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August 16, 2016

Commissioner Travis Kavulla, President
National Association of Regulatory Utility Commissioners
1101 Vermont Ave NW # 200, Washington, DC 20005

RE: Comments on NARUC Distributed Energy Resources Compensation Manual (responses@naruc.org)

Dear President Kavulla:

The Regulatory Assistance Project[1] (RAP) offers these comments in response to the questions issued by NARUC regarding the July 21, 2016, draft of the NARUC Distributed Energy Resources Compensation Manual (draft manual).

RAP wishes to commend the subcommittee for preparing such a thoughtful draft manual, and especially you, President Kavulla, for making this work on rate design one of the centerpieces of your tenure as NARUC President.

We have followed with great interest these discussions taking place at NARUC and around the country. RAP is involved to varying degrees as advisors to regulators and policymakers in similar deliberations in various markets around the world. We note that the depth and quality of NARUC's efforts on this topic are extraordinary. In hopes of making a constructive contribution to your work, and to promote fairness and clarity in this effort, we respectfully submit the following suggestions for consideration on three aspects of this topic:

1. The nature of distributed energy resources (DER);
2. The need to identify the value(s) of DER; and,
3. Translating those values into utility rates.

1. The Nature of Distributed Energy Resources

Broadly speaking, compensating DERs is about resource acquisition (the noun in "DER" is "resources") and it is normal for resource acquisition to create rate pressure.[2] In this context, however, regulators benefit from focusing on this issue in both the short- and the long-run. In the short-run, there is no question that the acquisition of DERs can create short-term pressure on rates, especially where a utility currently has adequate resources.

In the long-run, however, there is a universe of very different possible outcomes. The draft manual could be clearer about this, and consider the following questions:

[1] The Regulatory Assistance Project (RAP) is a global non-profit organization based in Montpelier, Vermont providing policy development and technical assistance services to governments involved in power sector regulation. Senior RAP personnel are former government energy regulators. RAP is supported by grants from foundations and government, and represents no private interests.

[2] Rate cases are frequently triggered by major resource acquisitions. For example, Montana faced major rate increases in 1983-85, when the Colstrip 3 & 4 units entered service.

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- What does this resource provide in the context of a utility's duty to provide generation, transmission, and distribution, while satisfying environmental and other public policy requirements?
- What additional benefits do the DERs provide? (For example, solar panels provide shading for buildings, which may reduce air-conditioning loads).
- How can rate design promote efficient acquisition of this group of resources? And a step further,
- How can it help society to efficiently allocate its investment resources, especially between regulated utilities and independent consumers?

Each of these questions should be considered in both the short- and long-run.

The draft manual frequently characterizes DERs as a disruptive force creating multiple *problems* that need to be addressed, but only in a few instances does it describe DERs as resources that create new *opportunities* for safe, affordable, reliable electricity services.[3] DERs also provide opportunities for lower total cost and lower-risk investment.[4] While the draft manual is generally reasonably balanced, in this respect it seems less so.

Likewise, the descriptions of DER-related costs or potential problems are often stated in a definitive way, while the descriptions of DER benefits are stated more tentatively. For example, in characterizing compensation of Net Energy Metering (NEM) customers at page 35, a retail NEM rate is described as "clearly a subsidy to the NEM customer paid for by the general body of ratepayers." The draft manual also states that the appropriate value for excess generation should be Locational Marginal Pricing (LMP). Nowhere does the text recognize that LMP can sometimes be greater than the retail rate. So, even if one viewed LMP as the appropriate value, how could one fairly state that the NEM rate always overcompensates? Furthermore, LMP is *by definition* a short-run measure of only one element of value (energy), and not a long-run measure of anything.

Resource acquisition involves an analysis that is best approached from the perspective of long-run marginal cost. The "Value of Solar" studies prepared for the Minnesota[5], Maine[6], and Mississippi[7] regulators are good examples of the application of an appropriate valuation framework that considers relevant long-run values. When all values are considered, the conclusion is often that DERs produce net benefits to the utility system, rather than impose net costs. There have been several meta-studies of

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[3] Or, for example, as an opportunity to avoid environmental compliance or damage costs. See Lazar, J. and Farnsworth, D. (2011). *Incorporating Environmental Costs in Electric Rates*. Montpelier, VT: The Regulatory Assistance Project. Retrieved from: http://www.raponline.org/knowledge-center/incorporating-environmental-costs-in-electric-rates-working-to-ensure-affordable-compliance-with-public-health-and-environmental-regulations, (Environmental costs are incurred by utilities and recovered from consumers. Most of these costs are related to the amount of energy consumed, and should be recovered in kWh rates).

[4] Binz, R., Sedano, R., Fuery, D., and Mullen, D. (2012) *Practicing Risk-Aware Regulation*. Montpelier, VT: The Regulatory Assistance Project. Retrieved from: http://www.raponline.org/knowledge-center/practicing-risk-aware-electricity-regulation-what-every-state-regulator-needs-to-know, (A guide for utility regulators in recognizing how different utility actions carry different risks, and how those risks are apportioned among investors, electricity consumers, and the general public).

[5] Norris, B., Putnam, M., and Hoff, T. (2014). *Minnesota Value of Solar: Methodology*. Clean Power Research. Retrieved from: http://www.cleanpower.com/wp-content/uploads/MN-VOS-Methodology-2014-01-30-FINAL.pdf

[6] Norris, B., Gruenhagen, P., Grace, R., Yuen, P., Perez, R., and Rabago, K. (2015). *Maine Distributed Solar Valuation Study*. Retrieved from: http://www.nrcm.org/wpcontent/uploads/2015/03/MPUCValueofSolarReport.pdf

[7] Stanton, E., Daniel, J., Vitolo, T., Knight, P., White, D., Keith, G. (2014). *Net Metering in Mississippi: Cost, Benefits, and Policy Considerations*. Cambridge, MA: Synapse Energy Economics. Retrieved from: http://www.synapse-energy.com/sites/default/files/Net%20Metering%20in%20Mississippi.pdf.

value of solar or DERs. Two that may be particularly helpful to the Committee were prepared by the Rocky Mountain Institute[8] and by the Brookings Institution.[9]

2. The Need to Correctly Identify the Values of DERs

The draft manual starts out by broadly discussing all types of DERs, but then seems to focus more narrowly on distributed generation (DG). Making definitive statements about all DERs—which may only be true about certain types of DG—can unnecessarily mischaracterize some of these resources. We would like to draw the committee's attention to this and encourage it to be clearer in discussing the various types of DERs. To put all types of DG in the same cost basket as, for example, demand response, simply doesn't reflect experience and only serves to undercut the strength and validity of the draft manual's analysis.

DERs provide many benefits that also need to be properly valued. Energy efficiency (EE), for example, stands out as a missed opportunity in many jurisdictions because it isn't evaluated as a resource on the same basis as other resources that utilities routinely procure. EE is often not procured under utility-operated programs unless it reduces the utility's revenue requirement – a standard that is never applied to supply-side resources. Consequently, in many jurisdictions EE is not deployed to its potential at reasonable levels or at optimal times or locations.[10] We also note that there is a need to recognize that – even where attempts are made to quantify DER benefits – these analyses need improvement.[11] The graphic below, taken from the study done for the Mississippi Commission referenced in footnote 7, shows how many of these values have been considered in one analysis. While this is not the only appropriate way to evaluate benefits, the draft manual could provide guidance as to how these types of long-run benefits should be considered in evaluating whether DERs provide a net benefit to the system under NEM, or whether there are cost shifts that should be considered.

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[8] eLab. (2013). *A Review of Solar PV Benefit & Cost Studies, 2nd edition*. Boulder, CO: Rocky Mountain Institute. Retrieved from: http://www.rmi.org/cms/Download.aspx?id=10793&file=eLab_DERBenefitCostDeck_2nd_Edition&title=A+Review+of+Solar+PV+Benefit+and+Cost+Studies

[9] Muro, M. and Saha, D. (2016). *Rooftop Solar: Net Metering is a Net Benefit*. Brookings Institute. Retrieved from: https://www.brookings.edu/research/rooftop-solar-net-metering-is-a-net-benefit/

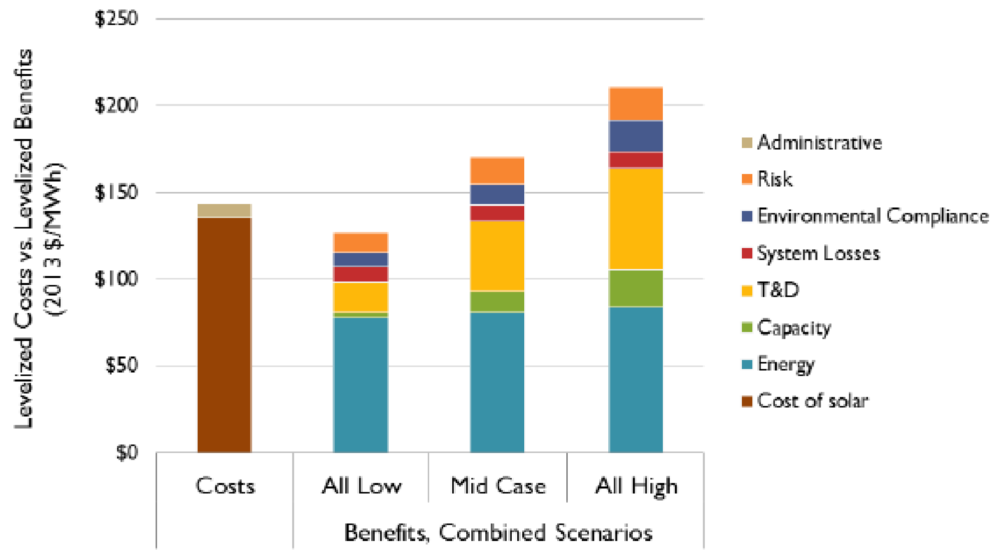
[10] Lazar, J. and Colburn, K. (2013). *Recognizing the Full Value of Energy Efficiency. Montpelier, VT: The Regulatory Assistance Project*. Retrieved from: http://www.raponline.org/knowledge-center/recognizing-the-full-value-of-energy-efficiency, (What's Under the Feel-Good Frosting of the World's Most Valuable Layer Cake of Benefits).

[11] See, for example, the recent Analysis Group paper:

> The valuation and cost-effectiveness of EV-related investments, like evaluation of investments in other distributed resources, will have to move beyond typical analyses to "more location-based analyses that focus on both expected and actual performance of [distributed energy resources].

Tierney, S. (2016, March). *The Value of 'DER' to 'D': The Role of Distributed Energy Resources in Supporting Local Electric Distribution System Reliability.* Analysis Group, Inc., p. ES-2. Retrieved from http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/About_Us/Organization/Divisions/Policy_and_Planning/Thought_Leaders_Events/Tierney%20White%20Paper%20-%20Value%20of%20DER%20to%20D%20-%203-30-2016%20FINAL.pdf. See also Sussman, M., and Lutton, J. (2015). The Economics of Solar, Storage and Solar-Plus-Storage. *Greentech Media*. Retrieved from: http://www.greentechmedia.com/articles/read/The-Economics-of-Solar-Storage-and-Solar-Plus-Storage, (Illustrating that – in combination – different DERs like solar and storage can produce greater value than each would independently).

Figure 1: Mississippi Net Metering Costs/Benefits Analysis

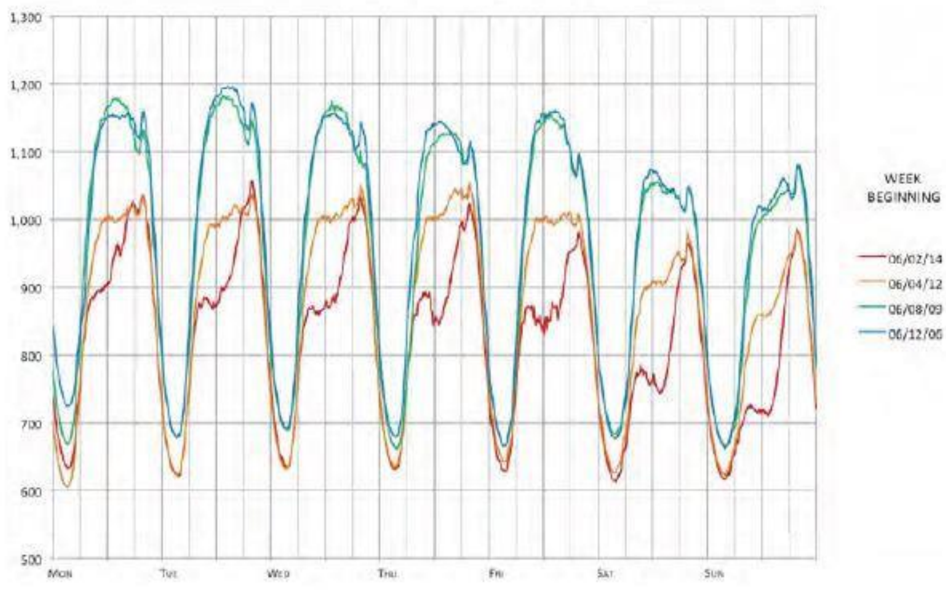


A Hawaii Example

Hawaii is globally recognized as a "postcard from the future" due to its high level of distributed generation saturation. This experience illustrates how DERs can affect the long-term evolution of a power system. Once the individual value of DERs is correctly identified, the combined benefits of multiple DERs can be correctly evaluated. The value of combined DERs, for example, is illustrated in the graphic below that shows how Hawaii's load has been modified over the years by a combination of customer-sited renewable energy (nearly all PV solar) and energy efficiency measures installed under Hawaii's utility programs and through more efficient appliances installed over time. The system peak load was reduced by about 150 MW over the period 2006 – 2014 by this mix of DERs.[12]

[12] Hawaiian Electric Maui Electric Hawai'i Electric Light. (2016). *Power Supply Improvement Plans Update Report*. Retrieved from: https://www.hawaiianelectric.com/Documents/about_us/our_vision/psip_executive_summary_20160401.pdf

Figure 2: O'ahu System Load Profiles 2006-2014



Additional observations:

- The "morning ramp" has been cut in half. In 2006, the system went from 750 to 1,200. Now it goes from 650 to 900, effectively pauses for the middle part of the day due to PV meeting the growth in mid-day loads, and then rises another 200 MW.
- Peak demand has been cut from 1,200 in 2006 to 1,050 in 2014.
- The total "afternoon ramp" moves from 850 to 1,150, a ramp of 300 MW.
- The system is starting to see some actual decline in net load for the dispatchable system, visible for Saturday and Sunday. So a "Duck Curve" is indeed beginning to form. But this did not occur until 2014, when PV saturation reached about 13 percent of all customers or about six times the saturation in California and other leading PV states.
- In 2006, the peaks occurred from noon to 4 PM; now they are occurring at 7 PM. But they are significantly lower. So the peak demand has both shifted and declined.
- The Hawaiian Electric reports that accompany their decoupling filings ascribe the causes of overall load reduction as being due to approximately one-third solar, one-third programmatic energy efficiency, and one-third price response and other factors. Based on the hourly shape in the 2006 era compared with 2014, at least 100 MW of the peak demand reduction appears to be due to PV.

Evidence shows that DERs can, and often do, reduce peak demand, thereby helping avoid long-run generation, transmission, and distribution cost that would be measured in an IRP framework, in addition to helping to avoid short-run benefits measured by LMP analysis. In addition, there are benefits in the form of avoided fuel cost risk, fuel supply risk, and avoided externalities that should be considered.[13] These benefits can be translated into signals to consumers through utility rates.

[13] Lazar, J. and Colburn, K. (2013). *Recognizing the Full Value of Energy Efficiency*. Montpelier, VT: The Regulatory Assistance Project. Retrieved from http://www.raponline.org/knowledge-center/recognizing-the-full-value-of-energy-efficiency, (What's Under the Feel-Good Frosting of the World's Most Valuable Layer Cake of Benefits).

3. Translating Value into Rates

As discussed above, improvements in the economics of DERs and other factors like increasing consumer preference and a favorable policy environment in many states have combined to produce significant increases in DER availability and adoption around the country. This has created a greater transactional quality to electric service provision, and requires utilities to both fairly compensate DER adopters for the system benefits and costs they produce, and ensure fair treatment of non-participating consumers for the value of the services they receive.

Utility rates are prices, and utility prices signal system value to ratepayers. With the availability of DERs, interested consumers have more choices than just buying electricity as they have in the past. This includes self-generation alternatives like rooftop PV and CHP.[14] It also includes the ability of customers to reduce and shift their demand. These rapid changes put regulators in the position of having to determine how utility rates can better reflect the value of the grid to these customers and the value of these customers to the grid.[15]

Time-based rates have been around for a long time. While they have not been used much for mass market customers, evidence shows they can dramatically affect customer behavior. In "Smart Rate Design," for example, we propose an illustrative rate design with a bi-directional time-varying energy charge, designed to be equitable for all customers, including DER owners supplying energy to the grid.[16] Time-varying rates send information to customers that guide their decisions consistent with grid value, and optimize society's cost of power. The best demand rate only approaches the effectiveness of time-varying rates. A recent report from Rocky Mountain Institute concludes that time-varying rates are far more effective than demand charges at shaping load into lower-cost periods. [17]

Conclusions

Again, we would like to thank NARUC and especially the participating commission staff for this important work and the opportunity to comment on it. The proliferation of distributed energy resources is integral to, and not something happening independent of, our utility system. The US utility system is becoming more distributed due to the availability of technology, its costs, environmental profile, and

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[14] See, Weston, R. and Bluestein, J. (2009). *Standby Rates for Customer-Sited Resources: Issues, Considerations, and the Elements of Model Tariffs*. Montpelier, VT: The Regulatory Assistance Project. Retrieved from: http://www.raponline.org/knowledge-center/standby-rates-for-customer-sited-resources-issues-considerations-and-the-elements-of-model-tariffs, (Analysis of what costs should be recovered in standby rates to partial service customers, and how rates should be designed to recover these costs.); see also
Selecky, J., Iverson, K., and Al-Jabir, A. (2014). *Standby Rates for Combined Heat and Power Customers*. Montpelier, VT: The Regulatory Assistance Project. Retrieved from: http://www.raponline.org/knowledge-center/standby-rates-for-combined-heat-and-power-systems, (Analysis of cost-recovery issues associated with commercial and industrial standby service to customers with medium to large CHP systems)

[15] Sedano, R. (2015). *Ratemaking & the Utility of the Future in Pennsylvania: Alternatives*. Presentation at Keystone Energy Efficiency Alliance Annual Conference. Montpelier, VT: The Regulatory Assistance Project. Retrieved from: http://www.raponline.org/knowledge-center/ratemaking-and-the-utility-of-the-future-in-pennsylvania-alternatives

[16] Lazar, J. and Gomez, W. (2015). *Smart Rate Design for a Smart Future*. The Regulatory Assistance Project: Montpelier, VT. Retrieved from: http://www.raponline.org/knowledge-center/smart-rate-design-for-a-smart-future/ (A discussion of residential and commercial electric rate design). See also, Lazar, J. (2012). *Rate Design Where Advanced Metering Infrastructure Has Not Been Fully Deployed*. Montpelier, VT: The Regulatory Assistance Project. Retrieved from: http://www.raponline.org/knowledge-center/rate-design-where-advanced-metering-infrastructure-has-not-been-fully-deployed/ (Rate design options for utilities that have not installed smart meters and the associated meter data management systems).

[17] Chitkara, A., Cross-Call, D., Li, B., and Sherwood, J. (2016). *A Review of Alternative Rate Designs*. Boulder, CO. Rocky Mountain Institute. Retrieved from: https://rmi.org/Content/Files/alternative_rate_designs.pdf

most important, consumer demand. Through inefficient compensation and other barriers to entry, regulation can either slow the deployment of these resources, or it can begin to value them properly and allow utilities and consumers to make informed investment decisions. The growing transactional nature of the power system calls for quality of rate design to adapt. One aspect of this adjustment will be the development of sound practices built for coming decades to help reveal the value of all utility resources and facilitate efficient long-term utility sector investments.

Respectfully submitted,

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