



## California Energy Commission

### IEPR Workshop

#### CALIFORNIA ENERGY DEMAND (CED) 2011 REVISED STAFF FORECAST

February 23, 2012 — 10:00 am

**DOCKET**

12-IEP-1B

DATE FEB 23 2012

RECD. FEB 23 2012

### Statewide Forecast Results for Electricity and Natural Gas and Methods

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## CED 2011 Revised Forecast

- Agenda
  - Statewide results for electricity and natural gas including discussion of methodology
  - Electric Vehicle Forecast
  - Conservation/Efficiency
  - Self-generation
  - Results for 5 major planning areas



## Planning Areas for Electricity

- LA Department of Water and Power (LADWP)
- Pacific Gas and Electric (PG&E)
- Southern California Edison (SCE)
- San Diego Gas and Electric (SDG&E)
- Sacramento Municipal Utility District (SMUD)
- Burbank/Glendale
- Pasadena
- Imperial Irrigation District



## Planning Areas for Natural Gas

- Pacific Gas and Electric (PG&E)
- Southern California Gas (SCG)
- San Diego Gas and Electric (SDG&E)
- Other



## Demand Forecast: Key Outputs

- Electricity and natural gas consumption
- Electricity sales and net energy for load
- Peak demand
- Energy savings by source
- Private supply (self-generation)



## Demand Forecast: Key Inputs

- Survey data (UECs, saturations)
- Econ-demo assumptions
- Energy prices
- QFER sales data
- Program data (efficiency, self-gen)



# Demand Forecast Methodology

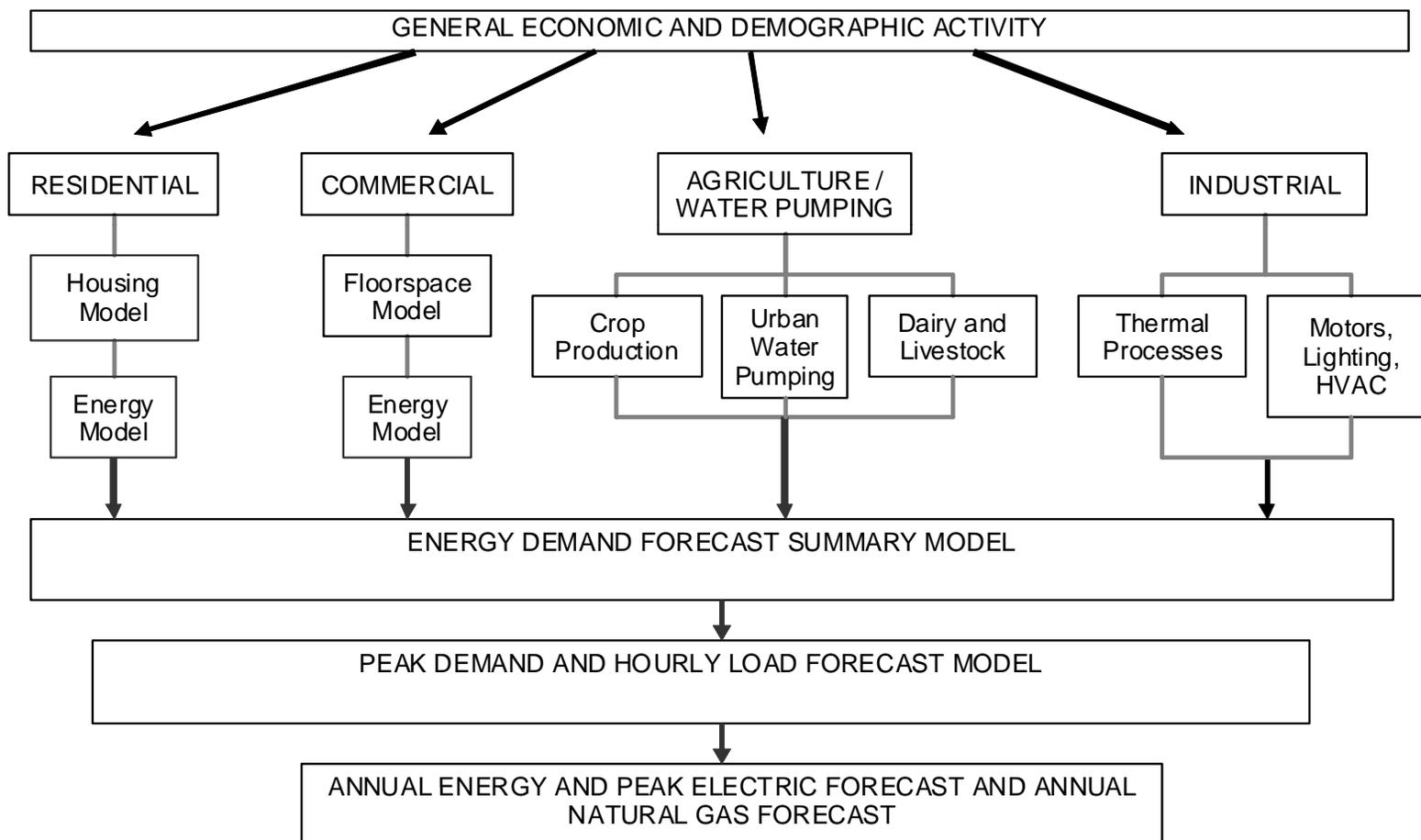
Individual sector models for:

- Residential
- Commercial
- Industrial
- Agricultural
- Transportation, communications, and utilities (TCU) and street lighting

Summary and peak models



# Demand Forecast Structure





# Demand Forecast Methodology

- New econometric models integrated into forecasting process (residential, commercial, industrial, peak)
- Predictive model for residential photovoltaics and solar water heating (trend analysis for other self-gen)
- Forecast incorporates climate change through temperature scenarios from Scripps
- Incorporates AB 1109, 2010 Title 24 revisions, and 2011 television standards as “committed” efficiency savings
- Includes updated natural gas efficiency program impacts



## Integration of Econometric Models

- Electricity price elasticities for residential and industrial models made consistent with elasticities estimated in corresponding econometric models
- Weather adjustment commercial end use electricity consumption results made consistent with coefficient for cooling degree days estimated in commercial econometric model



## Integration of Econometric Models

- Industrial electricity forecast for the manufacturing sector adjusted downward to reflect impact from increasing labor productivity estimated in manufacturing econometric model
- Peak results from the HELM adjusted to incorporate climate change scenarios using results from the peak econometric model
- Mining/construction econometric results used instead of INFORM model output



## Climate Change Adjustment

- Econometric peak model used for adjustment; re-estimated to include annual maximum of average daily temperatures instead of annual maximum of maximum daily temperatures
- Scripps provided 8 temperature scenarios; staff chose a “mid” and a “high” temperature increase for mid and high cases
- Low demand case included no climate change adjustment
- Staff used long-term trend (1990-2020) from scenarios to calculate annual maximum *average*631



# Three Demand Scenarios

- Scenarios are based on October 2011 economic projections
- High case: High econ-demo growth (Global Insight “Optimistic”), lower electricity rates, low (committed) efficiency program and self-generation impacts
- Mid case: Mid economic growth (Economy.Com “Base”), mid electricity rates, mid efficiency program and self-gen impacts
- Low case: Low econ-demo growth (Economy.Com “Protracted Slump” combined with “Lower Long-term Growth” scenarios), high electricity rates, high efficiency program and self-gen impacts



## Changes from Preliminary Forecast

- Economic/demographic projections updated (October 2011)
- Econometric models re-estimated
- Climate change formulation led to higher impacts on peak
- Revised (lower) electric vehicle forecast
- Incorporation of television standards



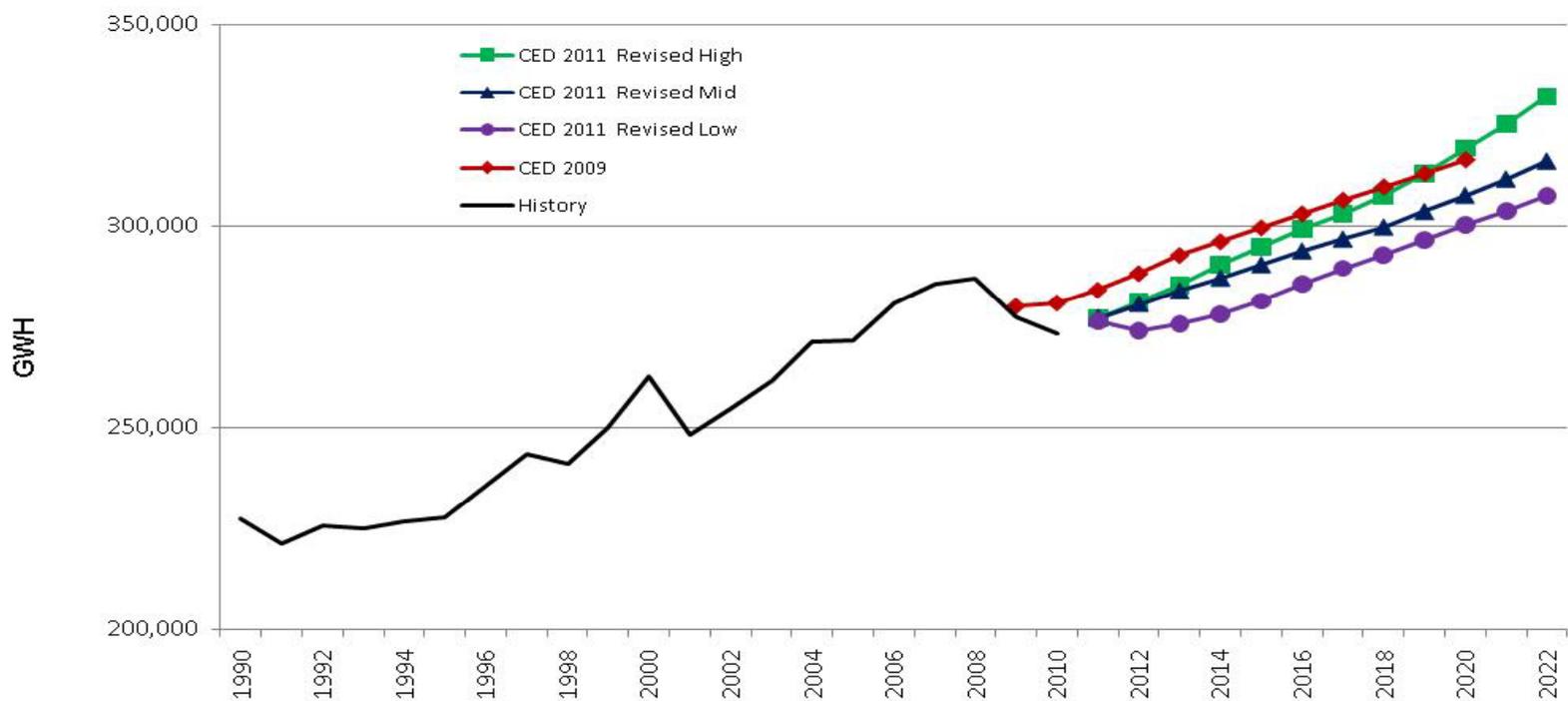
# Summary of Results

- Lower starting point for consumption vs. CED 2009; slightly lower growth 2011-2020 in mid scenario
- Slightly lower consumption growth 2011-2022 in all three scenarios vs. preliminary 2011 forecast because of television standards, lower electric vehicle forecast, and slightly lower income growth
- Mid and high case peak demand growth higher than CED 2009 because of climate change impacts
- Peak lower in mid and low cases vs. preliminary 2011 forecast because of lower starting point. Peak is higher in high demand case vs. preliminary because of higher climate change impacts



## Statewide Electricity Consumption

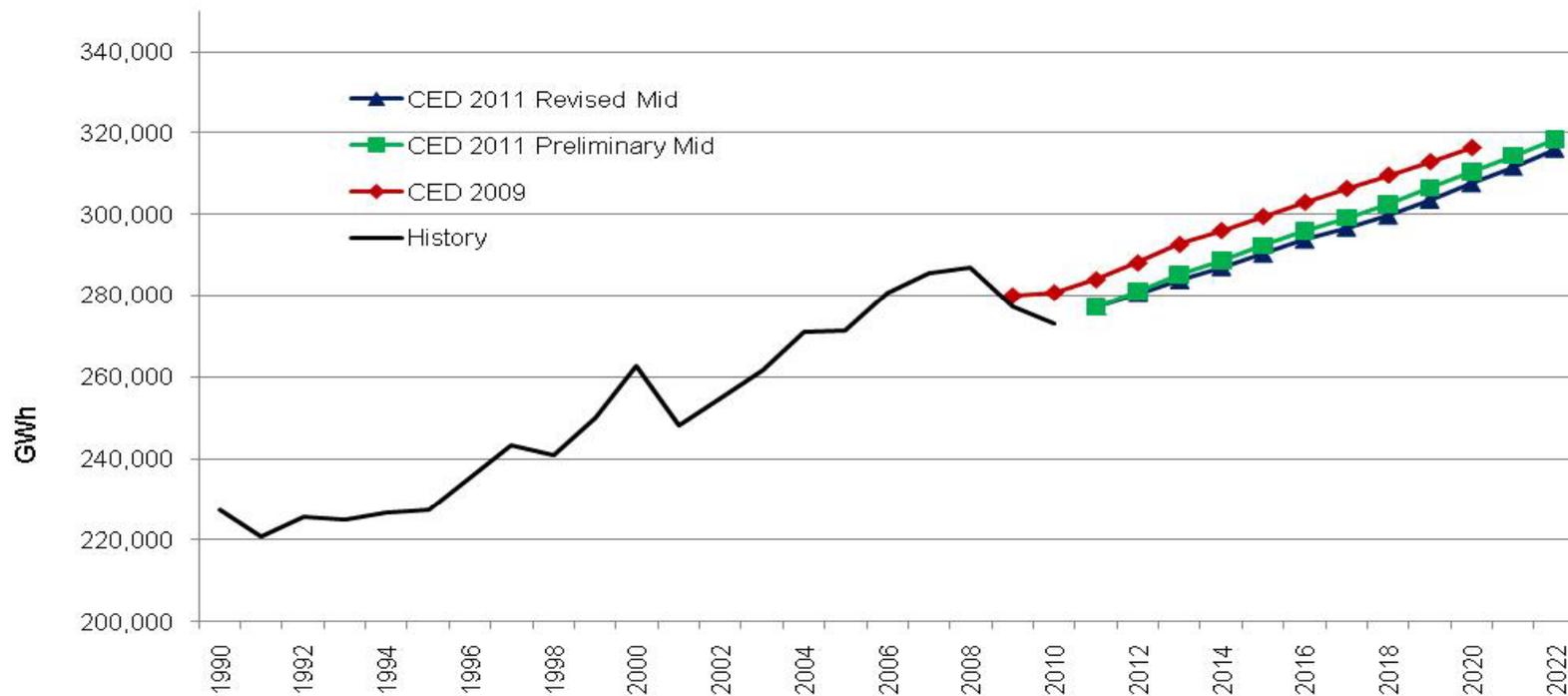
Average annual growth 2011-2022: 1.7 percent in high case, 1.0% in low case





# Statewide Electricity Consumption

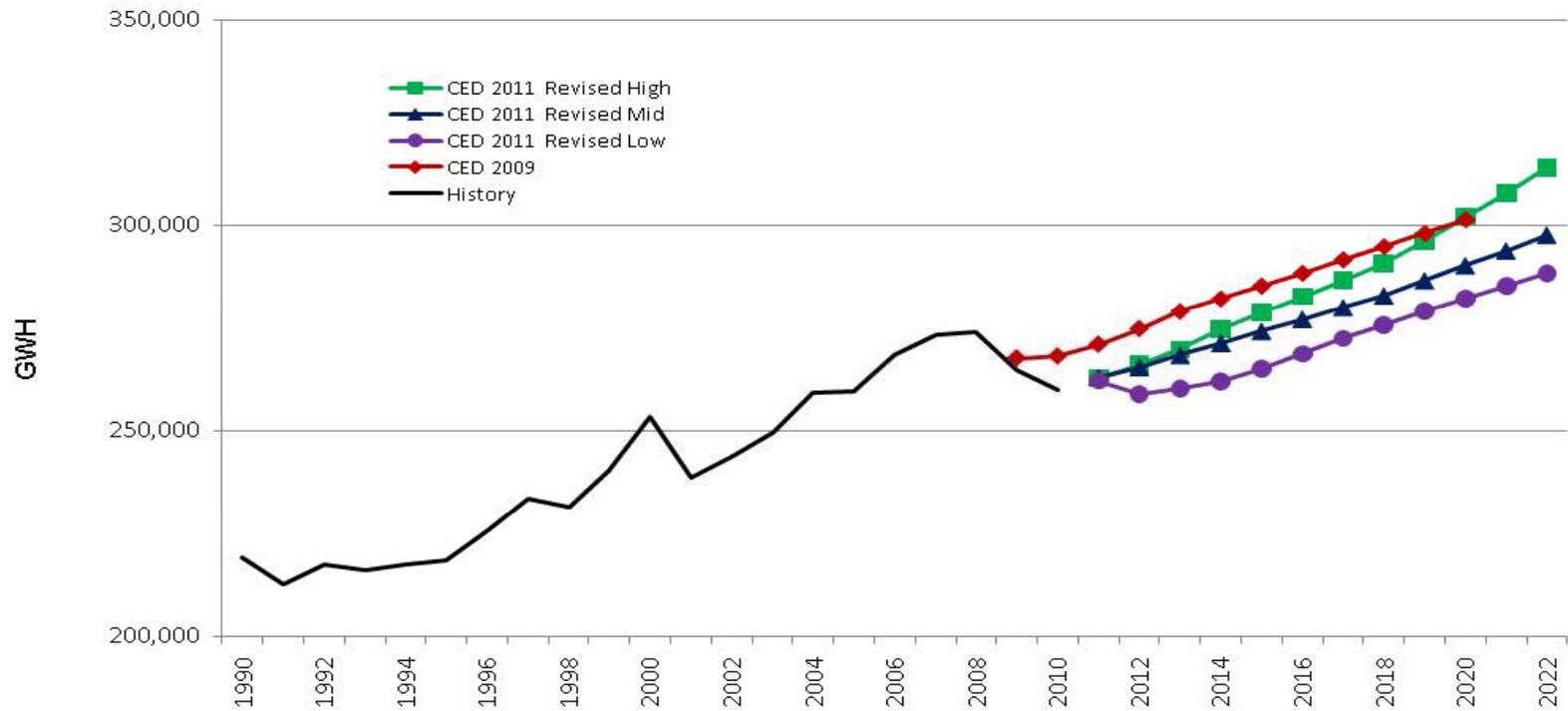
Average annual growth 2011-2020: 1.17% in revised mid, 1.26% in preliminary mid, 1.20% in CED 2009





# Statewide Electricity Sales

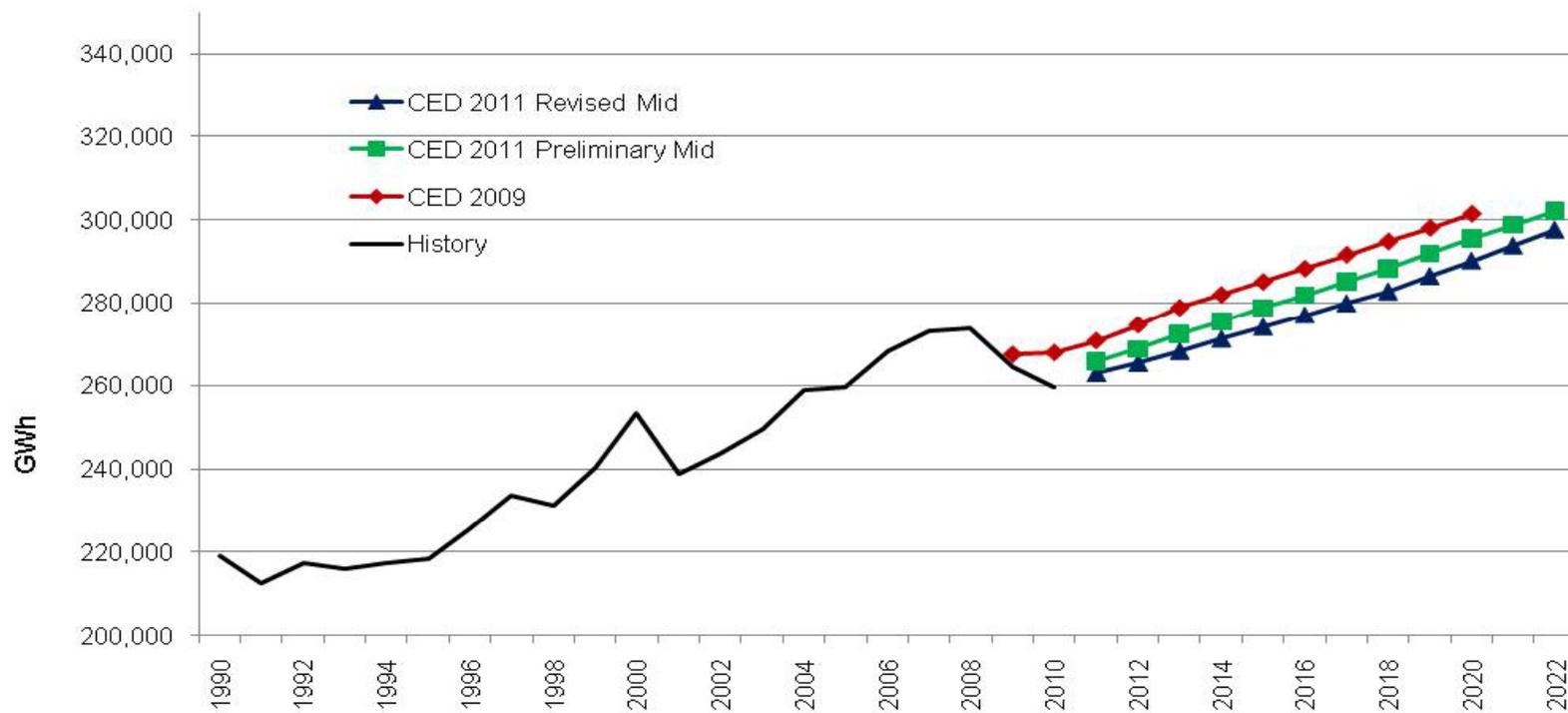
Average annual growth 2011-2022: 1.65 percent in high case, 0.9% in low case





# Statewide Electricity Sales

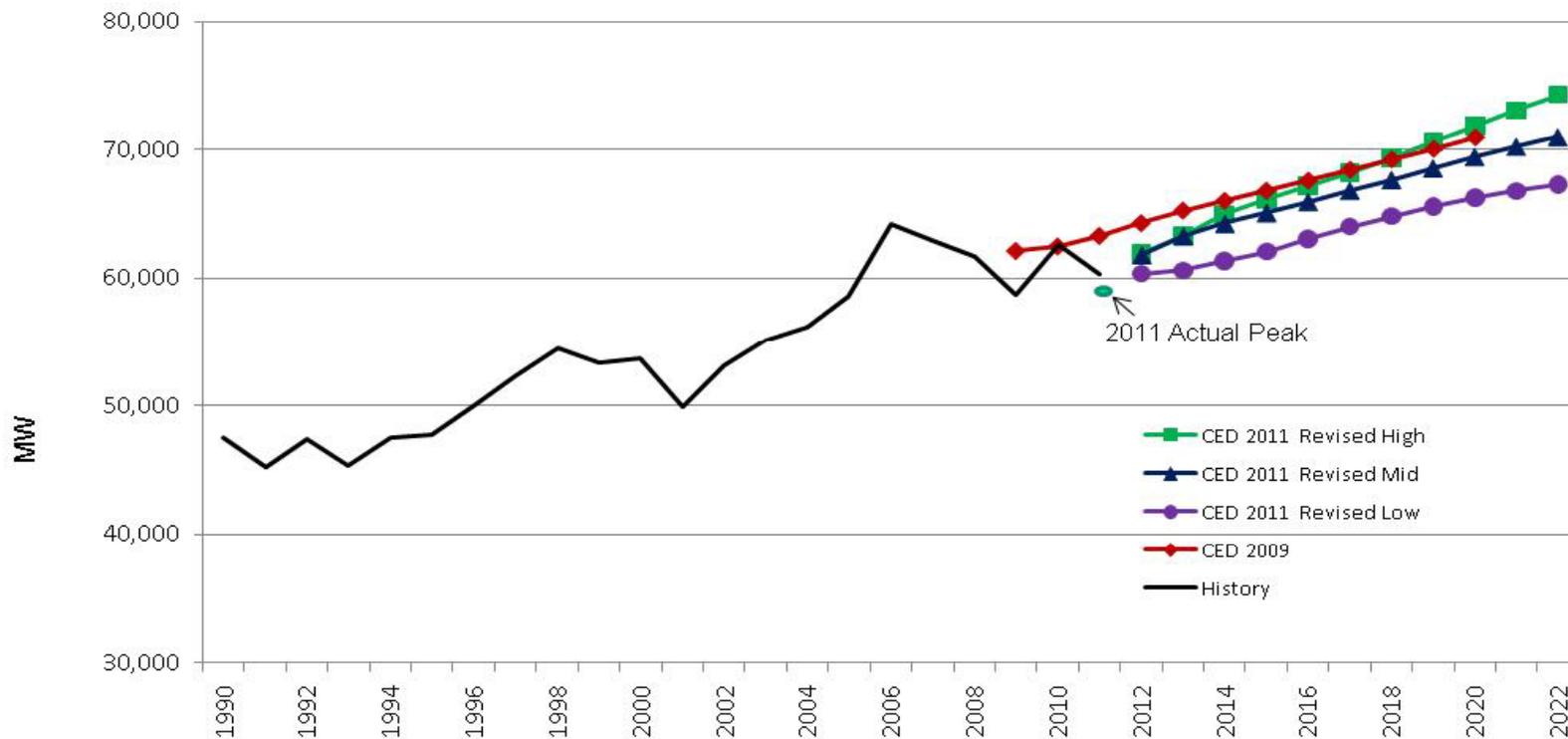
Average annual growth 2011-2020: 1.10% in revised mid, 1.19% in preliminary mid, 1.20% in CED 2009





# Statewide Non-Coincident Peak

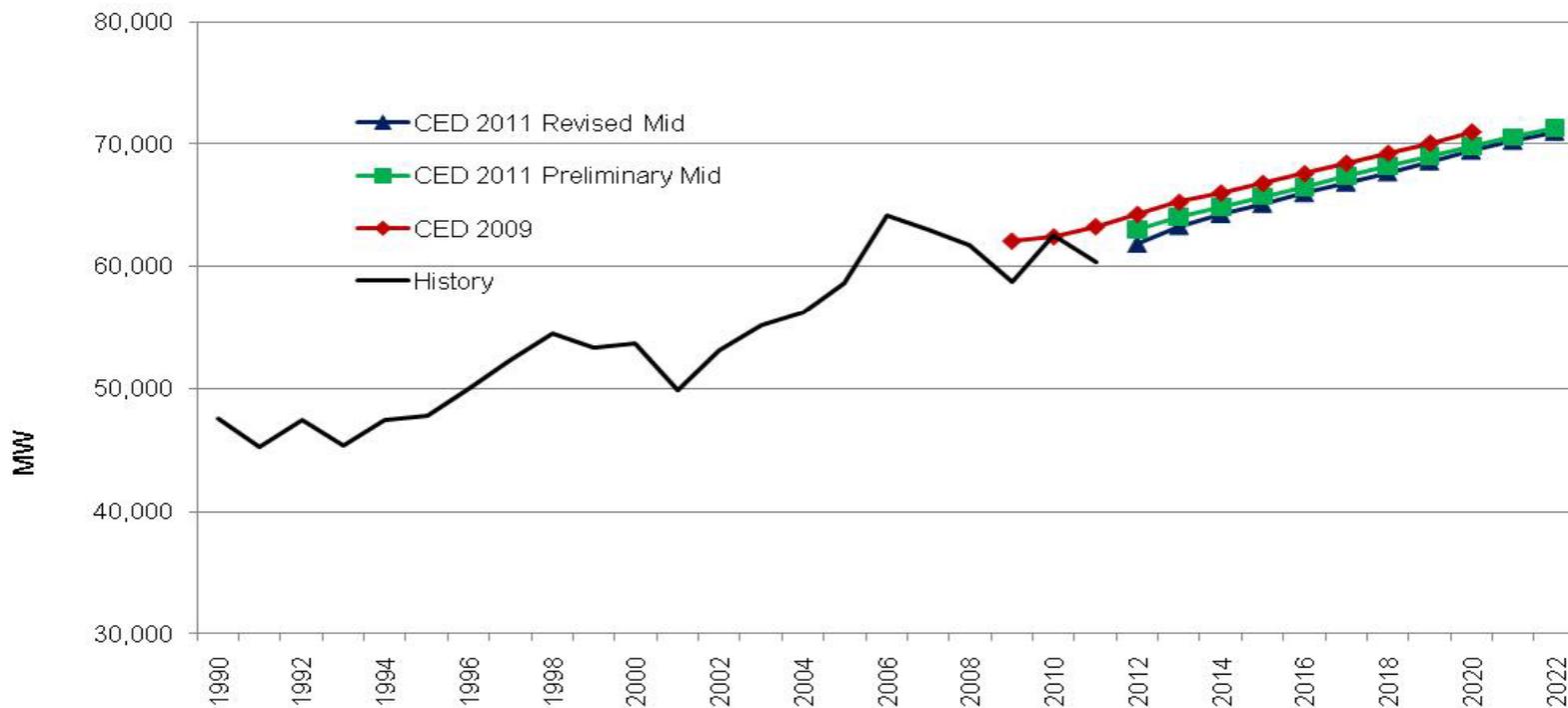
Average annual growth 2011-2022: 1.9% in high case, 1.0% in low case





## Statewide Non-Coincident Peak

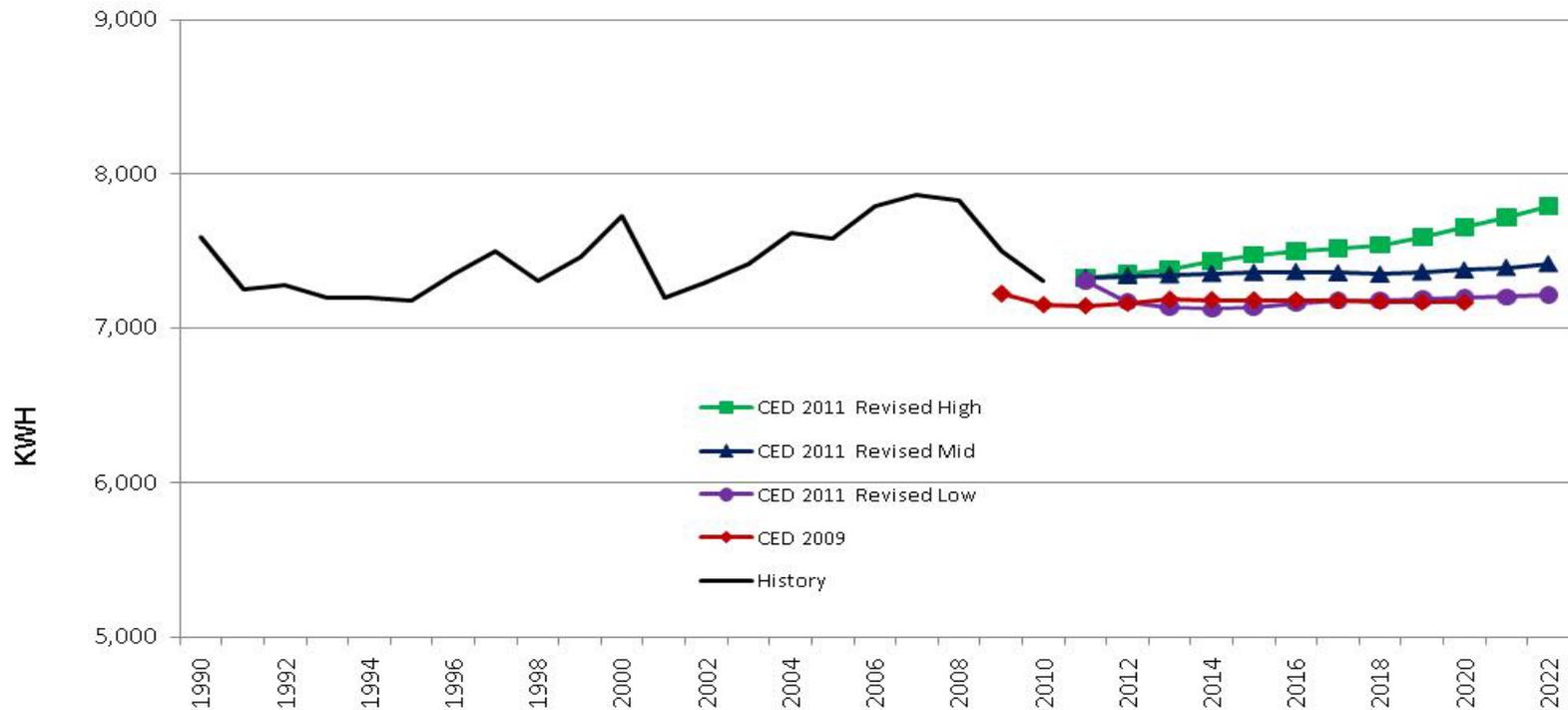
Average annual growth 2011-2020: 1.58% in revised mid, 1.14% in preliminary mid, 1.28% in CED 2009





# Per-Capita Electricity Consumption

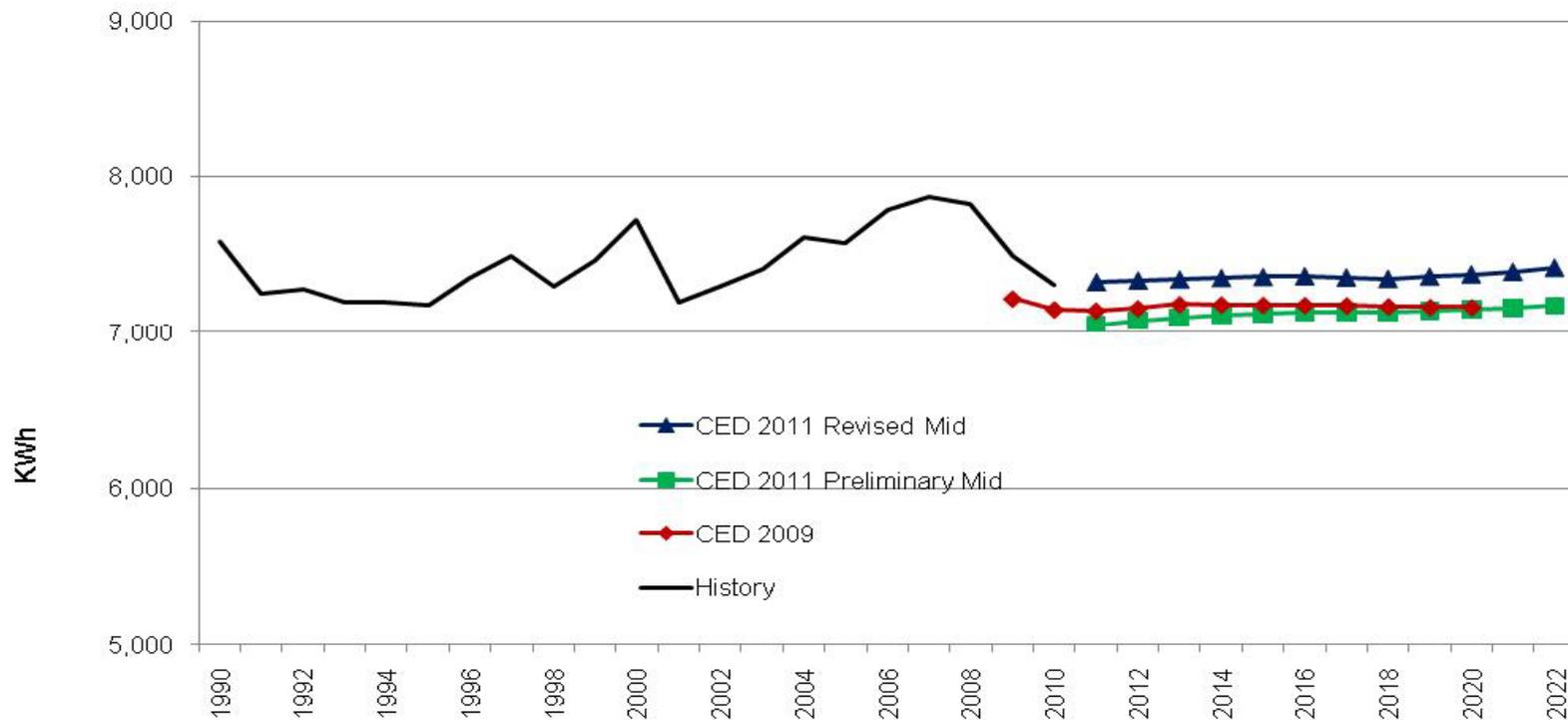
## EVs push per-capita consumption up toward the end of the forecasting period





# Per-Capita Electricity Consumption

Per-capita consumption up 270 KWh vs. preliminary in 2011 because of population adjustment





## Statewide Electricity Forecast: Sectors

- For the three main economic sectors in the mid case, average annual growth is fastest in residential (1.77% average for 2011-2022), followed by commercial (1.4%) and industrial (0.14%)
- In high scenario, fastest growth is in industrial sector
- In revised forecast mid case, average annual residential growth 2011-2020 is 1.56%, compared to 1.79% in preliminary forecast and 1.9% in CED 2009



## Statewide Electricity Forecast: Sectors

- In revised forecast mid case, average annual commercial growth 2011-2020 is 1.44%, compared to 1.48% in preliminary forecast and 1.2% in CED 2009
- In revised forecast mid case, average annual industrial consumption growth 2011-2020 is 0.26%, compared to 0.30% in preliminary forecast and 0.44% in CED 2009
- Average annual consumption growth in TCU/streetlighting and agricultural sectors is slightly less than 1 percent



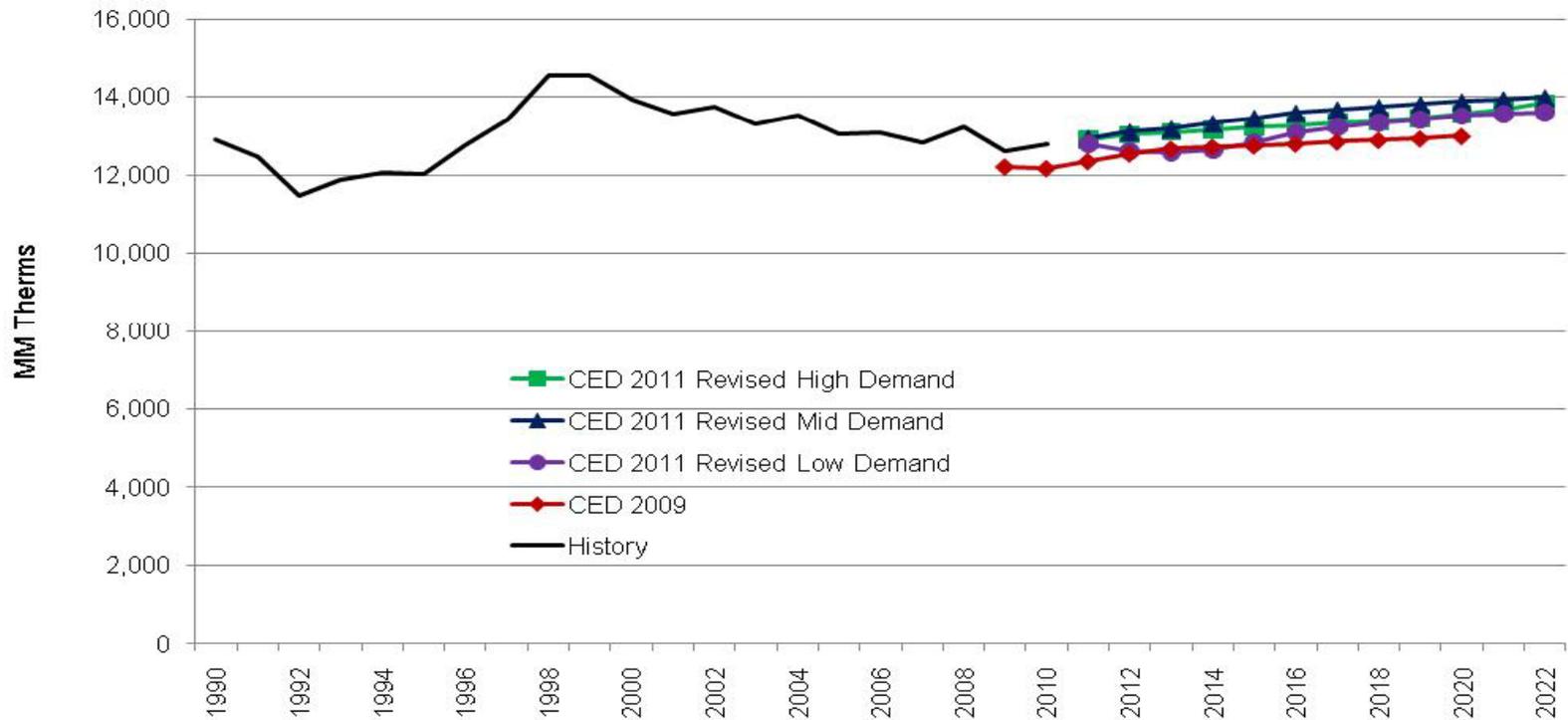
## End-User Natural Gas Forecast

- By planning area: PG&E, SCG, SDG&E, and other
- Does not include natural gas used by utilities or others for electric generation
- Forecast produced with same models as electricity
- Updated natural gas efficiency program impacts



# End-User Natural Gas Consumption

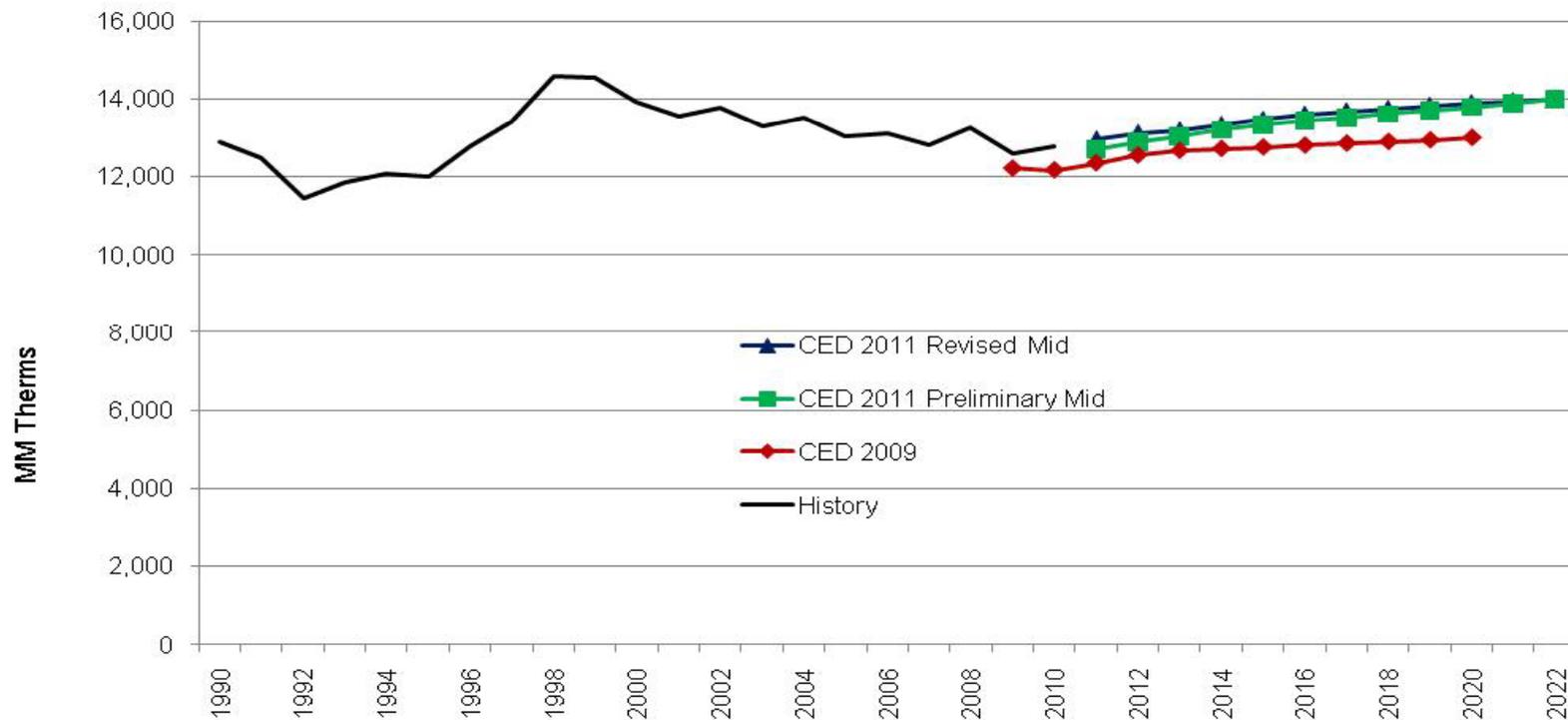
Mid case higher than high case because of Global Insight assumptions about resource extraction





# End-User Natural Gas Consumption

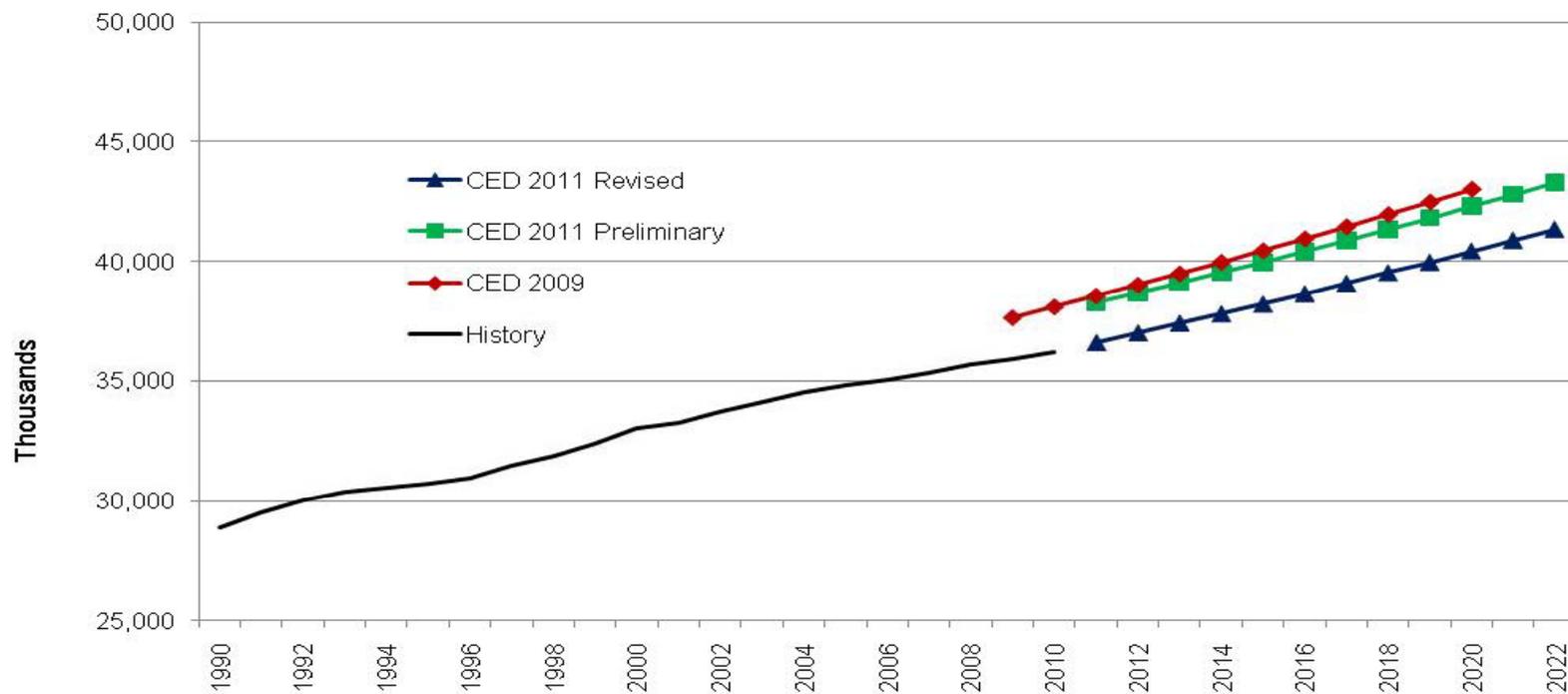
Flatter growth compared to electricity because of relatively more efficiency





## Key Input: State Household Population

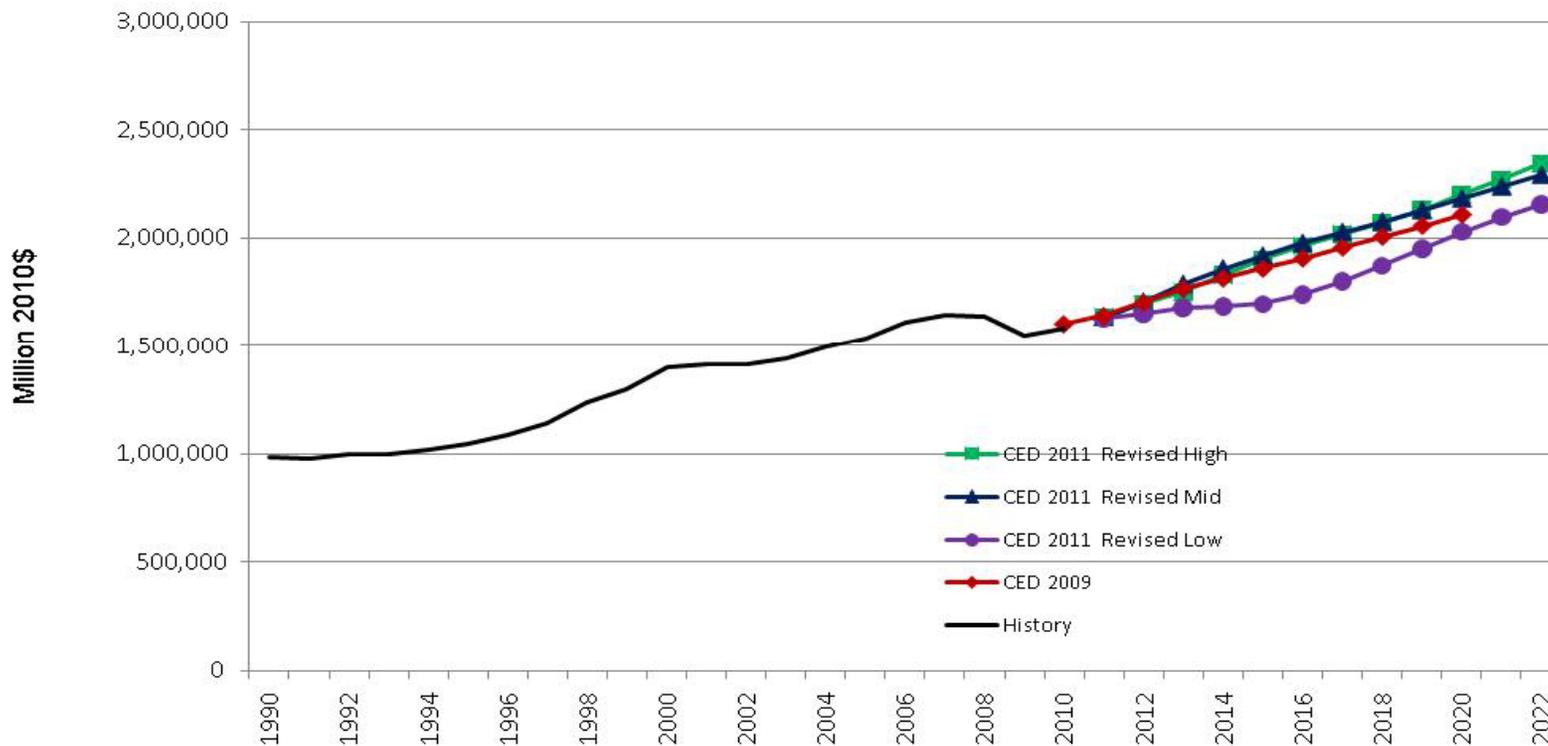
Downward adjustment of 1.6 million in 2010





## Key Input: State Household Income

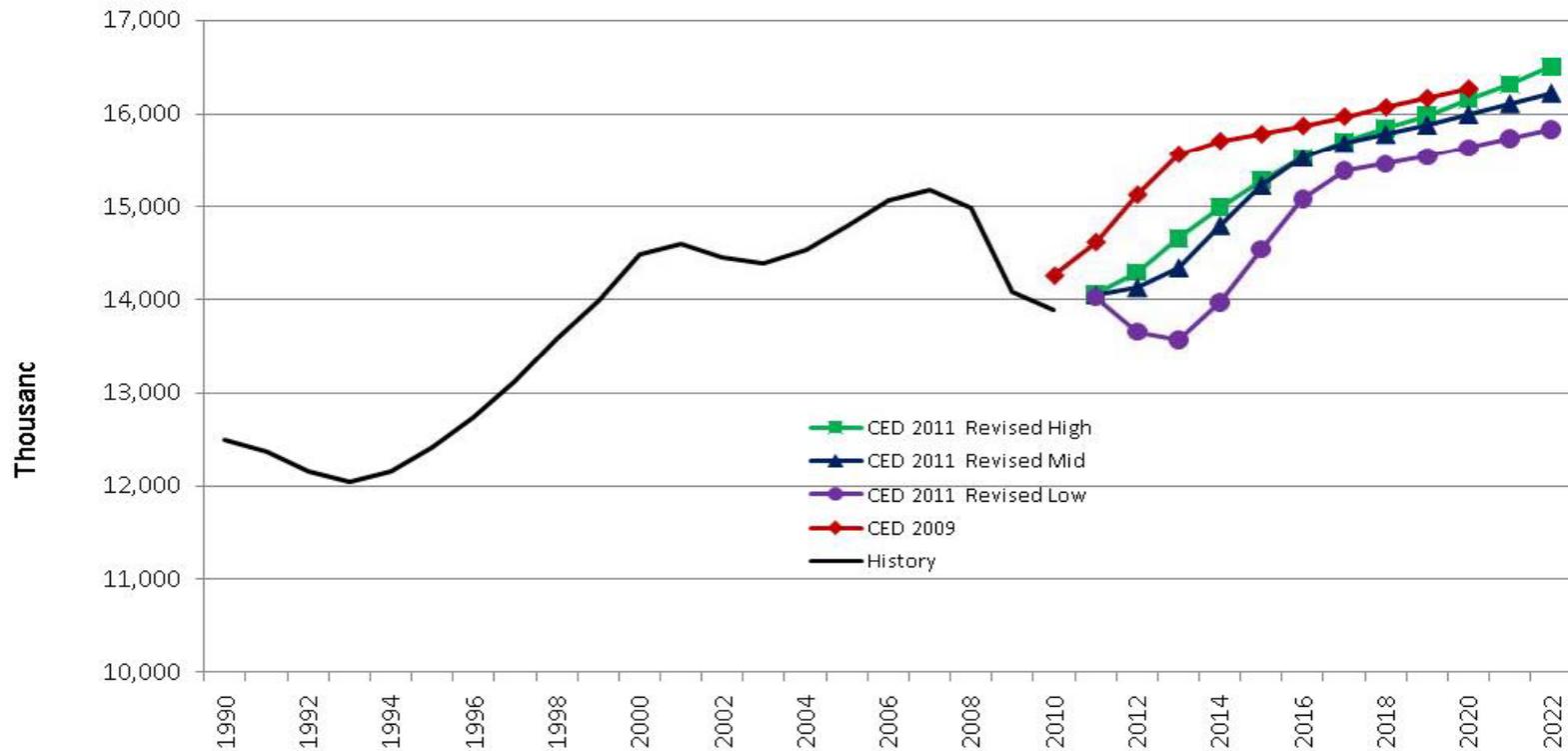
Faster growth in mid and high cases vs. CED 2009





## Key Input: Total Employment

Lower starting point, faster growth in mid and high cases vs. CED 2009





# Climate Change Impacts on Peak Demand

		Annual Maximum Average 631 (°F), Mid Demand Scenario	Annual Maximum Average 631 (°F), High Demand Scenario	Peak Impact, Mid Scenario (MW)	Peak Impact, High Scenario (MW)
LADWP	2015	84.0	84.2	35	54
	2020	84.5	85.0	83	131
	2022	84.7	85.2	105	165
PGE	2015	86.0	86.1	114	143
	2020	86.4	86.6	277	349
	2022	86.6	86.8	348	440
SCE	2015	86.2	86.3	121	171
	2020	86.6	87.0	293	421
	2022	86.8	87.2	368	533
SDGE	2015	78.6	78.6	27	28
	2020	79.0	79.1	66	70
	2022	79.2	79.3	84	88
SMUD	2015	85.4	85.6	13	23
	2020	85.7	86.2	31	57
	2022	85.9	86.5	39	72
State	2015	--	--	316	430
	2020	--	--	768	1,056
	2022	--	--	965	1,334



## CED 2011 Revised vs. Pure Econometric Forecast

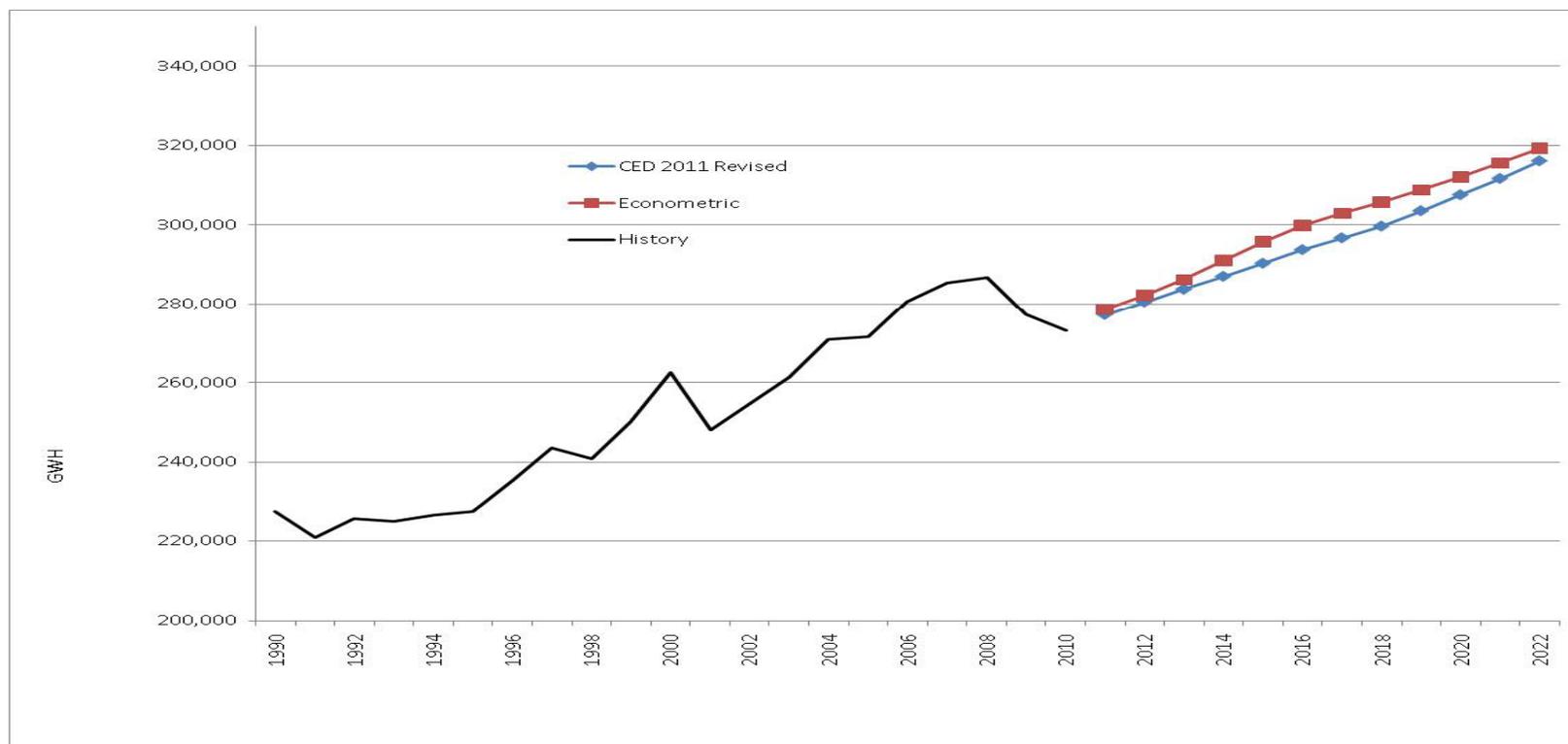
- Econometric forecasts slightly higher at statewide level
- Differences come from aggregate vs. disaggregate approaches and accounting for efficiency
- Goal is to explicitly account for efficiency in econometric models for better comparison



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# Consumption: CED 2011 Revised vs. Pure Econometric Forecast (Mid Case)

Econometric 1% higher in 2022

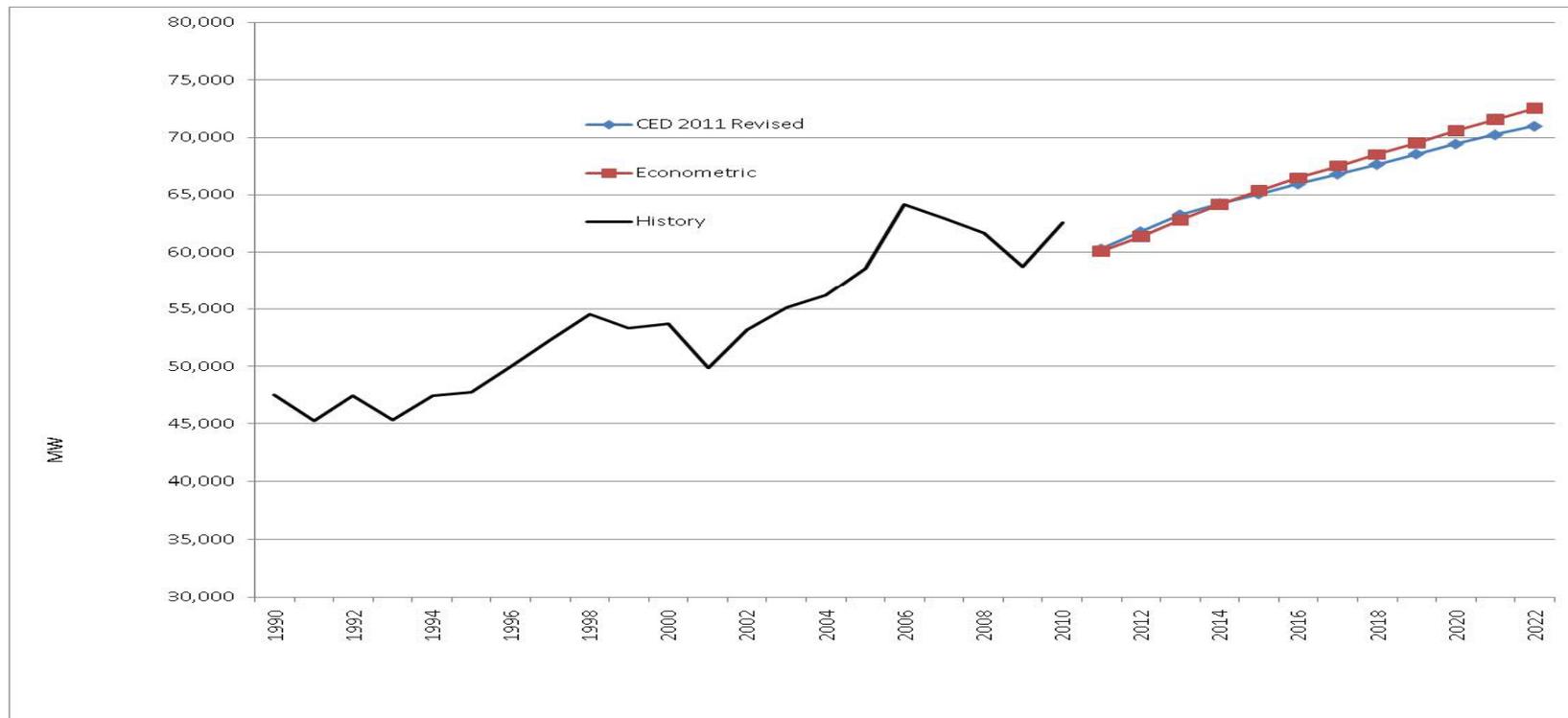




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# Peak: CED 2011 Revised vs. Pure Econometric Forecast (Mid Case)

Econometric 2% higher in 2022





## Electric Vehicles

- Used high and low scenarios from Plug-in Electric Vehicle Collaborative
- 500,000 EVs on the road in 2020 in low case, 1 million in high case
- Staff extrapolated to 2022, distributed to planning areas based on DMV data
- Mid case is average of high and low
- Lower forecast than CED 2009 (and preliminary) by 1,600 GWh in mid case (2022)



# Electric Vehicle Consumption

Most of the growth is in last few years of forecast

