The Brattle Group

SUMMARY OF FERC DR POTENTIAL: UPDATE FOR WECC STATES

April 5, 2012

Ahmad Faruqui
Ryan Hledik
Jenny Palmer

Prepared for

Lawrence Berkeley National Laboratory

TABLE OF CONTENTS

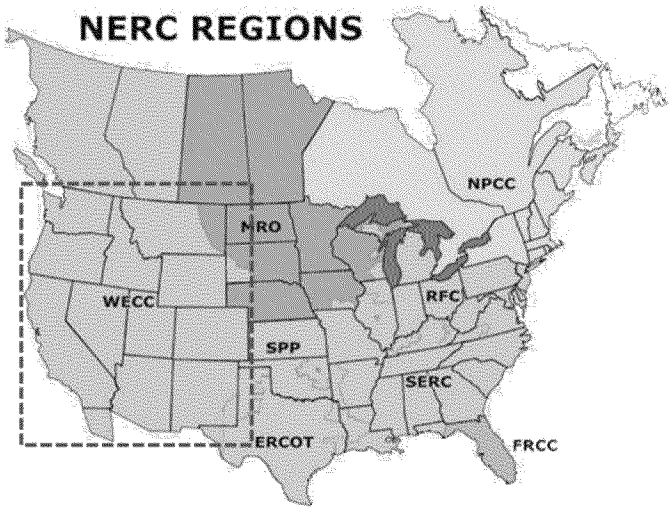
BACKGROUND

Regional transmission planning activities in the Western Interconnection are performed by the Western Electric Coordinating Council (WECC), under the direction of its Transmission Expansion Planning and Policy Committee (TEPPC). Lawrence Berkeley National Laboratory (LBNL) provides technical assistance to WECC in developing robust technical and policy analyses of the impact of energy efficiency and demand side management (DSM) on regional transmission expansion needs. One component of the technical assistance provided by LBNL is to assist in the development of production cost modeling inputs for a 10-year "High DSM scenario," which includes higher penetration of demand response (DR) resources than in the reference case scenario.

The High DSM scenario developed for the 2010 TEPPC Study relied on the DR potential estimates for each state in the Western Interconnection contained in the 2009 FERC Staff report developed by a team of consultants led by *The Brattle Group*, *A National Assessment of Demand Response Potential.* These estimates were developed using the Demand Response Potential Model ("the Model").

The High DSM scenario to be developed for the 2011 TEPPC study requires a projection of DR resource levels for the year 2022 and is based on the Model. Key input assumptions were updated in order to reflect changes to underlying market potential drivers for the "Enhanced Business as Usual" scenario and the "Achievable Potential" scenario. This paper summarizes the changes made to the input assumptions and the resulting DR potential in each of the eleven WECC states for the two scenarios. The WECC states, as shown in Figure 1, are Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming.

Figure 1



MODEL INPUT UPDATES

The Brattle Group updated the Model using two distinct approaches. First, we updated the data that drives the Model. This included updates to the current DR participation, current AMI deployment, and system peak load forecast. Then, we updated the assumptions driving the Expanded BAU and Achievable Participation scenarios, mainly participation rates and per customer impact assumptions. We also expanded the time horizon to 2012 to 2022 using a simple linear extrapolation for the last three years of the forecast.

We maintained the four customer classes in the Model, which were residential and small, medium, and large commercial and industrial (C&I). We also maintained the five types of demand response programs in the Model: pricing without enabling technology, pricing with enabling technology, automated or direct control, interruptible tariffs, and other DR.

Data Updates

The current participation rates in demand response programs were originally based on 2008 FERC Demand Response and AMI Survey data. We updated these inputs to reflect the updated 2010 FERC survey. Overall, this led to an increase in the potential peak load reductions on the whole for all customer classes and programs due to higher initial current participation rates.

The next input we updated was the current rate of AMI deployment. In the original Model, the AMI deployment was calculated from six different sources, as shown in Table 1 below. For the purposes of this update, we again used the 2010 FERC Demand Response and AMI Survey. Due to higher starting rates of AMI deployment, this change also leads to slightly higher demand response potential in the first years of the forecast. By the end of the forecast, the assumption regarding projected AMI deployment overshadows the current AMI deployment status. The projected AMI deployment is discussed in the assumptions section below.

Finally, we updated the system peak load forecast for the eleven WECC states. The original Model used NERC's 2008 Long-Term Reliability Assessment, which forecasts system peaks by region. The system peak was allocated across the states in that region using 2006 electric sales by state from the EIA. We updated the WECC system peak forecasts using the same methodology, with both the updated 2010 Long-Term Reliability Assessment and the 2009 electric sales by state from the EIA. The system peak load forecast was significantly lower in MW terms in the 2010 NERC Assessment. The EIA sales breakdown between the WECC states did not change significantly. As a result, this input change leads to lower DR in terms of MW, but the DR potential in percentage terms does not change significantly.

The data updates are summarized in Table 1.

Table 1: Data Updates

Original	Update	Effect on Results
Current participation in DR programs		
Based on analysis that used the 2008 FERC Demand Response Survey data	Updated using the 2010 FERC DR and AMI Survey data	Overall, this change increases the potential DR by a small amount
Current AMI Deployment		
Based on analysis of six different sources: KEMA's Perspectives for Job Creation (2008), 2008 FERC Survey, 2008 Utilipoint examination of AMI initiatives, Enermex Smart Meter Data, 2008 FERC Staff Report, and IEE survey on smart meter deployment	Updated Using the 2010 FERC DR and AMI Survey	This change leads to slightly higher DR potential in the first years of the forecast
System Peak Load Forecast		
Based on regional system peak forecasts from NERC's 2008 Long-Term Reliability Assessment; Allocated across states using total 2006 electric sales by state from EIA data	Updated using same methodology with NERC's 2010 Long-Term Reliability Assessment and 2009 electric sales data from EIA	There is no significant change in DR potential in potential terms, but there is a large drop in MW terms (both system peak load forecast and DR potential decrease)

ASSUMPTION UPDATES

We also updated the assumptions in program participation and per customer impacts, which often vary by scenario. For the pricing programs, the Expanded BAU Scenario assumes that 5 percent of eligible customers enroll. We updated this assumption on a state-by-state basis using *Brattle's* 2011 Survey of Energy Efficiency and Demand Response Experts. This update resulted in slightly higher DR potential overall. In the Achievable Participation scenario, we maintained the assumption that 60 percent of eligible medium and large C&I customers enroll and that 75 percent of residential and small C&I customers enroll.

For the three non-pricing programs, the original Model used FERC's 2008 survey to determine "best practices" participation rates in each program in both scenarios. Again, we updated these assumptions using the 2011 *Brattle* survey of experts. This update did not change the results in a significant way.

Another key assumption that drives the results of the model is the program impacts per customer. Originally, the pricing program impacts were based on PRISM simulations derived from the model that grew out of the California Statewide Pricing Pilot (SPP). In this update, we did not use PRISM simulations but instead relied directly on results derived from a variety of high-quality pricing experiments. When the demand response estimates from these experiments are plotted against the peak to off-peak price ratio, they yield an Arc of Price Responsiveness.[1] This new approach resulted in slightly lower peak impacts per customer and therefore slightly lower overall DR potential.

For the non-pricing programs, the per customer impact assumptions were originally based on state-by-state impacts reported in the 2008 FERC Survey. We scaled the 2008 FERC results using a scaling factor derived from the 2010 FERC Survey. This resulted in slightly higher DR potential.

Table 2: Assumption Updates

Scenario	Original	Update	Effect on Results
Pricing Program Participation			
Expanded BAU	5% of eligible customers enroll	Created new state-by-state assumptions using 2011 Brattle Survey of EE and DR experts	Slightly higher DR potential
Achievable Participation	60% of eligible medium and large C&I customers enroll; 75% of eligible residential and small C&I customers enroll	No change	No change
Non-Pricing Program Participation			
Expanded BAU	Determined using "best practices" developed from FERC's 2008 DR Survey	Used results from 2011 Brattle Survey of DR and EE Experts for residential and large C&I; No changes made to small and medium C&I	No significant changes
Achievable Participation	Same as above	Same as above	No significant changes
Pricing Program Impacts (per customer)			
Expanded BAU	Based on PRISM analysis derived from SPP results	Based on Brattle's latest Arc of Price Responsiveness	Lowers DR potential slightly
Achievable Participation	Same as above	Same as above	Same as above
Non-Pricing Program Impacts (per customer)			
Expanded BAU	Based on range of reported impacts from 2008 FERC DR Survey	Scaled up state-by-state results using scaling factor derived from 2010 FERC DR Survey	Increases results slightly
Achievable Participation	Same as above	Same as above	Same as above

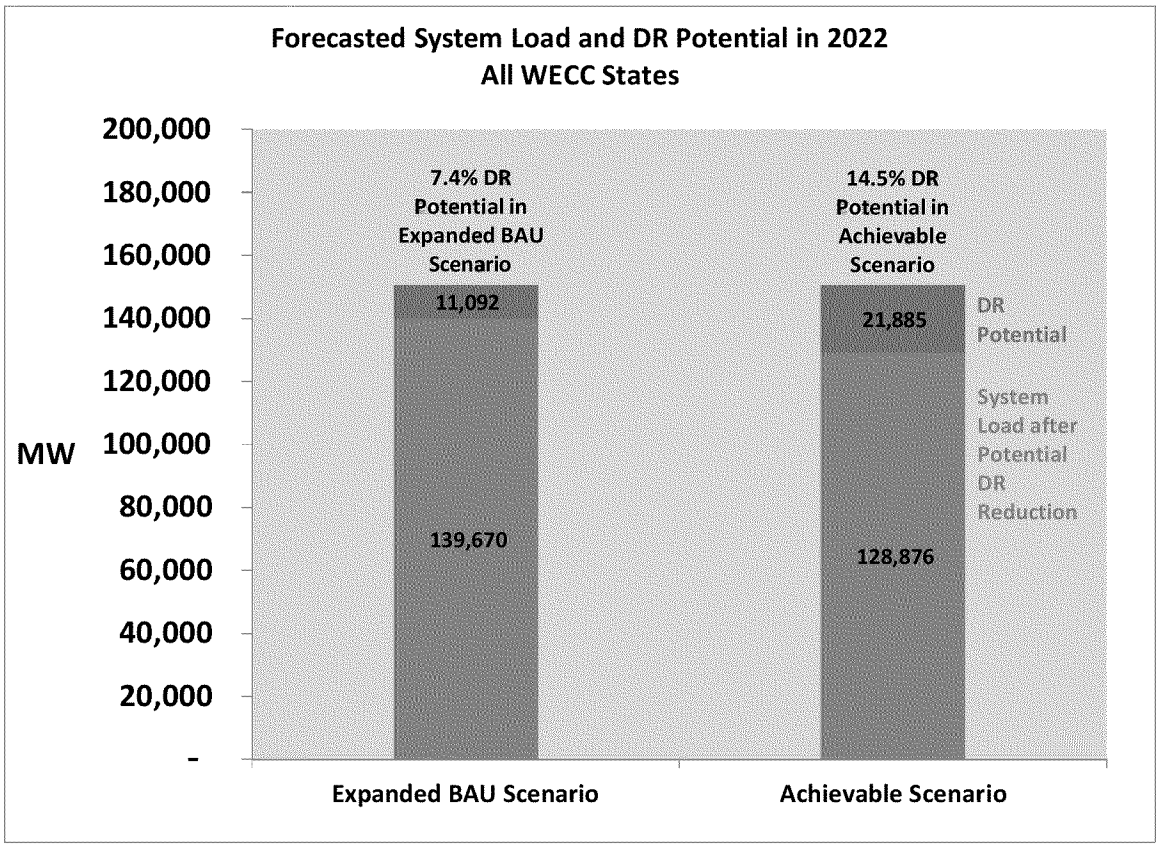
[1] Ahmad Faruqui and Jenny Palmer, "The Discovery of Price Responsiveness: A Survey of Experiments Involving Dynamic Pricing of Electricity," *EDI Quarterly*, 4:1, April 2012.

We also considered two other key assumptions in the Model—forecasted AMI deployment and the percent of customers with enabling technology—and determined that the inputs already in the Model still reflect the best available information. In the Expanded BAU Scenario, the forecasted AMI deployment varies by state and is based largely on a continuation of current trends. In the Achievable participation Scenario, the Model assumes 100 percent deployment by the end of the forecast horizon. For the percent of customers with enabling technology, both scenarios assume that eligibility for technology varies by state and that 95 percent of those eligible customers do get enabling technologies.

RESULTS

Each of the changes described above produced a small change in the overall DR potential of each WECC state. The resulting DR potential across all WECC states is 11,092 MW, or 7.4 percent, in the Expanded BAU Scenario. In the more aggressive Achievable Scenario, the DR potential is 21,885 MW, or 14.5 percent.

Figure 2: Summary of Results



The DR potential varies by state. In MW terms, California leads the WECC states with nearly 5,000 MW potential in the Expanded BAU scenario and 7,700 MW in the Achievable Participation Scenario. In percentage terms, the largest DR potential occurs in Nevada and Utah. The state-by-state results for both scenarios are shown in Table 3.

Table 3: State-by-State Results in 2022

	System Peak without DR	Expanded BAU Peak Reduction		Achievable Participation Peak Reduction	
	MW	MW	%	MW	%
AZ	16,801	915	5.4%	2,682	16.0%
CA	59,391	4,971	8.4%	7,732	13.0%
CO	11,677	828	7.1%	1,925	16.5%
ID	5,206	327	6.3%	784	15.1%
MT	3,278	125	3.8%	434	13.2%
NM	4,953	430	8.7%	821	16.6%
NV	7,844	775	9.9%	1,958	25.0%
OR	10,883	389	3.6%	1,125	10.3%
UT	6,312	936	14.8%	1,555	24.6%
WA	20,629	1,054	5.1%	2,265	11.0%
WY	3,789	341	9.0%	603	15.9%

CONCLUSION

For this update, we took the best and most-up-to-date data to re-estimate the DR potential in the eleven WECC states. Consistent with the prior results, the WECC states have the potential to produce significant peak load reductions through demand response programs.

SOURCES

Energy Information Administration, "Sales to Bundled and Unbundled Consumers by Sector, Census Division, and State, 2009." http://www.eia.gov/electricity/sales_revenue_price/

Faruqui, Ahmad and Jenny Palmer, "The Discovery of Price Responsiveness – A Survey of Experiments Involving Dynamic Pricing of Electricity," *EDI Quarterly*, 4:1, April 2012. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2020587

Faruqui, Ahmad and Jenny Palmer, "Dynamic Pricing and its Discontents," *Regulation*, Fall 2011. http://www.cato.org/pubs/regulation/regv34n3/regv34n3-5.pdf

Faruqui, Ahmad and Doug Mitarotonda, "Energy Efficiency and Demand Response in 2020: A Survey of Expert Opinion," *The Brattle Group*, November 2011. http://www.brattle.com/_documents/UploadLibrary/Upload990.pdf

Federal Energy Regulatory Commission staff, *A National Assessment of Demand Response Potential*, June 2009. http://www.ferc.gov/legal/staff-reports/06-09-demand-response.pdf

Federal Energy Regulatory Commission staff, "Assessment of Demand Response & Advanced Metering," November 2011.

Federal Energy Regulatory Commission staff, "2010 Survey on Demand Response and Advanced Metering." http://www.ferc.gov/industries/electric/indus-act/demand-response/2010/survey.asp

North American Electric Reliability Corporation, "2010 Long-Term Reliability Assessment," October 2010.

APPENDIX