Demand Forecasts for Generation and Transmission Planning

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Scope of Presentation

- Institutional Setting for Electricity Planning in California and the Western Interconnection
- Baseline Demand Forecasts
- Managed Demand Forecast Concept for Planning with a focus on Incremental, Uncommitted Energy Efficiency Impacts
- Where are We Now?
- Appendix

Institutional Setting

Regional / National Organizations

- FERC
- NERC
  - Constant forays into national assessment of resource adequacy
- WECC
  - 35 balancing authorities submitting loads & resources data
  - Four subregional transmission planning groups
  - TEPPC
- WGA, CREPC, WIRAB, SPSC
  - 12 states, 2 Canadian provinces, 1 Mexican state
  - Continuing efforts to find a role of state authorities

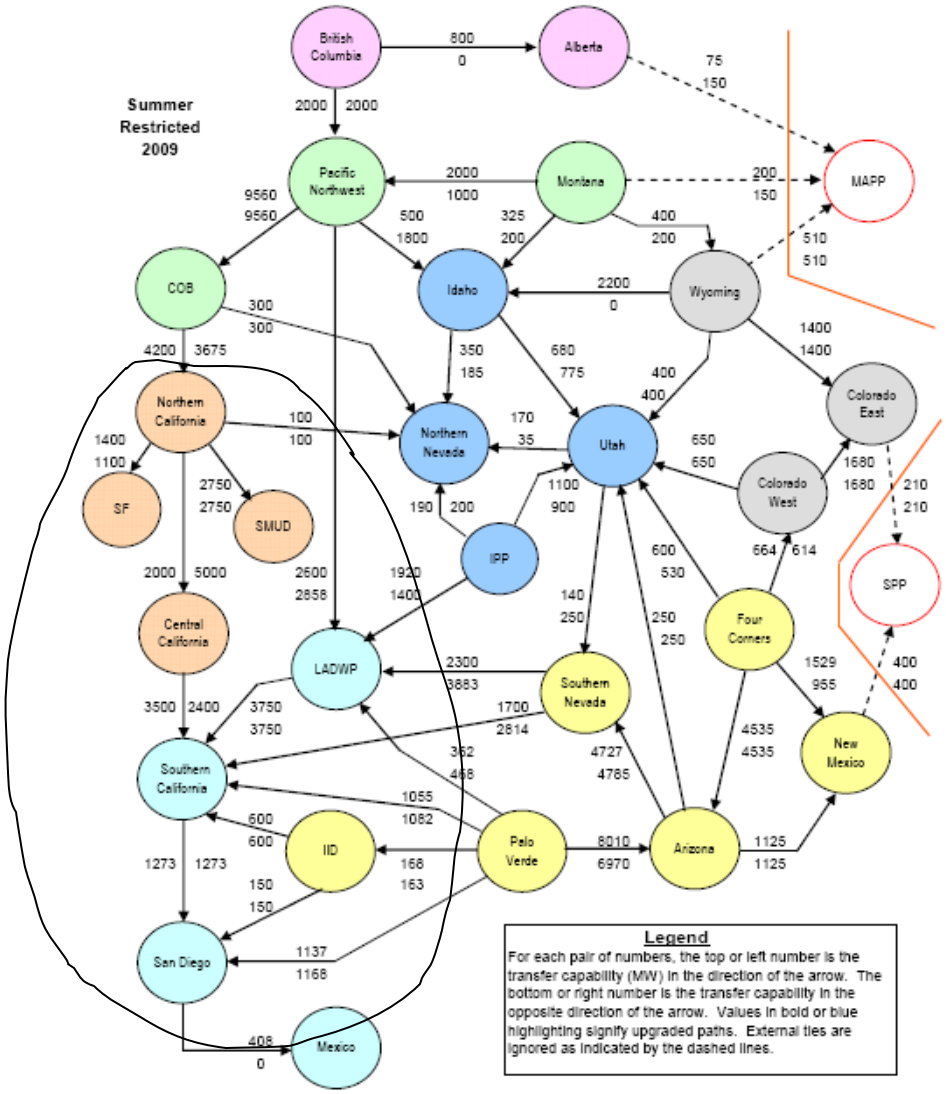
California Institutions

- California Energy Commission (CEC)
  - Lead policy agency, issues power plant licenses
  - Demand forecasts used in planning by CPUC and CAISO
- California Public Utilities Commission (CPUC)
  - Rate setting/procurement oversight agency for IOUs
- California Independent System Operator (CAISO)
  - Devises and operates market for 75% of load
  - Transmission planning responsibilities for IOUs
- California Air Resources Board
  - Lead agency for aggressive GHG emission reductions
- State Water Resources Control Board
  - Established OTC policy leading to massive retirement of older fossil generation

CA Institutional Relationships

WECC, NERC and FERC						
CPUC		CEC				
	CAISO		LADWP	SMUD	IID	TID
PG&E						
SCE						
SDG&E						
Numerous embedded small utilities			Burbank Glendale	WAPA Redding Roseville Modesto		MID

Bubble Diagram of WECC Modeling Topology



Westwide Activities

- WECC and WGA both received DOE funding to improve planning
- WECC is working through TEPPC to develop high DSM scenarios to expand its previous emphasis on renewables
- WGA and SPSC are developing adjusted baseline demand forecasts and a high DSM forecast for WECC to use in its planning processes

Baseline Demand Forecasts

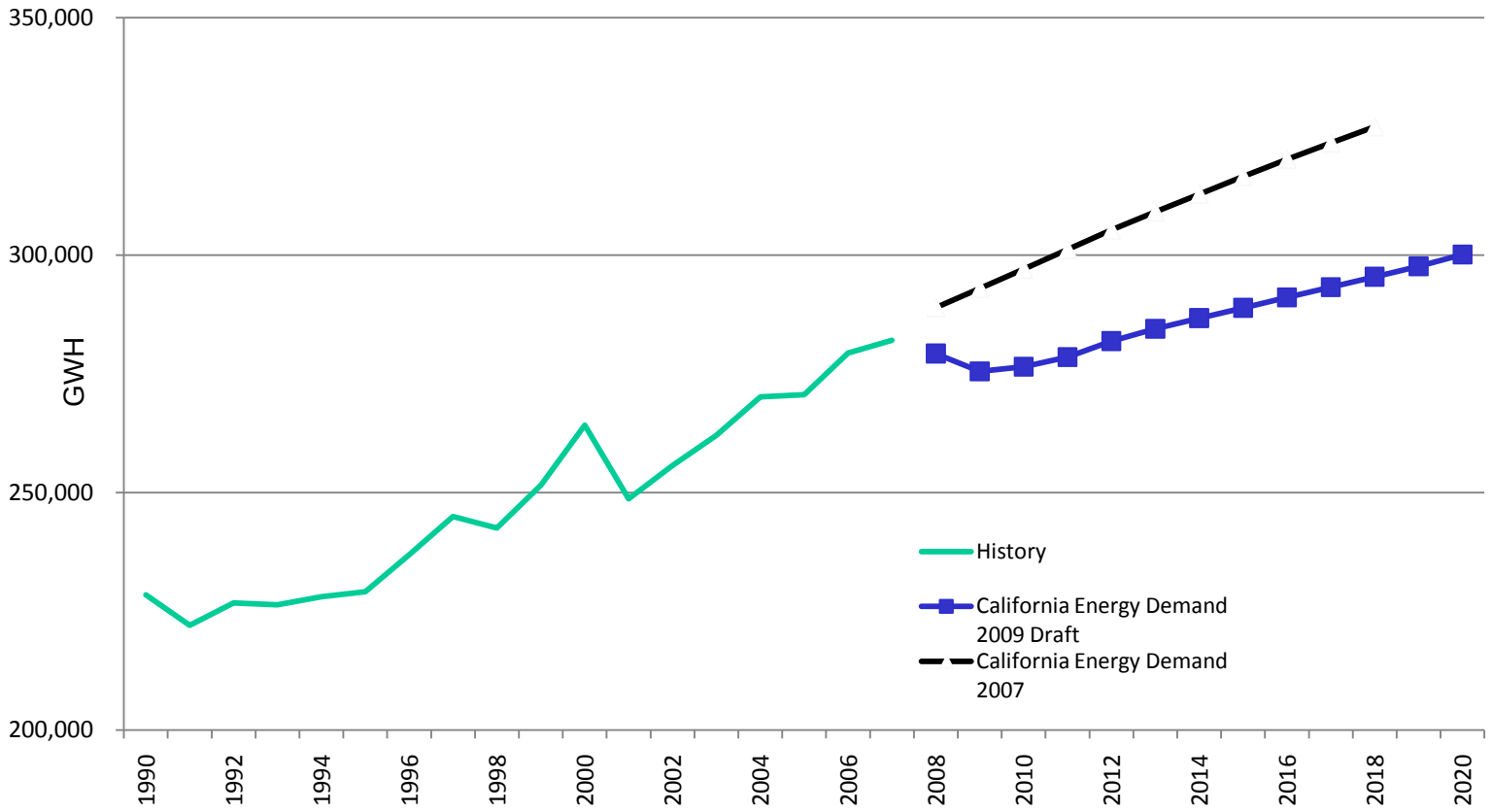
Demand Forecasting Setting

- Long term demand forecasts prepared biennially as part of CEC's Integrated Energy Policy Report
- CEC follows a practice of distinguishing between committed and uncommitted programs
  - Committed: funded and/or approved and program design allows quantification of impacts (EE, self-gen)
  - Uncommitted: impacts of goals, targets or programs too speculative to quantify
- EE Treatment
  - Committed impacts included in baseline demand forecast
  - Beginning in 2007, various attempts to quantify uncommitted program impacts and compare with supply-side resources additions in resource planning

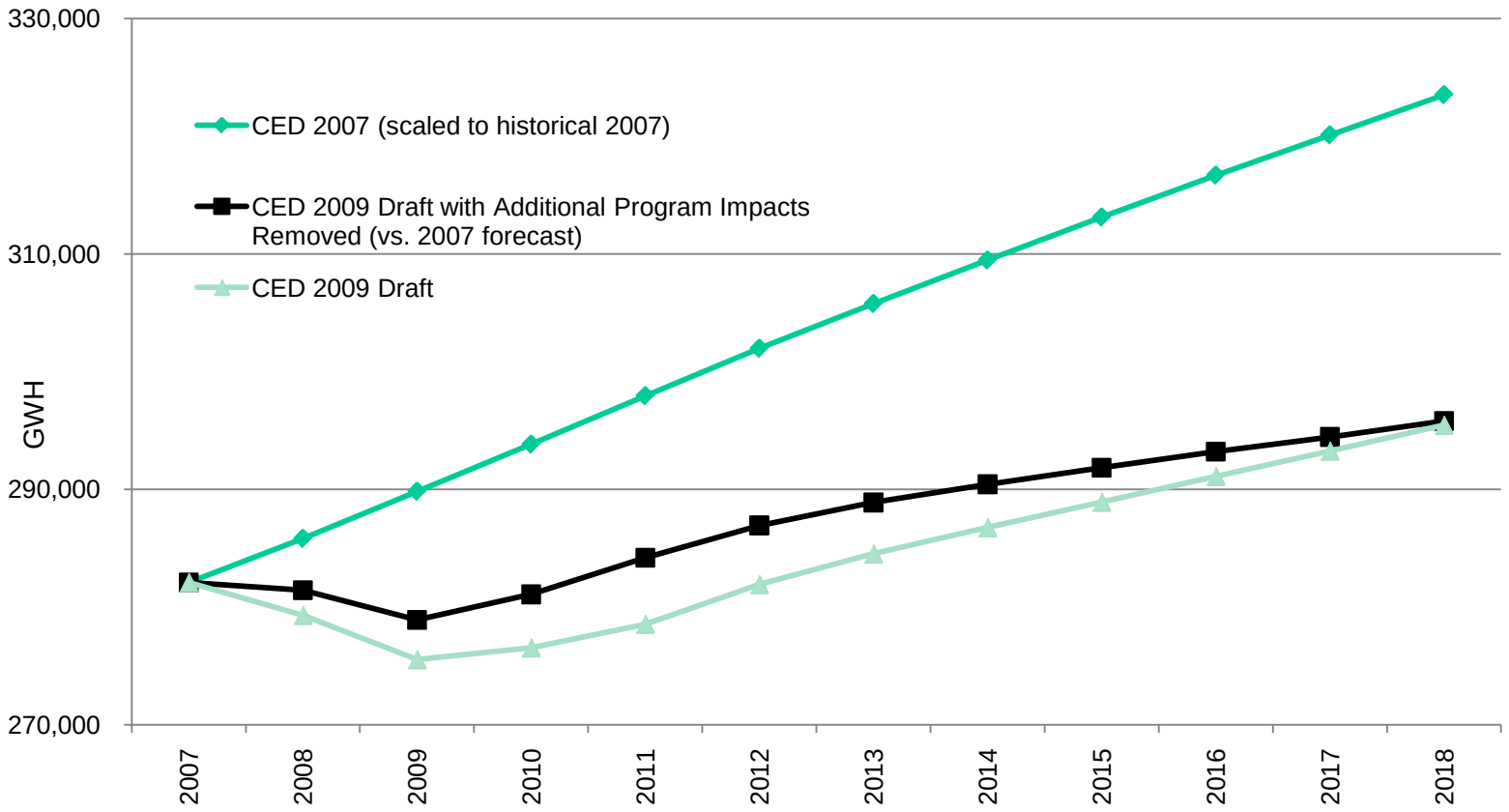
Sources/Uses of Demand Forecast

- Sources:
  - CEC for IOUs and small POUs in CAISO
  - Large POUs for themselves and their BA
- Uses:
  - CEC demand forecast used by CPUC, CAISO and CTPG
  - CAISO uses CEC demand forecast in its filings to WECC
  - POUs submit their own demand forecasts to WECC

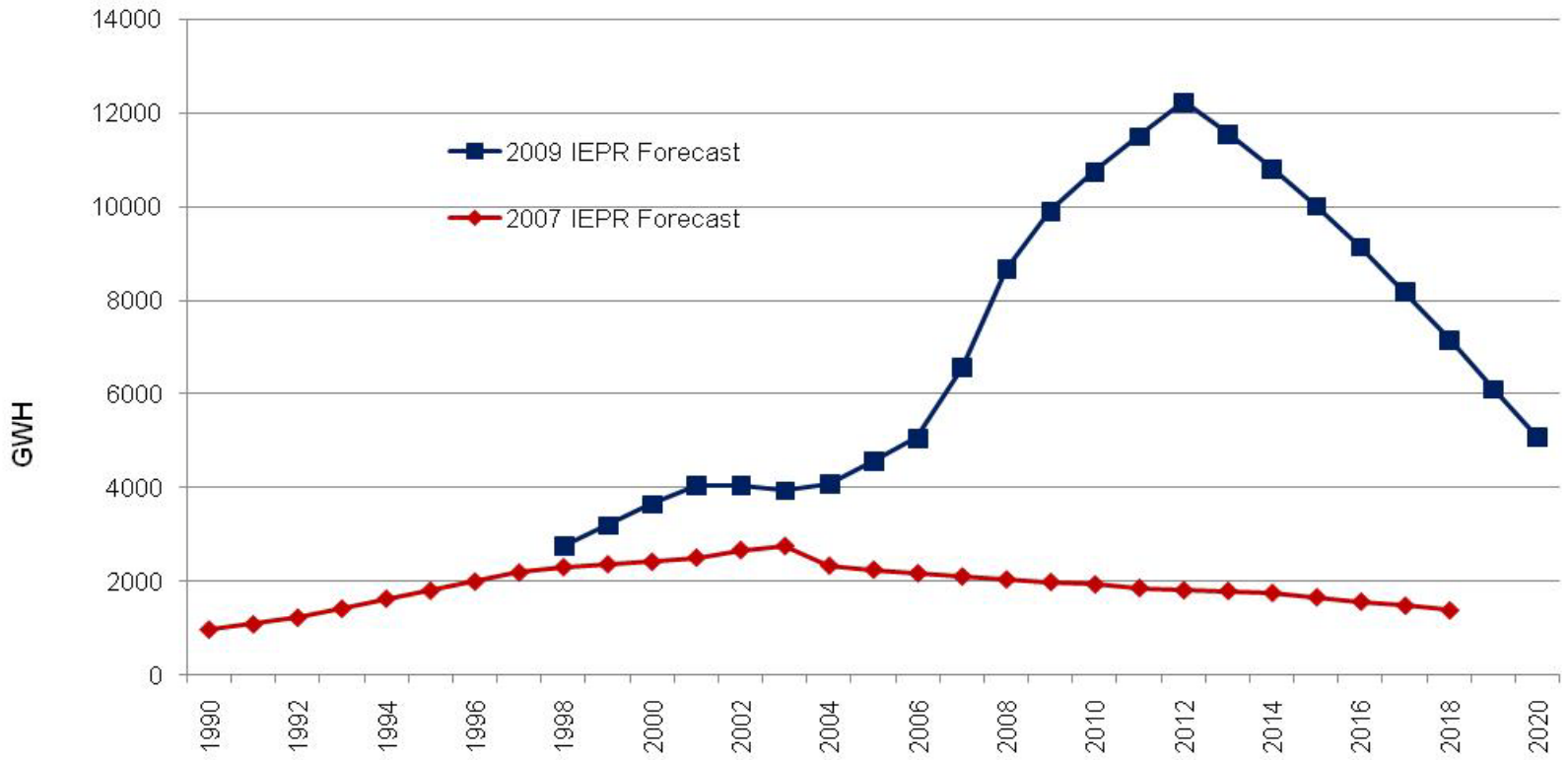
Statewide Electricity Consumption



Impact of Efficiency Programs



Cumulative Impact of IOU Efficiency Programs



Limitations of Analysis

- Relies on various assumptions of an untestable "counterfactual"
- Savings decay replacement is a key issue
- Attribution through a price elasticity is inexact compared to precision of measure penetration models
- "Take back" and related factors
- Industrial sector program impacts so jumbled with process/product changes that not modeled at all

Managed Demand Forecast Concept

Concept

- Consider the CEC demand forecast (including only committed impacts) as the baseline
- Construct a forecast for resource planning purposes that decrements the baseline for:
  - Energy efficiency
  - Combined heat and power
  - Other distributed generation on customer side of the meter
- Demand Response is considered a supply-side resource since it is dispatched as needed

Tracing the Process for EE

- Develop technical potential based on measures
- Construct hypothetical programs and variants based on stringency
- Evaluate programs (principal variants) to determine impacts incremental to baseline demand forecast
- Document and provide results to planning processes

Understanding Proposed EE Programs or EE Potential Studies

- Comparing subsets of EE potential with the demand forecast requires detailed information comparable to demand forecast end-use data
- Impact assessment for EE programs needs to evolve:
  - Greater design specification and use of *ex ante* data at the level of EM&V studies will be needed to allow comparisons to demand forecast results. Very flexible designs will be extremely difficult to quantify *ex ante* and to compare to demand forecasts
  - *Ex post* studies show may discrepancies from *ex ante* assumptions
- For EE potential studies existing measure detail is acceptable, but studies may need to evolve, including:
  - High measure penetration feasibility and cost should be modeled in more depth since GHG-motivated policy decisions emphasize this end of the “supply curve”
  - Feasibility and cost differences among alternative program delivery mechanisms

2008 Goals Process

- CPUC initiated an update to its energy goal setting process in 2007:
  - Itron was hired by the IOUs to update the IOU program potential study
  - Itron was hired by CPUC/ED to adapt the CPUC's energy efficiency strategic planning results and to prepare goals
  - Itron developed a new, flexible model called SESAT to assess non-utility program efforts and process many scenarios
  - Itron's 2008 Goals Update Report quantified the savings resulting from three scenarios which presumed alternative levels of effort and program stringency

2008 CPUC Goals, Cont'd

- Scenarios encompassed variations on the following:
  - IOU programs (plus naturally occurring savings)
  - Codes and standards
  - AB 1109 (Huffman)
  - Big Bold initiatives
- In D.08-07-047CPUC adopted the concept of "total market gross" as the basis for goals it had established, and chose quantitative values from the Mid-Case that Itron had evaluated
- Specified the goals simply as annual energy and peak impacts

CPUC Request to CEC

- In D.07-12-052, the CPUC wrestled with the issues of additional energy efficiency and overlap with CEC forecast. No analytically sound conclusions possible.
- In R.08-02-007, the CPUC requested that the CEC undertake an analysis of additional energy efficiency savings that were incremental to the base demand forecast
- CEC response:
  - held two workshops to scope the effort
  - established a working group to elicit cooperation from IOUs and stakeholders
  - With CPUC assistance, obtained Itron's cooperation

The Problems

- Innumerable possible programs tapping into some of all of potential
  - Solution: develop incremental savings estimates for the same set of policy initiatives established by the CPUC through its 2008 Goals Update Report process
- Devise methodology to quantify incremental impacts of specific policies
  - Solution: adapt Itron's original technique to prepare the 2008 goal Study impacts

Method of Analysis

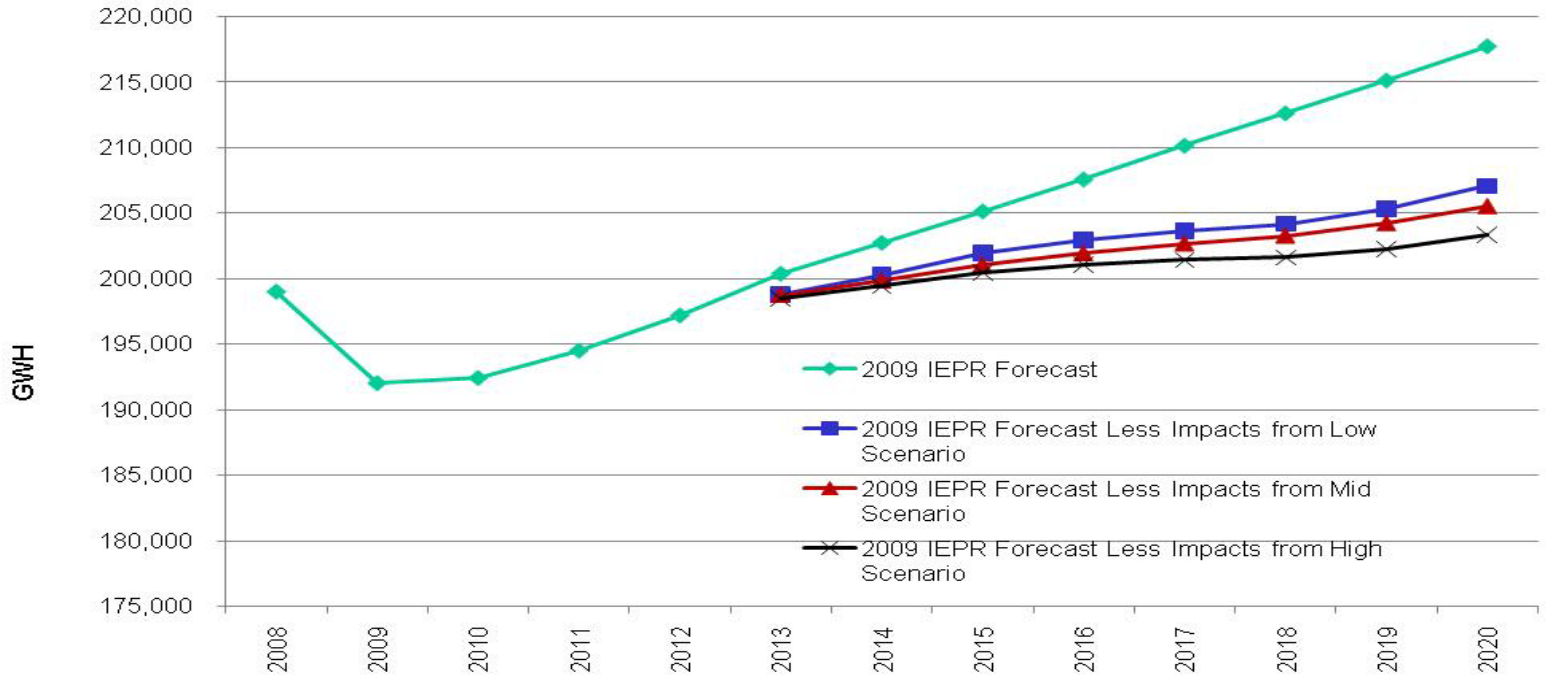
- Goal: estimate the incremental impacts of three CPUC efficiency initiative scenarios for the 2013-2020 period, accounting for overlap between these initiatives and savings in *2009 IEPR* forecast
- Three scenarios (high, mid, and low) based on varying assumptions regarding:
  - Uncommitted IOU programs
  - Codes and standards: Title 24 and Federal
  - AB 1109 (Huffman)
  - Big Bold Initiatives
- Adjust for EE impacts already in the baseline forecast

Method of Analysis

- Itron's model known as Scenario-based Energy Savings Analysis Tool (SESAT) was used
- Itron and Energy Commission staff matched inputs for respective models as closely as possible
- Energy Commission staff provided Itron detailed end-use level committed savings estimates and peak-to-energy ratios from the *2009 IEPR* forecast
- Method accounted for overlap between committed and uncommitted savings
- Incremental uncommitted energy savings converted to incremental peak savings using peak to energy ratios for each end use

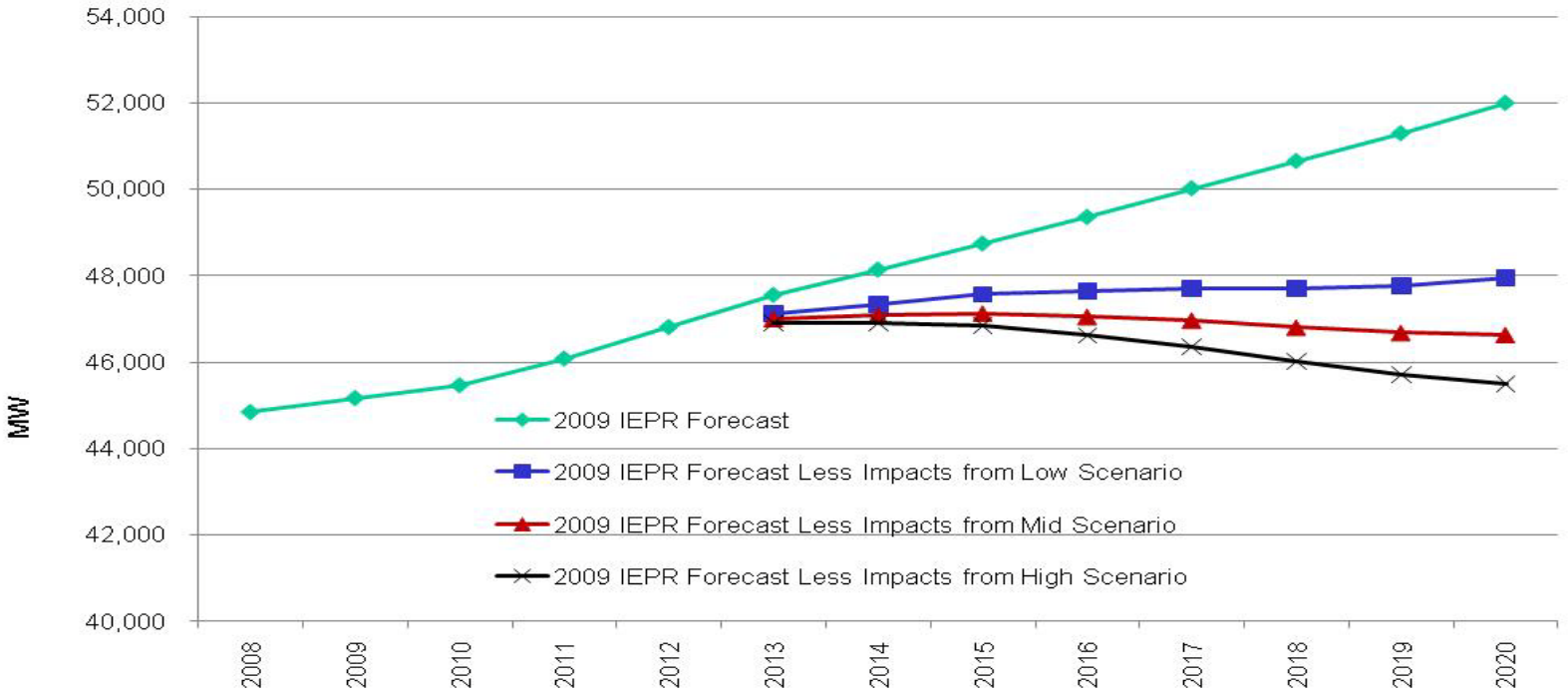
Incremental Uncommitted Savings Relative to 2009 IEPR Sales Forecast by Scenario, 3 IOUs Combined

5%-7% Reduction in 2020



Incremental Uncommitted Savings Relative to 2009 IEPR Peak Forecast by Scenario, 3 IOUs Combined

8%-12% Reduction in 2020



Uncertainties

- Policy
  - Will policy makers devote resources to push new EE programs to the extent shown in the scenarios?
  - How will the CPUC's policy toward replacement of savings decay change as technical analyses become available?
- Technical
  - Unintended biases introduced by trying to mesh together the results of two quite different modeling systems
  - Incomplete assessments within the domain of each model due to lack of resources, e.g. rerunning ASSET with 15% rate increase to discern its naturally occurring savings
  - Peak system conditions (time of day, weather)

Where Are We Now?

CA Clean Energy Future

- July 2009, five agencies set out to reconcile their visions of the future (circa 2020)
- Started from ARB AB32 Scoping Plan, and added reliability in more formal manner
- CCEF documents in preparation:
  - Vision statement
  - Implementation Plan
  - Metrics for tracking progress toward goals

Use of Incremental, Uncommitted Results

- CPUC
  - 2010 Long-term Procurement Planning will use CEC baseline demand forecast adjusted by mid-level incremental, uncommitted impacts
- CAISO and CTPG
  - Regular transmission planning only using baseline demand forecast with no incremental adjustments
  - Special analyses for CARB or SWRCB being prepared jointly by CEC-CPUC-CAISO will assess uncommitted policy initiatives, including incremental EE impacts
- WECC
  - TEPPC transmission planning will adjust BA load forecasts to account for energy efficiency impacts

Reconciling Scenario Selection

Renewable Development	High Net Load (No Incremental Impacts)	Mid-Net Load (Intermediate Level of Impacts)	Low Net Load (High Incremental Impacts)
Current Trajectory	CAISO Renew Integr Study	CPUC LTPP	AB 32 Scoping Plan
High DG		CPUC LTPP	AB 32 Scoping Plan
High Out of State		CPUC LTPP	AB 32 Scoping Plan
ISO Interconnection Queue	CAISO 2010/11 Trans Plan		

Analytic Next Steps

- CEC staff is implementing a demand forecasting model review and improvement project
- Conceptualize improved linkages between end-use forecasting models and platforms for quantifying impacts of hypothetical energy efficiency program designs
- Assess interactions with other demand-side policy initiatives leading to “managed” demand forecasts
- Develop specific plans for improvements for the 2011 IEPR cycle, and general plans for future cycles

References

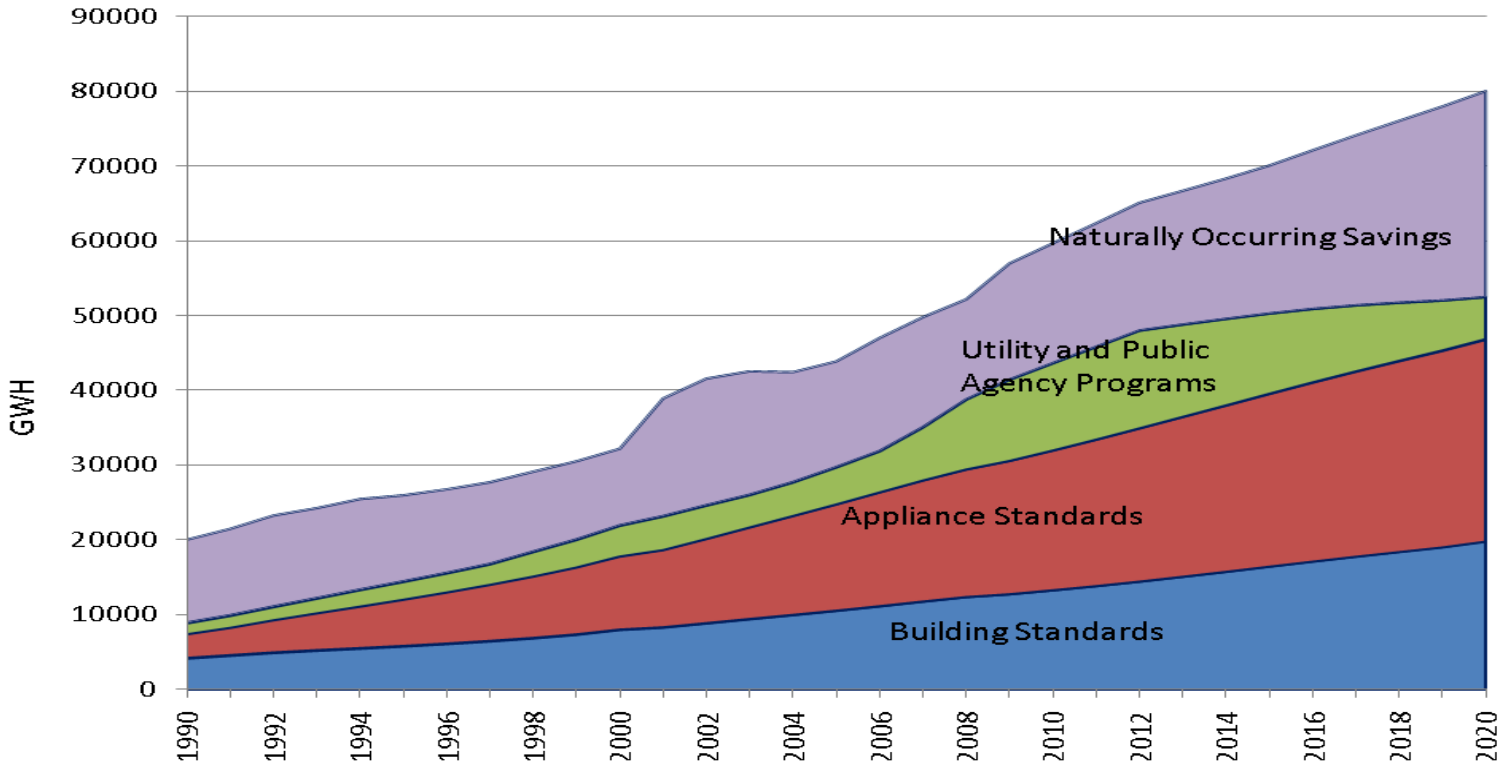
- Baseline demand forecast
  - http://www.energy.ca.gov/2009publications/CEC-200-2009-012/index.html
- Incremental, uncommitted impact report
  - http://www.energy.ca.gov/2010publications/CEC-200-2010-001/index.html
- History of CPUC EE Goals
  - Inc, Unc report – Attachment B

Appendix

Energy Savings Categories in IEPR Forecast

- Three fundamental forces:
  - Utility and Public Agency Efficiency Programs (committed)
  - Building and Appliance Standards
  - Naturally Occurring Savings
- Savings from these three sources reduce consumption and peak demand by 18-21% over the forecast period

Electricity Consumption Savings by Category, 2009 IEPR Forecast



Utility Program Impacts

- Updated program savings:
  - For IOUs using annual reports to CPUC and preliminary *ex post* study results
  - for POUs using SB 1037 filings to CEC
- Some impacts incorporated in models, others through “post-processing”
- Period considered committed:
  - IOUs: through 2012
  - POUs: through 2009

Building and Appliance Standards

- Energy Commission forecasting models incorporate building and appliance standards through changes in inputs
- End-use consumption per household in the residential sector and end-use consumption per square foot in the commercial sector
- To measure the impact of each individual set of standards, staff removed the input effects from standards one set at a time

Naturally Occurring Savings

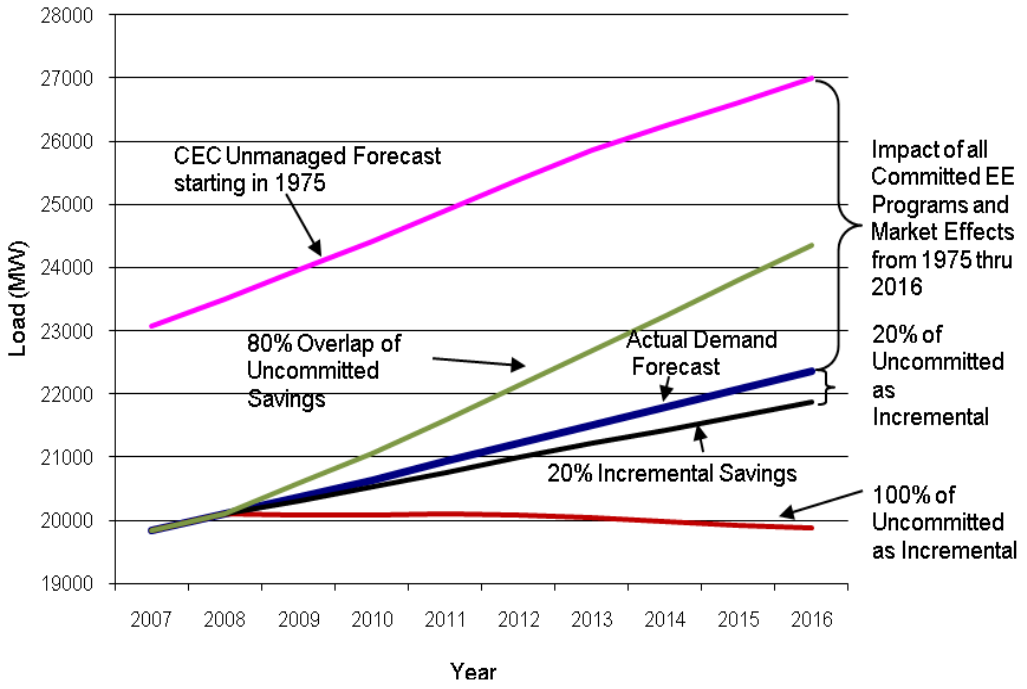
- Meant to capture load impacts of changes in energy use not directly associated with standards or efficiency programs
- Baseline forecasting models largely rely upon traditional price elasticity concept and analyses to obtain price effects
- EE models (like Itron's ASSET) has elaborate modeling of measure penetration calibrated to measure adoption data from one period

2009 Updates: IOU Program Impacts

- Staff set out to re-estimate the historical electricity savings from utility programs as well as to measure the impacts of the 2009-2011 program plans, with the idea of estimating program savings not previously incorporated in Energy Commission forecasts
- Itron provided estimates and analysis that fed into Energy Commission staff work, supplemented by the Demand Forecasting Energy Efficiency Quantification (DFEEQP) working group
- Some impacts incorporated in models, others through “post-processing”

Graphical Depiction of Overlap

- Staff Report
- (Figure 1)

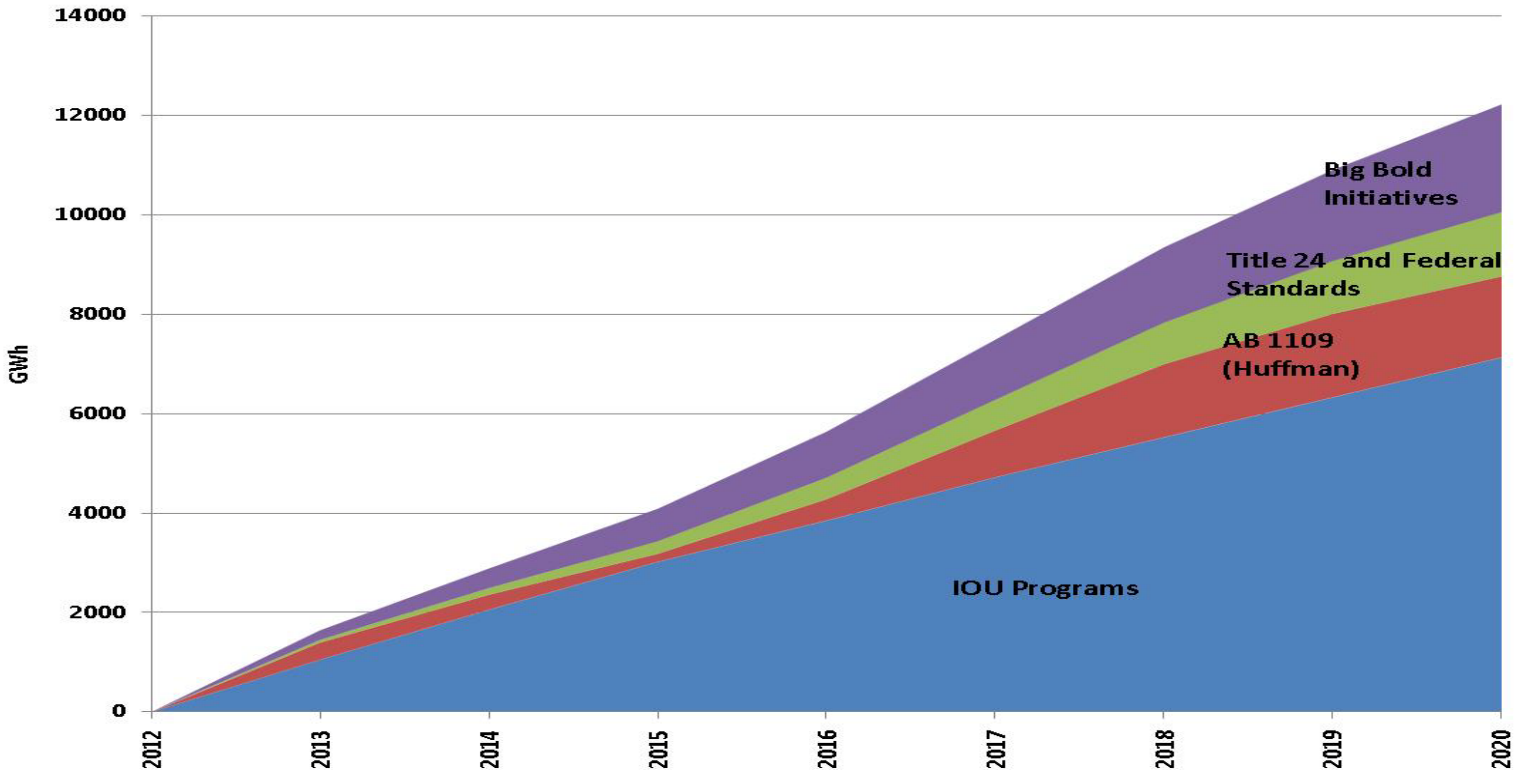


2020 Incremental Impacts of Policy Initiatives Relative to the *2009 IEPR* Demand Forecast

Utility	Savings	Scenario		
		Low	Mid	High
PG&E	Energy (GWh)	4,634	5,130	6,087
	Peak (MW)	1,731	2,245	2,722
SCE	Energy (GWh)	4,971	5,874	6,848
	Peak (MW)	1,941	2,593	3,160
SDG&E	Energy (GWh)	1,091	1,222	1,440
	Peak (MW)	363	514	602
Total IOUs	Energy (GWh)	10,658	12,225	14,374
	Peak (MW)	4,034	5,352	6,484

Distribution of Energy Incremental Uncommitted Impacts: Mid Scenario

IOU Programs account for 58% of total



Distribution of Peak Incremental Uncommitted Impacts: Mid Scenario

Big Bold accounts for 38% of total