Memorandum

TO: DISTRIBUTED GENERATION FORECAST WORKING GROUP, ISO-NEW ENGLAND

FROM: PAUL PETERSON & SPENCER FIELDS

DATE: MARCH 9, 2015

RE: DRAFT 2015 SOLAR PV FORECAST

Comments on the Draft 2015 Solar PV Forecast

Synapse Energy Economics (Synapse) appreciates the opportunity to provide comments on the Draft 2015 PV Forecast. These comments are on behalf of several clients that Synapse collaborates with in the NEPOOL stakeholder process, but they have not been specifically reviewed or approved by any individual client.

We are encouraged by the development of an ISO New England PV forecast that can be used in planning studies and market related activities. Based on the presentations and discussion at the February 27, 2015 DGFWG meeting, Synapse is providing comments on both the Draft 2015 PV Forecast and the ICF International report on economic drivers of PV. Some of the details in the ICF analysis illustrate the uncertainties in the Draft 2015 forecast. Our comments focus on the conservative assumptions used by the ISO to discount future PV installations in the Draft 2015 forecast and three elements of the ICF analysis that would benefit from further iterations.

We are encouraged to see an annual forecast of distributed PV in New England, and we understand that creating an accurate forecast for the entire region is a significant undertaking that involves input from a variety of stakeholders. We appreciate the ISO's hard work on developing the distributed PV forecast over the past two years—a process in which we have played an active role.

That said, we would like to express one major concern with what we believe are overly-conservative assumptions underlying the forecast, and highlight three specific inputs to the ICF report that we believe could be improved, all of which could have a substantial impact on the final forecast.

Conservative assumptions in the Draft 2015 PV Forecast

While we recognize the inherent uncertainty involved with forecasting future, behind-the-meter resource investment, we believe that the draft PV forecast significantly understates future PV installations. This is due in large part to the discount factors that ISO applies to future PV installations.

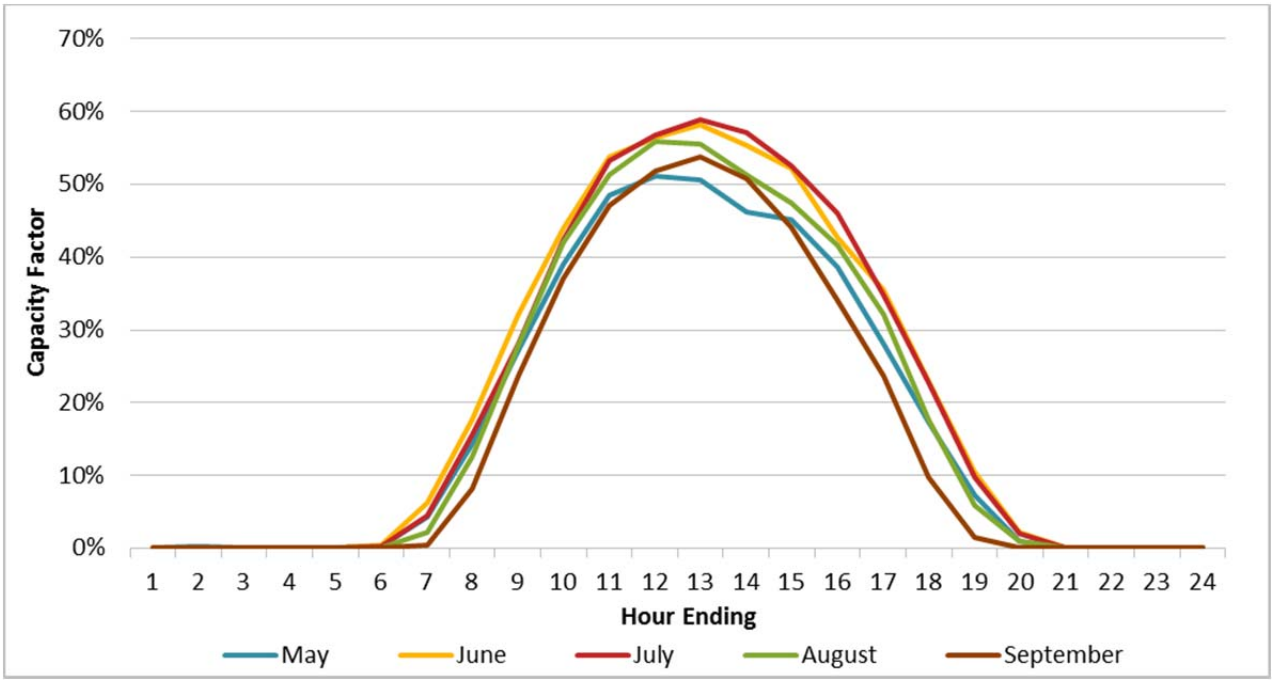
The ISO assumes an escalating discount of state policy PV goals from 35% to 50% for 2017 to 2020. The justification for this increased discount factor is the anticipated expiration of the Federal Investment Tax Credit (ITC) at the end of 2016. As a result of this new discount factor, the ISO concludes that states will not actually comply with their own policies for procuring distributed solar PV.

For example, the draft forecast shows that Massachusetts will comply marginally with the state goal of about 1,350 MW of total AC nameplate distributed PV capacity by 2020. However, after the ISO discount factor is applied, the ISO forecast shows that Massachusetts will not only miss compliance with the its policy goal during the compliance period – i.e., by 2020 – but will fail to procure that level of distributed solar PV capacity altogether, even by the end of the ISO's forecast in 2024. Applying a discount factor to hedge for some uncertainty is an appropriate and understandable step to take; however, the ISO should be assuming that each state in the region will comply with its own state policy targets.

In addition to this new discount factor related to the ITC, the ISO also applies an across-the-board 75% discount factor to all PV estimates for post-policy installations—which are already simply held steady from the final year(s) of the policy. The ISO provides no explanation for why a PV industry that is installing over 300 MW (AC nameplate) annually through 2015 and 2016 will suddenly drop to about 50 MW in 2020 and less than 40 MW in 2024. The intention of the ITC and state polices that promote solar installations is that the PV industry will continue to grow in the coming years, even as subsidies and support levels drop.

Another aspect of the forecast that we believe results in the forecast being too conservative is the ISO's assumption for solar PV capacity factors during peak hours in the summer. Our initial research of performance of distributed solar installations in Massachusetts shows that PV installations are performing at a much higher capacity factor during peak hours during the summer than the ISO assumes. As seen in Figure 1 below, distributed solar PV capacity factors reach levels much higher than the 35 percent Seasonal Claimed Capability value the ISO assumes during summer months. In fact, during reliability Hour Ending 2 p.m. through Hour Ending 6 p.m., the distributed PV installations in our dataset average a capacity factor of 43 percent. Although this difference may seem minimal, when applied to the capacity ratings for the entire PV forecast, this results in a difference of 171 MW of additional summer peak capacity credit beyond what the ISO assumes. While our dataset is a small sample and not necessarily representative of New England as a whole, we believe it is enough to merit further analysis by the ISO of the Seasonal Claimed Capacity value for distributed PV across the entirety of the region during summer reliability hours.

Figure 1. Average summer hourly capacity factor for rooftop PV installations in Massachusetts by month, 2014



The ICF report relies on three assumptions we question

ICF's presentation of their "Economic Drivers of PV Analysis" report demonstrated that the conclusions of the report rely upon factors heavily impacted by three main inputs: the assumed installation cost of solar PV projects, the future retail rate of electricity, and the assumed rate of inflation.

Installed cost of solar

The ICF report relies upon the 2014 edition of the U.S. Department of Energy's SunShot "Photovoltaic System Pricing Trends" report. According to the ICF report, the number used represents a recently observed installed cost of solar in Vermont and is deemed representative of the region because it falls within the observed costs listed for Massachusetts and Connecticut in the SunShot presentation. While we commend ICF for using the 2014 vintage of the pricing trends report, it is worth noting that the SunShot presentation reports prices from PV systems installed through year-end 2013.[1] Further still, the installed costs in Vermont were nearly 25 cents per Watt higher than in any other New England state in 2013. Given the rapidly declining installed cost of solar (listed at 12 percent in the SunShot report), it is inappropriate to compare the recent installed cost of solar from Vermont to a previous year's installed cost in other states in the region. In fact, the installed cost in Massachusetts and Connecticut was likely much lower in 2014 than in 2013. Additionally, taking a cost estimate from the state that has historically seen the highest installed cost of solar in the region makes this assumption overly conservative. As the

[1] U.S. Department of Energy (with NREL and LBNL), *Photovoltaic System Pricing Trends: Historical, Recent, and Near-Term Projections, 2014 Edition*, September 22, 2014. Available at: http://www.nrel.gov/docs/fy14osti/62558.pdf.

installed cost of solar is the largest driver of future PV costs in every waterfall chart provided in the ICF report, adjusting this assumption to reflect the continuously declining cost of solar would likely have a large impact on the future economics of solar in the region.

Future retail electricity rate

As we mentioned during the February 27, 2015 DGFWG meeting, the retail electricity rate projections used as an input to the PV economics study appear to include an incorrect assumption. The retail rate is a combination of the wholesale electricity rate and transmission and distribution rates. The comparison of the wholesale energy price forecast with the retail rate forecast from the ICF report leads the reader to believe that the cost for transmission and distribution will remain level for residential customers and decline for commercial customers over the course of the study period. As active participants in the Planning Advisory Committee, we are often reminded that transmission and distribution costs will not stay at their current levels; instead they will increase to cover the costs of upgrading aging infrastructure. Further, the Energy Information Administration's Annual Energy Outlook and corresponding forecast of New England retail electricity prices show that, although the wholesale price of energy is the main driver in increases in the retail rate, transmission and distribution costs increase steadily as well, though at a lower rate. Given that the largest non-ITC benefits associated with solar installations come from the avoided cost of energy and net metering, adjusting the retail rate to account for increases in transmission and distribution charges in the future would generate an even higher level of benefits for solar PV installations in New England.

Inflation Rate

As is described in detail in the Conservation Law Foundation's March 4, 2015 comments on the draft distributed PV forecast, "a return to inflation levels that are historically more typical would increase the economic incentive for development of solar PV."[2] Given that the ISO assumes significant economic recovery for other planning purposes, such as in load forecasting, it is inconsistent to assume that the inflation rate will remain at historical lows in this analysis. The current low inflation environment may persist for a few more years but is unlikely to stay at historical lows over the thirty-year horizon of the ICF report. This is especially true given the influence that the assumed rate of inflation has on the return on the investment for distributed PV investments. A higher inflation rate affects the ICF waterfall charts in two ways: it increases the installed cost of solar as compared to 2014 levels, and, more significantly, it will increase the retail rate that customers avoid and receive through net metering.

Importantly, while the installed cost of solar is a one-time capital investment affected by inflation until the system is bought, the retail rate continues to experience inflation, meaning the benefits to customers continue to accrue at a higher and higher level than they would under a lower inflation rate.

[2] Elmer, Jerry. Letter to the DGFWG regarding the February 27, 2015 Meeting. *Conservation Law Foundation*. Submitted: March 4, 2015.

Conclusion

Synapse is not requesting changes to the current Draft 2015 PV Forecast as long as it is understood as a work in progress. For the 2016 PV Forecast, Synapse would like the ISO to commit to additional analysis of the issues identified in these comments. Sensitivity analyses might be appropriate for the ICF issues; how much to discount state policy goals might be addressed as a discussion topic with the states and DGFWG stakeholders. We believe that, taken together, the concerns we have raised indicate that the ISO's Draft PV forecast significantly understates future PV installations in New England and that the forecast would be improved through continued refinement.

We appreciate the opportunity to comment on these issues.