 44%) will be alternative fuel vehicles that operate on liquefied natural gas (LNG), or a combination of LNG and a small quantity of ultra-low sulfur diesel (which is used for vehicle ignition). As of December 2007, there were 162 street sweeper vehicles in the City's Bureau of Street Services fleet; 87 of these (or about 54%) will run on compressed natural gas (CNG) by the end of Fiscal Year 2007/2008 (July 1, 2008). In addition, the City's Department of General Services has constructed three large, state-of-the-art natural gas fueling facilities to service these vehicles. A fourth smaller station is located in the harbor area.

Lead Agency	Department of General Services (GSD) Los Angeles Department of Public Works Bureau of Sanitation (BOS) Bureau of Street Services (BOSS)
Other Agencies	Bureau of Engineering (BOE) Environmental Affairs Department (EAD)

GSD constructs, maintains, retrofits, and operates fueling stations and maintenance facilities for most municipal or Council-controlled City departments, including the Bureau of Sanitation (BOS) and the Bureau of Street Services (BOSS). BOS and BOSS own and operate their own vehicles, which are the solid resource collection vehicles and street sweepers, respectively. BOS also finances the construction of fueling stations and provides fueling personnel, while BOE assists with the design and engineering of the stations. The Department of General Services (GSD), BOS, and other departments, partner with the Environmental Affairs Department (EAD) to apply for grant funding to offset the costs of alternative fuel infrastructure development and alternative fuel vehicle purchases. In addition, GSD, BOS, and BOSS work closely with vehicle manufacturers to ensure that new models meet City operational requirements.

Opportunity

Conventional transportation fuel is a major contributing factor to air pollution and greenhouse gases (CO_2). As alternative fuel technology continue to be refined, the City will be able to substantially reduce the air emissions associated with providing the collection and sweeping services to the community.

- **Solid Resource Collection Vehicles**

As of July 1, 2008, the City's Bureau of Sanitation will own and operate 309 refuse collection vehicles (RCVs) that operate on LNG or a combination of LNG and diesel. These are used to collect trash and recyclable materials. According to "Greening Garbage Trucks: Trends in Alternative Fuel Use, 2002-2005," by James S. Cannon of Inform, Inc., the Bureau of Sanitation's fleet, is the largest municipally-owned alernative fuel solid resources collection fleet in the nation.

- **Street Sweepers**

As of July 1, 2007, the City Bureau of Street Services owned and operated 54 street sweepers that are powered by CNG. By June, 2008, this number increased to 87 CNG sweepers, representing 54% of the

current Bureau sweeper fleet. This is among the nation's largest municipally-owned alternative fuel sweeper fleets.

Challenges

Attainment of the 100% alternative fuel goal will depend upon the availability of necessary funding, alternative fuel engines that meet operational requirements, and the needed fueling and maintenance facilities, as well as adequate fuel supply, additional staff (dedicated fuelers, mechanics, and supervisors), and new employee training. LNG fuel supply interruptions have occurred in the past, as current suppliers are few in number and located out of state. GSD and BOS are exploring options for additional sources of LNG supplies; GSD is in the process of forming a working group that would address LNG supply issues.

- For the solid resources collection fleet, three key challenges exist. The first two are the need to construct a LNG fueling station, and upgrade the existing maintenance facility, at the North Central Maintenance Yard, by 2009, to support the conversion of approximately 130 heavy-duty diesel powered vehicles located at this station. Funding for these projects has been allocated. Third, a West Los Angeles alternative fueling station must be established and activated to serve as the base for the last 116 diesel collection vehicles that will be converted to alt fuel. It typically takes 5 to 7 years to establish a fueling station such as this, and another 6 months to complete performance and safety evaluations. BOS is also exploring the possibility of establishing an off-site LNG fueling station for the solid resources collection vehicles of the West Los Angeles District, separate from the existing vehicle garage and maintenance location.
- It is anticipated that 14 diesel street sweepers will not be converted to alternative fuel because of their special work duty requirements. They require mobile tanker re-fueling that cannot, at present, be accomplished with alternative fuel. With the exception of these 14 sweepers, the balance of the sweeper fleet is currently scheduled for conversion by FY 2011/2012, which will result in a street sweeper fleet that is 91% alternative fuel.

Table 13. T2 Implementation Steps

If infrastructure development continues as planned, the street sweeper fleet will achieve a 91% alt fuel rate by 2011/2012. The solid resources collection fleet will convert as many vehicles as possible by the same date. The anticipated vehicle purchase implementation schedule is described in the following table.

Benchmark or Milestone[1]	Completion Date[1]	Quantity of Measure	Total Alt. Fuel Used/Year[4] mm = million gge = gasoline equivalent gallons
Current CNG Street Sweepers	FY 06/07	54 CNG Sweepers	0.23 mm CNG gge
33 more CNG Street Sweepers	FY 07/08	87 CNG Sweepers	0.37 mm CNG gge
15 more CNG Street Sweepers	FY 08/09	102 CNG Sweepers	0.43 mm CNG gge
15 more CNG Street Sweepers	FY 09/10	117 CNG Sweepers	0.50 mm CNG gge
20 more CNG Street Sweepers	FY 10/11	137 CNG Sweepers	0.58 mm CNG gge.
11-25 more CNG Street Sweepers	FY 11/12	148-162 CNG Sweepers[2]	0.69 mm CNG gge (162)
Current LNG SR Collection Vehicles	FY 06/07	294 LNG Collection Vehicles	2.2 mm LNG gallons
15 more LNG SR Collection Vehicles	FY 07/08	309 LNG Collection Vehicles	2.7 mm LNG gallons
96 more LNG SR Collection Vehicles	FY 08/09	405 LNG Collection Vehicles	3.7 mm LNG gallons
80 more LNG SR Collection Vehicles	FY 09/10	485 LNG Collection Vehicle	4.5 mm LNG gallons
109 more LNG SR Collection Vehicles	FY 10/11	594 LNG Collection Vehicle[3]	5.6 mm LNG gallons
110 more LNG SR Collection Vehicle[3]	FY 11/12	704 LNG Collection Vehicles[3]	6.7 mm LNG gallons

Notes:

1. The above schedule is based on information from GSD (in 1/2008) and from BOS (in 3/2008).
2. The last 14 CNG sweeper purchases may not occur due to mobile fueling requirements.
3. Purchase of the last 116 solid resources collection vehicle purchases is dependent upon timely completion of a West LA fueling station. It takes 5-7 years to build a new station, and an additional 6 months to complete a performance and safety evaluation. BOS is also exploring the option to establish an off-site LNG fueling station for its collection vehicles at its West Los Angeles Yard.
4. Based on a December 2006 U.S. Department of Energy, Energy Information Administration (EIA) survey of departments. This included mileages and fuel economies for calendar year 2006 (which were projected into the future, as vehicle numbers increase), and BOS vehicle fuel use estimates, as provided in March 2008. Fuel usage is used to calculate the GHG emission associated with operation of these vehicles. Fuel tank and transfer venting may be another source of emission that can be studied in the future.

Measure Evaluation

The success of this goal can be measured by the number of alternative fuel vehicles purchased, the amount of conventional fuels displaced by alternative fuels, and the reduction in associated greenhouse gas emissions.

GHGs Reduced

In calculating the emissions savings from this action, the City will estimate the total increase in alternative fuel use per year (CNG and LNG). The difference between the metric tons (MT) of carbon dioxide (CO2) associated with displaced fuel (conventional diesel) use and with alternative fuel use is calculated. Only the engine combustion or "tailpipe" emissions were calculated, not the life-cycle emissions associated with alternative fuel transport, storage, and use. The calculations assumed a reduction in fuel economy that is often associated with alternative fuel vehicles.

Table 14. T2 Emission Factors Used

Emission	
Diesel emission factor (kg CO_2/gal)	9.96
LNG emission factor (kg CO_2/gal)	4.37
CNG emission factor (kg CO_2/gge)	6.86

The emission factors above were based on assumed fuel economies of generic heavy-duty diesel vehicles (3 mpg) and CNG/LNG vehicles (2.2 mpg). (RMA, 2007)

Amount of additional LNG to be used in City's refuse collection trucks (gal/yr)	6,700,000
Amount of additional CNG to be used in City's street sweepers (gge/yr)	690,000
Diesel RCV fuel economy (mpg)	2.1
LNG RCV fuel economy (mpg)	1.02
Diesel sweeper fuel economy (mpg)	3.8
CNG sweeper fuel economy (mpgge)	2.99
RCV Diesel to be displaced by LNG (gal/yr)	3,254,000
Sweeper Diesel to be displaced by CNG (gge/yr)	542,921
AFV emissions (MT CO_2/yr)	34,012
Displaced diesel emissions (MT CO_2/yr)	37,820
BOSS sweeper & BOS RCV emissions avoided (MT CO_2/yr)	**3,800**

Action T3-Metro	Convert 100% of Metropolitan Transportation Authority (Metro) buses to alternative fuel.

The Los Angeles County Metropolitan Transportation Authority (Metro) Annual Report for 2007 estimated that a fleet of 2,500 buses would be mostly converted to 100% alternative fuel (alt fuel) by fiscal year 2009/2010. This conversion would reduce conventional fuel consumption and emissions of greenhouse gases (GHG) and other air pollutants. Estimates from the South Coast Air Quality Management District (SCAQMD) indicate that natural gas engines produce less greenhouse gas than conventional diesel engines, and substantially less particulate matter (PM), nitrogen oxides (NOx) and carbon monoxide (CO). For further information on the Metro bus fleet goals, please contact Metro Media Relations at 213-922-2700 or visit www.metro.net.

Lead Agency	Office of the Mayor of Los Angeles (a member of the Metro Board)
Other Agencies	Metro Board Members (elected officials from the Los Angeles County cities of Duarte, Glendale, Long Beach, Los Angeles, and Santa Monica; appointees of the Mayor of Los Angeles, including members of the State Assembly; and all 5 members of the Los Angeles County Board of Supervisors)

The Metro Board is a working group of 13 local officials and private citizens who oversee this unique agency that serves as the regional transportation planner and coordinator, designer, builder, operator, and funding partner for Los Angeles County transit projects. Metro's core mission is to ensure the continuous improvement of an efficient and effective transportation system for Los Angeles County. The City of Los Angeles influences the direction of Metro, as the Mayor will be serving as the Board's Chair for fiscal year 2009, and has 3 board appointees including one Los Angeles City Councilmember.

Opportunity

The transportation sector, through the combustion of transportation fuels, is one of the largest sources of air pollution and greenhouse gas emissions, both locally and statewide. Metro has implemented many environmental firsts for the transit industry. Years ahead of regulation, Metro operates the largest compressed natural gas (i.e., lowest carbon content fossil fuel) bus fleet in North America and the second largest green fleet in the world. With 97% of its bus service now operating on CNG, the Metro fleet is a successful model for other bus fleets operators throughout the region, state and nation. Metro expects to achieve 100% CNG operation in the next 12-24 months.

In terms of its own operations, Metro has installed solar photovoltaic arrays that currently generate over 850 kilowatts of renewable energy. A similar project that will produce one megawatt of renewable energy is currently in construction (the largest in the transit industry). In addition, Metro has incorporated sustainability design elements in the construction and upgrades of various bus divisions, transit oriented developments, administration buildings and for the Metro Orange Line transit/bike/pedestrian parkway.

The Metro Board of Directors recently adopted the 2008 Metro Sustainability Implementation Plan for fiscal year 2009. The plan outlines the four key areas the agency will work on to incorporate sustainable mobility projects, programs and policies to further the agency's environmental leadership and partner with the cities, special districts and key stakeholders in the County:

- *Metro and Countywide Greenhouse Gas Emissions and Climate Change Management* which consists of developing and measuring the agency's GHG emissions footprint, and monitoring, coordinating and providing input into the various local, regional, state and federal organizations developing Climate Change

policy.

- *Energy Sustainability Initiatives* which include energy conservation initiatives; planning, feasibility studies, and installation of additional solar panels at various bus and rail divisions; and exploration of other renewable resources and partnerships with energy providers;

- *Development of Sustainability Design Guidelines* that will be used to incorporate and implement core sustainability elements into Metro design and construction activities for linear projects (i.e., rail, busway, or road related projects);

- *Development and Implementation of Sustainable and Environmental Management Systems* that include the development of a Sustainability Information Management System (SIMS) pilot study for Division 10 and an additional Environmental Management System (EMS) pilot implementation through a Federal Transit Administration assistance program.

Challenges

Metro is making plans to operate CNG buses from all bus operating locations. One division (Division 6 in Venice) cannot accommodate CNG fueling, and Metro is making arrangements to fuel vehicles for this location off-site. Funding is a key challenge, as traditional sources are not keeping up with demand. In order to implement the longer-term strategies, Metro is exploring various options including but not limited to new transportation fees and taxes and public-private partnerships to achieve the long-term climate change objectives.

Table 15. T3 Implementation Steps

Milestone	In-Service Date	Quantity of Measure
Current alternative fuel (alt fuel) bus count	FY 2007/2008	2,500 alt fuel buses
Purchase 260 more alt fuel (CNG) buses*	FY 2008/2009	2,550 alt fuel buses*

*According to a memo dated April 17, 2008, the Metro has executed a contract for the purchase of 260 CNG buses to cover scheduled vehicle replacement requirements by FY 2009/2010. This table assumes a progressive delivery until 2009/2010 to fulfill the Metro goal of 100% alt fuel for their fleet of 2,500 buses. Metro also plans to start retiring some of our oldest first generation CNG buses.

Measure Evaluation

The success of this goal can be measured by the progress made (i.e., number of alt fuel/AT vehicles purchased) toward its 100% alt fuel/AT fleet goal. Additional evaluation measures include the amount of alternative fuel used and grant funds obtained to purchase the buses and for maintenance training or infrastructure.

GHGs Reduced

With detailed information from MTA (number and type of buses, routes, revenue miles, and passenger statistics), the GHG benefits of converting the balance of the MTA bus fleet to alt fuel/AT can be calculated.

Action T3-DOT	Convert 100% City Department of Transportation (DOT) Commuter Express diesel buses to alternative fuel.

Conversion of City buses to alternative fuel will reduce air pollution and greenhouse gas emissions.

Lead Agency Department of Transportation (DOT)

Other Agencies Environmental Affairs Department (EAD)

DOT and EAD are working together to identify funding for the purchase of alternative fuel buses and opportunities to test newer technologies.

Opportunity

The DOT operates several bus transit services that eliminate individual automobile trips, including Commuter Express, Community and Downtown DASH, and CityRide. These services reduce vehicles miles traveled (VMT) by private vehicles, fuel consumption and the associated CO2 emissions, by offering individuals alternatives for both commuting and intra-city trips. All 206 DASH buses have been converted to propane several years ago and 3 of 101 Commuter Express buses have been refurbished to low sulfur diesel and have had diesel particulate traps installed. The CityRide vehicles use ultra-low emission gasoline engines. The primary opportunities include the conversion of all 101 diesel Commuter Express buses to compressed natural gas (CNG) over the next five to six years.

Challenges

The primary challenge is the additional cost associated with the purchase of the alternative fuel vehicles. Thus DOT and EAD will continue to research funding for alternative fueled vehicles.

Table 16. T3-DOT Implementation Steps

Milestone	In-Service Date	Quantity of Measure
2007 CNG Commuter Express Bus fleet.		3 CNG Commuter Express Buses
Convert 17 more Commuter Express Buses from diesel to CNG.	FY 2008/2009	20 CNG Commuter Express Buses
Convert 24 more Commuter Express Buses from diesel to CNG.	FY 2010/2011	44 CNG Commuter Express Buses
Convert 24 more Commuter Express Buses from diesel to CNG.	FY 2011/2012	68 CNG Commuter Express Buses
Convert 33 more Commuter Express Buses from diesel to CNG.	FY 2012/2013	101 CNG Commuter Express Buses

Measure Evaluation

This measure can be evaluated by the reduction in air pollution and greenhouse gas emissions achieved by converting transit buses to CNG and ultra low emission gasoline, and the number of passengers carried annually by each service, which translates into fewer single occupancy vehicles on the road.

GHGs Reduced

Roughly 30 MTCO2e/yr reduction can be expected per bus conversion. If the remaining 97 buses are converted by FY 2012/2013, then an annual GHG reduction of about 2900 MT CO2e/yr can be expected from thereon.

Commuter Express diesel buses to be converted	97
Annual miles accumulated for diesel buses	3,372,600
Gallons diesel used	1,088,000
Miles accumulated for 3 CNG buses	106,449
GGE of CNG used	31,307
CNG fuel economy (mpgge)	3.4
RCV Diesel to be displaced by LNG (gal/yr)	3,672,000
Annual MT Co2e reduction per bus conversion	30
Commuter Express emissions avoided ($MT\ CO_2/yr$)	**2,900**

GOAL: Focus on mobility for people, not cars

Action T4	Complete the automated traffic signal synchronization and control system (ATSAC).

This action reduces vehicle emissions that result from idling at intersections. By reducing vehicle stops, delays and travel time through improved traffic signal timing, vehicles can travel a longer distance at a consistent rate of speed, improving fuel economy. Thus, the ATSAC system results in reduced air pollution and greenhouse gas emissions. Emissions are reduced through decreased incidences of idling, acceleration and incomplete fuel combustion. ATSAC implementation began in June 1984.

Lead Agency Department of Transportation (DOT)

Other Agencies Office of the Mayor

Opportunity

By minimizing vehicle stops and other traffic delays, total travel and idling time and vehicle emissions, including CO2, are reduced. The DOT's Automated Traffic Surveillance and Control (ATSAC) System is a state-of-the-art computer traffic signal system that enhances traffic flow on City streets. ATSAC monitors traffic conditions and adjusts traffic signal timing accordingly; it also recognizes unusual traffic conditions and implements special purpose short-term signal timing changes, and identifies signal equipment malfunctions.

During the first quarter of Fiscal Year 2006/2007 (July-September, 2006), ATSAC had been installed at a total of 3,242 intersections. During the latest count taken during the January to March 2008 quarter, an additional 1,175 intersections are scheduled to be completed.

Challenges

The primary challenge is the cost associated with the installation and maintenance of the system. State funding has been requested and programmed to help complete the planned installations. Each installation project must be approved by the State as it comes up for final State review.

Table 17. T4 Implementation Steps

Map the intersections with ATSAC and identify those still requiring completion.

Milestone	Completion Date
Install ATSAC and ATCS at 58 intersections	March '08
Install ATSAC and ATCS at 636 intersections	June '09
Install ATSAC and ATCS at 481 intersections	June '11

Measure Evaluation:

The near-term opportunity for reducing greenhouse gas emissions is significant. This measure can be evaluated by the reduction in vehicle idling time and the number of intersections with ATSAC.

GHGs Reduced

An ATSAC Evaluation Study conducted in June 1994 provides an estimate of emissions avoided on arterial streets, based on data collected from the speed and delay studies. Average vehicle fuel economies have changed little in California since that time (according to the CECs 2007 Integrated Energy Policy Report). The percentage of alternatively fueled vehicles has increased, but the model did include a 5% year projected decrease in vehicle emissions based on potential technology improvements. Each intersection was estimated to reduce annual CO2 emissions by 229 MT/yr. The City has already completed 3,242 of 4,417 intersections and successful full ATSAC implementation would result in a further annual Community-Wide emissions reduction of 269,075 tons of CO_2. This is a substantial reduction potential, however, there is much uncertainty involved in the estimate.

Total reductions from program implementation (MT CO_2/yr)	1,005,461
Reductions already achieved as of May '07 (MT CO_2/yr)	736,386
Remaining Community-Wide emissions reductions available (MT CO_2/yr)	**269,075**

Action T5	Expand FlyAway shuttles serving Los Angeles International Airport (LAX) and other regional airports, and convert existing FlyAway buses to alternative fuels.

FlyAway shuttles that provide transit service to LAX from several Los Angeles locations reduce the number of private vehicles traveling to the airport. FlyAway stations also provide convenient passenger pick-up and drop-off locations and parking. The first LAX FlyAway shuttle began operating from Van Nuys in 1975. In March 2006, Los Angeles World Airports (LAWA) began offering FlyAway service from Union Station in downtown Los Angeles; service from Westwood, on the UCLA campus, was added in June 2007. In 2006, the Van Nuys and Union Station shuttles tallied over 1 million passengers, the equivalent of eliminating about 2,500 daily vehicle trips and 167 tons of criteria air pollutants. (The Clean Air Act requires EPA to set standards for six air pollutants that are commonly found all over the US. They are particle pollution (or particulate matter—PM), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. These pollutants are harmful to health and cause property damage.)

Lead Agency Los Angeles World Airports (LAWA)

LAWA reviews passenger origin and destination studies to help identify sites where there's high demand for shuttle services. LAWA meets regularly with the Los Angeles County Metropolitan Transit Authority (MTA) and other regional transportation providers to discuss regional transportation needs. For example, LAWA holds regular meeting with UCLA Transportation Services to discuss operational, traffic flow and marketing issues concerning the Westwood FlyAway bus terminal. LAWA is also networking with the Westside Transportation Network to market this service to area community groups and businesses.

Opportunity

Los Angeles's transportation sector contributes about half of all local greenhouse gas (GHG) emissions. Providing additional convenient options to air travelers can decrease the number of vehicle trips to and from LAX, thereby decreasing associated GHG emissions. Since the commencement of the Union Station FlyAway service, LAWA has been studying other potential sites, including locations in Long Beach, Norwalk, El Monte, Anaheim and other areas. In addition, LAWA is investigating the use of alternative fuels, such as CNG, for its buses.

Challenges

The primary challenge associated with expanding this program is funding. When evaluating expansion opportunities, LAWA must optimize operational logistics to ensure long-term viability of the new services. While FlyAway services save travelers money, passenger fees do not cover all service costs. Identifying new locations for the service involve negotiations with landowners, which can be lengthy. The goal is to provide a convenient service at a reasonable cost, for a relatively large number of travelers. Converting FlyAway shuttles to alternative fuel is more difficult than for other bus fleets, because the FlyAway shuttles are “coach” buses with luggage storage areas under the passenger seating which conflicts with the fuel tank location. LAWA is also exploring different bus styles that are reconfigured to provide secured storage luggage compartments and passenger seating in the same area.

Table 18. T5 Implementation Steps

LAWA staff will continue negotiations for possible Long Beach locations and with the identification of additional potential sites in the greater Los Angeles area. These sites will be evaluated for a number of

factors, including cost and availability, local demand for the service, and the potential to reduce total vehicle trips to LAX.

Milestone	Completion Date	Quantity of Measure
Implement 6 additional FlyAway sites.	2015	# of FlyAway passengers or private vehicle trips avoided.

Measure Evaluation

As new FlyAway service is brought on line, the number of shuttle passengers is tracked daily. With passenger statistics, the number of vehicle trips and miles reduced and/or avoided, and GHG emissions reduced, can be calculated. The cost effectiveness of the FlyAway service varies by site, as it is determined by the lease or property purchase amount, cost of any required property improvements, and demand for the service.

GHGs Reduced

Convert existing flyaway buses to CNG

	Union Stn	Westwood	Total
Number of Trips, daily	88	82	170
Distance of each Trip (mi)	19.5	12.3	
Annual route mileage (mi)	626,340	368,139	994,479
Actual miles/yr	642,400	230,461	872,861
Diesel fuel consumption (gal/yr)	116,976	41,904	158,880
Diesel fleet fuel economy (mpg)	5.49	5.50	
Current Diesel fleet size	6	6	12
Diesel buses removed	0	-6	-6
CNG buses added	4	8	12
Annual number of CNG Trips	4,380		
Miles/yr CNG Buses	85,410	368,139	453,549
Diesel gallons displaced	15,552	66,938	82,490
Emissions reduced by displaced diesel (MT CO_2/yr)	158	679	837
Fuel Economy of CNG mid-size buses (mpgge)	5.0	5.0	5.0
CNG fuel projection (gge/yr)	17,082	73,628	90,710
Emissions added by new CNG buses (MT CO_2/yr)	117	505	622
Emissions Reduced (MT CO_2/yr)	**41**	**174**	**215**

Expand flyaway shuttles serving Los Angeles International Airport

Proposed Flyaway Site	Miles/yr[1]	Miles/trip[1]	# of trips	Pass/yr[1]	Gallons/yr[10]
Long Beach	928,195	18	50,445	504,454	539,648
Norwalk	889,505	21	42,357	423,574	517,154
El Monte	391,645	33	11,868	118,680	227,701
El Monte 2	317,915	33	9,634	96,338	184,834
Universal City	373,760	26	14,375	143,754	217,302
Pasadena	368,265	28	13,343	133,429	214,108
Irvine	279,225	42	6,648	66,482	162,340
Total	**3,548,510**		**148,671**	**1,486,711**	**2,063,087**

Total estimated CNG-use (gge/yr)[1]	709,702
Municipal emissions *added* (MT CO_2/yr)[1]	**5,000**
Citywide emissions *reduced* (MT CO_2/yr)	**18,000**

Action T6	**Make transit information easily available, understandable, and translated into multiple languages.**

Lead Agency	Department of Transportation (DOT)
Other Agencies	City of Los Angeles Personnel Department (Personnel); Environmental Affairs Department (EAD)

A DOT partnership with the Personnel Department and EAD will enable DOT to determine in which additional languages transit information should be provided.

Opportunity

Los Angeles traffic is a major source of greenhouse gas emissions. Facilitating access to transit information increases the likelihood of transit use, which can reduce single occupancy vehicle trips and help alleviate traffic congestion, and most importantly, reducing associated greenhouse gas emissions.

Challenges

The primary challenge associated with this goal is funding for the development of brochures, flyers, and revisions to Web sites to disseminate transit information. Translation services will also be required. According to an Arbitron study, 86% of Los Angeles County bus commuters speak English as a first or second language. Spanish is the second most commonly spoken language, and persons of Hispanic/Latino origin or descent account for over half (52%) of riders. Given these facts, system-wide Spanish-language information and signage makes sense. The benefit of providing information in Armenian, Chinese, Korean, Thai, and other languages, in targeted geographic areas, should be evaluated. But providing information in additional languages may not suffice: the Literacy Network of Greater Los Angeles estimates that 1.8 million Los Angeles County adults lack the skills to read street signs. Mexico City's subway offers maps with hieroglyphics, not text, for the illiterate; this type of signage could be useful in Los Angeles as well.

Table 19. T6 Implementation Steps

Determine which types of transit information need to be more widely promoted or disseminated. Determine the benefits (cost-effectiveness, increased ridership) of providing information in additional languages.

Milestone	Completion Date	Quantity of Measure
Task force created to discuss strategies.		New signage; an increase in ridership.

Measure Evaluation

Progress on this measure can be evaluated after the Task Force has been established and implementation milestones have been established.

GHGs Reduced - Potential GHG reductions cannot be quantified at this time.

Action T7	Increase the City employee participation in the Rideshare program and increase subsidy for use of mass transit.

Employee rideshare programs are intended to reduce the number of single-occupant vehicle trips associated with commuting to the workplace. These programs help reduce traffic, as well as reducing the air pollutants from personal vehicles. The City's rideshare program has many components, and provides incentives to those employees who use an alternative method of commuting. The City's main Employee Rideshare Program pays a nontaxable monthly subsidy of up to $50 per month to employees who commute to work via public transit (bus, commuter train or light rail), offers free parking to those who carpool with another City employee, and subsidizes participation in commuter vanpools. The subsidy amount is determined by the Joint Labor Management Committee on Commute Options and Parking and is incorporated into the employee benefits package. The City has encouraged increased participation, resulting in more than a 14% increase over the last two years. In 2008, the City received "Diamond Awards" for its rideshare programs from the local metropolitan transportation authority.

Lead Agency Joint Labor Management Committee on Commute Options and Parking

Other Agencies Personnel Department, City of Los Angeles
Los Angeles World Airports
Los Angeles Department of Water & Power

The City and the Port of Los Angeles share a component of the overall rideshare program. LAWA and LADWP oversee separate components of the program. There are opportunities to partner with the Mayor's Office, City Councilmembers, City union representatives, and the Department of General Services (GSD) to identify methods for increasing funding to the City's main Rideshare Trust Fund, while keeping costs down.

Opportunity

Traffic congestion wastes fuel and time and is a major source of greenhouse gas emissions. The increasing congestion and gasoline costs present opportunities to attract more employees to the Rideshare program. The annual Rideshare survey is one mechanism for determining what types of additional incentives would attract and retain new participants. The Joint Labor-Management Committee on Commute Options and Parking (JLMC-COP) is looking into potential new sources of funding for the City's main program.

Challenges

The main Rideshare program is intended to be self-funding – that is, revenues from City employee parking lots are put into the program to fund the transit subsidies and other incentives. The number of parking spaces available to City employees, and the associated revenue, are both declining. Other challenges include maintaining a cost neutral program while identifying funds to cover an increased transit subsidy and increased program marketing, and sustaining Mayor and Council support. Increases in the vanpool program would require leasing additional vans.

Implementation

The JLMC-COP is considering various ways to increase revenues to the Rideshare Trust Fund to allow additional marketing of existing services and to explore opportunities to increase the transit subsidy and/or add vans to the vanpool program. Some options include increasing the parking fees for City employees, requiring parking fees for employees at Hyperion Treatment Plant and Port locations, and identifying potential public funding opportunities.

Table 20. T7 Implementation Steps

Milestone	Completion Date	Goal
Joint Labor Mgmt Committee negotiates special parking MOU	September 2008	Bring additional revenues to program
Begin implementation of additional revenue programs	Sept-Dec 2008	
Personnel Dept begins additional marketing of rideshare programs & JLMC-COP sets new participation goal	March 2009	
Evaluate increased participation/need for additional measures	Sept 2009	

Measure Evaluation

GHGs Reduced - About 14.6% (or 7,319) of all City employees, including proprietary departments, now participate in the Rideshare program. Using a composite number based on the methodology outlined below, each participant results in a roughly 3 MTCO2 equivalent reduction. Increasing participation by 1% across all categories (about 500 employees), the City could reduce emissions by 1,500 $MTCO_2$ Eq.

Employee Participation (FY 06-07)	
Vanpool	2,264
Carpool	1,247
Transit/Bike/Walk	3,808
Total Participation	7,319
Total Employees	50,000
Participation Rate	14.6%

Methodology

Vehicle fuel consumption for three classes—single-occupancy vehicles (SOVs), vanpools, and carpools—were converted into CO2 (carbon dioxide), N2O (nitrous oxide), and CH4 (methane) emissions, with passenger-vehicle factors provided by EPA 2006. To estimate fuel consumption, vehicle miles traveled (VMT) were estimated for non-participants (SOVs), vanpools, and carpools. Once VMT were estimated, annual fuel consumption was calculated based on assumed fuel efficiency. This estimated fuel consumption was then converted to energy units, then to potential carbon, then to emitted carbon, then to MTCO2 Eq. as outlined above. Vehicle mileage was multiplied by N2O and CH4 emission factors and converted to MTCO2 Eq. to estimate non-CO2 emissions. In selecting the non-CO2 factors, all vehicles were assumed to have air pollution control equipment equivalent to a low emissions rating. Total emissions were then calculated by summing across all gases and all employee groups for each scenario. Increases in public transit usage were assumed to cause no increase in public transit GHG emissions under the assumption that the transit system has existing capacity to handle the additional riders.

Action T8	**Promote walking and biking to work, within neighborhoods, and to large events and venues.**

Agencies City of Los Angeles Personnel Department (Personnel); Department of City Planning (Planning); Environmental Affairs Department (EAD); Mayor's Office; Los Angeles City Council Offices; Library Department (Library); Department of Recreation and Parks (RAP); Community Development Department (CDD); Los Angeles Housing Department (LAHD); Port of Los Angeles (POLA aka "Harbor Department")

A partnership among the offices and departments listed above is crucial for locating funding sources to create an effective outreach campaign targeting Los Angeles residents and businesses.

The Port of Los Angeles (POLA) began the Waterfront Red Car Line (WRCL) to provide safe, reliable, enjoyable, and environmentally friendly transportation for the thousands who visit the San Pedro Waterfront each year. The current 1.5-mile route is now more of a tourist attraction than a commute alternative. But extension of WRCL service into the Wilmington area and to Cabrillo Beach in San Pedro is expected to result in a higher level of utilization as public transportation, reducing single-occupancy local vehicle trips and therefore reducing GHG emissions. As part of the Waterfront Development Project (described below), the Port is currently preparing development plans for the Waterfront Red Car Line to become part of an integrated transportation system for the waterfronts of Wilmington and San Pedro.

Opportunity

Los Angeles traffic is a major source of wasted fuel and time, and short commutes contribute heavily to congestion. With the growing obesity rates, both people and traffic would be better served if more residents walked and biked whenever possible. Promoting these alternate modes of travel will reduce the carbon emissions associated with single occupancy vehicles (SOVs). As described in Action Items LU1 and LU2 in this document, the City is promoting high-density and mixed-use housing close to major transportation arteries. Such developments will also support the advancement of Action Item T8, by improving accessibility for those who wish to walk and bike to work. The Metropolitan Transit Authority (MTA) now offers ticket discounts and other perks to customers who take transit to entertainment venues and events.

Challenges

For bicycling, the underlying challenge is the reduction of barriers to greater utilization of bicycles for both personal transportation and recreation, with particular emphasis on bicycling as a commute option. This requires further development of bicycle riding infrastructure, such as bike lanes, and the improvement of existing infrastructure. An effective outreach campaign, coupled with programs to make bicycling safer, will facilitate achievements in this arena. Funding is the common challenge for all these elements.

Table 21. T8 Implementation Steps

The first task is to identify funding for development of the bike/walk campaign strategy, and then for implementation. Other departments and community groups must be enlisted to provide assistance.

Milestone	Completion Date
Task force created to discuss strategies.	TBD

Successful attainment of this goal will require partnerships with a large number of entertainment and sports event organizers. Capturing accurate and meaningful data may be difficult and could require surveys. The MTA has partnered with major venues to provide ticket discounts for transit users. Typically, baseline information is needed to determine whether the incentive resulted in increased transit use. Entertainment venues will need to capture (or provide) parking statistics to establish baselines prior to implementation of outreach programs. A variety of incentives, financial and other, will likely be required. The City must assure that it qualifies for and receives the maximum amount of state, federal, and private funding for bikeway construction, bikeway maintenance, and bicycle safety education.

Measure Evaluation

The near-term opportunity for reducing greenhouse gas emissions is very difficult to estimate. An increased number of pedestrians and bicyclists on Los Angeles streets, and reduced vehicle miles traveled, will be the primary indicators of success.

GHGs Reduced The potential reduction in GHG emissions cannot be quantified at this time.

3.4 Focus Area: Land Use

GOAL: Create a more livable city

Action No.	Measure	Page
LU1	Promote high-density housing close to major transportation arteries (same as Action Items LU3 and LU6).	91
LU2	Promote and implement transit-oriented development (TOD).	93
LU3	Make available underutilized City land for housing and mixed-use development.	95
LU4	Make available underutilized City land for parks and open space.	95
LU5	Clean up brownfields sites for community economic revitalization projects and open space.	97
LU6	Make available underutilized City land within 1,500 feet of transit for housing and mixed-use development.	95

GOAL: Create a more livable city

Action LU1	Promote high-density housing close to major transportation arteries.

Promoting high-density housing in areas close to transportation arteries is a major component of the City's General Plan. High-density housing more easily helps accommodate the City's growing population and helps relieve traffic congestion, by increasing ridership on public transit. The high-density policy is incorporated in several Elements of the General Plan, including the Framework Element, Land Use Element, which includes the 35 Community Plans, and the Transportation Element. A high-density policy has also been implemented through such citywide ordinances as the Density Bonus Ordinance and Residential Accessory Services (RAS) zone.

Lead Agency	Department of City Planning (Planning)
Other Agencies	Los Angeles Housing Department (LAHD), Community Redevelopment Agency (CRA)

The Department of City Planning (Planning) has worked cooperatively with the Los Angeles Housing Department (LAHD) and the Community Redevelopment Agency (CRA) to develop long-range high-density plans, such as the Housing Element, and ordinances, such as the Density Bonus Ordinance.

Opportunity

The promotion of high-density housing close to transportation arteries is a long-term strategy that integrates land use, housing, transportation, and environmental policies into a city form, and complements and maximizes the region's transit system. High-density housing can meet the housing needs of various social and economic groups equitably. At the same time, it contributes to the preservation of low-density residential neighborhoods that are characteristic of Los Angeles. Many studies have demonstrated the trip reduction benefits of increased housing density.

Challenges

The scarcity of land for development of high-density housing often necessitates the demolition of existing smaller or under-performing structures, which can be controversial. Adjacent communities often voice concerns about potential traffic impacts and population changes that may result from higher density residential structures. These issues must be addressed through outreach and education about the community-wide benefits.

Table 22. LU1 Implementation Steps:

Update the City's Housing Element and integrate land use transportation policies into Community Plans that are under revision. Adopt citywide Density Bonus Ordinance that provides additional incentives for the development of affordable housing close to major transportation arteries.

Milestone	Completion Date	Quantity of Measure
Update Housing Element.	July 2008	# of units developed under the ordinance.
Adopt citywide Density Bonus Ordinance.	December 2008	

This strategy will help reduce vehicles miles traveled and the associated CO2 emissions, and improve quality of life. Successful implementation will require enforcement of the appropriate elements of the General Plan (Framework, Land Use, and Transportation elements), as well as education and outreach about the Density Bonus Ordinance and Residential Accessory Services (RAS) zone to contractors, traditional and non-profit housing developers, regional governments, and employers.

Measure Evaluation

Anticipated increases in transit ridership can be translated into reduced or avoided single occupancy vehicle miles traveled (VMT), and reductions in greenhouse gas emissions can be extrapolated from that.

GHGs Reduced Potential reductions in GHG emissions resulting from this item cannot be calculated at this time.

Action LU2	Promote and implement transit-oriented development.

Transit-oriented development (TOD) is a land use strategy to accommodate new growth efficiently, strengthen neighborhoods, and expand choices and opportunity by capitalizing on transportation assets to stimulate vibrant, compact, diverse, accessible, and sustainable neighborhoods.

Lead Agency Department of City Planning (Planning)

Other Agencies Los Angeles County Metropolitan Transit Authority (Metro); Department of Transportation (DOT); Community Redevelopment Agency (CRA)

TOD development requires collaboration by numerous public and private sectors. Planning's institutional partners include the Metro, CRA, DOT, the Los Angeles Department of Public Works (LADPW), and the Department of Building and Safety (DBS). Chambers of commerce, the development community, and residents and their representatives on the Certified Neighborhood Councils are also essential to successful implementation of TODs.

Opportunity

Transit Oriented Districts (TODs) represent opportunities for creating cohesive, vibrant, walkable communities where fragmented, auto-dependent corridors now exist. TODs are a positive alternative to low-density traditional land use patterns that typically segregate housing, jobs and neighborhood services from one another. In contrast, TODs cluster these community elements in close proximity, so a greater portion of trips can be made by transit, bike, or on foot. Metro is developing two initiatives that will expand our current partnerships around TODs; the Sustainable Mobility Corridors policy and Sustainable Mobility Transit Boulevards. The objective of the Sustainable Mobility Corridors is to optimize transportation services to increase throughput and safety, while reducing energy, VMT and emissions. The Sustainable Mobility Transit Boulevards will encourage the development of transit-supportive land uses, smart parking and high quality road design standards.

Challenges

The main challenge to the successful implementation of the TOD strategy is community acceptance. TOD plans involve zone changes and intensification of development in areas served by rail and fixed route transit. Educating the general public about the principles of TOD, potential benefits, appropriate applications, and short-term impacts, is critical to successful implementation.

Table 23. LU2 Implementation Steps

After securing local transit funds, Planning hired two consultant teams to produce TOD plans and market studies for seven rail stations that are part of the Metropolitan Transit Authority's (MTA's) planned Gold Line Eastside Extension and the new Exposition Light Rail Line. Upon completion of the studies, station area plans will be incorporated into the New Community Plan Revision Program. Other implementation tools include Specific Plans and zoning changes.

Milestone	Completion Date	Quantity of Measure
Finalize consultants' contracts.	3/2008	Station area plans
Conduct public outreach including workshops.	9/2008	
Approve station area plans.	3/2009	

Transit-Oriented Districts (TODs) will help reduce vehicles miles traveled (VMTs) and associated greenhouse gas (GHG) emissions, and improve quality of life. Successful implementation will require enforcement of the appropriate elements of the General Plan, including the Framework, Land Use, and Transportation elements. Success is also dependent upon education/outreach about the Density Bonus Ordinance and Residential Accessory Services (RAS) zone to contractors, traditional and non-profit housing developers, regional governments, and employers.

Measure Evaluation

Greater livability is the primary benefit of a TOD. Anticipated increases in transit ridership can be translated into reductions in vehicle miles traveled, and reductions in greenhouse gas emissions can be extrapolated from that. Many studies demonstrate the trip reduction benefits of increased density.

GHG Reductions

Potential reductions in GHG emissions resulting from this item cannot be calculated at this time.

Action LU3	**Make available underutilized City land for housing and mixed-use development.**
Action LU4	**Make available underutilized City land for parks and open space.**
Action LU6	**Make available underutilized City land within 1500 feet of transit for housing and mixed-use development.**

In addition to the City buildings and facilities that could be evaluated for their potential as housing or mixed-use developments, there are about 500 City-owned parcels totaling approximately 11 million square feet, that are vacant or could be declared "surplus" properties and used to accommodate the housing and open space needs of the City's growing population.

Lead Agency Department of City Planning (Planning); General Services Department (GSD); Los Angeles Department of Public Works (LADPW); Los Angeles Housing Department (LAHD): Department of Recreation and Parks (RAP); Library Department (Library); Department of Transportation (DOT)

Other Agencies Port of Los Angeles (POLA; aka "Harbor Department")

This proposal would require a highly synchronized and collaborative interdepartmental effort. In addition, site-specific projects will require the participation of numerous stakeholders, including local homeowner groups, Neighborhood Councils, business associations, and other entities. The Bureau of Engineering (BOE) of the Los Angeles Department of Public Works (LADPW) has assessed specific sites and prepared remedial action plans to bring the sites to residential or recreational standards.

The Port's waterfront redevelopment projects in San Pedro and Wilmington total over 500 acres. The projects focus on infrastructure improvements, expansion of the Port's existing cruise program, the creation of open space, and enhanced public access to the waterfront via pedestrian linkages and extension of the Waterfront Red Car Line. Approximately 77 acres will extend the California Coastal Trail, create an integrated system of passive and active open spaces, event spaces, paths, and promenades that offer recreational opportunities and also connect the community to the waterfront.

Opportunity

The City can leverage the value of its real estate assets, whether developed and unimproved lands, to further Smart Growth policies such as improving access to transportation, strengthening job/housing linkages, reducing vehicle trips, providing non-traditional open space such as linear networks, and parkland that is built upon freeway covers.

Parks and green space enhance the quality of life and reduce the environmental impact of our built environment. The City has a database of all property that it owns; the departments of City Planning (Planning) and Recreation and Parks (RAP) can evaluate all vacant property for its potential as parks or open space. If now-vacant land is planted with trees, there will be some greenhouse gas (GHG) reduction benefit, with the greatest benefit to be realized after the trees reach maturity.

Challenges

Identifying public priorities and coordinating the financing for the development of vacant or underutilized properties are the most significant challenges.

Table 24. LU3/LU4/LU6 Implementation Steps

Develop a methodology to evaluate publicly owned land that can be used by community planners when drafting new plans, and include financial analysis tools. Establish a fund to develop City owned properties.

Milestone	Completion Date	Quantity of Measure
Establish City working group to identify and evaluate publicly owned land.	6/2008	# of residential units developed at transit stations; square feet of park and open space developed.
Prioritize opportunities to transform underutilized City land.	12/2008	
Develop one to three City properties.	12/2010	

Measure Evaluation

GHGs Reduced The potential reduction in GHG emissions cannot be quantified at this time.

Action LU5	**Clean up brownfields sites for community economic revitalization projects and open space.**

The Los Angeles Brownfields Program will remove environmental barriers to development at 25 or more underutilized properties, by 2009. For additional information about the Program, please refer to www.lacity.org/ead/labf.

Lead Agency	Environmental Affairs Department (EAD)
	Community Redevelopment Agency (CRA)
Other Agencies	Los Angeles Community Development Department (CDD); Mayor's Office; Department of City Planning (Planning); Department of Recreation and Parks (RAP); Bureau of Engineering (BOE) of the Los Angeles Department of Public Works (LADPW); Port of Los Angeles (POLA; also called "Harbor Department")

The Los Angeles Brownfields Program is a well-established partnership of City departments including the Mayor's Office, Environmental Affairs Department (EAD); Community Redevelopment Agency (CRA); Los Angeles Community Development Department (CDD); and the Office of the Chief Legislative Analyst (CLA). Other departments such as Recreation and Parks RAP), the Bureau of Engineering (BOE), the City Attorney, and City Planning are involvedd on a site-specific basis. The Program has also partnered with outside organizations such as U.S. EPA, CalEPA, and local community-based organizations (CBOs).

Brownfield remediation will occur at several locations in San Pedro, including a Superfund site that will be converted into a park, and the Westways tank farm, which will be remediated for future institutional or commercial uses, such as a maritime research center. In Wilmington, two large oil storage tanks will be removed and the property remediated to prepare for use as a future park. Vegetation and trees will be planted when these sites are converted for recreational uses; plants sequester or remove carbon dioxide from the atmosphere.

Opportunity

Brownfields are a tremendous resource—open space in the urban core—available for redevelopment as projects, many of which confer public benefits. Each brownfield site that is successfully redeveloped can result in improved utilization of existing infrastructure, such as transit, and a concomitant decrease in vehicle trips. Brownfields can also be turned into urban parks, thereby expanding our urban forest.

Challenges

Environmental concerns can be a barrier to brownfields redevelopment, although the perception of risk (about previous site uses) may not reflect the actual risk. It can also be difficult to identify brownfields, as some have transient uses and businesses. If the desired end use of an existing brownfield is open/green space, obtaining funding for the additional cleanup that is required, and for acquisition, development, and operating costs, can be difficult.

Table 25. LU5 Implementation Steps

The Brownfields Program has a caseload of about 50 active projects and recently completed an inventory of 200 vacant lots in the Empowerment Zone, Enterprise Zones, and Renewal Community areas. This inventory provides the screening level environmental information necessary for assessing potential development opportunities. The Program will continue to assist its caseload sites in the removal of brownfield barriers and will distribute the inventory to property development interests. All sites will also receive sustainable development assistance.

Milestone	Completion Date	Quantity o f Measure
Distribute lot inventory	2/2008	number of acres developed or used as open space.
Create long-term plan	8/2008	
Remove brownfields barriers at 20 small sites	8/2009	
Remove brownfields barriers at 5 large sites	8/2009	
Enable park development at 5 sites	8/2009	

To dissuade sprawl and the associated traffic congestion and GHG emissions, the City should encourage in-fill whenever possible. With the surge in downtown residential development and the resulting loss of some area light-manufacturing enterprises, prioritizing the revitalization of brownfields is critical. The City has a database of all property that it owns; coordination among City and regional economic development organizations, combined with anti-sprawl incentives, can facilitate in-fill development.

Measure Evaluation

This measure will be difficult to evaluate in terms of GHG emissions. It is hoped that in-fill development will reduce vehicle miles traveled, and/or increase transit use. For brownfields that are used as open spaces, the GHG estimates are more straightforward, as the carbon sequestration that occurs from tree planting can be quantified. In general, the revitalization of brownfields sites will not be a major source of GHG reductions, but there are important, concurrent environmental and community benefits.

GHGs Reduced Cannot be quantified at this time.

3.5 Focus Area: Waste

Goal: Shift from waste disposal to resource recovery

Action No.	Measure	Page
Action WsT1	Reduce or recycle 70% of trash by 2015.	100

In addition to the above measures, The City will continue to evaluate emerging issues and strategies for reducing GHG emissions relating to transportation and will incorporate findings into future versions of this document. This includes conversion technology facilities and innovative market-based incentives.

Goal: Shift from waste disposal to resource recovery

Action WsT1	Reduce or recycle 70% of trash by 2015.

Assembly Bill (AB) 939, the California Integrated Management Act of 1989, mandated that cities, counties, and other agencies achieve a 50% solid waste diversion rate by 2000. Many California jurisdictions launched recycling programs in response to AB 939, but the City of Los Angeles had established its source reduction and recycling office prior to passage of AB 939.

The City has already achieved a 62% diversion rate (also called the *recycling rate*) through an extensive array of source reduction, buy-recycled, reuse, and collection programs, activities, policies, and technical assistance that are provided by the Bureau of Sanitation (BOS) of the Los Angeles Department of Public Works (LADPW) to business, industry, institutions, and single-family and multi-family dwellings.

Lead Agency Bureau of Sanitation (BOS) of the Department of Public Works (LADPW)

Other Agencies General Services Department (GSD), Environmental Affairs Department (EAD)

The LAUSD, business owners and managers, retail stores and chains, residents, apartment building owners and managers are all stakeholders in the Solid Waste Integrated Resources Plan process.

Current BOS collection programs include: residential and multi-family curbside collection for commingled recyclable materials; separated yard trimmings collection (for single family and some multi-family dwellings); free special collections (of bulky items, appliances, horse manure, bulky brush, weekend cleanups upon City Council request, and dead animal collection); used oil recycling centers; mobile household hazardous waste collection events; Christmas tree recycling; SAFE Collection Centers (for solvents, automotive products, flammables, and electronics); City Facilities collection program (see description below); retailer partnerships for the collection and recycling of batteries and other universal waste; construction and demolition (C&D) recycling program.

Related activities and programs include the backyard composting program; Green Yard trimming processing/mulching facilities (including the Griffith Park Composting Facility); mulch/compost giveaways; restaurant food waste recycling program; recycled-content construction product incentives program; business waste assessments and technical recycling assistance; Los Angeles Unified School District (LAUSD) recycling program (326 schools are now participating); and the Recycling Ambassador Program. Please see the BOS Web site at www.lacity.org/san for additional information about recycling and waste reduction programs.

The City Facilities Recycling Program (CFRP), operated by the Department of General Services (GSD), provides recycling services to an estimated 400 buildings. These encompass City-owned and leased locations, including libraries, police stations, fire stations, and most recently, City-managed construction sites. Fifteen of the sites are high-rise buildings. The CFRP collects and recycles books, confidential materials (from the Los Angeles Police Department, LAPD), cardboard, E-waste, eyewear (which is donated to Lion's Club), GAPS (glass, aluminum, plastics, steel), greeting cards (which are donated to Los Angeles Children's Museum), mixed paper, newspaper/magazines, rechargeable batteries (RBRC Program), white paper, and toner cartridges. CFRP also manages the CitiMAX Re-Use Program, which posts listings of available and wanted items and materials, to encourage re-use by City employees. In calendar year 2006, CFRP collected 2,081 tons of materials (mixed paper, 971 tons; E-waste, 286 tons; corrugated cardboard, 226 tons; white paper, 161 tons; burn box (confidential materials), 135 tons; newspaper, 130 tons; books, 93 tons; G.A.P.S., 60 tons; toner cartridges, 11 tons; rechargeable

batteries, 8 tons; greeting cards, .07 tons; eyewear, .005 tons). With litter reduction funding (SB332), CFRP offers free recycling at more than 200 special events each year (note: effective July 1, 2008, the CFRP will be operated by the BOS).

Opportunities

- RENEW LA, which was adopted by the City Council as the City's overarching waste management policy, established the goal of expanding the Multi-Family Recycling Program to 50% of the City's multi-family units by 2010.
- BOS was tasked with developing an aggressive outreach program to educate residents about how and what to recycle, and initiating an organic waste recycling pilot program.
- Source reduction and recycling programs not only conserve natural resources and landfill space, but also confer climate benefits.
- Manufacturing products from recyclables rather than virgin materials requires less energy and water.
- Methane is generated by the decomposition of materials in landfills. Although methane emissions are not yet quantified by the City, methane is a potent GHG that traps heat in the atmosphere at least 21 times as effectively as CO2.
- Landfill gas-to-energy systems are in operation at two of City-owned landfills (Toyon and Lopez Canyon). Additionally, the Los Angeles Department of Water and Power (LADWP) installed microturbines at Lopez Canyon in 2001; the turbines use landfill gas to generate electricity.

Challenges

Many challenges exist in meeting the overall goal. Budget limitations, the need for further public education and technical expertise, citing of facilities, and policy/regulatory barriers, all present certain challenges that the City must overcome. These will be further addressed in an annual review process.

Implementation Steps

In FY 2007/2008 and 2008/2009, the Bureau of Sanitation plans to:

- Expand the Bureau's successful Solvent, Automotive, Flammables, & Electronics (SAFE) Collection Center Program from six to eight permanent collection centers.
- Expand the Citywide program for multifamily recycling to households that are served by private waste haulers, and couple the expansion with a public education and outreach campaign.
- Expand recycling awareness and participation by the commercial and industrial sectors with an Annual Business and Environmental Forum showcasing recycled products and waste reduction/ recycling activities. The Forum will also host a Business and Environment awards ceremony recognizing businesses demonstrating environmental stewardship.
- Continue the expansion of the citywide program for the recycling of food and organic waste from Los Angeles restaurants, based on availability of funding, and recruit at least 425 restaurants to participate in the program by June 2008.
- Extend the Construction and Demolition (C&D) debris recycling policy to all private sector construction and demolition projects.

- In cooperation with the Los Angeles Unified School District (LAUSD), provide Blue Bin recycling and environmental awareness presentations to all LAUSD schools.
- Continue to develop partnerships with retail stores, nonprofits and other City departments, such as LADWP, to collect from City residents, free of charge, items such as alkaline batteries, SHARPS, fluorescent tubes, and expired medications.
- Partner in the Mayor's Million Tree Los Angeles Program by supplying mulch to residents for tree planting, and also provide those residents with home composting training and at-cost home composting units.
- Identify specific routes within the City where there is low recycling participation or high contamination levels in the blue and green bins. The routes will be visited by Recycling Ambassadors who will inspect and analyze the three curbside bins (including the refuse or trash bin) to identify possible contamination and/or improper bin usage. The Ambassadors will educate the residents about the importance of recycling and proper bin usage
- Evaluate and implement the residential food waste pilot program to assist in increasing solid waste diversion from landfills
- Identify municipal solid waste (MSW) processing technologies for implementation in 2010 that will increase landfill diversion in an environmentally sound manner and generate renewable energy, with an emphasis on options that are energy efficient, socially acceptable, and economical. The alternative technologies under consideration include advanced thermal recycling, pyrolysis/gasification anaerobic digestion, MSW composting, autoclaving, fermentation, among others. The Phase I Study was completed in 2005 and the report is available at http://www.lacity.org/san/alternativetechnologies.
- Develop and implement the Solid Waste Integrated Resources Plan (SWIRP) through a consensus building process with the community and stakeholders. SWIRP is a waste reduction strategy that will be implemented through the year 2025.
- BOS has already exceeded the milestone of making at least 335 presentations promoting recycling activities to approximately 9,150 students in FY 07-08. Through November 2007, BOS has made 425 presentations to LAUSD schools about the LAUSD Blue Bin recycling program. BOS is currently increasing its milestones to reflect its successful recruitment and outreach efforts.
- Increase solid waste recycling awareness in the commercial sector (on-going).

Table 26. WsT1 Implementation Steps

Milestone	Completion Date	Quantity of Measure
62% diversion rate.	2005	Tons disposed
Conduct at least 290 business waste assessments.	June 2008	
Implement recycling for at least 125,000 multi-family households. (As of November 2007, this program had been expanded to more than 150,000 multifamily units.)	June 2008	
Recruit at least 305 schools to participate in the LAUSD School recycling program. (As of November 2007, 326 LAUSD schools were already participating in blue bin recycling program.)	June 2008	
Implementation of Citywide Multifamily Recycling Program.	2008	
Develop a centralized data system to track the recycling activities in the City in order to meet the City's legal requirements.	FY 2007-2008	
Implementation of alternative technology facility to process post source-separated municipal solid waste for renewable energy generation.	2010	
Recycle 70% of trash.	2015	
Zero waste.	2030	

Measure Evaluation

The City's progress toward accomplishment of Zero Waste will be measured at the 2015/70% diversion mark. Future versions of this report will provide emissions reductions estimates.

3.6 Focus Area: Open Space and Greening

GOAL: Unpave paradise / Create new paradises

Action No.	Measure	Page
OS/G1	Create 35 new parks.	105
OS/G2	Revitalize the Los Angeles River to create open space opportunities along the 32-mile corridor within the City of Los Angeles.	107
OS/G3	Plant 1 million trees throughout Los Angeles.	110
OS/G4	Identify opportunities to "daylight" streams.	115
OS/G5	Identify and develop promising locations for stormwater infiltration to recharge groundwater aquifers.	117
OS/G6	Collaborate and partner with schools to create more parks in neighborhoods.	105

In addition to the above measures, The City will continue to evaluate emerging issues and strategies for reducing GHG emissions relating to open space and greening and will incorporate findings into future versions of this document. This includes low impact development measures, additional community partnerships and innovative market-based incentives.

GOAL: Unpave paradise / Create new paradises

Action OS/G1 & OS/G6	Create 35 new parks or joint-use sites by 2010.

Los Angeles has lost many of the green spaces that historically provided Angelenos with recreational opportunities. Parks and their trees, shrubs and other vegetation help mitigate climate change impacts by absorbing CO2 and releasing oxygen into the atmosphere.

As envisioned by the Mayor, a plan released in the Fall of 2006 calls for the Department of Recreation and Parks (RAP) to provide recreational access through 35 new parks or joint-use sites within the next five years. One goal calls for the identification of at least 50% of the new park sites in high priority areas, to allow for an equitable distribution of recreational opportunities to all Angelenos. RAP responded by creating an implementation plan for site acquisition, planning and development, as well as a tracking system. The Plan's first step was accomplished when the Mayor directed all City departments to conduct an inventory of their land assets and report back about open space opportunities within their purview.

Lead Agency	Department of Recreation and Parks (RAP)
Other Agencies	General Services Department (GSD); Los Angeles Department of Water and Power (LADWP); Community Redevelopment Agency (CRA); and other landowners

There are significant opportunities for partnerships with City Departments that own surplus property that is suitable for transfer to RAP for park development. GSD has reported on its available parcels. There are also significant park and open space funding opportunities, which are described in detail in the Environmental Issues report that was presented to City Council on October 7, 2007. Funding sources that have been approved for parkland acquisition include Proposition 84, Proposition 40, Quimby, and Community Development Block Grant funding. RAP is also pursuing partnerships with non-profits and state and federal agencies to develop alternative funding sources for open space.

Opportunity

The benefits of this measure include increased green, open and recreational spaces, which will help create a healthier environment: vegetation absorbs CO2 and releases oxygen, and the new parks will also help improve air quality, as vegetation and trees filter and absorb particulate matter. Vehicle miles traveled may also be reduced, as some Angelenos will now have access to parks that are closer to their homes.

Challenges

The City needs to prioritize which areas it will target for open space development, given that funds are limited. An analysis of key community demographics, existing parks and recreational facilities, park land, and open space will be conducted in order to develop guidelines for establishing high priority areas where new parks would make the greatest impact. Other challenges include the continual change in priority listing for potential sites, and any environmental constraints associated with potential park sites. RAP is working with the Mayor's office to pursue several policy options that would increase the amount of open space in Los Angeles on a long-term basis. RAP is also working with City Council members to ensure the equitable distribution of parks across Council Districts.

Table 27. OS/G1 & OS/G6 Implementation Steps

RAP will create approximately 7 new parks per year, for a total of 35 parks by the year 2010. Currently, RAP is exceeding those goals. [NOTE: Individual park listings cannot be provided at this time, as prioritization study is still underway.

Milestone	Completion Date	Quantity of Measure
Property acquired/transferred.		Number of parks and acres
Park opened to public	2010	
Measurement and verification		

Measure Evaluation

The quantity of carbon sequestered in trees depends greatly on the tree species, the size of the trees at planting, tree mortality, and the timeframe. Carbon sequestration increases as the trees mature.

GHGs Reduced The GHG benefits cannot be quantified at this time.

Action OS/G2	Revitalize the Los Angeles River to create open space opportunities along the 32-mile corridor within the City of Los Angeles

The Los Angeles River flows for 51 miles through some the most diverse communities in Southern California, 32 miles of that stretching across the City of Los Angeles, from Canoga Park to Boyle Heights. The Los Angeles River Revitalization Master Plan (LARRMP), adopted by the City Council on May 9, 2007, intends to create an extensive "emerald necklace" of parks, trails, and bike paths through the heart of Los Angeles. The LARRMP recommends more than 240 projects, to be financed by federal, state, and local sources, over the next 20 to 50 years. The LARRMP was funded and produced by the Los Angeles Department of Water and Power (LADWP) and the Bureau of Engineering (BOE) of the Los Angeles Department of Public Works (LADPW), respectively, over a period of 20 months and at a cost $3 million.

The primary goal of the LARRMP is to revitalize the River by restoring some of its ecological functions. Where feasible, projects will enhance the creation and protection of habitat, floodwater retention, groundwater recharge, water quality, and other natural processes.

To oversee implementation of this massive effort, the Los Angeles City Council's Ad Hoc River Committee was established in June 2002. For further information, please refer to www.lariver.org.

Lead Agency	Bureau of Engineering (BOE) of the Los Angeles Department of Public Works (LADPW)
Other Agencies	Department of Recreation and Parks (RAP); Bureau of Sanitation (BOS) of the Los Angeles Department of Public Works (LADPW); Los Angeles Department of Water and Power (LADWP); Department of City Planning (Planning); and the Community Redevelopment Agency (CRA)

The LARRMP recommended the establishment of 3 new governance entities: (1) the River Authority, a cooperative agreement between the City and Los Angeles County for the River right-of-way, with the Army Corps of Engineers participating by means of a Memorandum of Understanding (MOU); (2) the River Foundation, a nonprofit organization tasked with raising funds to support the ongoing revitalization of the River; and (3) the River Revitalization Corporation, a nonprofit, nongovernmental organization tasked with implementing the LARRMP through land development and project management. The key City stakeholders include the Mayor's Office, the City Council Offices, BOE, CRA, Planning, and RAP.

Opportunities

The many benefits of this program include the expansion of green and open spaces within the City, the creation of additional native riparian habitats within the River corridor, connections with other habitat and species corridors outside the River area—to the Santa Monica and Verdugo Mountains, increased recreational space, which facilitates exercise and public health, and enhanced regional environmental educational opportunities.

River projects also support sustainability goals through their incorporation of stormwater management, groundwater recharge, and water conservation programs, and multi-benefit land uses. Newly-created parks and their trees and shrubs help clean the air by filtering air pollutants. They also aid climate protection efforts by absorbing or sequestering CO2 and releasing oxygen into the atmosphere. And the reduction in impervious surfaces that will be achieved through green space expansion will not only improve water quality, but enhance water infiltration, which can increase water supply and support the growth of vegetation. Collectively, all these elements will reduce the urban heat island effect.

Creation of the 32-mile River bikeway and transit-oriented development, in conjunction with implementation of the Plan-recommended River Improvement Overlay (RIO) district, is expected to increase opportunities for nonmotorized commuting. This would mean fewer cars on the nearby roadways and a commensurate reduction in automobile-generated greenhouse gases.

Challenges

The LARRMP is one of the largest projects the City has ever undertaken. The City has high hopes, but is aware of the immense challenges, including funding and implementation of the Plan's recommended three-tiered governance structure. Existing infrastructure near the River, such as highways and rail lines, may have to be relocated. Rapid private development of properties in or near the River corridor may limit opportunities for the public acquisition of these lands for open space use. The LARRMP has identified multiple high priority areas and projects where early funding resources can be focused to make the greatest impact.

Implementation Steps

Next steps include finalizing the establishment of the 3 new governance entities, which will involve determining the entities' leadership, functional and jurisdictional boundaries, powers, authority, influence, staffing, and financing.

- In June 2007, $25 million in Proposition O funds were approved for acquisition of the Taylor Yard G-2 site.
- In July 2007, the City Council endorsed a short-list of 13 priority River projects.
- In July 2007, $1.9 million was awarded to the West Valley Bikeway Project from the Proposition 50, "California River Parkways Program."
- In August 2007, the City partnered with the Mountains Recreation and Conservation Authority (MRCA) to submit a grant application for the Proposition 12 "Los Angeles River Parkways Program" for the Elysian Valley Bikeway Project. In early November, MRCA was awarded $536,519.
- In October 2007, the City submitted 3 grant applications for the next round of Proposition 50 funding for the Canoga Park Greenway, Los Angeles River Greenway Phase II, and North Atwater Park projects—an approximate total of $5 million. The City is also supporting the Trust for Public Land's application for $2.5 million of Proposition 50 land acquisition funds for the Taylor Yard G-2 site.
- In November 2007, the City submitted a $500,000 grant application to the State's A.B. 471 Environmental Enhancement and Mitigation program for the park portion of the Sunnynook River Park project.

Table 28. OS/G2 Implementation Steps

Milestone	Completion Date	Quantity of Measure
$1.9 million in Proposition 50 funding received.	July 2007	Acres of parks and green space added
AB 471 funding received.		
Bikeway projects completed.		
Taylor Yard G2 parcel completed.		
Other green spaces created.		
RIO implemented.		

Measure Evaluation

This is a long-term measure offering the significant benefits of expanded green and community space in a key area of the City. This measure is dependent upon funding for the implementation of each component.

GHGs Reduced

New parks will not directly reduce greenhouse gas emissions; instead, the vegetation and trees in the parks will absorb or sequester CO2 and release oxygen.

Action OS/G3	Plant 1 million trees throughout Los Angeles.

The City of Los Angeles has a tree canopy cover of 21%, according to a recent survey, while the national average is 27%. In an effort to make Los Angeles greener, cleaner, healthier and more beautiful, the Mayor launched the "Million Trees LA" (MTLA) Initiative in September 2006. The initiative is rooted in the idea that natural processes can reduce pollution and transform our city into a sustainable, green city. The one million new trees will provide shade and reduce energy costs, clean the air, absorb the greenhouse gases that cause global warming, capture polluted urban runoff, improve water quality, provide homes for wildlife, and add beauty to our neighborhoods. The most sustainable trees—those that are native to the area and drought tolerant species—will be featured. The initiative is a cooperative effort among City of Los Angeles departments, community groups, businesses, and individuals. The program is administered by the Los Angeles Department of Public Works (LADPW), which created a Web site featuring an online reporting system for tracking tree planting efforts by all Initiative participants.

Three concurrent efforts are underway:

- City departments are planting trees on public property to restore parks;
- The City is forming public-private partnerships to plant large numbers of trees and to help fund the Million Trees LA Initiative; and
- Voluntary efforts are underway for individuals to participate.

Lead Agency	Mayor's Office, Los Angeles Department of Public Works (LADPW)
Other Agencies	Department of Recreation and Parks (RAP); Environmental Affairs Department (EAD); Los Angeles Department of Water and Power (LADWP); Community Redevelopment Agency (CRA); Department of Transportation (DOT); Los Angeles Housing Department (LAHD); the Bureau of Street Services (BOSS) and the Bureau of Engineering (BOE) of the Los Angeles Department of Public Works (LADPW)

The Los Angeles Department of Water and Power's (LADWP's) on-going program, "Trees for a Green LA," allows City of Los Angeles residents (and LADWP customers) who are homeowners to obtain free trees. LADWP also offers a nonresidential and multifamily-apartment program that helps residents form communities as they share planting and tree care tasks. Through an easy 20-minute online course or hour-long presentation at a neighborhood workshop, individuals are advised about the tree varieties that work best in their microclimates, and the best planting locations to maximize shading and lower energy use.

The Department of Recreation and Parks (RAP) and TreePeople and have joined forces to plant 300,000 trees over the next several years. RAP is the largest owner of open space and parkland in LA, overseeing nearly 400 parks that cover over 16,000 acres. Plantings have taken place at many key parks, including Harbor Regional Park in San Pedro, Griffith Park, and the Hansen Dam Recreation Area.

The Urban Forestry Division of the Bureau of Street Services (BOSS) of the Los Angeles Department of Public Works (LADPW) oversees the planting of about 4,500 street trees each year. The Bureau of Engineering (BOE) of LADWP is working on projects that support the Million Trees Initiative and has provided mapping expertise for the effort.

EAD is an integral part of the Mayor's Initiative and works to assist other departments with the tree plantings. EAD facilitates, hires, and oversees selected contractors to plant trees for a majority of City

departments, including the Community Redevelopment Agency (CRA); Los Angeles Department of Water and Power (LADWP); the Department of Transportation (DOT); and the Los Angeles Housing Department (LAHD). EAD also provides education to residents and secures funding to plant street trees.

The CRA has allocated $250,000 of Agency funds to support the Million Trees LA Initiative and increase the tree canopy along major commercial corridors within CRA project areas.

POLA's Tree Planting Program was initiated in January 2007 and will continue until 2010. While the initial goal was to distribute or plant 2,200 trees during the first year, the program flourished and has greatly exceeded initial expectations. As of September 2007, approximately 6,875 trees had been distributed. Of these, 2,014 were planted in public areas of the communities located around the Port, through the Port's Capital Maintenance and Improvement Program. It is anticipated that in 2007, about 7,179 trees will be distributed to the community, customers, and employees, or planted through the Harbor's Capital Maintenance and Improvement Program. The 2008 Tree Planting Program has already identified 4,865 trees for distribution at events this calendar year, and will continue to look for opportunities to expand distribution and planting.

For all housing projects that are built in conjunction with its Major Projects Division, LAHD's landscaping guidelines encourage the planting of trees. In addition, LAHD provides a free tree for all Homeownership and Single-Family Rehabilitation projects.

Hollywood/Los Angeles Beautification Team (H.LABT) will help plant 125,000 trees in City Council Districts 2 and 4 and in portions of Council District 13. H/LABT is a grassroots non-profit that works on a countywide basis implementing tree planting and other environmental projects, in partnership with community members.

Koreatown Youth & Community Center (KYCC) will help plant 50,000 trees in Council District 10. KYCC is a non-profit, community-based organization hat has been focused on serving the Koreatown and central Los Angeles communities since 1975.

Los Angeles Conservation Corps (LACC) will help plant 200,000 trees in City Council Districts 3, 6, 7, 8, 9, 11, and 15. The LACC has been the most prolific planter of public space trees in Los Angeles. Over the past 20 years, it has engaged more than 20,000 young people in environmental service projects, such as tree plantings, to improve the quality of life across Los Angeles.

North East Trees (N.E.T.) will help plant 200,000 trees in Council Districts 1, 12, and portions of Districts 13 and 14 over the next few years. North East Trees has developed the local leadership and community stewardship capacity necessary to ensure that the planted trees will be nurtured and so will substantially improve the quality of life in the participating neighborhoods.

TreePeople is helping the Department of Recreation and Parks (RAP) plant 300,000 trees on park property citywide, including wilderness areas. TreePeople staff and volunteers have planted over two million trees in on Los Angeles streets and school campuses, as well as in the mountains surrounding Los Angeles.

Opportunity

Planting trees combats climate change naturally, by absorbing carbon dioxide or CO2—the most prevalent greenhouse gas—and releasing oxygen. By providing shade and evaporating water through their leaves, trees also lower the ambient air temperature. Planting trees strategically to shade buildings is one of the easiest and most-effective methods of reducing energy use, which in turn reduces demand for electricity and the associated power plants emissions. Trees also beautify our parks and neighborhoods, reduce storm water runoff, and provide homes for wildlife.

Challenges

This on-going program has made substantial progress since its launch in late 2006. Counting and tracking the location of the trees as they are planted is challenging, given the number of groups, communities, and individuals that are involved. Tracking trees that are dead or in need replacement can be difficult. A database that is accessible to all partners is key to the Initiative's success, but requires funding for implementation.

Table 29. OS/G3 Implementation Steps

Milestone	Milestone Date	Quantity of Measure
Identify and approve specific funding objectives to support MTLA.	Ongoing	# of trees planted
Review commercial corridors that have been identified for tree plantings.	Ongoing	
Enter into contracts with service providers or purchase tree planting equipment.	Ongoing	
Conduct MTLA events to distribute trees to households.	Ongoing	
Create opportunities for tree planting in projects built in conjunction with LAHD's Major Projects division.	Ongoing	
EAD grant to plant 1,000 trees.	April 2009	1,000
EAD grant to plant 3,000 trees.	2011	3,000

Measure Evaluation

This is a long-term measure that offers the significant, concurrent benefit of greening the City. By providing shade, trees also reduce requirements for air conditioning and electricity, and thus reduce emissions from power plants.

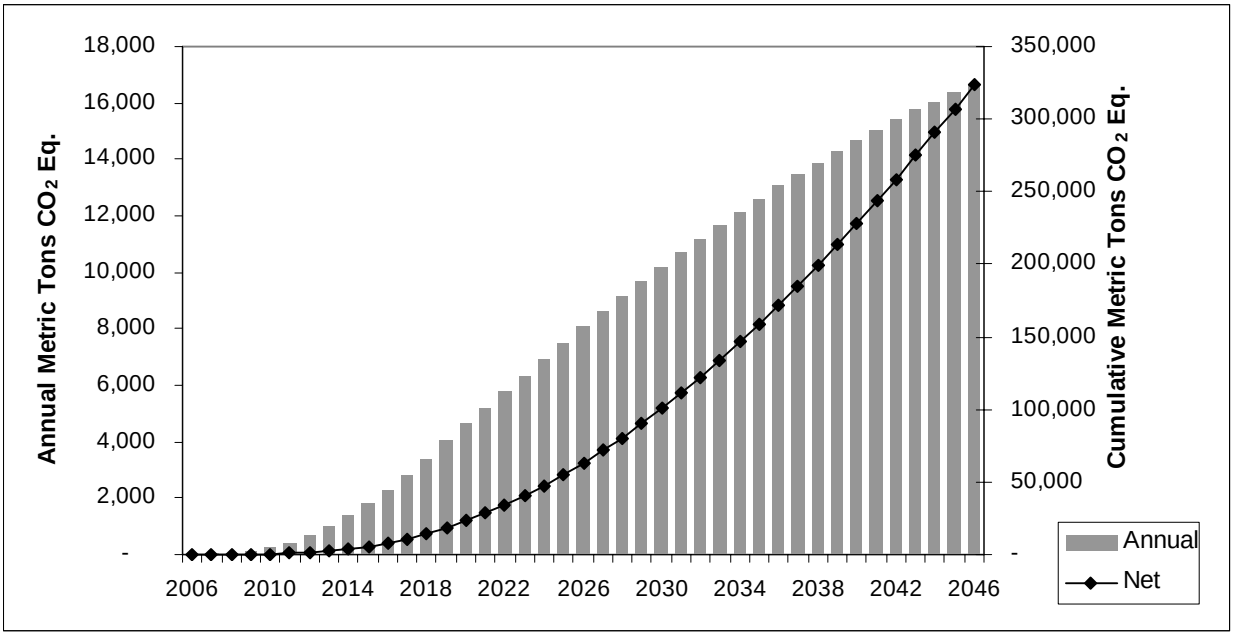
GHGs Reduced

The quantity of carbon sequestered in these trees depends greatly on tree species selection, the size of the trees at planting, tree mortality, and the timeframe (carbon sequestration starts slow in trees, but increases as the trees mature). Assuming a ten-year planting schedule beginning in 2006, annual sequestration is just 12 $MTCO_2$ eq. (million tons of CO2 equivalent) in 2006, but reaches over 8,000 $MTCO_2$ eq. annually by 2026 and continues to grow. are presented below.

Table 30 – Annual and cumulative carbon sequestration from MTLA plantings

	Sequestration ($MTCO_2$ eq.)	
Year	Annual	Cumulative
2006	12	12
2016	2,300	8,134
2026	8,062	62,845
2036	13,064	171,987
2046	16,647	323,733

Figure 2 – Annual and cumulative carbon sequestration from MTLA plantings



Methodology

This analysis used the methodology provided by the U.S. Department of Energy (DOE 1998). This methodology uses annual survival factors and annual carbon sequestration factors to calculate sequestration. For each calculation, the number of trees planted in year X is multiplied by the survival factor corresponding to the trees' age in that year to estimate the remaining trees from planting year X. Remaining trees are then multiplied by the annual carbon sequestration factors, which increase with age. This process is repeated for each tree planting year and then for each year in which carbon sequestration is estimated. The total carbon sequestration from all tree planting cohorts is then summed for each year, providing annual carbon benefits. Total carbon sequestered is also cumulatively summed for each year to provide total cumulative benefits.

The growth and survival factors vary by tree type (hardwood or conifer) and growth rate (slow, moderate, and fast). Estimates on the distribution of tree species were not available. It was assumed that trees would be distributed in equal proportion among the 57 species listed as part of the MTLA Initiative (USFS 2006). The distribution of these species is provided below. It is likely that actual distribution will differ from these values, so this assumption should be noted.

Tree Type	Growth Rate	# of Species	% of Total
Hardwood	Slow	4	7%
Hardwood	Moderate	26	46%
Hardwood	Fast	17	30%
Conifer	Moderate	3	5%
Conifer	Fast	7	12%

The next step is to assume a planting schedule. Based on discussions with EAD, a ten-year schedule was used, with 100,000 trees planted in each year beginning in 2006. EAD assumed that 10% of trees would be 15-gallon saplings, 30% would be 5-gallon saplings, 30% would be 1-gallon saplings, and 30% would be seedlings. This distribution of sizes was assumed to be equal for each tree type. The DOE methodology

assumes that all trees planted are 15-gallon saplings, but also provides guidance on how to adjust for trees less than this size. The planting year and quantity of trees smaller than the 15-gallon size are adjusted by a survival factor and age adjustment.

For example, it was assumed that 2,105 slow-growing hardwood saplings are planted each year for ten years (100,000 trees per year x 7% slow-growing hardwoods x 30% saplings). For hardwood saplings, the age correction factor is -6 years and the survival rate is 0.443. Saplings planted in 2006 would not reach age zero (the functional age of 15-gallon trees in the model) until 2012. At that time, the number of remaining trees would be 933, based on 44.3% survival. No carbon sequestration for these saplings is calculated until reaching "age zero" in 2012. In this case, the 2,105 slow-growing hardwood saplings planted in 2006 would be entered into the DOE methodology as 933 15-gallon trees planted in 2012. Increasing the proportion of 15-gallon trees planted would increase sequestration due to better survival and faster sequestration.

Uncertainties and Further Steps

Carbon sequestration in urban and suburban trees is difficult estimate without a monitoring and verification program; hence major sources of uncertainty exist in the above estimates. First, the tree species selection is likely to differ from the assumptions used above. Second, the planting schedule may also differ depending on budget and public participation. Third, the mortality rates are based on averages in urban and suburban settings. It is likely that some trees will benefit from increased attention while others may not. For example, trees planted in a resident's yard may benefit from individual care, while trees planted in high stress areas (along streets, for example) may not be as successful. Lacking any data specific to Los Angeles, this methodology is the best available given current resources. As more data becomes available, it can be plugged into the equations to update the estimates.

Action OS/G4	Identify opportunities to "daylight" streams.

Los Angles was once home to a vast network of natural streams and waterways, but development has caused many of these streams to be buried in culverts or pipes, covered by decks, filled-in, or diverted. The "daylighting" of streams"—bringing them to above ground channels again—has been identified as a strategy the City could employ to address new regulatory requirements pertaining to stormwater runoff. The ideal is to re-establish a waterway in its old channel, but with our dense urban environment, most daylighted streams will probably not function as they did originally. But daylighting still offers multiple benefits. These include improving water quality, managing runoff by expanding stream channel capacity, increasing recreational opportunities, and providing wildlife habitat. Liberated streams will also function as an educational tool for stream and environmental stewardship, a symbol of our natural history, an aesthetic community amenity, and they'll enhance our natural environment.

Lead Agency	Department of Recreation and Parks (RAP), Bureau of Sanitation (BOS) of the Los Angeles Department of Public Works (LADPW)
Other Agencies	Bureau of Engineering (BOE) of the Los Angeles Department of Public Works; Department of City Planning (Planning); North East Trees (N.E.T.)

- The Bureau of Sanitation (BOS) is the lead City department for stormwater issues. BOS, with assistance from the Department of Recreation and Parks (RAP), has submitted many of the grant applications for the daylighting of streams in strategic locations. Specific daylighting projects include the Hazard Park Wetland and Stream Restoration Project and the North Atwater Creek Restoration and Water Quality Enhancement Project. These projects will restore wetlands for stormwater runoff capture and treatment and provide habitat linkage to the LA River.
- RAP is the primary City department that owns, operates, and maintains the open space properties where the proposed daylighting projects will be implemented.
- The Bureau of Engineering (BOE) would likely be the City agency responsible for the design and construction of the proposed stream daylighting projects.
- North East Trees (N.E.T.) is conducting research and studies related to the Hazard Park Wetland and Stream Restoration project and will assist the City with implementation. The North Atwater Creek Restoration project is considered the lead project and corner stone of the City's proposed LA River Revitalization Plan.
- The Ballona Creek Watershed Group is pursuing the daylighting of an historic stream at Lafayette Park.

Opportunity

In 2004, Los Angeles voters passed Proposition O to fund stormwater projects, which includes daylighting of Los Angeles streams. Several Proposition O projects that incorporate daylighting have been awarded to the City and will be implemented in parks throughout the City. Projects are being implemented by BOS and RAP, with assistance from BOE for development and construction of the proposed projects, and from other departments.

Challenges

The process of daylighting of streams is not a simple task and can present any number of challenges. Each project will require a team of planners, engineers, landscape architects, biologists, and citizens for planning and implementation. Many parks have large homeless populations, so daylighting raises safety and public health issues. Daylighting techniques are still in development and have therefore not been evaluated thoroughly. In addition, the proposed siting of such projects in park settings has yet to be evaluated, specifically from a maintenance perspective. RAP will need to rely upon BOS for support services. RAP will continue to work with BOS on project implementation and to resolve issues that may arise. Maintenance funding will continue to play a large role.

Table 31. OS/G4 Implementation Steps

Projects are in various stages of implementation. Please see attached schedule for the proposed Hazard Park Wetland and Stream Restoration and the North Atwater Creek Restoration and Water Quality Enhancement Projects.

Milestone	Completion Date	Quantity of Measure
Proposed projects.		
Projects constructed.		
Measurement and Verification (monitoring).		

Measure Evaluation

The proposed projects will implement the City's innovative water and wastewater integrated resources plan, which is designed to increase conservation and maximize the capture and reuse of stormwater. The projects will restore historic creekbeds and their associated wetlands so they can capture and treat urban stormwater runoff. No direct CO2 emission reductions will resulT, but indirect emission reductions will be achieved. This action can be evaluated by the number of proposed projects that are implemented, and through project compliance monitoring upon completion.

Action OS/G5	**Identify and develop promising locations for stormwater infiltration to recharge groundwater aquifers.**

Stormwater infiltration is a Best Management Practice (BMP) that mirrors the natural process of infiltration found in undeveloped (or natural) watersheds. Where site conditions allow, a portion of urban stormwater runoff can be managed through infiltration, to effectively increase the volume of water returned to the soil and reduce the volume of direct runoff to streams and sewers. Increased infiltration also improves flood protection and aids in meeting local water demand by helping to recharge (replenish) underground aquifers. As an added bonus, stormwater infiltration projects assist the City in meeting both dry and wet weather mandated Total Maximum Daily Loads (TMDLs) established for Los Angeles area receiving waters. **NOTE: DEFINE TMDLs and receiving waters.**

Lead Agency	Department of Recreation and Parks (RAP), Bureau of Sanitation (BOS) of the Los Angeles Department of Public Works (LADPW)
Other Agencies	Bureau of Engineering (BOE) of the Los Angeles Department of Public Works (LADWP), Department of City Planning (Planning), Department of General Services (GSD)

- The Bureau of Sanitation (BOS) is the lead department for stormwater issues. The Department of Recreation and Parks (RAP) owns the parks where the proposed projects will be implemented.
- The Bureau of Engineering (BOE) will be required to submit plans and specifications for the projects on park property.
- With proper approvals, the Department of General Services (GSD), Los Angeles Department of Water and Power (LADWP) and other departments may be able to make their surplus property available for other infiltration projects to replenish groundwater aquifers.
- LADWP, Los Angeles County, and FEMA (Federal Emergency Management Agency) will participate by restoring spreading grounds and retrofitting dams for increased capacity; both measures will result in substantial water conservation. **NOTE: need to define spreading grounds**

Opportunity

In 2004, voters of Los Angeles passed Proposition O to fund stormwater projects of this type. Numerous Proposition O projects have been awarded and will be implemented in parks throughout Los Angeles. The projects are being implemented by BOS and RAP, with assistance from BOE for project development and construction.

Challenges

Urban stormwater management techniques include the installation of capture and infiltration mechanisms, which are still in development and have therefore not been evaluated thoroughly. In addition, the proposed park settings have yet to be evaluated, specifically from a maintenance perspective. RAP will need to rely upon BOS for inspection and maintenance of the infiltration structures. RAP will continue to work with BOS on project implementation and to resolve issues that may arise. Maintenance funding will continue to represent a challenge. Lastly, City and public health officials need to develop criteria pertaining to the use of treated stormwater, in order to protect those who use these parks.

Implementation Steps

BOS currently has six stormwater infiltration projects for spreading grounds and dams, which are in various stages of implementation. All are water conservation projects of a significant size that focus on restoring the capacity and efficiency of spreading grounds, or on restoring the capacity of a dam.

- Hansen Dam Spreading Grounds Enhancement Project
- Pacoima Spreading Grounds Enhancement Project
- Big Tujunga-San Fernando Basin Groundwater Enhancement Project
- Cesar Chavez Project Phase I
- Strathern Pit Multiuse Project
- Tujunga Spreading Grounds Enhancement Project

BOS has also submitted a number of grant applications related to stormwater infiltration in strategic locations, primarily on RAP owned property that is already zoned for open space. RAP will assist with project implementation when these projects come on line.

Table 32. OS/G5 Implementation Steps

Milestone	Completion Date	Quantity of Measure
Proposed Projects:		
Projects Constructed.		
Measurement and verification (monitoring).		

Measure Evaluation

This measure implements the City's innovative water and wastewater integrated resources plan that is designed to increase water conservation and maximize the capture and reuse of stormwater.

GHGs Reduced

No direct emission reductions can be measured, but indirect emission reductions will be achieved. Measures can be evaluated by the number of projects approved for implementation, and by compliance monitoring upon project completion.

3.7 Focus Area: Green Economy

Goal: Create demand and catalyze growth of the green economic sector

Action No.	Measure	Page
GrE1	Leverage City policy, purchasing, and regulation, and deepen local university partnerships, to promote local research, development, and production of green technology and products.	120
GrE2	Strengthen global economic relationships to promote investment in Los Angeles' green sector and help local environmentally focused companies penetrate both local and foreign markets.	122
GrE3	Identify and promote locations for green businesses.	122
GrE4	Develop targeted programs to train residents of low and middle income communities for jobs in the green economy.	122
GrE5	Collaborate with the private sector to offer effective incentives for the growth of local green businesses.	122
GrE6	Collaborate with local educational institutions such as universities, community colleges, and adult education programs to create more curricula that provide City residents with the skills and knowledge to work for competitive green businesses.	122

In addition to the above measures, The City will continue to evaluate emerging issues and strategies for reducing GHG emissions relating to the green economy and will incorporate findings into future versions of this document. This includes investment strategies, developing a green retrofitting sector, flexible work schedules and innovative market-based incentives.

Goal: Create demand and catalyze growth of the green economic sector

Action GrE1	**Leverage City policy, purchasing, and regulation, and deepen local university partnerships, to promote local research, development, and production of green technology and products.**

Lead Agency	Department of General Services (GSD), Environmental Affairs Department (EAD)
Other Agencies	Port of Los Angeles (POLA; also called "Harbor Department")

GSD's Supply Services Division oversees supply chain functions (e.g., the procurement of equipment, supplies, and services) and provides support for City's three non-proprietary departments: POLA, LADWP, and LAWA. The four key components of the support functions are Supply Chain Management (inventory and contracting), SMS Support. Payment Services, and Supplier and Customer Relations. Through outreach and workshops, EAD assists businesses and City departments in minimizing and eliminate waste, and with environmental regulation compliance.

The POLA will present an Environmentally Preferable Purchasing Policy (EPPP) to its Board in 2008. In addition to the traditional concerns of price, performance and availability, the policy will require that whenever reasonable, the POLA will select the environmentally preferable products (EPP), such as Energy Star rated equipment, that have the least environmental and human health impacts.

Opportunity

Recognizing its role as a major purchaser of goods and services, the City will seek opportunities to support markets for environmentally preferable products through employee education; encourage pilot testing of new products; adopt innovative product standards and specifications; and embark on cooperative ventures with other jurisdictions. The environmental factors to be considered in selecting products include pollutant releases, waste generation, recycled content, energy consumption, depletion of natural resources, and potential impact on human health and the environment.

Challenges

GSD has received resources to complete Phase I of an Environmentally Preferred Purchasing (EPP) Program. Resources for Phase II will be needed to continue the development of purchasing criteria and other program elements.

Table 33. GrE1 Implementation Steps

Milestones Phase I	Planned Date
Develop a comprehensive City of Los Angeles Environmentally Preferred Purchasing Policy and Statement.	**Completed**
Establish Environmentally Preferred Purchasing Program that will be housed in the General Services Department.	Completed
Develop an EPP program implementation plan that prioritizes purchasing goals and objectives. The Plan will include the following tasks: • Identify EPP purchasing opportunities. • Develop written environmental specifications and contractual language for specifications or general terms and conditions. • Explore establishment of a "green faith" environmental rating program for bid preferences. • Prepare an annual report documenting the City's efforts to buy more environmentally preferable goods and services.	April 2008

Measure Evaluation

The greenhouse gas reduction benefits of this measure cannot be calculated at this time. But lifecycle assessments have documented reductions in air and water emissions and waste generation, and decreased energy and natural resource consumption, for recycled-content (and other environmentally preferable products), when compared to their conventional counterparts.

In future versions of this document, it may be possible to calculate the GHG reduction benefits for specific environmentally preferred products.

Action GrE2	**Strengthen global economic relationships to promote investment in Los Angeles' green sector and help local environmentally focused companies penetrate both local and foreign markets.**
Action GrE3	**Identify and promote locations for green businesses.**
Action GrE4	**Develop targeted programs to train residents of low and middle-income communities for jobs in the green economy.**
Action GrE5	**Collaborate with the private sector to offer effective incentives for the growth of local green businesses.**
Action GrE6	**Collaborate with local educational institutions such as universities, community colleges, and adult education programs to create more curricula that provide City residents with the skills and knowledge to work for competitive green businesses.**

The green sector has experienced unprecedented worldwide growth during the past few years. This rapid growth will support the City's long-term sustainability goals, strengthen its economy and increase its global competitiveness. "Green economy" is a loosely defined term and therefore encompasses a continuously evolving range of products, services, and technologies for energy generation and the management/treatment of air pollution, solid and hazardous waste, wastewater, and greenhouse gases. Experts anticipate that field will bring innovation and changes in our daily lives of similar magnitude to the information technology explosion over the last two decades. It is impossible to predict the future scope of the "green sector" economy, but we have adequate knowledge to begin laying the foundation for a vibrant green economy in Los Angeles through strategic policies and programs.

Lead Agency Mayor's Office

Other Agencies Environmental Affairs Department (EAD); Los Angeles Department of Water and Power (LADWP); Community Redevelopment Agency (CRA); Community Development Department (CDD)

Opportunity

With the Mayor's aggressive Green agenda providing the momentum, the City has the opportunity to support the rapid and sustainable development of the green economic sector through targeted, multi-pronged strategies. The opportunities are primarily two-fold: a) "green" existing businesses and industries and b) support the creation of new green businesses. As discussed above, the definition of "green sector" is continuously evolving, but the clean technology or "clean tech" industry is undoubtedly a critical component. In general, "clean tech" products and services must optimize the use of natural resources, have their genesis in an innovative or novel technology or application, and offer added economic value.

Challenges

Los Angeles must be dedicated in its efforts to ensure that a large portion of this developing economy will be locally based. The will require ongoing, coordinated, visible support from the Mayor's office, City Council and public and private sector economic development entities. City policies must be reviewed to

eliminate unintentional barriers. While public policy alone cannot guarantee a booming green sector economy, lack of attention would have a negative impact. A well-coordinated and visible commitment from the City will support the green sector economy by:

- Attracting and fostering startups;
- Encouraging venture capitalists to invest in local companies;
- Creating conditions for the development of a green sector cluster; and
- Training an appropriately-skilled workforce.

It will be important to build institutional capacity within the City to oversee these initiatives.

Implementation Steps

In order to create the necessary competitive landscape, the City must leverage its efforts with the following deliberate strategies:

- **Leadership**: Build the necessary capacity to coordinate and lead City efforts.
- **Market Demand**: Create sufficient demand for green products and services.
- **Marketing**: Aggressively promote a coordinated green sector vision.
- **Investment**: Ensure sufficient access to capital and financing.
- **Regulations and Incentives**: Create a business-friendly environment for green sector companies.
- **Workforce Development**: Invest in workforce development programs that feed into the green industry.

The Mayor's office will work with the City Council and appropriate City departments to develop program implementation steps and timelines.

Measure Evaluation

These action items cannot readily be quantified for greenhouse gas reduction benefits, but can be evaluated by metrics such as the number of new "green" businesses established and new green jobs created.

3.8 Proprietary Departments

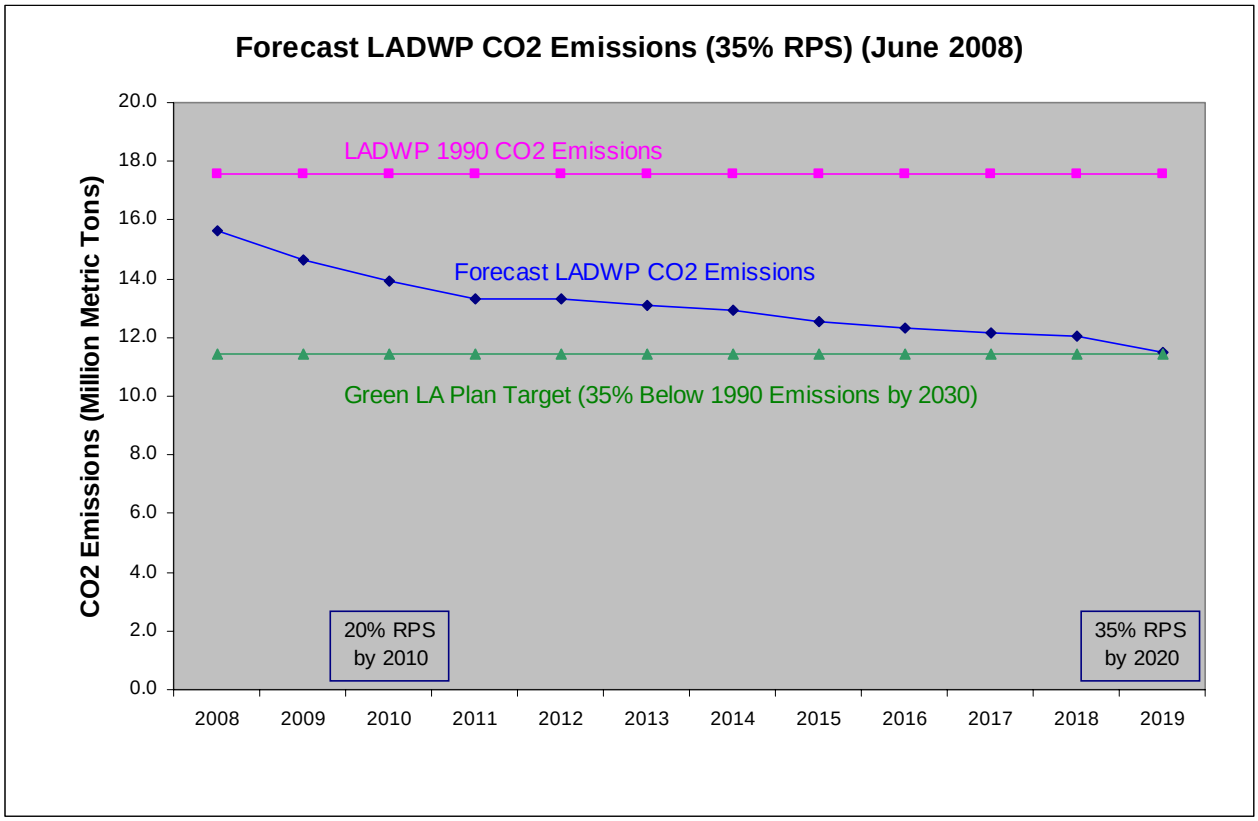
Department of Water and Power—Implementation Overview

In September 2002, LADWP became a charter member of the California Climate Action Registry, and has since reported and certified seven annual entity-wide greenhouse gas emissions inventories (2000 – 2006) with the Registry. LADWP was the first electric utility to report and certify its GHG emissions using the Registry's Power/Utility Reporting Protocol, which includes an efficiency or "carbon intensity metric" (pounds of CO2 emissions per megawatt-hour of electricity generated). This metric tracks changes in emissions intensity over time and provides a consistent basis for comparison among electric utilities. Between 2000 and 2006, LADWP's carbon intensity metric changed from 1407 lbs CO2/MWh to 1238 lbs CO2/MWh, which is a 12% improvement in efficiency. During that same time period, LADWP's CO2 emissions from owned and purchased generation decreased 11% from 18.4 to 16.3 million metric tons, a difference of 2.1 million metric tons.

On January 8, 2008, the Board of Water and Power Commissioners approved LADWP's 2007 Integrated Resource Plan (IRP). The 2007 IRP includes plans to increase renewable generation to 20% by 2010 and 35% by 2020 (see Action Items E1 and E2 in this document). It also includes re-powering four natural gas fired generating units at the Haynes and Scattergood Generating Stations (Action Item E4), which will improve efficiency by 15% to 35%. The new generating units will produce more electricity per cubic foot of natural gas burned, resulting in lower greenhouse gas emissions per unit of electricity generated.

Figure 1 below shows that LADWP's CO2 emissions are already below its 1990 baseline, and that LADWP is on track to achieve the Green LA Plan goal of reducing emissions 35% by 2030.

Figure 3. Forecast LADWP CO_2 Emissions (35% RPS by 2020) (June 2008)



The table below shows LADWP's forecast CO2 emissions and emission reductions resulting from the combination of Actions E1, E2, E3 and E4. Emission reductions shown are relative to 2008 and 1990 emissions, and reflect the projected increase in renewable generation, decrease in coal-fired generation, and efficiency improvements at LADWP's natural gas-fired power plants due to the re-powering projects.

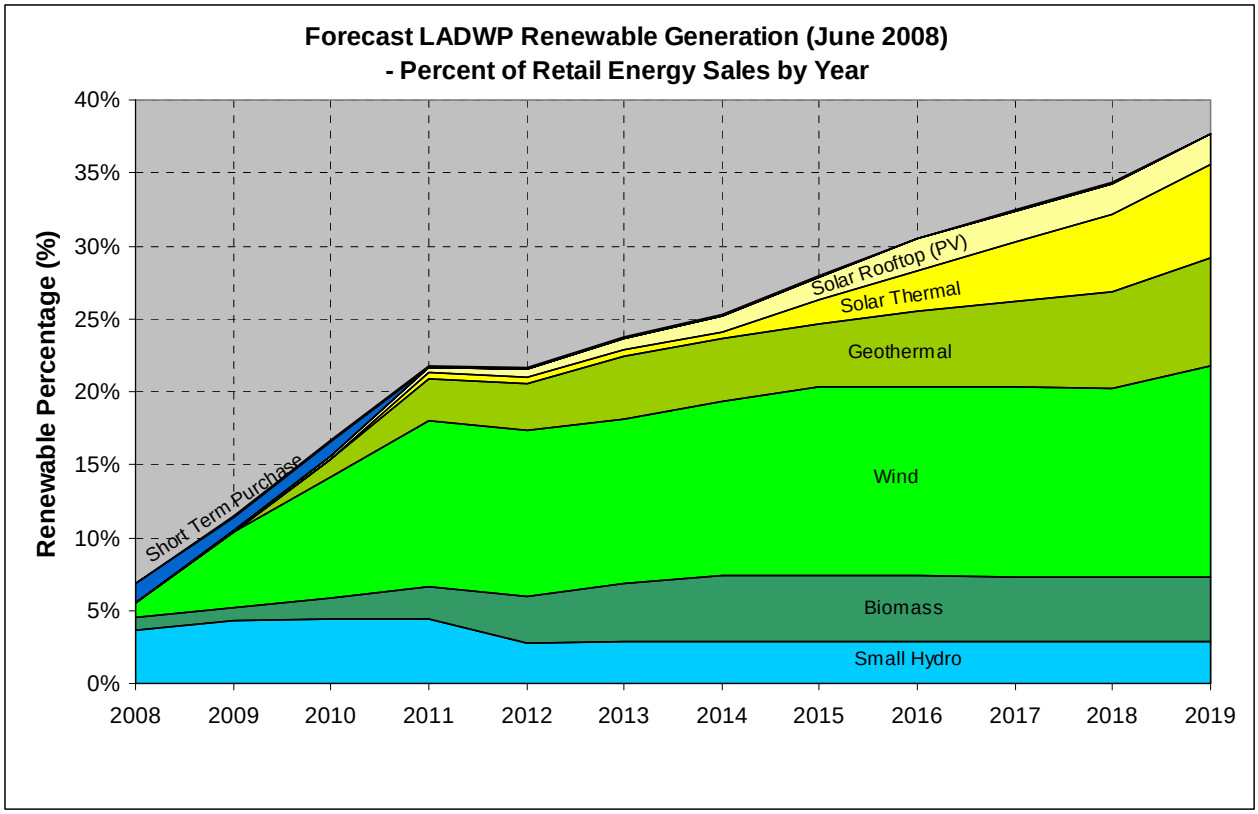
Forecast LADWP CO2 Emissions and Reductions (35% RPS by 2020) (June 2008)

Year	Forecast LADWP CO2 Emissions (million metric tons)	Reduction in Forecast LADWP CO2 Emissions relative to 2008 (million metric tons)	Reduction in Forecast LADWP CO2 Emissions relative to 1990 (million metric tons)
2008	15.6	-	1.9
2009	14.6	1.0	2.9
2010	13.9	1.7	3.6
2011	13.3	2.3	4.2
2012	13.3	2.3	4.2
2013	13.0	2.5	4.5
2014	12.9	2.7	4.6
2015	12.5	3.1	5.0
2016	12.3	3.3	5.2
2017	12.1	3.5	5.4
2018	12.0	3.6	5.5
2019	11.5	4.2	6.1

Note: LADWP 1990 Total CO2 emissions from owned & purchased generation ~ 17,790,561 metric tons

Figure 2 below shows the projected increase in renewable generation in LADWP's portfolio, and that the LADWP will achieve its IRP target of 35% energy sales from renewable generation by 2020.

Figure 4. Forecast LADWP Renewable Generation (June 2008)



In addition to investing in renewable generation, the LADWP is increasing funding for energy efficiency programs that will directly reduce its customers' energy consumption (Action Items E14 and E15). These programs include offering up to 50,000 new energy efficient refrigerators to replace customer's old units; installing thermal energy storage systems to shift air conditioning demand to the off-peak hours; and working with the Department of City Planning (Planning) to develop Green Building Standards that will promote sustainable design in all new buildings. The Green Building standards were adopted by the Mayor and City Council on April 22, 2008.

The LADWP's water conservation and water recycling programs reduce greenhouse gas emissions by reducing the amount of water that must be treated and pumped through the water distribution system, thereby reducing energy consumption and associated power generation emissions (Action Items W1, W2 and W3).

Energy efficiency and conservation programs implemented by the LADWP since 1990 have avoided or sequestered over 6.3 million tons of greenhouse gas emissions, as detailed in the following table:

Table 34. Energy Efficiency and Conservation Programs Implemented by LADWP

Years in Effect	Program	Description	Cumulative CO_2 Emissions Avoided or Sequestered (short tons)
Water Conservation			**4,218,537**
1991-2005	Water Conservation Program	Encourage customer water conservation with rebates for installing hardware (such as ultra-low-flush toilets and low-flow showerheads); a rate structure that rewards conservation; and public education.	Retrofits: 1,832,116 Behavior: 2,365,003 4,197,119
1999-2005	High efficiency clothes washer rebate	Rebates for purchase of energy efficient residential & commercial clothes washers.	21,418
Energy End Use			**969,027**
1999-2001	Neighborhood Bill Reduction Service	Provide free compact fluorescent light bulbs (CFLs); clean refrigerator condenser coils; distribute low-flow showerheads & aerators; and check for toilet leaks for residential low-income customers.	125,809
1999-2001	Commercial Refrigeration Tune-up	Free audits and tune-ups of refrigeration equipment for small commercial customers.	3,856
1999-2005	Refrigerator Replacement	Sale of high efficiency refrigerators at discounted prices to multi-family residential units and non-profit organizations that are LADWP customers, and removal & recycling of old refrigerators.	4,887
1999-2005	Commercial Lighting	Incentives for small commercial customers to install lighting equipment that exceeds Title 24 standards.	504,107
1999-2005	HVAC Replacement	Incentives for small commercial customers to install HVAC equipment that exceeds Title 24 standards. From 2000-2002, expanded to include residential HVAC units.	87,872
2000-2002	HVAC Tune-up	Low cost tune-ups of A/C equipment for commercial and residential customers.	17,510

Years in Effect	Program	Description	Cumulative CO_2 Emissions Avoided or Sequestered (short tons)
2000-2005	Chiller Replacement	Incentives for businesses and hospitals to install new high-efficiency water or air-cooled chillers that exceed Title 24 standards.	162,171
2002-2005	Consumer Rebates	Rebates to residential customers for the purchase & installation of Energy Star appliances, lighting, windows, and HVAC.	46,482
2004-2005	Refrigerator Retirement	Free pick-up and recycling of old spare refrigerators for residential customers.	8,361
2004-2005	CFL Distribution	Free compact florescent light bulbs (CFLs) to residential customers.	5,477
2000-2005	Energy Star Office Equip	Use of Energy Star office equipment (computers & monitors, printers, copiers and FAX machines**). NOTE: LADWP'S USE?**	2,494
Digester and Landfill Gas-to-Energy			**854,849**
1995-2005	Scattergood	Burn (combust) Hyperion wastewater treatment plant digester gas at Scattergood Generating Station to generate electricity.	844,853
2002-2005	Lopez Canyon	Burn Lopez Canyon landfill gas in micro turbines to generate electricity.	9,996
Recycling			**159,034**
1998-2005	Recycling Program	Recycling of paper, cardboard, metals and other materials from LADWP facilities.	159,034
Building Energy Efficiency Retrofits			**60,538**
1999-2005	John Ferraro Building Lighting Retrofit	Eliminated 50% of the light fixtures, replaced the remaining fixtures with energy efficient equipment, and installed automatic lighting controls in LADWP's corporate office building.	55,568
2001-2002	Cool Roofs	State-funded incentives to install Energy Star roofing product on commercial or multi-family residential buildings.	2,473
2001-2004	Reflective Window Film	Incentives to install reflective film on windows to reduce building solar heat gain and reduce A/C load.	1,947

Years in Effect	Program	Description	Cumulative CO_2 Emissions Avoided or Sequestered (short tons)
2004-2005	City Building Retrofit	Retrofit 37 City of Los Angeles facilities with energy efficient lighting.	550
Electricity Generation & Distribution System			**36,023**
1999-2005	Solar Power	LADWP has 2 solar generation programs: Customer systems (net metered) LADWP and City facilities (grid connected)	26,757
1996-2005	Energy Efficient Transformers	1,592 Energy Star transformers were purchased in 1995 & installed in LADWP's distribution system	9,266
Tree Planting (Urban Forestry)			**19,462**
1998-2005	Cool Schools	Planted 8,435 trees (cumulative) at Los Angeles Unified School District LAUSD) campuses.	6,206
2001-2005	Trees for a Green LA	Planted 38,618 trees (cumulative) at customer homes and in community areas.	13,256
Total CO_2 Emissions Avoided / Sequestered			**6,317,469**

Port of Los Angeles

Implementation Overview

As directed by the Green LA Plan, the Port of Los Angeles (POLA) developed an individual Harbor Department Climate Action Plan to examine opportunities to reduce GHG emissions from its operations. The Harbor Department Climate Action Plan is included in this document as Appendix ___. The Port of Los Angeles is a department of the City of Los Angeles and is often referred to as the Los Angeles Harbor Department.

The Port of Los Angeles, Southern California's gateway to international commerce, is located in San Pedro Bay, 20 miles south of downtown Los Angeles. This seaport not only sustains its competitive edge with record-setting cargo operations, but is also known for its groundbreaking environmental initiatives, progressive security measures, and diverse recreational and educational facilities.

The Port is operated and managed under a State Tidelands Trust that grants local municipalities jurisdiction over ports and stipulates that activities must be related to commerce, navigation, and fisheries. A five-member Board of Harbor Commissioners (BHC), appointed by the Mayor and confirmed by the Los Angeles City Council, provides direction and establishes policy for the Port.

In March 2006, POLA joined the California Climate Action Registry (Registry) and inventoried baseline GHG emissions for the City's Harbor Department for that year. This inventory required assessment of direct and indirect emissions from stationary and mobile sources that are under the Department's operational control. The completed inventory was certified in November 2007 and the results are presented in the Harbor Department Climate Action Plan.

The primary focus of the Plan is to outline specific measures that have been or will be implemented in Harbor Department (municipal) operations in order to reduce GHG emissions. Each of these measures includes a ranking of an estimated high, medium, or low GHG reduction potential.

In addition, staff recognizes that significant GHG emission reductions could be achieved through the modification of tenant operations. Tenant emissions are currently being inventoried and will be described in the 2006 Portwide Emission Inventory, which is scheduled for release in March 2008. The Inventory will allow Harbor Department staff to identify which tenants generate the most GHG emissions. Staff will work with those tenants to build upon and expand the strategies contained in the Clean Air Action Plan (CAAP), and implement many of measures included in the Harbor Department Climate Action Plan. Section P1 of this document discusses CAAP strategies that have the potential to also reduce GHGs. The Environmental Management Division plans to update the Harbor Department Climate Action Plan periodically as appropriate to include new measures.

Goal: Green the Port

Action P1	Fully implement the San Pedro Bay Ports Clean Air Action Plan (CAAP).

The Port of Los Angeles (POLA) is a "landlord port" that leases its property to tenants who, in turn, operate their own facilities. The Port does not operate the terminals, ships, yard equipment, trucks, or trains that move cargo. However, the Port is committed to accelerating efforts to reduce air pollution from these goods movement activities.

The San Pedro Bay Ports Clean Air Action Plan (CAAP) is the most comprehensive plan to cut air pollution and reduce health risks ever produced for a global seaport complex. On November 20, 2006, the Plan was jointly approved by the Port of Los Angeles Board of Harbor Commissioners and the Port of Long Beach Board of Harbor Commissioners. That historic vote commits both ports to an aggressive plan to reduce pollution by at least 45% in the next five years. The $2-billion CAAP addresses all tenant operations and all port-related emission sources — ships, trains, trucks, terminal equipment, and harbor craft — to significantly reduce health risks posed by air pollution.

Although the CAAP is a plan to reduce criteria pollutants and air toxics, several of the strategies also reduce GHG emissions. Per the Clean Air Act, criteria pollutants particle pollution (particulate matter—PM), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead.

These strategies provide the preliminary foundation for a larger suite of measures that will comprise a Portwide Climate Action Plan.

Lead Agency Port of Los Angeles (POLA; also called the "Harbor Department")

Other Agencies Mayor's Office, Community Redevelopment Agency (CRA)

The CAAP was created by the ports of Los Angeles and Long Beach with the cooperation and participation of the South Coast Air Quality Management District (SCAQMD), California Air Resources Board (CARB), and the Environmental Protection Agency (EPA). The Community Redevelopment Agency (CRA) will assist this effort by helping find locations for the necessary training sites.

Opportunity

The CAAP outlines specific measures to be implemented by 2011. The following measures have been identified as having the potential to reduce GHG emissions:

Ocean-Going Vessels (OGV)

- *OGV1: Vessel Speed Reduction (VSR) Program*. All ships within 40 nautical miles of Point Fermin will reduce speed to 12 knots. This measure will result in GHG reduction due to reduced fuel consumption.
- *OGV2: Reduction of At-Berth OGV Emissions*. Ships will use shore-power for electrical generation while at berth, rather than on-board auxiliary engines. This is known as Alternative Marine Power (AMP) and also referred to as "Cold Ironing." Shore-power that is generated by power plants generates fewer GHG emissions per kilowatt-hour of electricity than the on-board auxiliary engines. The California Air Resources Board (CARB) has listed AMP as a proposed statewide mitigation measure to reduce GHG emissions.

Harbor Craft (HC)

- *HC1: Performance Standards for Harbor Craft (HC)*. All HC will meet EPA Tier II or equivalent emissions standards. All previously repowered HC will be retrofitted with the most effective CARB-verified NOx and/or PM emission reduction technologies. When Tier III engines become available, all HC will be repowered with these new engines within 5 years. All tug boats will use shore-power while at their home fleeting location. Newer engines have electronic engine and fuel management systems that reduce fuel consumption by up to 20%. The use of AMP will also result in GHG reduction.

Railroad Locomotives (RL)

- *RL1: PHL Rail Switch Engine Modification*. All existing Pacific Harbor Line (PHL) switch engines will be replaced with Tier II engines equipped with 15-minute idling limit devices and retrofitted with diesel particulate filters (DPFs). Any new switch engine that is acquired after the initial PHL replacement will meet EPA Tier III standards or equivalent. The use of anti-idling devices will result in GHG reduction due to reduced fuel consumption.
- *RL2: Existing Class I Railroad Operations*. All diesel-powered Class I switcher and helper locomotives will use ultra low sulfur diesel (ULSD) fuels, be 90% controlled for PM and NOx emissions, and will be equipped 15-minute idle restrictors. The fleet average for Class I long haul locomotives will be Tier III equivalent. The use of anti-idling devices will result in GHG reduction due to reduced fuel consumption.
- *RL3: New and Redeveloped Rail Yards*. Any new rail yard developed or significantly redesigned shall be required to operate with the cleanest available technology for switcher, helper, and long haul locomotives; utilize idling shut-off devices and exhaust hoods; use only ULSD or alternative fuels; and use clean vehicles and cargo handling equipment. The new and redeveloped rail yards will result in GHG reduction due to improved efficiency and reduced fuel consumption.

Challenges

Developing new Port programs will require collaboration with and input from tenants, businesses that operate within the Port, regulatory agencies, environmental advocacy groups, and others.

Funding has been allocated for implementation of the CAAP. Current total monetary commitments for each funding entity over the next five years are:

- Port of Los Angeles—$177,500,000
- Port of Long Beach—$240,400,000
- SCAQMD—$47,000,000
- Bond/Impact Fee Funding—TBD

Industry will fund all strategies that are not covered by above funding commitments. **NOTE: THIS ISN'T CLEAR**

Implementation Steps

The ports intend to implement CAAP provisions through the use of lease agreements, tariffs, and Memoranda of Understanding (MOUs). The Port will continue to consider GHG emissions in all future Environmental Impact Reports (EIRs); GHG mitigation measures will be required if the GHG impacts will be significant.

Measure Evaluation

The Port has created criteria pollutant emission inventories for 2001 and 2005, and will continue to update these inventories annually. The emission inventory estimates emissions of particulate matter (PM), oxides of nitrogen (NOx), oxides of sulfur (SOx), carbon monoxide (CO), and total organic gases (TOG) for five major tenant mobile source categories:

1. Heavy-Duty Vehicles/Trucks (HDV)
2. Ocean-Going Vessels (OGV)
3. Cargo Handling Equipment (CHE)
4. Harbor Craft (HC)
5. Railroad Locomotives (RL)

Beginning with the 2006 Port of Los Angeles Air Emissions Inventory, GHG pollutants, including CO_2, CH_4, and N_2O, will also be estimated for these mobile source categories. This inventory, scheduled for release in early 2008, will serve as a baseline by which to measure the success of future Portwide strategies in reducing GHG emissions from the mobile sources that service the Port.

Action P2	Complete strategic plan for the Port of Los Angeles, including sustainable and green growth options.

The Strategic Plan for the Port of Los Angeles, which is a five-year plan covering 2006 through 2011, was approved by the Board of Harbor Commissioners on March 1, 2007. One of its primary objectives is to transform the Port into the world's greenest port by raising environmental standards and protecting public health.

Lead Agency Port of Los Angeles (POLA; also called the "Harbor Department")

Other Agencies Los Angeles Department of Water and Power (LADWP)

LADWP for the provision of shore-power (or "AMP"), and the Port of Long Beach and others for CAAP (see Action Item P1).

Opportunity

Environmental Initiatives included in the Strategic Plan are:

- *Clean Air Action Plan (CAAP)*—Implement the CAAP and promote adoption of the CAAP measures internationally;
- *Sustainability Ethic*—Incorporate sustainability ethic into all Port activities and communicate to employees, customers and the community;
- *CEQA/Mitigation*—Revamp the California Environmental Quality Act (CEQA) process to ensure development of high quality CEQA evaluations for terminal improvement, and utilize mitigation as an implementation strategy for environmental action plans;
- *Clean Water/Soil/Habitat Plans*—Create and implement action plans for clean water, clean soil and groundwater and habitat management, including pursuing additional habitat mitigation projects; and
- *Compliance Measures*—Provide an environmental compliance program for Port and customer construction and operations in support of the environmental directive of the Port's Leasing Policy.

Challenges

Divisions were asked to determine resource allocations for their budgets. No budget challenges are foreseen at this time.

Implementation Steps

The Port's Strategic Plan was approved by the Board of Harbor Commissioners on March 1, 2007; implementation is now beginning. Harbor Department divisions were asked to ensure that their budget requests align with their supporting responsibilities for this fiscal year. The actions should be incorporated in the day-to-day decisions of each Division.

Measure Evaluation

Minimally, the Strategic Plan will be visited by Harbor Department Divisions annually during the budget cycle. The Strategic Plan will be revised beginning in 2010, as necessary.

Action P3	**Complete economic development plan for the port, identifying opportunities to link the port's investment in green growth to new economic opportunities in the green sector.**

One goal of the Green LA Plan is the completion of an economic development plan for the Port of Los Angeles (POLA), which would identify opportunities to link the Port's investment in green growth to new economic opportunities in the green sector.

Lead Agency Port of Los Angeles (POLA; also called the "Harbor Department")

Other Agencies Mayor's Office, Community Redevelopment Agency (CRA)

The Harbor Department will work with the Community Redevelopment Agency (CRA), the Mayor's office (Deputy Mayors for Economic Development and Workforce Development), and other strategic partners from the port and maritime communities in this endeavor.

Opportunity

This strategy is expected to include creation of:

- A waterfront that combines enhanced access and environmental quality for the community and residents of the state;
- Business opportunities that enhance our waterfront;
- Business opportunities for the port and maritime industries, particularly in the areas of green technology and export development; and
- Educational and training opportunities to support sustainable employment opportunities for the Port workforce, as well as related maritime businesses and activities.

Challenges

This topic will be addressed in detail in the Port's 2008 Sustainability Plan.

Implementation Steps

A Director of Economic Development position has been established at the Port. The Director's primary goal will be development of an overall economic development strategy that focuses on redevelopment, and business and workforce development activities in the Harbor Area.

Measure Evaluation

This topic will be addressed in detail in the Port's 2008 Sustainability Plan.

Los Angeles World Airports

Overview

Airports, like ports, present a unique set of issues pertaining to greenhouse gas (GHG) reduction plans.

The Los Angeles World Airports (LAWA) department owns and operates four airports in Southern California: Los Angeles International (LAX), LA/Ontario International (ONT), Van Nuys (VNY), and LA/Palmdale Regional (PMD).

LAWA does not operate aircraft, but provides the infrastructure (runways and terminals) and services (air traffic control, police, security) that support the aviation industry. The majority of GHG emissions associated with airport operations fall outside of th

e direct, and sometimes even the indirect control, of LAWA. But LAWA is committed to the implementation of a plan that will reduce its own emissions and *facilitate* reductions by airport tenants. The Board of Airport Commissioners recently adopted a comprehensive sustainability program that will govern how LAWA operates and develops.

Challenges

The United Nations Intergovernmental Panel on Climate Change (IPCC) estimates that aircraft emissions contribute approximately 2—3% of total global greenhouse gas (GHG) emissions. By 2050, it is estimated that this contribution could increase to 5%.

To monitor the effectiveness of a GHG reduction plan, LAWA must first identify a reasonable protocol for calculating airport related GHG emissions. The methods for assessing airport-level air quality, through the measurements of criteria and toxic air pollutants, are well established. But there is no specific guidance, nor standard practices, for computing airport-level GHG emission inventories.

For example, the State of California estimates that aviation represents 12% of CO_2 equivalent emissions within the state. In contrast, the City of Seattle estimates that aviation represents 17% of its total GHG emissions. This wide variance is due to the use of different quantification methodologies and databases, and some may be attributed to the double counting of emissions.

Because aircraft release emissions at high altitudes, the impact of aviation on global warming may be greater than that of other major greenhouse gas emissions sources. In the case of high-altitude airliners that frequently fly near or in the stratosphere, non-CO_2 altitude-sensitive effects may increase the total impact of anthropogenic (man-made) climate change emissions significantly.

Cognizant of this effect, the European Parliament approved a global warming control plan that limits carbon dioxide emissions from airlines flying to and from Europe beginning in 2011. The State of California also petitioned the United States EPA to adopt global warming regulations for aircraft.

For purposes of GHG inventory development, LAWA is committed to implementing its Sustainability Performance Improvement Implementation Plan (SPIMS), which promotes both environmental sustainability and economic prosperity. The comprehensive Sustainability Plan supports the “Greening LAX” program with its “Triple Bottom Line” approach to sustainability, which measures success from economic, environmental, and social perspectives. The intent is not to recreate LAWA’s business model, but to use it as a tool to 1) develop policies that will align LAWA's overarching vision, sustainability principles, and executive directives; 2) identify opportunities and implement sustainable initiatives; and 3) promote continual improvement.

The primary challenge facing LAWA is the development of a permanent working partnership with its employees and the employees of other stakeholders (tenants, members of the public, regulatory agencies, and neighborhood communities). This partnership will enable LAWA to collect credible data for the development of a comprehensive GHG inventory, and then a comprehensive GHG reduction plan.

Airports' Contribution to Climate Change

Aircraft in flight emit CO_2 through the burning or combustion of fuels; these comprise the majority of aviation related GHG emissions. Passenger and cargo ground access vehicles, ground equipment that services aircraft, energy used by airport facilities such as terminals, and equipment used for the construction of airport infrastructure also contribute to aviation GHG emissions.

Although LAWA does not operate aircraft, it provides the infrastructure for aircraft operations. The infrastructure, public access, employee and tenant operations, and fueling activities all contribute to GHG emissions. Airport emissions can be divided into four source categories:

1. Aircraft
2. Ground Vehicles
3. Buildings and Facilities
4. Construction

Aircraft

LAWA has very little control over the types of engines used by aircraft. But LAWA does provide services that can reduce engine use and associated emissions. For example, LAWA's ground power units supply electrical power to aircraft during the loading and unloading of passengers, so aircraft don't need to idle while parked at the gates. LAWA also supplies pre-conditioned air to aircraft. And through an efficient airfield layout, LAWA can reduce the on-ground distances that aircraft must travel.

Ground Vehicles

In Los Angeles, air travel is just one element of a complex transportation system that continuously moves goods and passengers and contributes GHG emissions. Efficient airport access can reduce traffic congestion and idling that unnecessarily increases GHG emissions.

Ground vehicles can be separated into on-road and off-road vehicles. For on-road vehicles, LAWA has direct control over fleet and pool vehicles, specialized vehicles, and FlyAway buses. Other on-road vehicles, over which LAWA exercises very little control, include passenger and employee vehicles, tenant/concessions vehicles, and cargo/freight vehicles.

Off-road vehicles are those driven solely on the airfield; they include LAWA's vehicles and equipment; ground support equipment that is owned by the airlines and tenants; and the construction equipment owned by the contractors.

LAWA was an early adopter of alternative fuel vehicles and is aggressively replacing its vehicle fleet with vehicles with very low or no emissions.

Buildings and Facilities

LAWA's infrastructure supports the aviation industry; GHG emissions are associated with the lighting, heating and cooling of these facilities, and the lighting of airport grounds. Stationary equipment and the co-generation facility at Los Angeles International Airport (LAX) also generate GHG emissions. **NOTE: JP ADDED THIS TEXT:** Co-generation plants produce both electricity and heat.

Construction

Construction equipment utilized at the airport, such as generators, batch plants and crushing plants, generate GHG emissions.

What the Airport is Doing Now

Aircraft are the largest source of carbon emissions at the airport. However, federal laws preempt LAWA from regulating the types of aircraft that utilize the airport facilities, or their operations. But LAWA is continually reviewing the airfield configuration to determine opportunities for more efficient operations. Improvements to the airfield can reduce unnecessary fuel use both on the ground and in the air.

LAWA is also continually working on ground access improvements. Efficient transportation design can provide easier airport access and reduce the added emissions from traffic congestion and idling. LAWA has been very proactive in promoting and expanding the FlyAway program throughout the Los Angeles region to reduce unnecessary vehicle trips to LAX. FlyAway services are now offered at Van Nuys Airport, Union Station in downtown Los Angeles, and UCLA/Westwood. LAWA operates a very successful employee Rideshare Program that removes many private vehicles from roadways. Over 62% of LAWA-owned fleet vehicles use alternative fuel (including CNG, LNG, propane, hydrogen, solar, hybrid electric and pure electric). A cell phone waiting lot for vehicles picking up arriving passengers at LAX helps reduce the number of vehicles that circle the terminals. Rental car and hotel shuttle services are now being consolidated at LAX to help reduce congestion in the terminal area; a consolidated rental car facility is already in operation at LA/Ontario International Airport. Intermodal transportation systems that link various types of transit can also help ease congestion. LAWA is now working with area transportation agencies to improve airport access while also dispersing traffic to through other transportation modes.

To reduce electricity consumption and associated emissions, LAX installed energy efficient lighting fixtures exclusively, variable demand motors on terminal escalators, and variable frequency drive on fan units at terminals and in LAWA buildings. LAWA also purchases renewably generated Green Power from the Los Angeles Department of Water and Power (LADWP).

The Board of Airport Commissioners adopted sustainable building policy requiring “highest practical” Leadership in Energy and Environmental Design (LEED) standards for all airport projects. The LA/Ontario (ONT) International Airport terminals include energy conservation designs and features, and the Tom Bradley International Terminal (TBIT) will be one of the first LEED-certified renovated airport terminal projects in the nation.

LAWA recycled over 98% of construction debris from the South Airfield Improvement Project; has achieved a 65% recycling rate for all airport waste; and is participating in the EPA airport recycling pilot program.

Furthermore, as part of the LAX Master Plan process, LAWA has implemented an agreement with the LAX Coalition for Economic, Environmental, and Educational Justice to reduce emissions with the following actions and programs:

- Electrification of passenger gates
- Electrification of cargo operations areas
- Electrification of hangars
- Emissions reductions from technology retrofit requirements and offering rapid chargers for ground service equipment (GSE)

- Emission reductions from on-road trucks, buses and shuttles
- Conversion of on-site trucks, shuttles and buses to alternative fuel
- Limits on diesel idling
- Assessment and mitigation of particulate matter
- Provision of alternative fuel
- Hydrogen fuel cell infrastructure at LAX

LAWA will also conduct an Air Quality Source Apportionment Study.

Our Goals

LAWA's goal is to reduce CO_2 emissions 35% below 1990 levels by 2030. LAWA is also working aggressively to implement sustainability practices and develop programs that will reduce waste and pollutants.

How We Are Going to Get There

The development and implementation of the Sustainability Performance Improvement Implementation Plan (SPIMS) will improve energy conservation and efficiency. LAWA is gathering the information necessary information to compile and calculate an accurate GHG emissions inventory, which is the foundation that will enable us to meet our 2030 goal.

LAWA will continue to implement early actions such as increasing usage of LADWP's Green Power, continued expansion of the alternative fuel program, completion of the ground power and pre-conditioned air infrastructure at passenger gates and cargo hangers, shuttle and van conversion to alternative fuel, conversion of ground service equipment (GSE) to meet zero emission standards, the use of clean construction equipment, and other conservation measures and policies.

Finally, LAWA will develop and implement new initiatives and sustainability practices to ensure that LAWA reaches the reduction of GHG emissions 35% below 1990 levels.

Summary of GHG Reduction Actions

Aircraft Operations

- Develop aircraft idling policies
- Use hydrant systems at terminals and cargo area instead of fueling trucks
- 100% electrification of passenger gates, cargo areas and hangers at all LAWA airports
- Stage 2, larger aircraft, phase-out at Van Nuys Airport and the continued support of research, design, and implementation of lower emissions technology

Ground Vehicles

- Install rapid chargers to support electric ground support equipment and pre-conditioned air to minimize use of auxiliary power
- Hydrogen fueling station at LAX and pilot testing of hydrogen fuel cell vehicles
- Expand FlyAway services to Pasadena, Long Beach, Irvine and other Southern California locations

- Use alternative fuel buses at the FlyAway bus terminals
- Rideshare program for employees and use of mass transit program for all airport personnel;
- Promote the bicycle program and add bike lanes access to the airport
- By 2015, 100% of LAWA-owned fleet vehicles will use alternative fuel (including CNG, LNG, propane, hydrogen, solar, hybrid electric and pure electric)
- Construct additional compressed Natural Gas (CNG) stations at airports
- Board of Airport Commissioners adopted LAWA alternative fuel vehicle fleet requirement
- Hotel shuttle consolidation program
- Rental car shuttle alternative fuel vehicle fleet requirement

Electrical Consumption

- Retrofit parking lot lights to reduce energy spikes when the lights are first turned on
- Zoning cargo facilities and utilities expenditures for tenant (instead of flat rates) to promote energy conservation

Building

- Increased use low-VOC adhesives, sealants, paints and coatings
- Reduce emissions of ozone-depleting substances through the removal of the remaining halon systems in AC units

Other Actions

- Develop and implement the Sustainability Performance Improvement Management System (SPIMS)
- Develop and implement LAWA's Green LA Work Plan Matrix and Action Plan
- Apply GHG reduction technology to South Airfield Improvement Project construction equipment
- Build the infrastructure to support a recycled (reclaimed) water program for landscape and other areas

Conclusion

Although LAWA's four airports now have little direct control over the major sources of airport-related GHG emissions (aircraft and transportation), LAWA is committed to implementing programs, such as the Sustainability Performance Improvement Management System, and developing new initiatives, that will help reduce GHG emissions.

This will require the participation and dedication of all sectors of the aviation industry. Through a partnership of these stakeholders, LAWA will be able to address the challenges posed by climate change and implement policies and practices that will preserve the environment for future generations.

Goal: Green Airports

Action AIR1	**Fully employ the Sustainability Performance Improvement Management System to track and improve sustainability initiatives.**

The Sustainability Performance Improvement Management System (SPIMS) was developed by LAWA as a tool to aid in the implementation and tracking of sustainability initiatives. It will also allow LAWA to easily recognize, and then communicate, environmental stewardship accomplishments. In short, SPIMS will help advance our global leadership position through continual sustainability performance improvement. SPIMS focuses on the "Triple Bottom Line" (TBL) approach to sustainability, which recognizes that organizations must measure their success not only by the traditional bottom line of financial performance, but also by their impact on the broader economy, the environment, and on the society in which they operate.

With the implementation of SPIMS, LAWA is committed to integrating sustainable practices into operations and administrative processes throughout our organization, and to identifying sustainable opportunities that will then be used to create a baseline against which our sustainability progress can be measured. Upon identification of these opportunities, goals and targets will be established, and a plan to implement those initiatives will be developed.

Lead Agency Los Angeles World Airports (LAWA)

Other Agencies Environmental Affairs Department (EAD), Los Angeles Department of Water and Power (LADWP)

LAWA regular participates in the Mayor's Sustainable Practices Cabinet and will continue to work and coordinate stakeholders, such as the airlines and other City departments, to ensure that LAWA's sustainable objectives are appropriate, and that they are implemented, during the development and implementation of all projects at all four LAWA airports: Los Angeles International (LAX), LA/Ontario International (ONT), Van Nuys (VNY), and LA/Palmdale Regional (PMD).

Opportunity

During the development phase of the SPIMS, Implementation Teams were formed to identify sustainability opportunities in 6 areas: Sustainable Design; Energy and Atmosphere; Materials and Resources; Water Efficiency; Transportation Resources; and Administrative Processes. The opportunities within each the 6 areas were assigned a ranking based on associated environmental benefits, personnel resources, feasibility, stakeholder concerns, community benefits, cost-effectiveness, and regulatory requirements. Opportunities with the highest ranks are those that would provide the most benefit to the environment and community, and would offer the highest rate of return. The Implementation Teams identified fundamental sustainability objectives; LAWA is now in the process of setting goals and targets and identifying projects and initiatives.

Challenges

The competition for resources will be challenging, as implementation of these projects and initiatives will require the dedication of staff and budget resources while LAWA is also undertaking major Master Planning efforts at all four airports. Unless it is stipulated in their leases or concessions or operating

agreements, LAWA tenants, lessees, and concessionaires are not required to participate in emissions reductions practices or programs. It will be challenging for LAWA to engage and motivate these entities to do so on a voluntary basis.

Table 35. AIR1 Implementation Steps

Milestone	Completion Date	Quantity of Measure
Conduct assessment and identify sustainability opportunities.	Pending	Improve environmental sustainability initiatives and seek opportunities for further improvement.
Draft sustainability assessment matrix.	Completed	
Develop comprehensive list of sustainability indicators.	Completed	
Implement sustainability initiatives.	Pending	

Measure Evaluation

Upon implementation of the Sustainability Performance Improvement Management System (SPIMS), the benefits of LAWA's GHG reduction programs will be tracked and measured.

Action AIR2	**Develop and implement comprehensive policies to green Los Angeles airports to meet green building specifications, improve recycling, use alternate fuel sources, use recycled water, employ water conservation methods, reduce energy requirements, and reduce GHG emissions.**

Los Angeles World Airports (LAWA) strives to be a leader in the development and implementation of airport sustainable practices. LAWA's vision is "to set the global airport standard for customer satisfaction and security, regional economic leadership and organizational performance." This vision was melded with the Mayor's Executive Directive on Sustainable Practices, the City Council motion directing Los Angeles International Airport (LAX) to be "built and held to the highest green standards," and the Board of Airport Commissioners' (BOAC) goal that LAX become the greenest airport in the world, resulting in LAWA's commitment to improving the sustainability performance of its four airports (LAX; LA/Ontario International Airport or ONT; Van Nuys Airport or VNY; and LA/Palmdale Regional Airport—PMD). To fulfill this commitment, LAWA developed and is now implementing the Sustainability Performance Improvement Management System (SPIMS). SPIMS will enable LAWA to measure its progress and facilitate the continuous improvement of sustainability practices.

LAWA's Airport Sustainable Planning, Design, and Construction Guidelines (Guidelines) will help ensure that sustainability concepts and practices are integrated into all capital and non-capital airport projects by providing performance standards for all planning, design and construction activities. The Guidelines also provide a method for measuring the degree to which performance standards are achieved, so that successes will be documented and "lessons learned" can be shared.

Lead Agency Los Angeles World Airports (LAWA)

Other Agencies Environmental Affairs Department (EAD), Mayor's Office

The Guidelines, which resulted from a collaborative effort among LAWA staff, other City departments, and other airports and stakeholders, are a compilation of performance standards, guidelines and tools published by numerous organizations including the United States Green Building Council (USGBC), other national airports including Chicago O'Hare (O'Hare), the Port Authority of New York and New Jersey (PANYNJ), Airports Council International (ACI), the American Association of State Highway and Transportation Officials (AASHTO), the United States Army Corps of Engineers (Corps), the University of California, the Building Research Establishment (BRE), and the International Federation of Consulting Engineers (FIDIC). A complete list is included in this document.

The Guidelines are not meant to supersede any existing standards, regulations, codes, guidelines, or practices currently in place or adopted by the State of California, City of Los Angeles, or LAWA and its tenants. The Guidelines represent additional actions that can be considered during the design and construction processes. If conflicting regulations are encountered or if a sustainable performance standard is deemed to be more environmentally beneficial than an established, conflicting regulation, it is the responsibility of the design and/or construction teams to review these conflicts and identify a plan of action. This may entail negotiations with regulators. It is expected that, to the extent feasible, the most rigorous requirement will be met.

Opportunity

In addition to LAWA staff, every engineering and construction professional team working at LAWA will be provided with a copy of the Guidelines to ensure the incorporation of sustainable elements in their

planning, designs and/or construction and maintenance implementation. LAWA's design, construction, and maintenance projects will embrace the best possible environmental, social, and fiscally responsible practices, in order to enhance the overall quality of a project and to maintain consistency with the mission and goals of the City.

Challenges

The fundamental belief underlying the Guidelines is that an integrated design process will enable LAWA to achieve thoughtful, sustainable design and construction efforts with no or minimal impact to schedules or budgets. It is especially critical that all members of a project team incorporate the Guidelines during the earliest planning efforts. Design requirements, competing interests, schedule and budget issues must be balanced at both the project and department levels. During the pre-evaluation project stage, general sustainability goals and specific design and construction strategies, including added budget demands, must be identified and communicated to all interested stakeholders. Given that sustainability initiatives may add to project costs, it will be imperative for the team to consider life cycle costs rather than initial investment alone. After the initial evaluation, continued use of the Guidelines through all stages of the planning, design and construction processes will ensure that the sustainability goals are met. Persuading hundreds of tenants/lessees/ concessionaires to embrace sustainability initiatives will also be very challenging.

Table 36. AIR2 Implementation Steps

Milestone	Completion Date
Draft Guidelines.	6/2007
Issue Final Guidelines.	1/2008
Implementation of Guidelines.	1/2008

Measure Evaluation

LAWA's Mitigation Compliance Division will track and report LAWA's progress as the Guidelines evolve, to ensure that sustainable design measures are incorporated into every element of all LAWA projects, to the greatest extent possible.

Action AIR3	Evaluate options to reduce aircraft-related GHG emissions.

Los Angeles World Airports (LAWA) has already implemented a number of early action items that will greatly assist the City in meeting its goal of reducing greenhouse gas emissions 35% below 1990 levels by 2030. Some of these actions are still ongoing; some are mandated by agreements signed in conjunction with the LAX Master Approval process, while others are required by the mitigation-monitoring plan that was established for the LAX Master Plan.

Lead Agency Los Angeles World Airports (LAWA)

Other Agencies Environmental Affairs Department (EAD), Los Angeles Department of Water and Power (LADWP)

To develop the emissions inventory, LAWA will work closely with the Federal Aviation Administration (FAA); California Department of Transportation (Caltrans); Environmental Protection Agency (EPA); airlines; airport tenants; various air quality districts; and various emissions registries, as well as other City departments.

Opportunity

The mandate to compile a GHG emissions inventory represents two unique opportunities for LAWA. LAWA will develop a comprehensive database of emissions sources and impacts for greenhouse gases *and* criteria and toxic air pollutants. Because there is now no standardized GHG reporting protocol for airports, the GHG reporting protocol and framework that LAWA develops will likely become benchmarks for other airports to use.

Challenges

Clearly defining the limitations and boundaries of the inventory is paramount. Scientific experts employ different data collection methods. Sorting out relevant data points and ensuring the credibility of the collected data may be difficult. LAWA will need to be able to defend its approaches. Compiling an inventory of this scope requires a significant allocation of LAWA funds and staff, and the cooperation and input from the hundreds of airlines, tenants, lessees, and contractors that generate emissions.

Implementation Steps

LAWA is now developing a protocol that will be used to compile the 2005 emissions inventory. Upon completion of that inventory, LAWA will extrapolate its 1990 baseline emissions inventory. A formal GHG Reduction Plan and Implementation Plan will follow.

Table _____. AIR3 Implementation Steps

Milestone	Completion Date
Develop framework and scope.	1/2008
Develop Inventory Protocol.	6/2008
Commence Inventory.	6/2008
Data collection and compilation.	1/2009
Complete GHG inventory, determine 1990 baseline and establish 2030 goal.	12/2009
Begin GHG verification (in 1/2010).	4/2010
Develop Emissions Reduction Plan and implement new initiatives.	2010-2030

Measure Evaluation

LAWA's emissions inventory will be certified (approved) by an independent verifier. LAWA will monitor its progress through the formal Emissions Reduction Plan and Implementation Plan.

GOAL: Citywide Climate Change Education Program

Action Ed1	**City will partner with community, environmental justice, and environmental organizations to develop educational materials and reach out to Angelenos with steps they can take to reduce their own emissions.**
Action Ed2	**Conduct multi-lingual outreach to all neighborhoods, with emphasis on those with environmental justice challenges, to inform them of climate action.**
Action Ed3	**Convene a series of at least 20 community workshops to engage public input into the climate plan.**
Action Ed4	**Develop a program to challenge all Angelenos to reduce their individual / household carbon footprint.**

As part of the City's climate change program, the Environmental Affairs Department (EAD), the Environmental Affairs Commission (EAC), and other departments will conduct public participation, outreach, and educational activities. These activities may be conducted in a variety of ways, and will take advantage of on-going environmental outreach and education programs. Informing City staff about the climate change crisis will be emphasized, and ways to mitigate and adapt to climate change, to allow all City staff to carry the climate message in their daily work activities.

Lead Agency Environmental Affairs Department (EAD) and Environmental Affairs Commission (EAC)

Other Agencies Department of City Planning; Bureau of Sanitation (BOS) of the Los Angeles Department of Public Works (LADPW); Department of Recreation and Parks (RAP); Los Angeles Housing Department (LAHD); Los Angeles Department of Water and Power (LADWP); Los Angeles World Airports (LAWA); Port of Los Angeles (POLA, also called the "Harbor Department"); Community Redevelopment Agency (CRA)

EAD plans to partner with non-profit organizations and institutions, in addition to other City departments and offices, to provide venues for community events, to attract public participation, and to help provide information on the City's climate change plans. EAD will also pursue grant funding from foundations, as well as state and federal agencies, to assist in funding these activities.

Opportunity

Several City departments are planning or conducting public participation, outreach, and educational activities on a number of environmental programs. These include the Planning Department's workshops on 12 proposed Community Plan revisions; the Bureau of Sanitation's Solid Waste Integrated Resources Plan/Zero Waste Initiative; the Recreation and Parks Department's Community Needs Assessment; the Department of Water and Power's Integrated Resources Plan for Electricity, and electricity and water rate changes studies; the Port of LA's Clean Air Action Plan; and LAWA's LAX Master Plan activities, among others. Several departments, such as Housing, Building and Safety, and Planning, have employees who meet daily with City residents and businesses, or their representatives. These employees, and the public

participation and outreach activities, represent a unique opportunity to share resources to inform the public and solicit input on climate change issues, as a complement to other environmental initiatives and goals.

Challenges

No specific funding is allocated for climate change public participation activities, or for outreach and educational materials and activities. Thus, EAD will incorporate climate change messages into on-going public contacts, through our newsletter, website, and at events. With so many public activities planned by other City departments, our challenge will be to develop a consistent message that all departments, at a limited increased cost to them. It will be a challenge to ensure that the message reaches all neighborhoods, and to provide translated materials, with no budget identified. In addition, with the City's residential population of 4 million, and thousands of businesses, it will be a challenge to reach all constituents that want to participate in the climate plan activities.

Table 37. Ed1/Ed2/Ed3/Ed4 Implementation Steps

Milestone	Completion Date	Results/ Outcome
Develop strategy for public participation activities.	**March 2008**	
Develop initial outreach materials, update EAD Web site.	**March 2008**	
Provide training for City staff.	**September 2008**	
Implement public participation activities.	**December 2008**	
Study public input and prepare plan revisions.		
Develop additional outreach & educational materials.		
Assess need for new incentive programs and/or requirements to reduce GHG emissions.		

Measure Evaluation

This measure has the potential to significantly assist in the reduction of GHG emissions in the community of Los Angeles. This measure will not achieve direct emissions reductions, but will help in the development of a more complete list of actions that can do so. Based on public input, the City will design additional outreach materials to encourage residents and businesses to reduce their own GHG emissions and begin to adapt to our changing climate. It is possible that new incentive programs to reduce energy and fuel use, and/or new City requirements to do so, would also be developed.

Appendix A: Matrix of Action Items

Appendix B: Municipal CO_2 Inventory

Appendix C: Preliminary Community CO_2 Inventory

Appendix D: Harbor Climate Action Plan

Appendix E: Acknowledgements/Participants