Transportation Fuels Assessments - Policy

Economic, Demographic, and Energy Price Inputs for Electricity, Natural Gas, and Transportation Fuel Demand Forecasts

DOCKET
11-IEP-1L
DATE FEB 24 2011
RECD. FEB 25 2011

Joint Committee Workshop

February 24, 2011

Gordon Schremp
Fuels and Transportation Division
California Energy Commission

Topics

- Transportation Energy Demand – Federal and State Policies
  - Federal - Renewable Fuels Standard (RFS2)
  - State - Low Carbon Fuel Standard (LCFS)
- Transportation Energy Demand – Infrastructure Assessments
  - Historical & forecast demand
  - Infrastructure needs – petroleum & renewable fuels
- Advanced Biofuel Technologies
- Crude Oil
  - Historical & forecast import demand
  - Refining capacity scenario & infrastructure needs
  - Crude oil "screening"
- Other Issues
  - MOTEMS status, new ozone standards, agricultural commodities, ethanol import tariffs, blending credits, Macondo oil spill, and energy security

Federal & State Regulations – More Biofuels









Renewable Fuels Standard (RFS2) – Increased Demand for Ethanol and Biodiesel

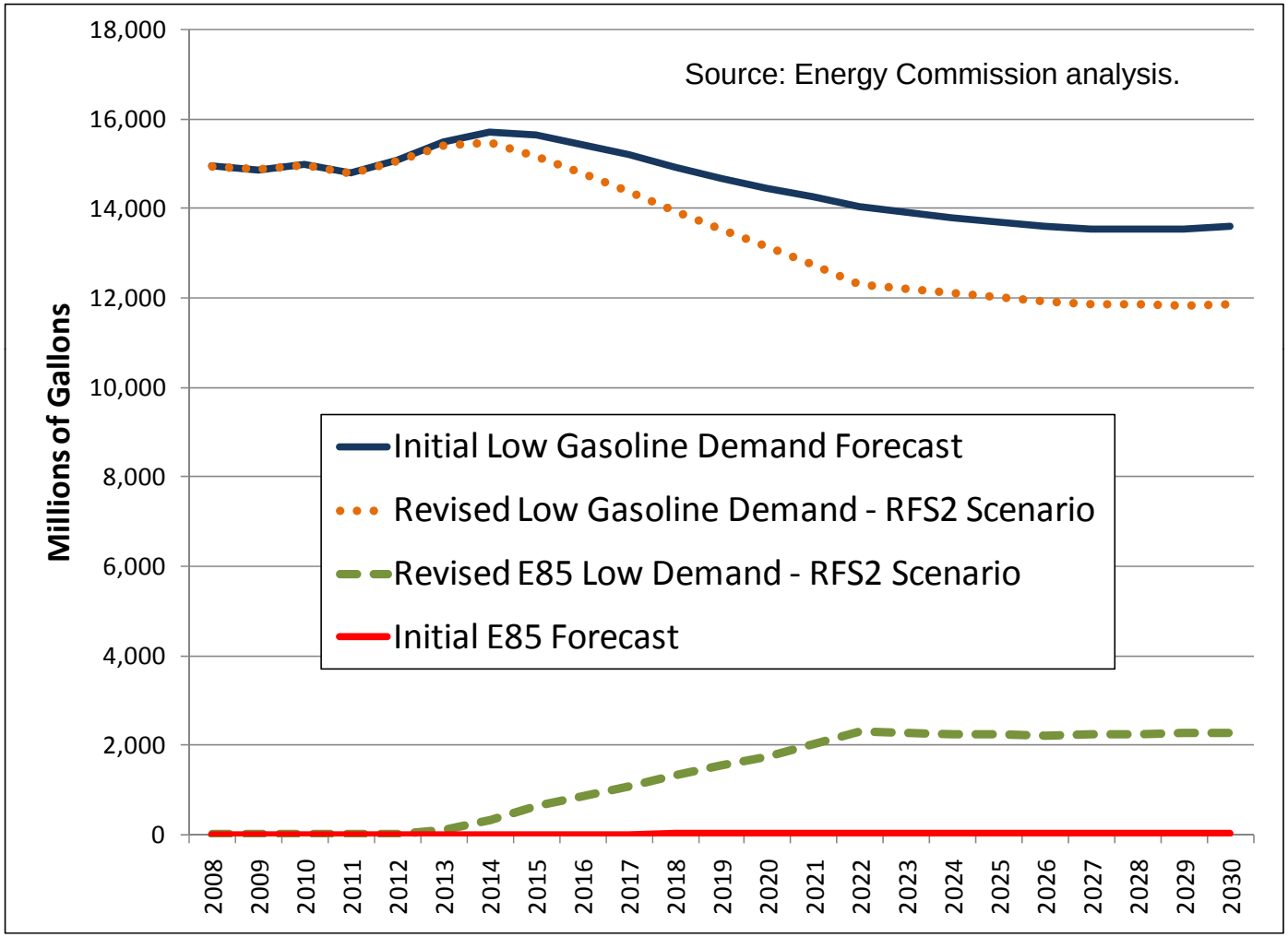
- Federal standard (RFS2) *mandates* increased use of renewable fuel – both ethanol and biodiesel
- Obligated parties include refiners, importers, and blenders
- Companies can generate Renewable Identification Number (RIN) credits for excess renewable fuel use or purchase credits
- Program is not a "per-gallon" regulation
- Regulation impacts can include:
  - Increased demand for & production of ethanol
  - Increased demand for ethanol feedstock such as corn
  - Displacement of gasoline
  - Need for expanded renewable fuel infrastructure

Renewable Fuels Standard (RFS2)

Year	Total Renewable Fuel Requirement Bil. Gallons	Starch Derived Biofuel Bil. Gallons	Advanced Biofuels			
			Cellulosic Biofuels Bil. Gallons	Other Advanced Biofuels Bil. Gallons	Biomass Based Diesel Bil. Gallons	Total Advanced Biofuels Bil. Gallons
2008	9.00	9.00				0.00
2009	11.10	10.50		0.10	0.50	0.60
2010	12.95	12.00	0.10	0.20	0.65	0.95
2011	13.95	12.60	0.25	0.30	0.80	1.35
2012	15.20	13.20	0.50	0.50	1.00	2.00
2013	16.55	13.80	1.00	0.75	1.00	2.75
2014	18.15	14.40	1.75	1.00	1.00	3.75
2015	20.50	15.00	3.00	1.50	1.00	5.50
2016	22.25	15.00	4.25	2.00	1.00	7.25
2017	24.00	15.00	5.50	2.50	1.00	9.00
2018	26.00	15.00	7.00	3.00	1.00	11.00
2019	28.00	15.00	8.50	3.50	1.00	13.00
2020	30.00	15.00	10.50	3.50	1.00	15.00
2021	33.00	15.00	13.50	3.50	1.00	18.00
2022	36.00	15.00	16.00	4.00	1.00	21.00

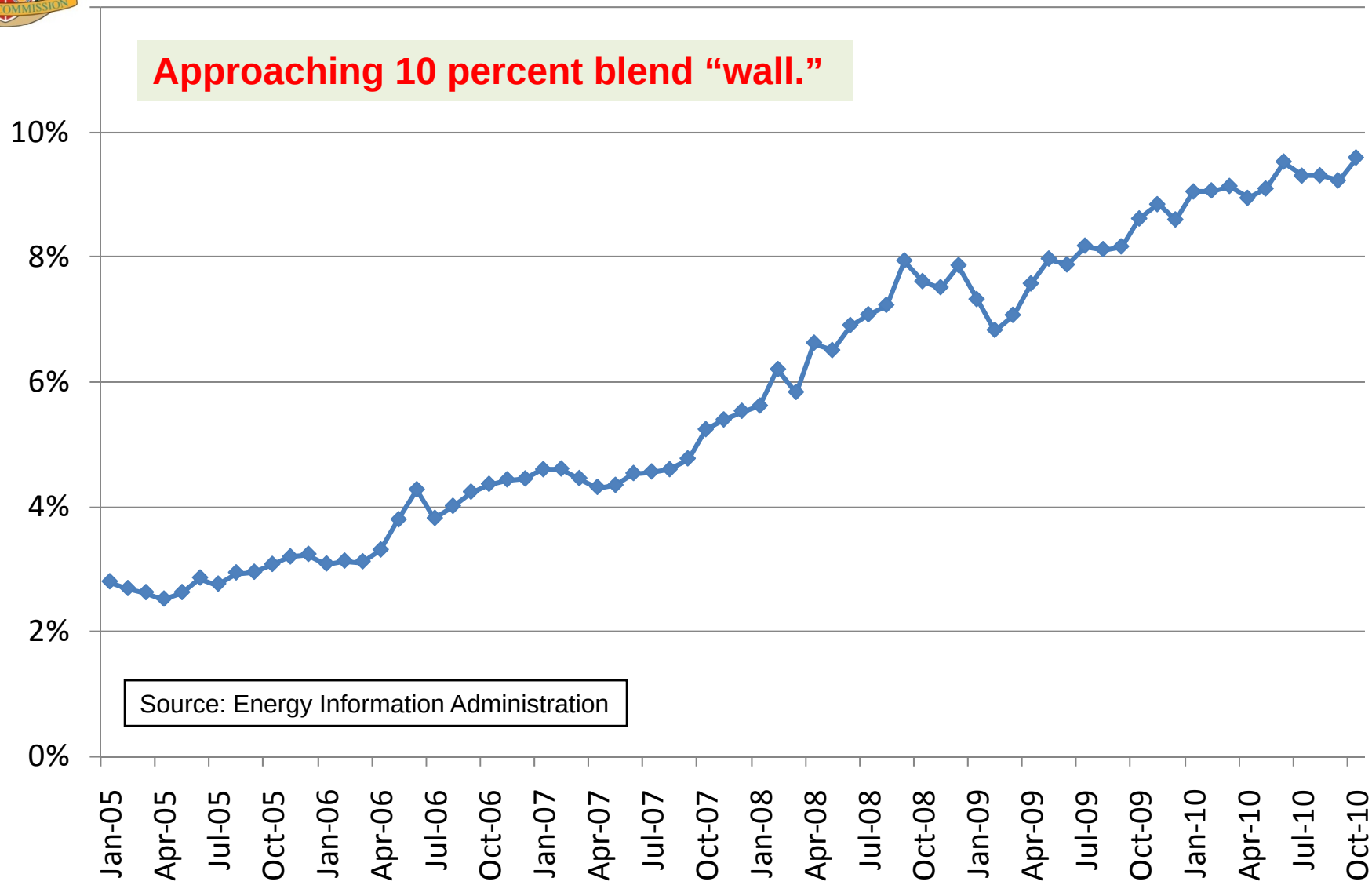
Cellulosic requirement downgraded to 6.0 million gallons for 2011.

RFS2 Impact on CA Gasoline Demand Forecast 2009 Results Will Be Updated

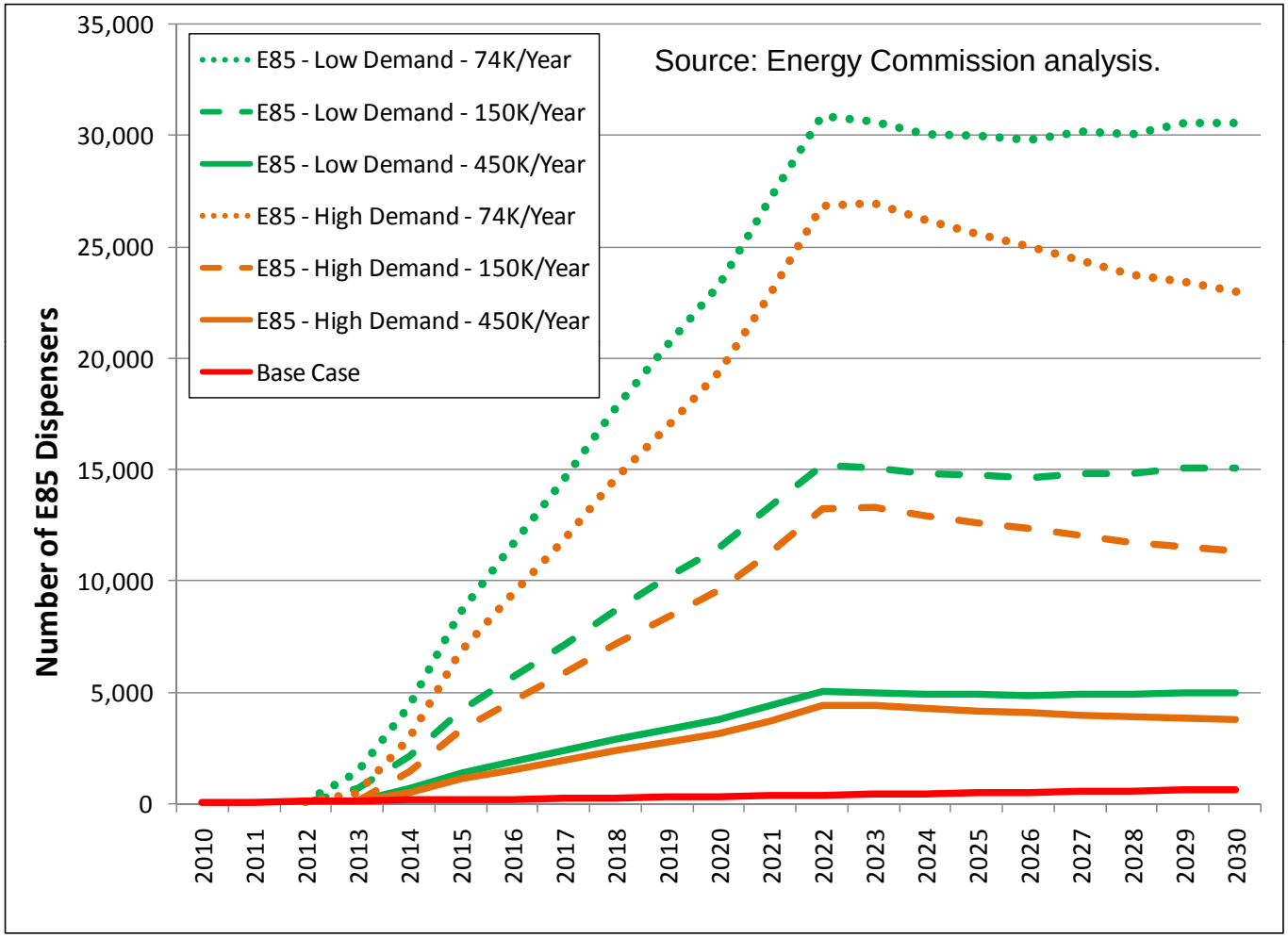


Can contribute to refinery overcapacity & E85 infrastructure constraints.

U.S. Ethanol Concentration in Finished Gasoline



RFS2 Impact on E85 Demand Forecast 2009 Results Will Be Updated



E15 not assumed to be available over the base case forecast period.

California LCFS - Overview

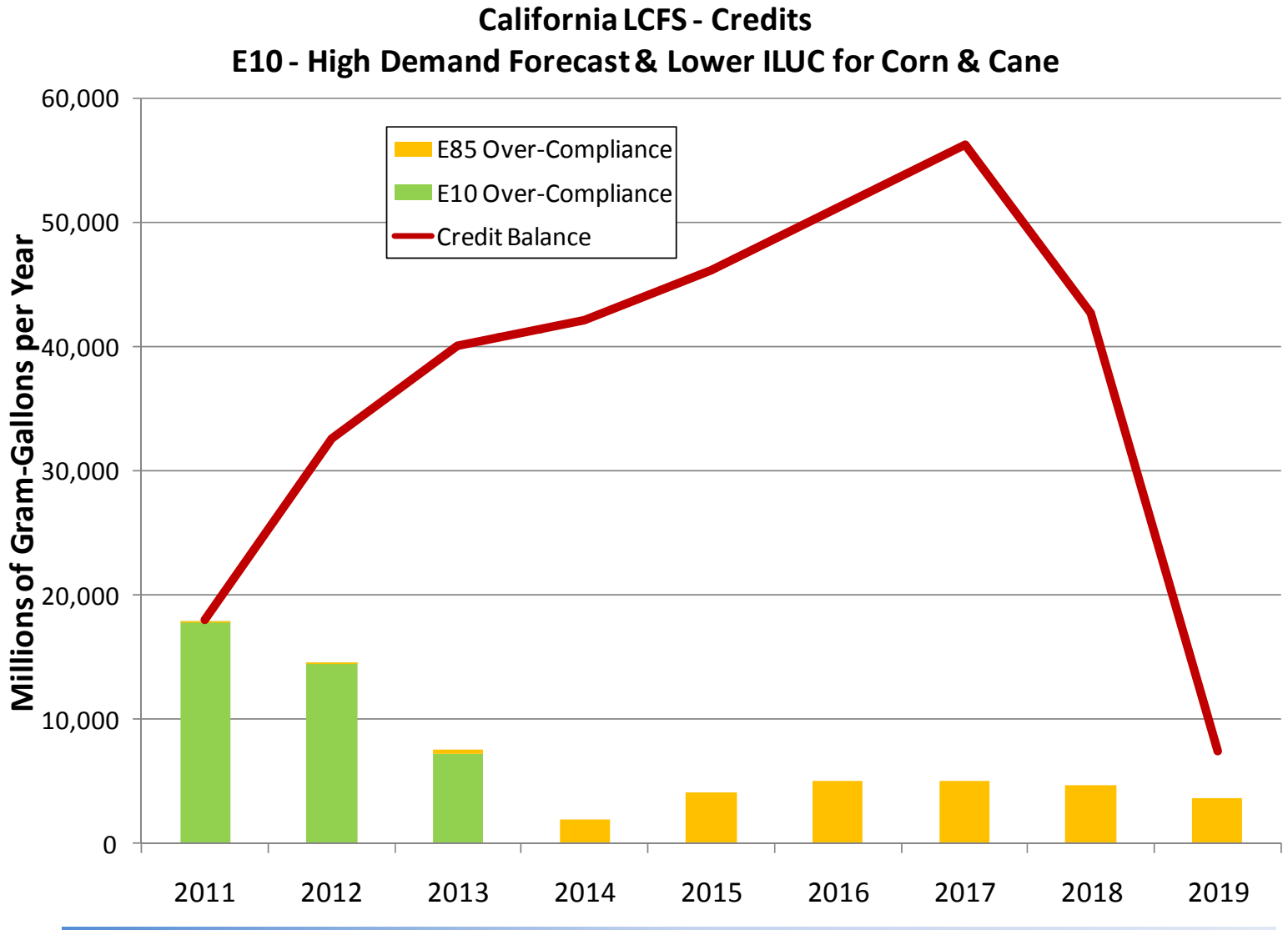
- California Air Resources Board regulation
- Designed to reduce the per-gallon carbon intensity of gasoline and diesel fuel – easier initially, then increasingly difficult
- Does not apply to other transportation fuels such as jet fuel and bunker fuel
- Does not apply to non-transportation petroleum, e.g. lube oils
- LCFS compliance began January 1, 2011
  - However, regulation still not finalized
- CARB adopted resolution on November 18, 2010
  - Discusses “enforcement discretion”
  - Details items that still need to be addressed
    - Credit trading system
    - Crude oil screening
    - Indirect Land Use Change impact reassessment – could be reduced by 50 percent

California LCFS – Carbon Intensities (CI)

- CI consists of direct & indirect emissions
- Indirect Land Use Change values are expected to be reduced by 50%
- Compliance beyond 2018 will likely require availability of renewable hydrocarbons that can be blended with gasoline to reduce the base fuel CI
  - Both gasoline & diesel
- Use of LCFS credits will likely be an important compliance strategy

Fuel	Pathway Description	Carbon Intensity Values (gCO_2e/MJ)		
		Direct Emissions	Land Use or Other Indirect Effect	Total
Gasoline	CARBOB – based on the average crude oil delivered to California refineries and average California refinery efficiencies	95.86	0	95.86
Ethanol from Corn	Midwest average; 80% Dry Mill; 20% Wet Mill; Dry DGS	69.40	30	99.40
	California average; 80% Midwest Average; 20% California; Dry Mill; Wet DGS; NG	65.66	30	95.66
	California; Dry Mill; Wet DGS; NG	50.70	30	80.70
	Midwest; Dry Mill; Dry DGS, NG	68.40	30	98.40
	Midwest; Wet Mill, 60% NG, 40% coal	75.10	30	105.10
	Midwest; Wet Mill, 100% NG	64.52	30	94.52
	Midwest; Wet Mill, 100% coal	90.99	30	120.99
	Midwest; Dry Mill; Wet, DGS	60.10	30	90.10
	California; Dry Mill; Dry DGS, NG	58.90	30	88.90
	Midwest; Dry Mill; Dry DGS; 80% NG; 20% Biomass	63.60	30	93.60
	Midwest; Dry Mill; Wet DGS; 80% NG; 20% Biomass	56.80	30	86.80
	California; Dry Mill; Dry DGS; 80% NG; 20% Biomass	54.20	30	84.20
	California; Dry Mill; Wet DGS; 80% NG; 20% Biomass	47.44	30	77.44
Ethanol from Sugarcane	Brazilian sugarcane using average production processes	27.40	46	73.40
	Brazilian sugarcane with average production process, mechanized harvesting and electricity co-product credit	12.40	46	58.40
	Brazilian sugarcane with average production process and electricity co-product credit	20.40	46	66.40

Preliminary Example of Compliance Strategy



Transportation Energy Demand Infrastructure Assessments

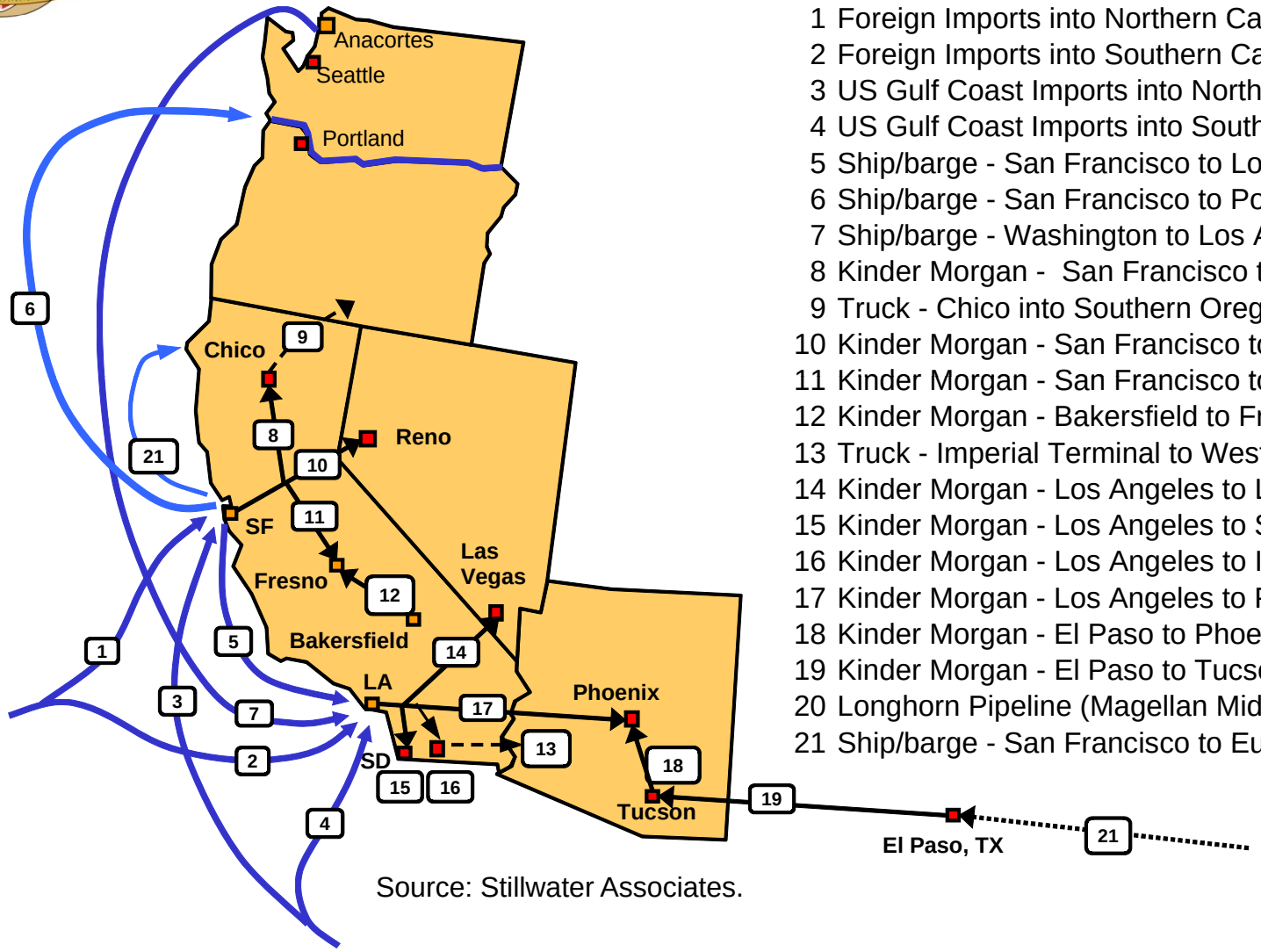








Western States – Fuel Flows



1 Foreign Imports into Northern California
2 Foreign Imports into Southern California
3 US Gulf Coast Imports into Northern California
4 US Gulf Coast Imports into Southern California
5 Ship/barge - San Francisco to Los Angeles
6 Ship/barge - San Francisco to Portland
7 Ship/barge - Washington to Los Angeles
8 Kinder Morgan - San Francisco to Chico
9 Truck - Chico into Southern Oregon
10 Kinder Morgan - San Francisco to Reno
11 Kinder Morgan - San Francisco to Fresno
12 Kinder Morgan - Bakersfield to Fresno
13 Truck - Imperial Terminal to Western Arizona
14 Kinder Morgan - Los Angeles to Las Vegas
15 Kinder Morgan - Los Angeles to San Diego
16 Kinder Morgan - Los Angeles to Imperial
17 Kinder Morgan - Los Angeles to Phoenix
18 Kinder Morgan - El Paso to Phoenix
19 Kinder Morgan - El Paso to Tucson
20 Longhorn Pipeline (Magellan Midstream Partners, L.P.)
21 Ship/barge - San Francisco to Eureka

Source: Stillwater Associates.

Distribution infrastructure needs assessment – imports, terminals & retail.

Infrastructure – Regional Demand Forecast

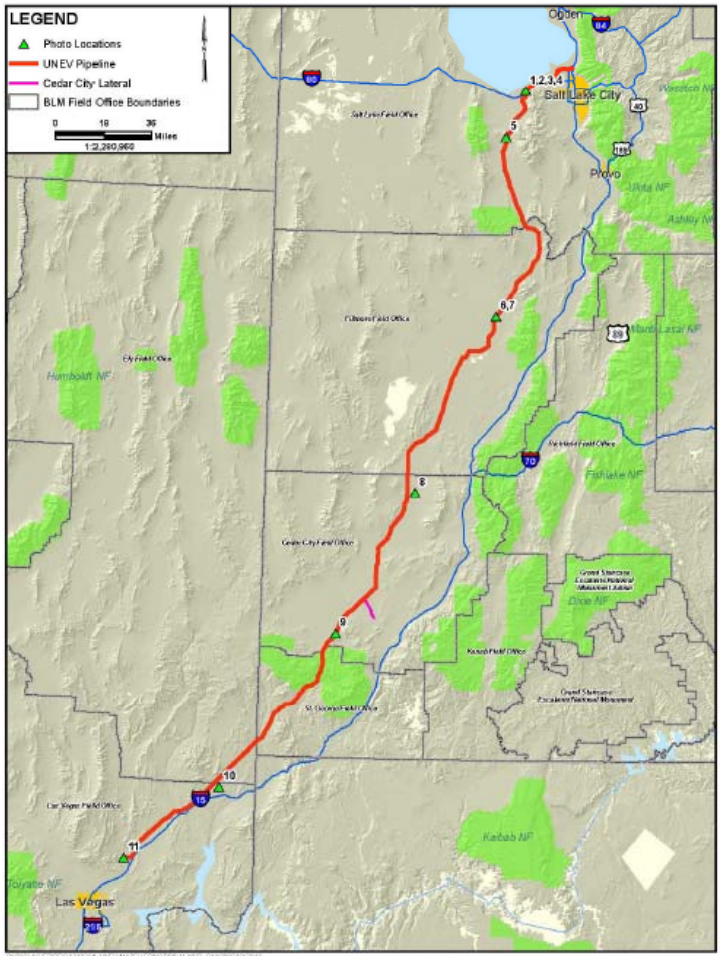
- Demand forecasts for AZ and NV will be used in conjunction with California to determine range of pipeline export demand
- This information will be used to calculate incremental change of imported volumes of renewable & petroleum transportation fuels



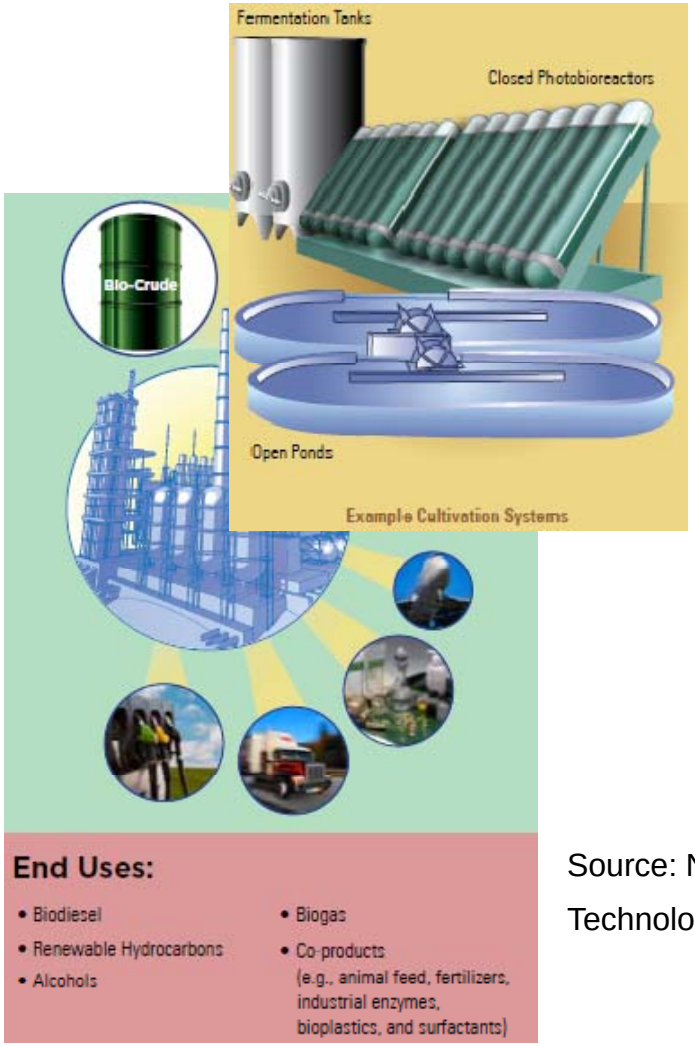
Source: Kinder Morgan Pipeline Company.

Infrastructure – Regional Pipeline Projects

- UNEV pipeline could become operational as early as the 2nd Q of 2011 with an initial pumping capacity of 30,000 BPD
- Over time, the pipeline system could be expanded to a maximum pumping capacity of up to 118,000 BPD
- Will displace an undetermined portion of the forecasted pipeline deliveries to Las Vegas from California



Advanced Biofuel Technologies
Algal Fuels



- Algal fuels will be examined
  - Primary technology types
  - Range of supply potential
  - Estimated production costs
  - Pilot projects & status of commercial-scale efforts
  - Suitability to California



Regions with annual average climate conditions meeting selected criteria: ≥ 2800 hour annual sunshine, annual average temperature ≥ 55° F, and ≥ 200 freeze-free days

Source: National Algal Biofuels Technology Roadmap.

Advanced Biofuel Technologies
Renewable Hydrocarbons

- Renewable hydrocarbon fuels will be examined
  - Primary technology types
  - Range of supply potential
  - Estimated production costs
  - Pilot projects & status of commercial-scale efforts
- Demand will increase for “drop in” blending components that can be used to decrease CI of gasoline, diesel & jet fuel
  - Will likely be necessary to achieve compliance with LCFS regulation



NExBTL-diesel started at the Porvoo refinery in 2007.

Crude Oil

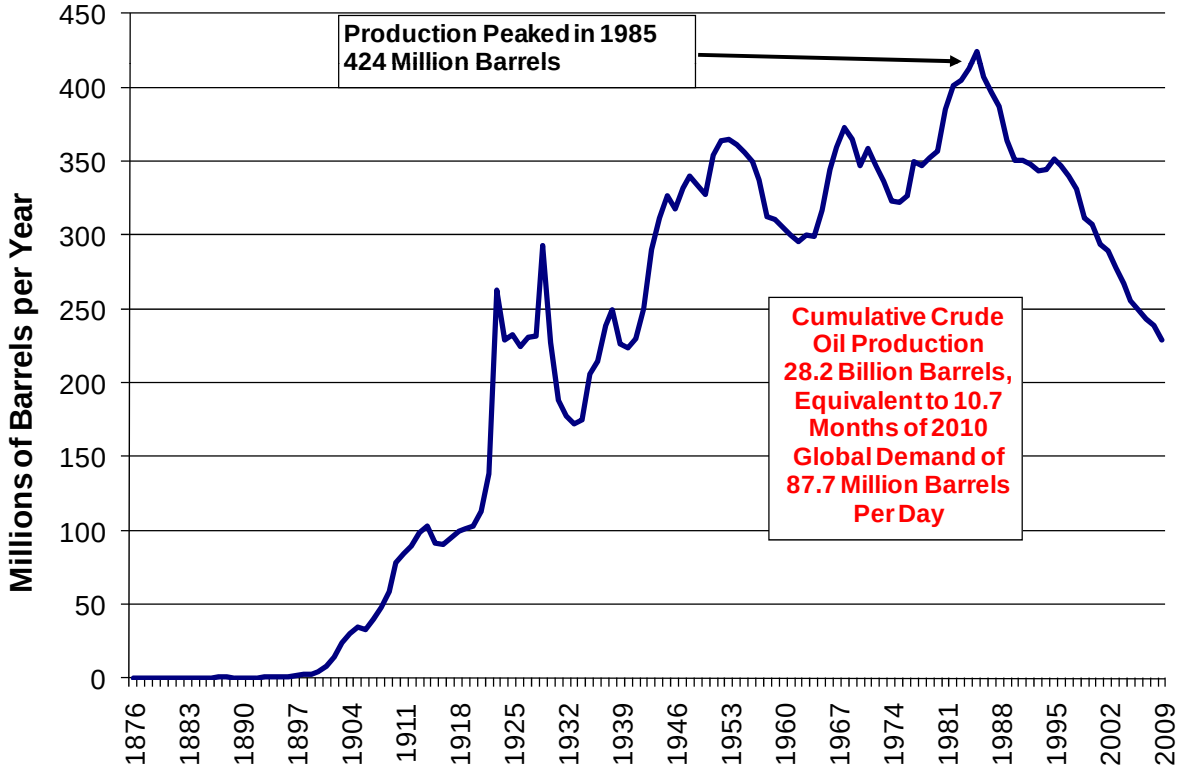




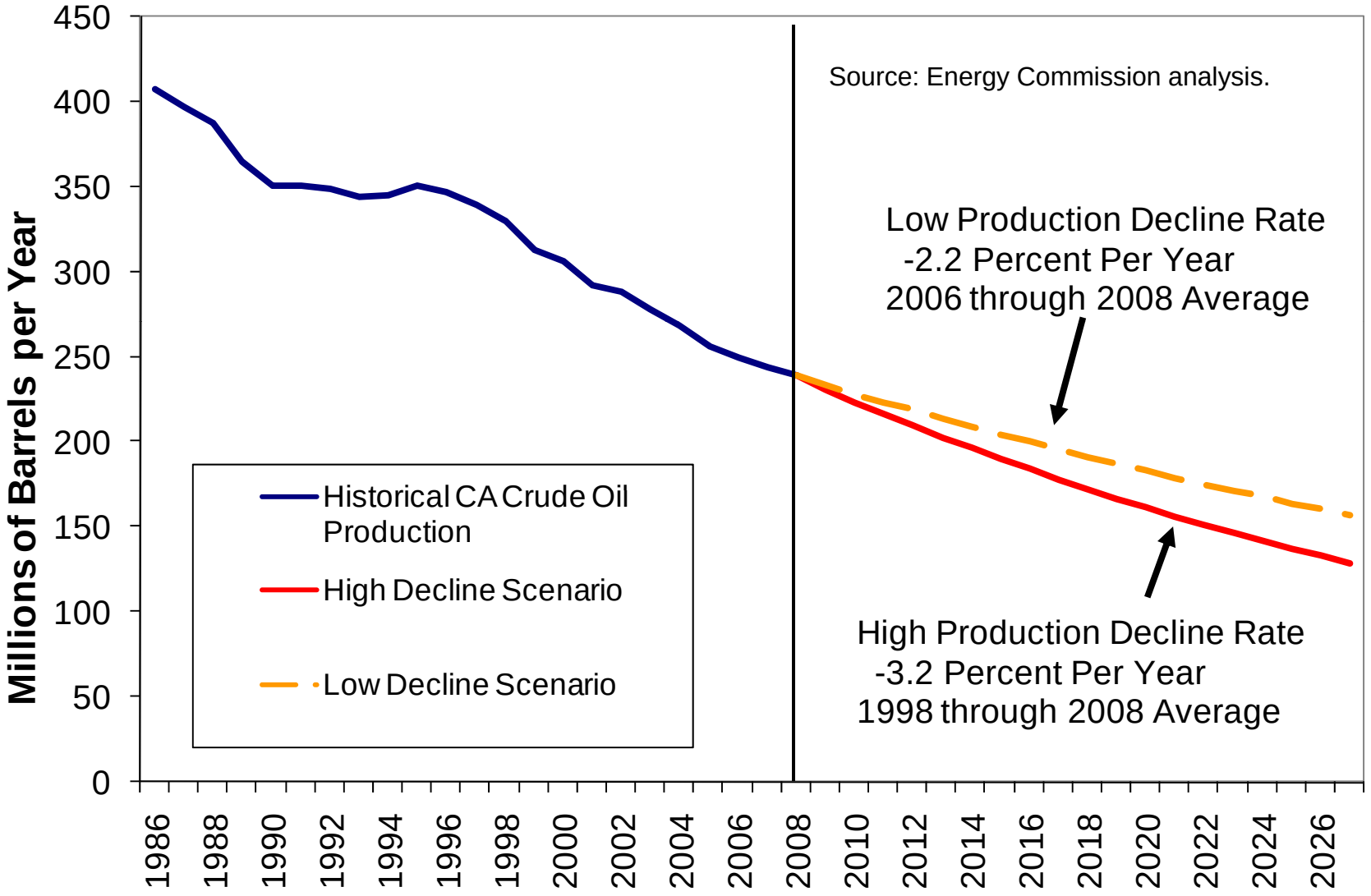


Crude Oil – Import Forecast

- Crude Oil Import Forecast – Several Elements
  - California oil production – historical & forecast rate of decline
  - Demand forecast for petroleum-based transportation fuels
    - California, Nevada & Arizona
  - California refining capacity – level or declining?

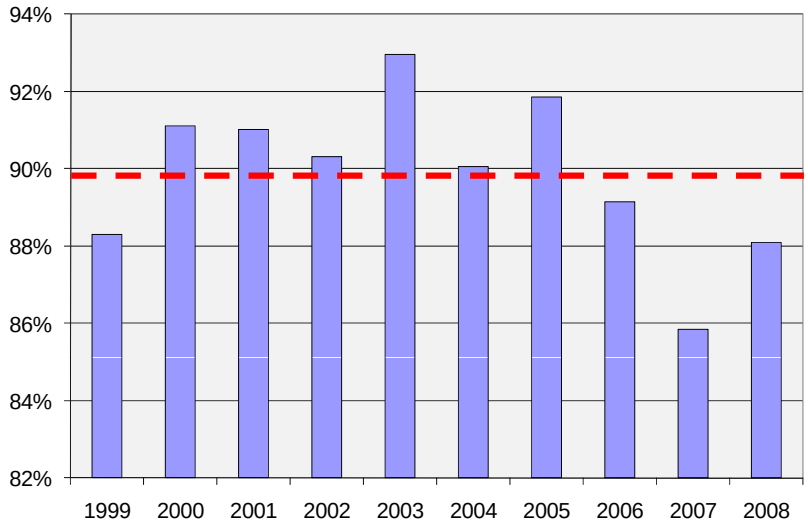


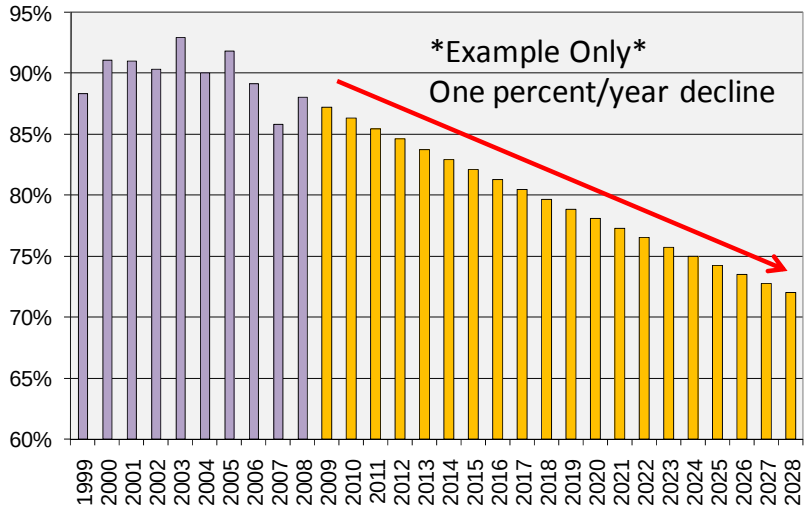
California Crude Oil – Production Decline Forecast - 2009



California Refining Capacity Assumptions

- Assumed level capacity as part of 2009 IEPR forecast analysis
- Will also examine scenario of declining utilization or capacity in light of:
  - Increased use of renewable fuels
  - Higher CAFÉ standards
  - Petroleum reduction goals
- Will decrease crude oil import forecast
- Will increase transportation fuel import forecast

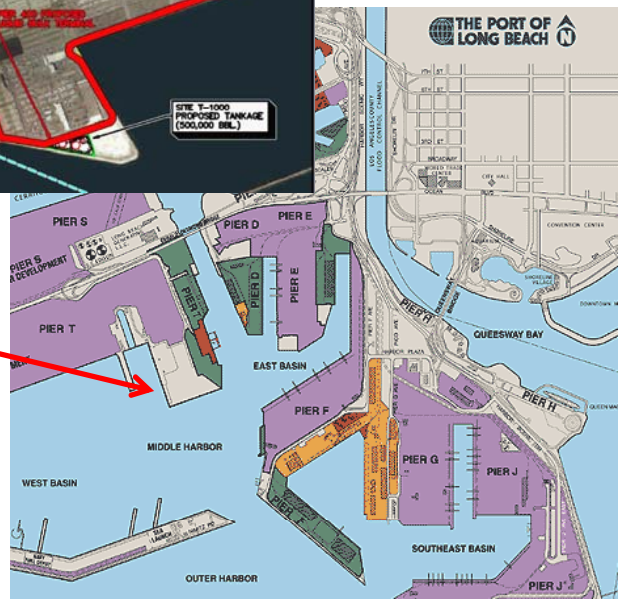




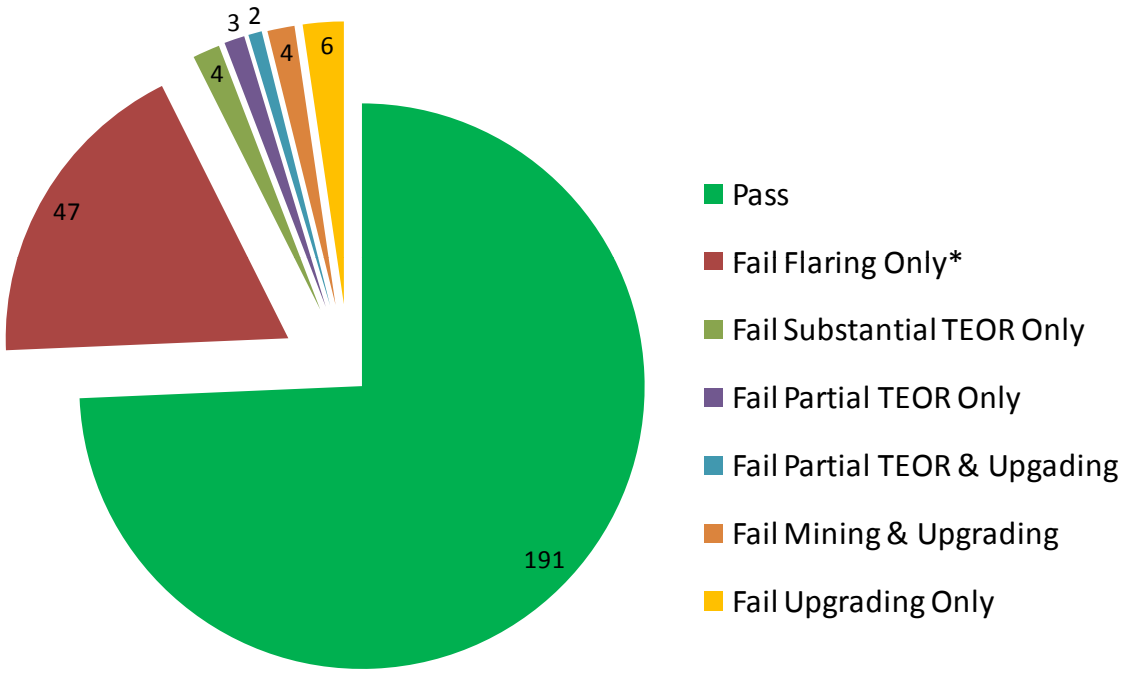
Crude Oil – Import Infrastructure

- Crude oil imports – increasing or decreasing?
- If increasing:
  - What additional import capacity is needed & where?
- Pier 400, Berth 408
  - Los Angeles City Council approved the Pier 400, Berth 408 project's DEIR/DEIS in the second quarter of 2009
- Port of Long Beach – Pier Echo
  - RFP released May 2010
  - T-126 berth would handle crude oil and transportation fuels





Crude Oil – LCFS "Screening" Proposal



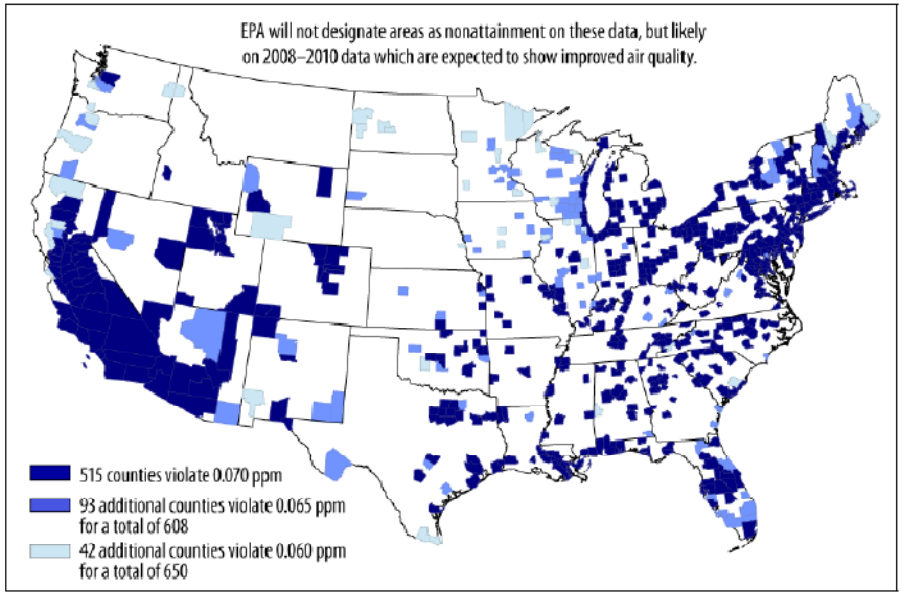
Source: Energy Commission analysis.

- Continuing to assess proposal to screen potentially high-carbon intensity crude oils
- Refiners would have to off-set carbon debits from using HCICOs
- The increasing difficulty of using HCICOs will potentially result in a decreased availability of crude oil sources for refiners
- May have economic and energy security implications

Other Issues – MOTEMS Update

- Marine Oil Terminal Engineering & Maintenance Standards (MOTEMS) part of California Business Code – Chapter 31F
  - Require upgrades to existing marine terminals to reduce the risk of spill related to earthquakes and tsunamis
- Most, if not all, marine oil terminals with medium or high risk of a potential spill have completed their safety audits
  - Include assessments of work that needs to be completed to achieve compliance with the standards
- Timing impacted by discussion over who pays
- It is possible that some facilities will not be upgraded and their leases not renewed
  - Forecast for imports (both crude oil and transportation fuels) will have a direct role in this debate

Other Issues – New Ozone Standard

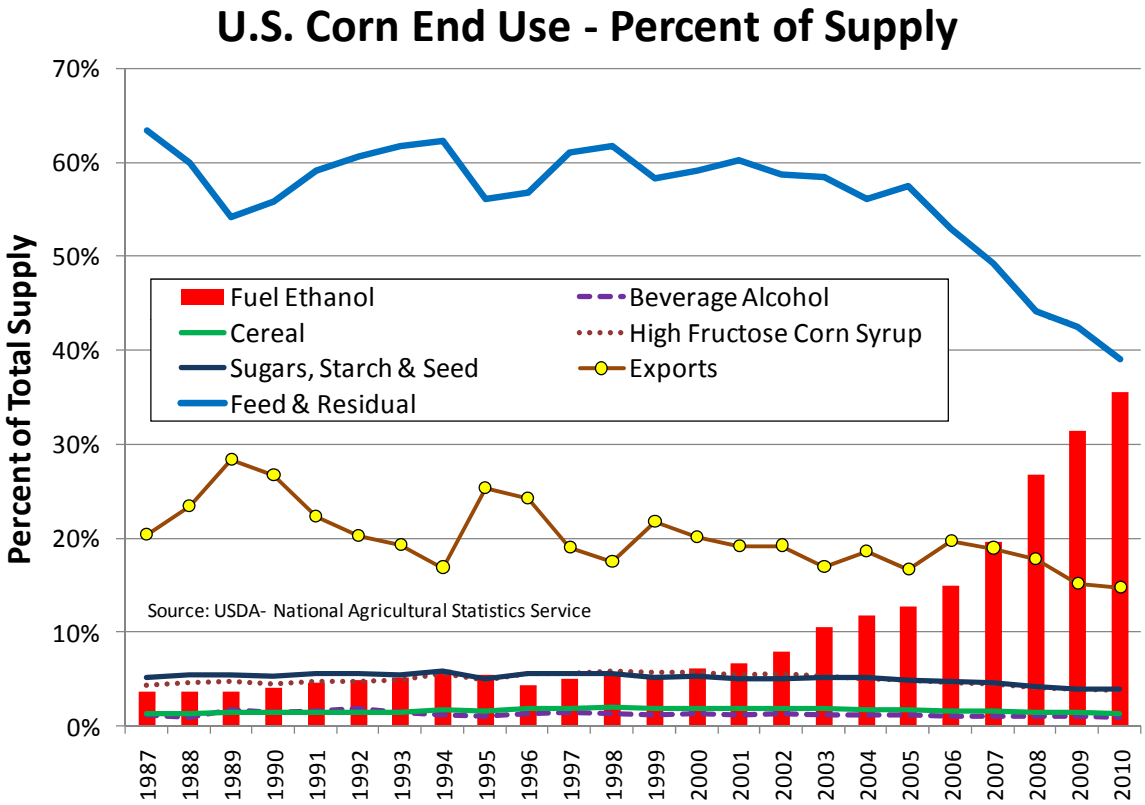


Source: U.S. EPA

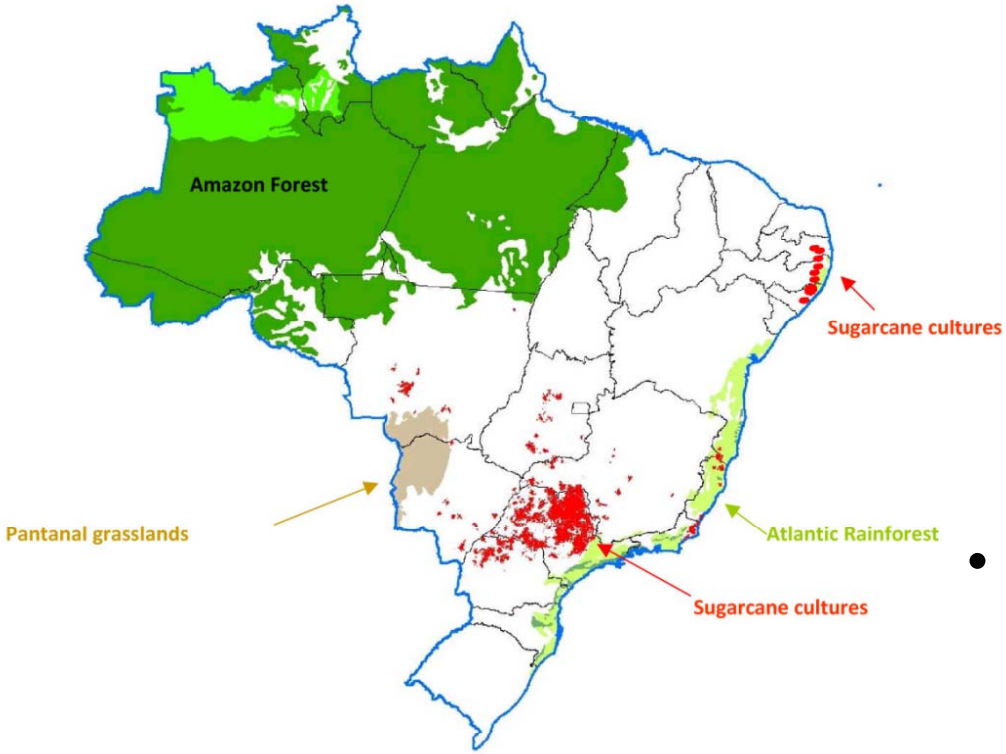
- January 6, 2010 – U.S. EPA proposes to strengthen ground-level ozone standard
  - 75 parts per billion (ppb) standard would be lowered to between 60 and 70 ppb
  - Final level due out by end of July of 2011
  - December of 2013 - State Implementation Plans, outlining how states will reduce pollution to meet the standards, are due to EPA
  - 193 to 328 additional counties could be included
- Proposed stricter standard could result in new fuel specifications for neighboring states of Arizona and Nevada
  - Potential change in CA pipeline export fuel quality assumptions

Other Issues – Agricultural Commodities

- Implications of increasing use of corn & other agricultural commodities for biofuel production
- Interactions of rising feedstock prices for biofuel producers – profitability impacts
- Crop forecasts and outlook for continued productivity – will yield keep pace?



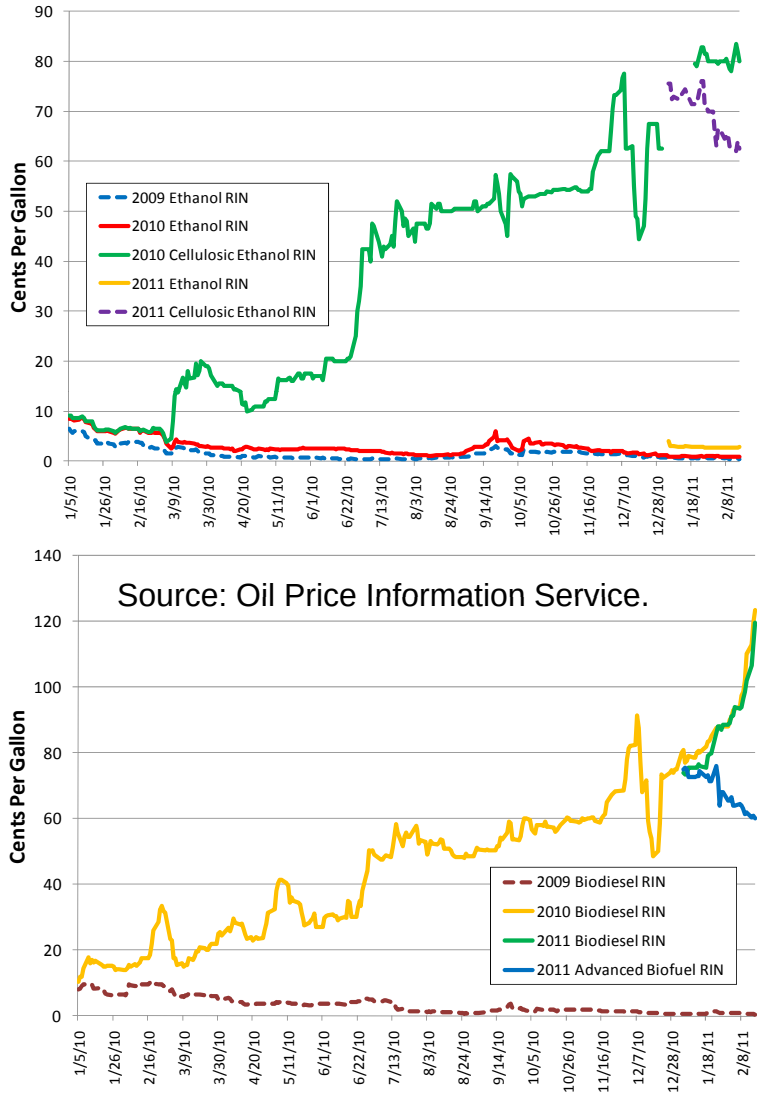
Other Issues - Ethanol Import Tariff



Source: José Goldemberg, *Biotechnology for Biofuels* 2008.

- Brazilian exporters of ethanol to the U.S. must pay two types of import duties
  - Ad valorem tax equivalent to 2.5 percent of the ethanol transaction price
  - Secondary import duty of 54 cents per gallon
- California demand for sugarcane-based ethanol could be significant under LCFS
- Is it time to retire this duty?
- How might the price of ethanol be affected?

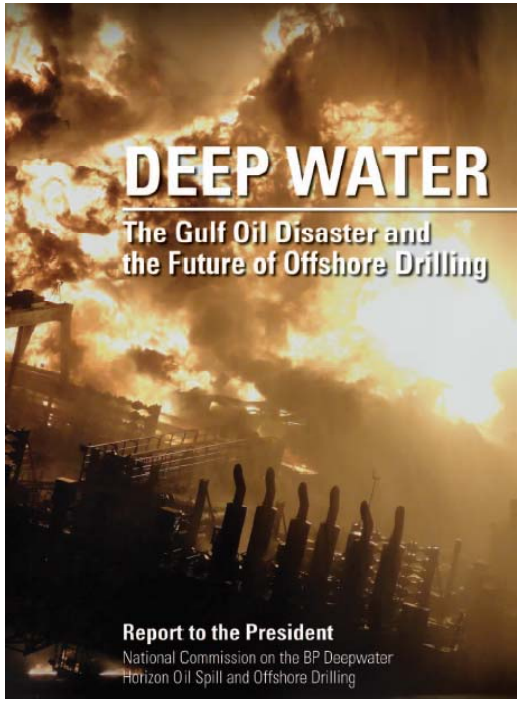
Other Issues - Renewable Fuel Credits



- RFS2 program has renewable identification number (RIN) credits
- Values have been increasing
- Will examine how these credits are generated, valued and used to achieve compliance
- Will also examine the dynamics and value of LCFS credits once that credit trading system is active and values made available to the public (price transparency)

Other Issues - Macondo Oil Spill

- 78 to 167 million gallons released to environment
- At higher estimate - largest volume of accidental release in world history

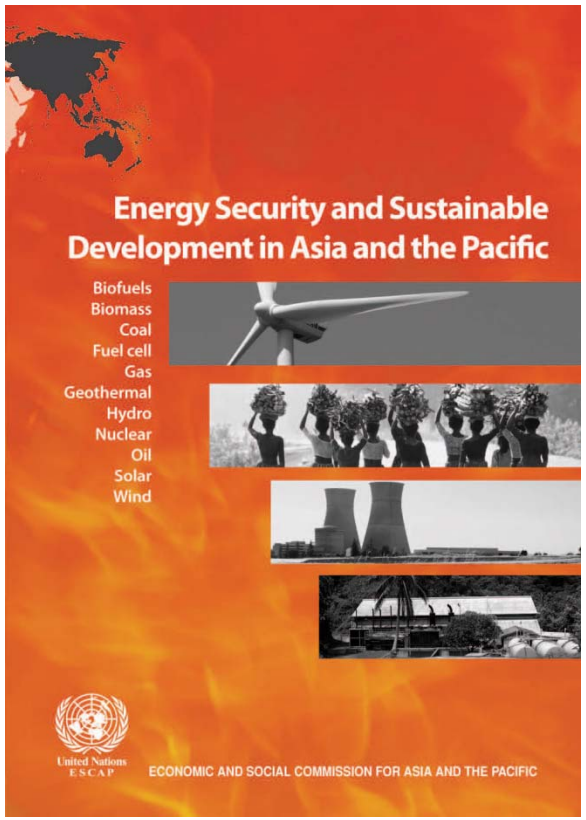




- Status of U.S. offshore drilling
- California vs. Gulf - comparison of drilling environment & potential resource base estimates
- Prospects of renewed drilling in California's offshore waters

Other Issues – Energy Security

- The issue of energy security is attracting renewed interest as a policy consideration
- Analysis of transportation fuel issues will include a qualitative energy security assessment for specific fuels and crude oil
- Can also be relevant for renewable fuels and even advanced technologies



Additional Q & A



Torrent Ducks – Rio Bremajo – Near San Isidro, Eastern Ecuador 10-15-2010