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July 5, 2017

MEMORANDUM

TO: **Power Committee**

FROM: **Massoud Jourabchi**

SUBJECT: **Action item ANLY-4-** Review and enhancement of peak load forecasting

BACKGROUND:

Presenters: Massoud Jourabchi

Summary: On an ongoing basis Council's models are reviewed and if necessary enhanced. In this presentation weather-normalized peak loads produced by the modeling systems currently in use at the Council were compared. Review of the long-term model used in RPM and the short-term model used in RA were reconciled and found to present a consistent view of the near term future.

Relevance: Improving modeling capability at Council.

Workplan: Action Plan Item Analysis 4.

Background: This action item called for review and enhancement of peak load forecasting models. Action item was completed in cooperation with Council staff, Demand Forecasting Advisory Committee, Resource Adequacy Advisory Committee - forecasting models were reconciled. This task reviewed and reconciled peak load forecasting methods used for long-term resource planning (RPM) and short-term Adequacy Assessment (Genesys) analysis.

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Report on Action Item Analysis 4

Review and Comparison of Peak Load Forecasts

Massoud Jourabchi

July 11 , 2017

Action Item ANALY- 4

- Review and enhancement of peak load forecasting.
- This task reviews and reconciles peak load forecasting methods used for long-term resource planning (RPM) and short-term Adequacy Assessment (Genesys) analysis.
- This task should be completed before the next Resource Adequacy Assessment.

Peak Load Forecasting Methods

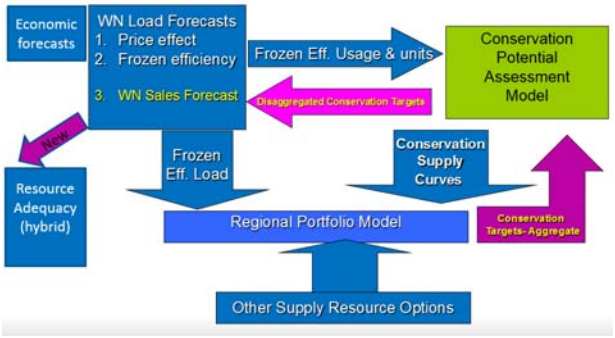
- Suitable method depends on needs of the forecast
- Next hour, next day, next month, next year, longer
  - For shorter-terms econometric load forecasting methods
  - For longer terms Simulation methods

Differences between LTM and STM

(Climate and Weather Forecasts)

	LTM	STM
Intended Applications	20year horizon, Conservation supply assessment, tracking enduse efficiency. A policy and load forecast model	3-5 year forward look, Resource Adequacy
Methodology differences	Enduse Simulation modeling. Produces different forecasts, Explicitly knows about future codes and standards, other trends.	Econometric modeling, Embedded Energy Efficiency, no explicit knowledge of future policies, codes/standards.
Impact of weather	In historic calibration period uses annual CDD and HDD. For the forecast period uses Normal weather. Forecasted loads are weather normalized	Explicit account of past daily and hourly temperature conditions
Focus	Forecast of monthly Energy, Peak, minimum Loads	Forecast of Hourly Energy and Peak under past temperature conditions
Data update	Every 5 years, by sector, enduse, technology, by state	Annual, region-wide

Timelines



- Typically it takes about two years to complete a plan.
- Final Plan
- Draft Plan
- RPM updates
- Conservation Supply Curves
- Frozen Efficiency Forecasts
- Supporting past data
  - Economic drivers
  - Market shares
  - Efficiency

Short term model is updated every year as the load and temperature profiles from previous year becomes available

What LTM and STM know and do not know

Before Adjustments	Past Energy Efficiency	Past Standards	Future Energy Efficiency	Future Standards
LTM (FE)	2012 Vintage	2012 Vintage	Yes	Yes
STM	2015 Vintage	2015 Vintage	No	No
Adjustments needed				
LTM	EE in 2013, 2014, 2015	Standards in 2013, 2014, 2015	No Adj.	No Adj.
STM	Embedded EE	Embedded Standards	Expected EE 2016-2022	Expected Standards 2016-2022

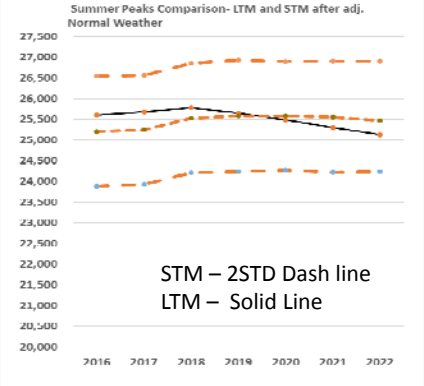
Adjustments to LTM

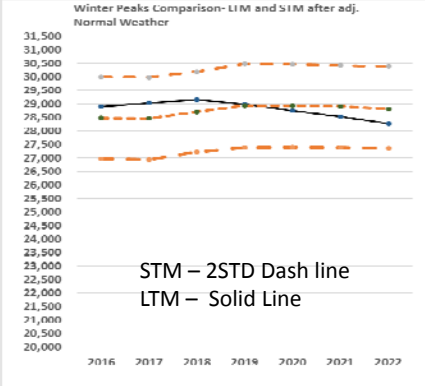
	Reduction to LTM for EE in 2013, 2014 and 2015 278+264+287=829 aMW Increase to LTM for additional DSI post 2018 421-338=83 aMW			
	LTM WN Summer Peak reduction MW	LTM WN Winter Peak Reduction MW	Ratio of Summer Peak to Average Energy	Ratio of Winter Peak to Average Energy
2016	1,091	1,214	1.316	1.464
2017	1,088	1,209	1.313	1.459
2018	1,169	1,288	1.310	1.453
2019	1,171	1,283	1.312	1.448
2020	1,172	1,279	1.314	1.443
2021	1,174	1,274	1.316	1.437
2022	1,176	1,269	1.318	1.430

Adjustment to STM

	WN Load net of DSI load	Embedded Estimated Conservation Cumulative (+)	Impact of Standards post 2015 Cumulative (-)	Power Plan Conservation Target Cumulative (-)	Cumulative change in Load aMW	Load after adjustment for Conservation and Standards	Cumulative percent Change in WN load *(Multiplier value)*
2016	20,691	311	129	147	36	20,727	0.17%
2017	20,841	633	262	357	14	20,855	0.07%
2018	20,958	965	382	575	8	20,967	0.04%
2019	21,047	1,303	515	821	(33)	21,015	-0.16%
2020	21,122	1,647	636	1,097	(85)	21,037	-0.40%
2021	21,153	1,996	738	1,398	(140)	21,014	-0.66%
2022	**21,204**	**2,352**	**832**	**1,715**	**(195)**	21,009	**-0.92%**

Comparison of Peaks from LTM and Range of Forecast from STM Under Normal Weather





Conclusion

- Once adjustments for the unknowns to each model are made LTM forecast of peak loads provided to RPM and the STM forecast of peak loads provided to Genesys model have a comparable view of the near-term future.