**IRP Modeling Advisory Group**

**Responses to Questions Posed During Webinar #7 on March 29, 2018**

**Background**

Energy Division staff moderates the IRP Modeling Advisory Group (MAG), an informal, interactive forum to discuss the technical aspects of modeling to support the CPUC’s IRP process. More details on participating in the MAG and previous materials are found at [the MAG website](http://cpuc.ca.gov/General.aspx?id=6442453968). Staff hosted MAG webinar #7 on 3/29/2018 and discussed next steps for production cost modeling to support the IRP process, introduced the audience to data development for Energy Division’s SERVM model, and reviewed RESOLVE model results when using the 2017 IEPR demand forecast. The following are staff responses to questions from the webinar that required further investigation.

**Questions and Responses**

1. How do you compare the statutory requirements for doubling of additional achievable energy efficiency (AAEE) to the projections of AAEE in the 2017 IEPR?

See the workbook [Comparison of 2017 IEPR AAEE to Doubling Target Statewide](http://cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/ElectPowerProcurementGeneration/irp/2018/Compare2017IEPRAAEE_to_DoublingTarget-Statewide.xlsx) on [the MAG website](http://cpuc.ca.gov/General.aspx?id=6442453968) that compares energy savings from the 2017 IEPR Mid-Mid AAEE (Scenario 3), 2017 IEPR Mid-High-Plus AAEE (Scenario 6), and the doubling targets adopted by the CEC in October 2017 ( [SB350 TARGETS FINAL](http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-06/TN221616_20171025T135101_SB350_TARGETS_FINAL.xlsx); [Senate Bill 350 Doubling Energy Efficiency Savings by 2030](http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-06/TN221611_20171025T133309_Senate_Bill_350_Doubling_Energy_Efficiency_Savings_by_2030.pdf)). The comparison shows that the Statewide 2017 IEPR Mid-Mid AAEE is about 50% of the doubling target in 2030, while the Statewide 2017 Mid-High-Plus AAEE is about 67% of the doubling targets in 2030. The comparison is done with Statewide values since the doubling targets are based on the doubling of IOU AAEE and POU AAEE combined.

Prior to comparison, the 2017 IEPR AAEE scenarios were adjusted to reflect the same baseline as the doubling targets.  The doubling targets were based on the 2015 IEPR AAEE scenarios which contained savings streams that were included in the 2017 IEPR baseline load forecast as part of the committed savings. To enable comparison, these committed savings had to be manually extracted from the forecast model and added to the 2017 IEPR AAEE scenarios, as shown in the workbook.

1. Will RESOLVE and SERVM use the most recent fuel price projections associated with the 2017 IEPR?

Yes. The SERVM model will use fuel price projections using the “April 2018 Updated Model in Microsoft Excel” workbook found here: <http://www.energy.ca.gov/assessments/ng_burner_tip.html>. SERVM will also use the carbon allowance price projections in the workbook found here: <http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-03/TN222145_20180116T123231_2017_IEPR_Revised_Carbon_Allowance_Price_Projections.xlsx>. The RESOLVE model results presented at the 3/29 webinar did not include these updates. Since then, staff has worked with E3 to incorporate the 2017 IEPR fuel and carbon price projections and rerun RESOLVE.

[Selected presentation slides from the 3/29 MAG webinar have been updated](http://cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/ElectPowerProcurementGeneration/irp/2018/IRP_MAG_webinar_2018-03-29_RerunUpdatesOnly_2018-04-23.pdf) to reflect the results from this rerun of RESOLVE and are posted to [the MAG website](http://cpuc.ca.gov/General.aspx?id=6442453968). This RESOLVE rerun includes updates to the fuel and carbon allowance prices, as well as updated peak impacts from TOU rates (214 MW by 2030 as described below), aligning with current 2017 IEPR information. This is the set of RESOLVE results that will be used in the calibration exercise with SERVM, as was described in Attachment B to the February 2018 IRP decision. The [full RESOLVE model and results with the 2017 IEPR](http://cpuc.ca.gov/General.aspx?id=6442457210) is posted to [the MAG website](http://cpuc.ca.gov/General.aspx?id=6442453968) under Webinar 7 – 3/29/18.

1. Why did the peak hour impact of TOU rates in the RESOLVE model go down when using the 2017 IEPR?

RESOLVE models TOU rate impacts in two parts of the model, the hourly operational part and the Planning Reserve Margin (PRM) constraint part. In the operational part, TOU annual shapes representing change in load are layered onto the baseline load shapes. TOU shape positive values indicate the hourly load increases relative to baseline load and negative values indicate the hourly load decreases relative to baseline load. This net load shape is then used to balance hourly demand and supply for the 37 representative days in RESOLVE.

In the PRM constraint part of RESOLVE, the projected annual peak demand is compared to effective supply and RESOLVE reports the actual reserve margin. The model solution is constrained to ensure the 15% PRM requirement is met. As long as this constraint is not binding, it has no impact on resource build in RESOLVE. Projected annual peak reduction from TOU rates is part of RESOLVE’s reserve margin calculation.

In the version of RESOLVE used to develop the Reference System Plan, the annual peak reduction from TOU was about 1000 MW by 2030, based on an MRW study as described on slide 12 of the 3/29 MAG webinar. In the version of RESOLVE using the 2017 IEPR mid TOU case, CPUC staff approximated the load reduction from TOU as about 170 MW by 2030, measured at the CAISO area coincident managed peak. Since then, CEC staff has provided an updated calculation of peak reduction from the IEPR hourly data as 214 MW by 2030. The difference between the TOU peak impact used with the Reference System Plan and the impact based on the 2017 IEPR mid TOU case is attributed to multiple factors:

1. The TOU peak impact used with the Reference System Plan used an “aggressive” assumption based on the 2015 MRW study scenario 4 multiplied by 1.5
2. The 2017 IEPR considered recent CPUC decisions on TOU implementation, lower impacts from defaulted customers, and other differences in input assumptions
3. Misalignment between IEPR hourly TOU shapes and IEPR baseline load shapes that resulted in lower than expected TOU impacts in the highest peak hours

The CEC’s 2018 IEPR Update process will incorporate information from the most recent TOU pilot studies and correct the misalignment in hourly shapes.

To maintain consistency with the 2017 IEPR mid TOU case, RESOLVE has been rerun using the peak reduction data provided by CEC staff, i.e. 214 MW by 2030 at the CAISO area coincident managed peak. Since the PRM constraint is not binding in the results from the version of RESOLVE using the 2017 IEPR, this change has no effect other than increasing the reported reserve margin by a small amount (relative to the results that were presented on 3/29).

1. Why does the maximum output from the BTM PV shapes in the IEPR (about 16,600 MW in 2030) fall short of the assumed installed capacity (about 20,000 MW in 2030) modeled in RESOLVE?

See the workbook [2017 IEPR BTMPV and AAPV installed capacity and hourly](http://cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/ElectPowerProcurementGeneration/irp/2018/IEPR_btmpv_aapv_icap_and_hourly.xlsx) data posted to [the MAG website](http://cpuc.ca.gov/General.aspx?id=6442453968) that illustrates IEPR raw source data including hourly BTM PV shapes, compared to aggregate BTM PV assumptions used in the RESOLVE UI. The annual energy values in RESOLVE and the IEPR match. The workbook uses the IEPR raw source data (hourly production and installed capacity) to calculate the ratio of “max MW output of aggregate CAISO area BTM PV shape” to “CAISO area BTM PV installed capacity” as about 0.86. The maximum value of the normalized BTM PV shapes used in the RESOLVE model is comparable, about 0.85 (by inspection of the max value of the normalized shapes in the RESOLVE UI). The fact that the maximum output of BTM PV in aggregate is somewhat less than the assumed installed capacity reflects the non-coincidence of the maximum solar generation between the 3 TAC areas and within each TAC area when aggregating up from more geographically granular solar shapes.