

STATE OF VERMONT
PUBLIC UTILITY COMMISSION

Case No. 19-0855-RULE

Proposed revisions to Vermont Public Utility Commission Rule 5.100	
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**Rábago Energy LLC Responses on Behalf of Renewable Energy Vermont
to the Public Utility Commission’s Request for Additional Information
and to Comments Filed by Selected Stakeholders**

I. General Introduction and Summary of Key Points

Rábago Energy appreciates the opportunity to submit comments on behalf of Renewable Energy Vermont (“REV”) to the Vermont Public Utility Commission (“VTPUC” or “Commission”) in response to the Commission’s request for additional information and to comments and proposals filed by selected stakeholders in this proceeding.

The overarching character of comments from the Vermont Department of Public Service (“Department”) and several of the utilities is an attack on the economics of net energy metering (“NEM”) and the opportunity for customers to take advantage of NEM to manage their electric bills and to contribute to the reduction of greenhouse gases associated with energy production and use in Vermont. This contravenes the express provisions of Vermont law.

The Commission should use this opportunity to bring integrity back to the assessment of NEM impacts by requiring a full, fair, and transparent accounting of costs and benefits associated with NEM operations. Critically, the Commission should not allow the analysis of NEM benefits to stop with consideration of a few selected avoided wholesale market and other costs, as proposed in the misleadingly labeled Green Mountain Power (“GMP”) “market value of

solar” or the Vermont Electric Cooperative (“VEC”) “value of solar.” Likewise, the Commission should not allow the calculation of NEM impacts to be inflated by the assumption that lost sales due to NEM operations are a cost of NEM, such as appears to be the approach of Washington Electric Cooperative (“WEC”).

Further, the Commission should acknowledge the pernicious, discriminatory, and confiscatory impacts of the Department’s proposed two-channel billing method, both as a means for calculating NEM impacts (GMP & VEC) and as a method for setting NEM rates. In particular, the two-channel billing method assumes that every kilowatt hour generated and not simultaneously used to offset consumption is “excess generation.” The effect of this approach is the elimination of net metering, that is, production during the billing period is not netted against consumption during that same billing period under two-channel billing. As such, even a NEM system that does not produce all the electricity a NEM customer uses will be characterized as having 80% excess generation.

In combination, these two key analytical flaws comprise the basis for the attack on non-utility net metered generation in Vermont—an attack that the Commission may have fostered but can now correct. There are two critical steps that the Commission must require in order to correct the course on net metering in Vermont—both of which will ensure that the Commission’s Net Metering Rule meets statutory obligations and does, in fact and effect, establish and maintain a net metering program that, *inter alia*, advances and meets the requirements of Vermont law and policy, and that “ensures that net metering does not shift costs included in each retail electricity provider's revenue requirement between net metering customers and other customers;” by “account[ing] for all costs and benefits of net metering, including the potential for net metering to contribute toward relieving supply constraints in the transmission and distribution systems and

to reduce consumption of fossil fuels for heating and transportation;” and “ensures that all customers who want to participate in net metering have the opportunity to do so.”¹

The Commission should require all utilities in Vermont to use the same method for calculation of NEM impacts. In so doing the two critical steps it must take are:

1. The Commission should require that every utility conduct a full bottom-up assessment of all relevant costs and benefits according to a common set of methodologies that have been fully vetted by all stakeholders and an unbiased and independent analyst with expertise in “value of solar,” “benefit-cost analysis,” and similar analytical processes. More detail on this analysis is addressed in these comments. The approach used by some utilities that is framed around the two-channel conceptualization of net metering operation unreasonably ignores the benefits side of the equation, while over-inflating NEM costs, and should be discarded entirely. It particular, it should be noted that while these utilities load the calculation with the full retail rate value for all excess energy (net of adders and subtractors adjustments), they completely ignore the offsetting benefit of revenues earned due to resale of exported energy—something that happens naturally in the system when excess energy serves the nearest unserved and metered load or makes up for system losses that otherwise would have occurred. A specific and comprehensive calculation of the offsetting sales revenues and of all other costs and benefits would improve the quality of the results. In the absence of such an evaluation, the offsetting sales or savings revenues should be assumed to be the total excess generation amount net of adders and subtractors. The principle is simply this: NEM resources should not be “charged” with costs they do not create or that are offset by benefits, including offsetting sales, they do create.

¹ 30 V.S.A § 8010.

2. The Commission should require that the utilities follow standard and accepted financial analysis principles and exclude from any NEM impacts calculation any consideration of cost shifting. Cost-shifts are not cost-causation. NEM generation does not cause the costs that the utility incurs in order to produce, procure, and deliver the energy services that NEM customers do not purchase. Therefore, lost sales and associated lost revenues are not a proper basis for estimating NEM impacts.

The Department's Two-Channel Billing Proposal

The Department advances, and some utilities appear to adopt as a foundation for NEM impact analysis, a particularly nefarious position to effectively eliminate net metering with its proposal that the Commission adopt two-channel billing and dramatically reduce compensation for the significantly increased fraction of NEM production that would be treated as excess under the two-channel construct. The Department proposal would restrict net metering to only those customers who have the resources to provide for on-site generation and eliminate entirely the “virtual” and “community” net metering marketplace, which has been incredibly successful in making net metering available to many more customers.

For co-located NEM projects, the Department proposal would provide for retail offsetting of consumption only when it is perfectly matched with NEM production, and after recording consumption and exports on two separate metering channels—without any netting during the billing period. At the end of each month, the sum of excess production would be monetized into a billing credit. Under the Department's proposal, the utilities would go further and the credit for such excess would be set based only on a confiscatory “market value of solar” or misnamed “value of solar” rate that would not reflect a comprehensive evaluation of the total costs and benefits of NEM generation. The Department's rate design would further expose NEM

customers to continuously changing annual changes in the excess credit or force NEM customers to opt for a reduced excess production compensation rate if they wish to obtain a stable rate for that production—which is what most NEM customers specifically seek when they make their significant private investments in solar generation equipment.

In short, the Department’s two-channel billing proposal greatly increases the fraction of generation that would be considered “excess,” eliminates any netting of generation credits and consumption credits over the billing period, and treats the excess production retail net metering customers and facilities as if they were wholesale PURPA generators who constructed their facilities for the purpose of generating electricity for sale. The Department’s approach is at odds with basic principles of sound rate making, and with the legislature’s requirement that the Commission make net metering widely available and encourages the Commission to usurp legislative priorities.

Worse still, the effects of a two-channel approach are to create perverse incentives for co-located NEM customers. Under the Department’s approach, the only way to maximize the value of NEM investment is to maximize usage during hours of solar production, behavior which will lead to NEM customers adopting a load profile that actually increases system peak demand. This will frustrate the economics of energy efficiency—each increment of efficiency that operates during the period of solar production will greatly reduce the value of solar production that occurs at that same time.

The two-channel billing approach will thus lead to reduced investment in small solar facilities and investment in smaller, undersized facilities exactly at the time when Vermont needs all the in-state carbon-free generation it can get. This outcome is uneconomic because solar investments have significant fixed costs related to siting, permitting, project development, project construction, grid modernization, and the incremental price of added unit of capacity—

capacity that could generate energy to support grid operations—will get less expensive if the NEM market is allowed to develop and mature toward self-sustainability.

For virtual and community net metering projects, the entire output of the project would be deemed “excess” and would fall within the Department’s proposed confiscatory billing scheme. As a result, two-channel billing devastates the economics of remote and community solar operating under net metering and makes solar unaffordable for renters, and many low-income customers that cannot install or afford on-site systems.

The two-channel billing approach does strengthen the monopoly hold on the distributed generation sector, of course, unless the customer can afford to take the more dramatic step of actual or, more likely, economic defecting from the grid—reducing grid usage to the very lowest level possible through deployment of batteries, for example. As a consequence, the Department’s proposed two-channel billing approach is much more likely to cause cost-shifts and stranded costs than the existing NEM structure.

For all these reasons, and with the notable exception of the climate-laggard state Louisiana, utility and staff proposals for two-channel billing have been consistently rejected by legislatures and regulators alike. New Hampshire and Arkansas have notably recently rejected the concept. In sum, two-channel billing is spherically perverse and makes no sense, no matter which way you look at it.

The Department’s justification and analysis supporting its proposal is cursory and willfully blind to the costs and benefits of NEM generation; utility NEM impacts analysis suffer from the same deficiency. So, as a preliminary matter, key threshold questions have not been answered, and therefore, it is premature to talk about such a dramatic change to rate design. Two-channel billing is being presented as a solution to a problem that has not been demonstrated. There is not

credible empirical evidence that the existing rate structure does not recover the cost of service from net metering customers. Essential preliminary questions that are yet to be answered include:

- What is the cost of serving net metering customers and does it differ in any material way from others in their same class of service?
- How should the value of net excess generation be factored into that cost of service in order to fairly compensate NEM customers for bringing a valuable, even if non-utility, resource to the system?

The first question cannot be reliably answered based upon available load research. The record before the Commission is inadequate to support a just and reasonable answer to the question. The second question requires going beyond the conventional, utility-centric cost of service analysis embodied in the Department's proposal, which is not designed to value benefits provided by customers as opposed to services provided to them.

As these comments address in much greater detail below, the Commission should be discussing how to collect and characterize the necessary data to examine cost of service and the long-term value of distributed generation resources. The data in the record is inadequate to support cost-of-service rate making—no other utility rate would ever be approved without specific and statistically valid metered data on costs.

These questions, and data and analysis needs, are not eliminated by moving to a two-channel billing approach. A comprehensive rate that encompasses the factors identified by the Legislature will require good data and careful analysis.

Again, two-channel billing is an inherently flawed framework for compensating distributed generation customers with co-located systems. The Department's two-channel billing proposal seems aimed at the elimination of virtual net metering.

1. Two-channel billing enables setting different levels of compensation for self-generation based on when the customer uses energy in their home or business. Whereas self-generation coincident with a customer's own usage is effectively compensated at retail (because it remains behind the meter), any self-generation that is not consumed instantaneously and is therefore exported to the local distribution system would, under the Department's proposal, be compensated at a different rate. This is irrational because in both cases, the self-generated kilowatt-hour is serving load on the distribution system, whether it be the self-generating customer's or their neighbors,' and presents the same *avoided* costs to the utility. Remote NEM facilities also export energy into the distribution grid where distribution-level load is served. Cost-based rate making is intended to reflect the averaged cumulative costs of production, transmission, distribution, and service. A self-generated unit of energy avoids the need for the energy and all its associated costs and is provided by a customer that assumes financing responsibility as well as operating and insurance risks. Self-generated solar energy—both co-located and virtual—is also drought- and climate-proof and is not subject to fuel price volatility. It is likewise not dependent on transmission systems and avoids transmission and distribution system loss inefficiencies. That is why objective and comprehensive analysis finds value in solar generation that exceeds the full avoided costs of utility-delivered energy.

Second, where the rate for exports is set (with or without supporting data) at a lower rate than retail, it creates perverse incentives for self-generating customers to shift their usage to the time of peak solar generation in order to get the likely higher value for their generation. In other words, during peak solar generation, the self-generating customer has an economic incentive to consume, rather than put back to the grid, those kilowatt-hours,

because when the customers uses the electricity generated by his or her system, the customer effectively receives full retail value whereas if the customer were to export the generation to the grid it would receive a lesser value. Because solar production is still significant in the late afternoon, when utility systems increasingly tend to peak on summer days in a warming world, two-channel billing will result in less peak shaving than otherwise would have occurred.

2. Two-channel billing for co-located systems (usually small residential systems) makes it very difficult for customers, financial investors and lenders, and solar installers to predict the payback period for a solar investment. This uncertainty has two sources. First, the customer does not know how much of the system's generation would be consumed on-site versus "sold" to the utility. Under Vermont's current framework, every customer does not have access to both real-time data and the sophisticated ability to manage loads and usage patterns, as such they will find it practically impossible to make a reasonable investment decision regarding the solar option. Two-channel billing is therefore anti-competitive. Second, the customer, the bank, and the solar installer face uncertainty about the long-term rate of compensation for the net excess generation due to an added element of variability in a primary component of the Department's proposed net value of the self-generation option. Professional wholesale generators have the sophistication and tools to participate in systems characterized by such complexity; but not most customers.

Residential, Town, School and small business self-generators are not and should not be expected to become sophisticated wholesale generators in order to participate in net metered self-generation. In combination, it is nearly impossible to accurately predict the customer's return on their solar investment. Vermont law clearly states that every customer must receive an opportunity to participate in net metering, and considering the

impacts of the Department proposal as described above, that proposal is therefore unlawful. Finally, frequent readjustments to the net excess generation rate also contribute to the uncertainty discussed in the point above; financing any generation investment becomes substantially more difficult when the revenue stream will vary unpredictably.

Minimizing Price While Ignoring Value

Overall, the goal of the Department and utilities appears to be minimizing the price paid to net metered generation above all else, including at the cost of reducing the value that Vermont gets from solar generation and the cost-effectiveness of solar to future customers. In this latter regard, the Department cynically cites the interests of low-income customers while proposing measures that will ensure that the feasibility, simplicity, access, and ability to control electric bill costs that the existing net metering program provides are no longer viable for lower-income customers at all. Making net metering less economic means fewer choices for all customers and condemns all customers to dependence on the monopoly utility. The attack on net metering is therefore also an attack on the opportunity for improvements in energy justice.

The Department's comments favor heavy reliance on out-of-state renewables and the protection of arbitrage-based profits for utilities,² while ignoring the very real costs of excessive reliance on out-of-state low-quality electricity resources that impose huge social and environmental costs where they are constructed and operate.³

Vermont needs all the secure, locally empowering, reliable, and resilient renewable energy generation it can get, especially if electrification and decarbonization are going to happen, and to achieve the State's statutory climate commitments. Non-utility renewable generation and

² See E. Gribkoff, Renewable Energy Trade Scheme Comes under Scrutiny, Vermont Digger (Sept. 24, 2019), available at: https://vtdigger.org/2019/09/24/in-the-renewable-energy-credit-market-some-recs-are-greener-and-more-valuable-than-others/?utm_source=email&utm_medium=Social&utm_campaign=SocialWarfare.

³ Vermont Digger Editor, *The Hidden Costs of New England's Demand for Canadian Hydropower*, Vermont Digger (Dec. 1, 2019), available at: <https://vtdigger.org/2019/12/01/the-hidden-costs-of-new-englands-demand-for-canadian-hydropower/>.

customer self-generation through net metering must have a major role in Vermont's energy present and future and should not be sidelined based on flawed utility-centric assessments of costs and inadequate consideration of net metering benefits. The key concept that the Commission must articulate and require utilities to implement is that the system needs generation diversity, investment diversity, and resilience.⁴ Net metering is a powerful and necessary tool for realizing the benefits of customer and local non-utility investment and participation in the deployment of renewable energy at the scale and in the locations to bring those benefits to Vermont.

Lost Revenues are Not a Cost of Net Metering Generation

The utilities and the Department provided misleading numbers to support their claims that net metering imposes a significant cost on Vermont rate payers. The assertion that utility lost revenues are a cost that should be attributed to net metered generation under NEM impacts analysis is false. The Commission must apply a broader cost test perspective. Private investment in renewable energy generation outside of utility rate base and a reduction in utility revenue requirements benefits all customers, both those that participate in net metering and those that do not. The record before the Commission does not yet include the kinds of comprehensive, transparent, and well-documented analysis needed to make a change in net metering policy or rates. But, for example, a simple offsetting of the "excess energy" lost-revenue costs with an equal amount of sales revenue in the spreadsheet submitted by GMP in this matter moves net metering from a cost to a net benefit for Vermont—almost \$.5 million per year in net benefits even without a full accounting of those benefits.⁵ With this credit for offsetting sales revenues,

⁴ For a comprehensive assessment of operational, engineering, financial, and economic benefits of right-sized energy resources of all kinds, see A. Lovins, et al., *Small Is Profitable: The Hidden Economic Benefits of Making Electrical Resources the Right Size*, Rocky Mountain Institute (2002), available at: <https://rmi.org/insight/small-is-profitable/>.

⁵ Calculated as \$33,275,516 - \$33,768,922 = (\$493,405).

the GMP data implies that net metering is, after all, a cost-effective resource for Vermont. A fair evaluation would likely show it to be even more cost-effective.

Even before addressing the cost-shift issues arise when customers use less utility energy than the utility believed they would, such impacts can only fairly be evaluated in the context of a full and comprehensive assessment of both costs and benefits associated with net metered generation. Indeed, such an assessment is essential for informing the true nature and amount of any cost shift.

The lost revenues-equals-costs fallacy is revealed as nonsensical and unreasonable with the simple steps of: (1) asking whether the argument should be applied to value any other resource that reduces demand, and (2) asking what happens to electricity that is excess to the solar host's immediate needs.

If the answer to the first question is no, then the Department and utility proposals constitute a *prima facie* case of unjust discrimination. If the answer is yes, the irrationality of the approach is plainly revealed. That is, if lost revenues are a cost to be counted against the value of a displacing resource option, the assessment of the investment decision will be perversely distorted.⁶ Moreover, approach would allow the dead hand of obsolete and uneconomic—and therefore properly stranded—excessive investments to stifle technological innovation in the electricity sector. Worse still, the approach sends exactly the wrong signal about the relentless pursuit of cost reductions that should be a watchword in the transition to a climate-friendly energy reality for Vermont.

⁶ See P. Kelly-Detwiler, *Quarterbacks and New Nuclear Power Plants – Sunk Costs*, Forbes (Jan. 22, 2013), available at: <https://www.forbes.com/sites/peterdetwiler/2013/01/22/quarterbacks-and-new-nuclear-power-plants-sunk-costs/#56aad0881298>. The Kelly-Detwiler piece uses an amusing vehicle for making the fundamental point that sunk costs should not be used in evaluating the cost-effectiveness of new investment options.

The answer to the second question is a matter of physics. Excess production from a net metered facility serves the nearest unserved load on the grid. Even the energy from a remote community or shared solar facility will serve distribution load. And when load is served, the meter through which the energy flows registers a charge that the utility turns into a bill and revenue. The more valuable and appropriately higher-compensated net metered generation generally offsets dirtier, more remote, and less valuable regional utility generation. This is a positive societal outcome for Vermont but suggests a key driver for utility antipathy to non-utility generation. Adders and subtractors are properly netted out of the calculation.

Failure to Take the Long-Term Perspective in Evaluating Costs and Benefits

It is increasingly imprudent to base a long-term energy strategy on short-term economics and resource availability. Continued excessive reliance on imported renewable energy and/or RECs exposes Vermonters to several kinds of supply risk including price risk, political risk, errors in estimating discount rates, and the risks of an excessively concentrated portfolio of supply.⁷ Even if large imported renewable energy/REC arrangements are low-price today, they are not sure to be so in a world that faces broad-scale carbon emissions constraints.

In light of the compounding realities of increasing global climate change with regional impacts and the uncertain cost outlook associated with any conventional, utility-scale generation options, including large hydropower operating in another country, the only prudent and precautionary approach is to maximize, not hobble, non-utility markets for distributed generation. Only in this way can Vermont's regulators ensure that the state has real, affordable options for in-state generation. It takes time to develop such markets; more work needs to be done, more investment must be made, more customer education is needed. But that is the only option to ensure that Vermont has real, clean, and affordable options.

⁷ See *Small Is Profitable*, supra note 4.

Unjust Discrimination Against Self-Generation and Net Metering

Net metering rule changes should not discriminate against non-utility generators and market choice in favor of monopolistic control over the emerging distributed solar market in Vermont. The state's aggressive and necessary greenhouse gas emissions reductions targets require that the state's agencies act as if we were in a climate emergency, because we are. Every resource will be required, and Vermont will be better off it increases the share of in-state renewable energy generation, especially including generation installed and operated with non-utility investment capital. Even if a comprehensive and honest assessment of net metered generation value were to show modest or slightly negative near-term net benefits, maintaining and not decreasing net metering compensation rates would be in the public interest in order to foster the development of a self-sustaining market for non-utility distributed solar generation in Vermont. A self-sustaining market for non-utility generation in Vermont is a goal that no rational assessment would conclude has been reached, especially in light of recent market contraction following the most recent round of compensation reductions.

II. Detailed Comments

The Vermont Public Utility Commission ("Commission") opened this rulemaking proceeding on April 16, 2019 in order to review Commission Rule 5.100, relating to net energy metering ("NEM") under 30 V.S.A. § 8007. In its order of August 22, 2019, the Commission issued a request for additional information.

As reprised by the Commission in its order requesting additional information issued on August 22, 2019, the statutory obligations of the Commission regarding NEM are as follows:

Vermont law requires that the Commission develop a net-metering rule that, in addition to supporting Vermont's renewable energy policies and greenhouse gas reduction goals, "accounts for all costs and benefits of net-metering" and "to the extent feasible ensures

that net metering does not shift costs . . . between net-metering customers and other customers.” (30 V.S.A. § 8010(c)(1)(A)-(H)) The rule is also supposed to allow for access to the net-metering program for all customers who want to participate, balance the pace of deployment with the effect of the program on rates, and allow customers to retain ownership of renewable attributes. (*Id.*)

In the order requesting additional information, the Commission set out a number of information requests and invited stakeholder comments. The purpose of these comments is to respond to the first fifteen questions posed by the Commission.

Vermont’s 2016 Comprehensive Energy Plan confronts the climate crisis by setting two goals for reducing greenhouse gas emissions from energy use below their 1990 levels, a 40% reduction by 2030 and 80% to 95% reduction by 2050. This builds upon climate goals established by the Vermont legislature in 2006, which called for overall reductions to 1990 levels of 50% by 2028 and 75% by 2050.

The Energy Action Network 2018 Progress report⁸ points out that Vermont is not on track to meet these goals, noting that greenhouse gas emissions are now 16% higher than in 1990. Furthermore, Vermont’s climate emissions have been increasing while total and per capita greenhouse gas emissions in other northeast states have been declining. While these emission increases are largely attributed to increases in transportation and thermal fuels, substituting low carbon electricity for transportation and thermal fuels is one the most promising pathways to achieving these climate goals. Vermont needs all the renewable energy it can get, especially high-value non-utility distributed generation.

⁸ Vermont Energy Action Network, *2018 Progress Report*, (Mar. 2019), available at: <https://www.eanvt.org/2018-progress-report/>.

Renewable Energy Vermont (“REV”) members work hard together to eliminate reliance on dirty fossil fuels by increasing renewable energy and energy efficiency to create self-reliant communities and build a clean energy economy. We are businesses, non-profits, utilities, and individuals who believe 100% total renewable energy (electric, heating and cooling, and transportation) is not only possible, but necessary.

Karl R. Rábago is an independent consultant with thirty years of relevant experience working in a wide range of roles and on many regulatory issues relating to distributed energy resources, including solar PV. More information about Mr. Rábago’s experience relating to solar PV is provided in the Appendix to these comments.

These comments request that the Commission abate any action to change the rate structure and/or compensation schedules for NEM generation and operation. First and foremost, the Commission should preserve the fundamentals of net metering as currently in effect, including billing period (monthly) netting, 12-month credit carry-forward, applicable blended retail rate credit for exported/excess generation, and traditional rate design. The Commission should consider deviating from this fair and easily understood framework only if substantial evidence supports any changes. This is the standard set in law, and is the standard that proponents for change, including the utilities and the Department and the utilities must meet. We also specifically call upon the Commission to take proper account of the following:

- a. NEM customers are making significant private investments in order to exercise a measure of control over their electricity and energy bills.
- b. The private investments that NEM customers make bring well-documented and significant benefits to the electric grid and non-NEM customers, and these benefits, where fairly evaluated, have been found to greatly exceed any potential costs to the utility or non-NEM customers connected to the same grid. These benefits include progress in

meeting Vermont statutory renewable energy and greenhouse gas emissions reductions goals.

- c. Electric utility companies are monopolistic businesses that are permitted to operate in our free-market capitalist society pursuant to a kind of “regulatory compact” in which they may only seek return of and on investments made in the public interest by utility shareholders for costs prudently incurred to deliver safe, reliable, and affordable electric service. Utility return may be earned only through the charging of just and reasonable rates. It is therefore incumbent on the Commission to establish a fair, transparent, and comprehensive process for evaluating the actual costs and benefits of distributed solar generation.
- d. The Commission has the primary regulatory responsibility for ensuring the advancement and protection of the public interest inherent in electric rates and services by ensuring that the utilities and any other party, including the Department, meet their burden of proving that their proposed rates and rate structures are just and reasonable and in the public interest.
- e. The public interest in Vermont, especially in light of Vermont’s renewable energy policies and greenhouse gas reduction goals, will be advanced if Vermont is home to a thriving non-utility distributed generation sector. Customers should continue to enjoy the right to recover the value of their own investments in solar PV systems installed to help manage their electric bills and should not be unfairly discriminated against.
- f. Electric utilities, by their nature as chartered monopoly businesses, wield enormous market power and control over customers and potential competitors. These utilities are also charged with operating and maintaining a safe, reliable, and cost-effective grid. The Commission must ensure that net metering is implemented so as to transparently,

objectively, and fairly establish charges and compensation rates for customers that seek to interconnect solar PV systems offsetting their electricity consumption at their homes or businesses to the grid. Utilities must be limited to charging only for actual costs incurred and measured, and customer-generators must be fully compensated for the value of the benefits and avoided costs their solar PV systems create.

- g. Charges and rates for net metered generation directly impact accessibility to clean, level-priced energy resources for all Vermont customers. The rates and charges the Commission approves must recognize the importance of economically affordable access to clean energy resources especially for low-income customers. Utility lost sales and associated revenue may lead to cost-shifts, depending on the nature of underlying revenue requirements and a full assessment of costs and benefits (including avoided costs) over the life cycle of the net metering facility. Lost sales do not constitute a cost of net metering.

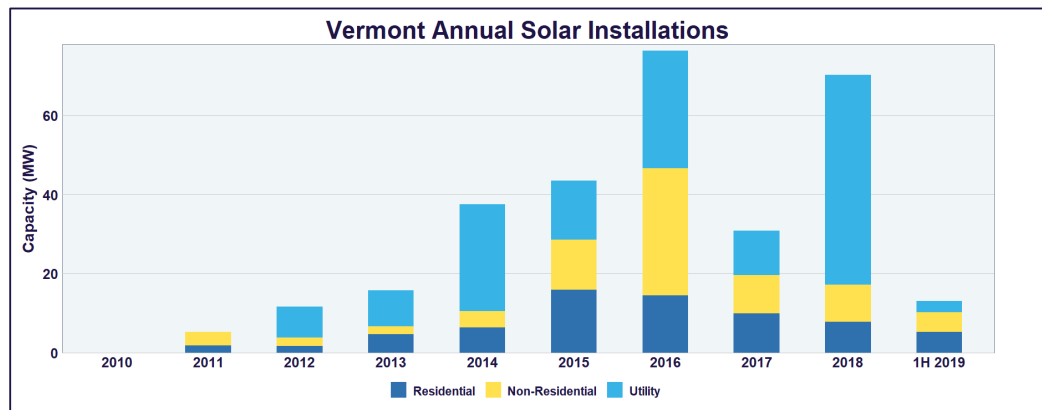
III. The Current Status of Customer-Scale Solar PV in Vermont

There was about 200 MW of installed net metered solar in Vermont in 2018. This solar capacity produces about 250,000 MWH, about 80% of which, 200,000 MWH, is being exported to the grid. This compares to 940 MW in installed generation capacity in the state, and total delivered energy of about 5.5 million MWh.⁹ Net metering exports (called “sales” by EIA) in Vermont represent about 5% of total electricity use and about 25% of installed capacity.

Net metering represents a small but growing component of overall Vermont generation and makes a similarly small contribution to total costs and benefits of electric and other energy services in Vermont. The incremental contributions of net metering to Vermont’s economy have been significantly reduced as a result of the Commission’s last, recent changes to the Net

⁹ This is total energy from all sources, not energy generated by only in-state sources.

Metering Rule. (Commission order in Biennial Update of Net Metering Rule, Case No. 18-0086-INV, dated May 1, 2018.) While there is promise for re-growth of this exciting sector, with local jobs, environmental benefits, and reduced utility costs for all customers, the recently adopted policies in Vermont have had a chilling effect on customers' solar option. As data from the Solar Energy Industries Association dramatically depicts, new solar installations in Vermont in 2019 are on track to be at the lowest level since 2013.



IV. The Commission's Tasks

The Commission has been presented with an awesome responsibility. In its review of the Net Metering Rule, it should address the reasons for the sharp decline in net metering business activity in Vermont, the impact that this change in activity will have on Vermont's ability to meet its renewable energy and greenhouse gas emissions reductions goals, and the extent to which the rule meets the statutory standard of ensuring that customers enjoy the right of meaningful access to the net metering program. In so doing, the Commission should also take a hard look at the substantiation behind claims of cost-shifting, net metering costs, and system benefits. Unsubstantiated claims of cost-shifting and net metering program costs based heavily on lost-revenue and sales should be rejected in favor of comprehensive benefit-cost analysis. Finally, the Commission should take careful note of the impact that frequent changes in the net

metering rule can have on market development and growth. Regulatory certainty and stability are attributes that impact not just utilities, but all customers and competitive service providers as well.

The Commission should preserve the one-for-one offset credit. The current net metering rule correctly adopts a symmetrical structure for exports and consumption over the billing period. For co-located systems, charges over the billing period should allow customers to earn a one-for-one cost-of-service based credit for avoided consumption through self-generation over the billing period. The customer monthly bill over the billing period is based on the cost of service reflected in rates. So, if the service requirement is reduced, the bill should be reduced by the cost of the service as reflected in the consumption rate, especially since customers cannot offset non-bypassable charges. Just as a customer will earn a full retail reduction on their electric bill when they conserve energy through energy efficiency, they should be able to earn the same bill reduction with self-generation.

The Commission has not been presented with substantial evidence that justifies a reduction in the netting period (via two-channel billing) or in the compensation rate for net exports over the billing period. The Commission has before it no recent data that establishes conclusively that the costs of net metering significantly exceed the benefits for either co-located or virtual net metering facilities. Indeed, when the analysis is not artificially constrained by assumptions of cost-shifts and “market value” framing, the evidence is that net metering costs remain small and potentially negative.

If the Commission decides that the comments it has received justify a reexamination of costs and benefits of net metering, it should conduct or adapt from another jurisdiction a full benefit-cost analysis (“BCA”) to characterize and account for the benefits and costs created when customers generate and export solar PV electricity. This process, which should be guided by

principles of objectivity, transparency, and stakeholder engagement, involves three distinct steps. First, the process should fully account for all costs and benefits (including avoided costs) resulting from the generation of electricity from net metered facilities. The following tables¹⁰ represents a starting point for the categories of impacts—benefits and costs that may be created by distributed energy resources.

¹⁰ National Efficiency Screening Project, *National Standard Practice Manual for Assessing the Cost-Effectiveness of Distributed Energy Resources*, DRAFT (Forthcoming, 2020).

Table 1. Potential Costs and Benefits of: Utility System

Type	Utility System Impact	Benefit, Cost, or Depends (/)
Generation	Energy Generation	B/C
	Generation Capacity	B/C
	Environmental Compliance	B/C
	RPS Compliance	B/C
	Market Price Response	B/C
	Ancillary Services*	B/C
Transmission	Transmission Capacity	B/C
	Transmission Line Losses	B/C
	Transmission Congestion	B/C
Distribution	Distribution Capacity	B/C
	Distribution Line Losses	B/C
	Distribution O&M	B/C
	Distribution Voltage	B/C
	Grid Flexibility	B
	Interconnection Costs	C
General	Utility Program Measure Costs	C
	Program Financial Incentives	C
	Program Administrative Costs	C
	Program EM&V Costs	C
	Shareholder Incentives	C
	Credit and Collection Costs	B
	Risk	B/C
	Reliability	B/C
	Resilience	B
	Optionality	B
	Market Transformation	B

* Ancillary services can include: spin/non-spin reserve, voltage support, energy arbitrage, frequency regulation, black start.

Table 2. Potential Costs and Benefits of Distributed Energy Resources: Host Customer

Type	Host Customer Impact	Benefit, Cost, or Depends (/)
Customer	Measure Costs (customer)	C
	Transaction Costs	C
	Interconnection Fees	C
	Other Fuel Consumption	B/C
	Water Consumption	B/C
	Asset Value	B
	Productivity	B
	Economic well-being	B
	Health and Safety	B
	Comfort	B/C
	Low Income: Customer	B
	Satisfaction/Pride	B
	Customer Empowerment	B
	Risk	B
	Reliability	B
	Resilience	B
	Power Quality	B
	Optimize Other DERs	B

Table 3. Potential Costs and Benefits of Distributed Energy Resources: Societal

Type	Societal Impact	Benefit, Cost, or Depends (/)
Society	Risk	B
	Reliability	B
	Resilience	B
	GHG Emissions	B/C
	Other Environmental	B/C
	Economic and Jobs	B/C
	Public Health	B/C
	Low Income: Society	B
	Energy Security	B

Second, the process should review and select from available methods to quantify impacts and understand who—utilities, participants, non-participants, and/or society at large—bears the costs or enjoy the benefits. Quantification efforts should, in turn, be founded on a few key execution principles, including the following:

- Costs and benefits should be assessed over the entire anticipated useful life of the net metering resource, using levelization techniques and appropriate discount rates to derive present value estimates of impacts that can support meaningful comparison of alternative resources.
- Absolute precision is not possible, nor has it ever been the standard in utility planning and rate making. Methods exist for addressing uncertainty, including range estimates and periodic updating.
- Ignoring or disregarding a cost or benefit category assigns a value of zero to the category—resulting in the only valuation that is, with 100% certainty, wrong.
- Utilities must be good faith participants in the process, especially in the provision of data. Unreasonable efforts to mark data as “trade secret” or “business confidential” must be rejected.
- Proper assignment of costs or benefits to the right stakeholder perspective is essential. In assessing impacts on the utility and its customers, for example, private investment costs associated with net metering facilities are not a cost. Indeed, the amount of money spent by customers on interconnected net metering facilities is a benefit to the utility and non-participant customers because it reduces the need for utility investments to maintain and replace those facilities—net metering can reduce rates for all customers over the long run.

Third, and only after the characterization and quantification steps are completed, the Commission should determine the appropriate uses—such as indexing net metering compensation rates—for the benefit-costs analysis results. For example, it is appropriate for the Commission to determine that some values are too imprecise or inadequately substantiated with data to be used in a rate or tariff. Such decisions should never constrain the first two steps

(impact identification and quantification), because data and methods can always be improved and in some cases values change.

In conducting the BCA for Net Metering generation, the Commission should also be mindful of the following issues and principles. The Commission should:

- Recognize that exports physically serve the nearest unserved load and are metered when they do so, earning the utility full retail rate charges for such service. As a result, any effort to characterize “excess production” costs must also account for excess production revenues earned when that electricity is sold through a nearby revenue meter. Electric utilities and their customers receive a benefit when net metering facilities export energy in avoiding the costs associated with generating, transmitting, and distributing energy from central station power plants, in particular when those exports are from commercial-scale virtual net metering projects. Moreover, since this energy moves through the grid to the nearest unserved load—likely a neighbor of the net metering customer or facility—the utility will charge the receiving customer for the full retail value of that exported energy. Contrary to one popular anti-distributed solar argument, therefore, net metering customers are not using the grid to “store” or “sell” their excess electricity. Significantly, the exported energy from net metering facilities is made available to the utility during hot sunny days when peak demands and system marginal costs are increasing or are still high. The credit to net metering customers, in turn, is applied against lower-cost off peak consumption. These values vary with winter-peaking systems during the winter, but the essential fact that the utility resells and charges for excess net metering production for full retail remains true. Graphs which show solar generation for a single facility charted against system-wide load curves for a single day should be accorded no evidentiary weight in evaluating solar production impacts on system peak costs.

- Establish that utility excess capacity of any kind should not be used to de-value Net Metering benefits. Vermont must always be on the search for more cost-balanced, just, and environmentally responsible ways of meeting the need for energy services and the State's energy and climate policy goals.
- Establish that compliance with existing regulatory requirements does not equate to definitive quantification of environmental costs and benefits relating to Net Metering generation. Compliance regimes based on yesterday's understanding of climate and pollution impacts result in permitted residual impacts that still impose costs on society. The fact that a pollutant or impact is not today regulated does not reasonably support a conclusion that there are no costs or benefits associated with avoiding that pollutant or impact.
- Recognize that market prices can serve as a useful starting point for estimating resource value, but market prices do not necessarily capture the long-run costs or benefits of Net Metering generation. Market prices are artifacts of a wide range of factors, including the subjectively-formed bidding behaviors of market participants. Wholesale markets in particular tend to externalize many aspects of resource value, including for example, the economy-wide and job creation benefits of net metered generation.
- Recognize that not estimating a component value is valuation—at a level of zero. For any recognized value component, zero is the value that is certainly wrong. Uncertainty should be characterized, but estimates should be developed using available data. Sensitivity analysis and confidence intervals can be used to characterize uncertainty.
- Establish that valuation of streams of future benefits and costs must account for the appropriate discount rates associated with particular values. Societal values, like the

social cost of carbon and other emissions should be assessed with societal (lower) discount rates than private investments such as energy or capacity.

- Establish that valuation methods must assess resources over their useful life and not arbitrarily constrain the term for evaluation of impacts. For example, reasonable distributed solar generation estimates should assume at least 25 years of operation based on the industry standard warranties offered today, and should include sensitivity analyses for the much longer useful lives that these systems demonstrate.
- Recognize that net metered generation valuation studies are often hampered by lack of availability of and access to utility distribution system cost data. This lack of data can be an artifact of either of two drivers—the failure of utilities to gather the data in the first place, and unreasonable use of business-confidential designations.
- Recognize that multiple methods may exist for estimating values. Often the argument of a stakeholder for a particular method is the result of subjective and self-serving assumptions and preferences. Variability in valuation resulting from variability in methodologies should be expressly acknowledged through the use of output ranges, not through elimination of reasonable methods.
- Recognize that experience with valuation exercises shows that the biggest arguments are often associated with the smallest values, and with attributes for which precise quantification methods are not available. The answer should never be to ignore the value stream, but rather to acknowledge the legitimate competing arguments.
- Establish that utility revenue impacts associated with reduced use of utility-supplied energy and services are *not a cost of net metering*. Rather, they are a cost associated with operating a system without net metered generation. This raises a proper regulatory oversight question regarding whether infrastructure investments were prudently made,

and inversely, whether necessary upgrades were imprudently deferred, and whether the infrastructure remains fully used and useful in the provision of electric service.

- Recognize that private investment in net metered generation is an appropriate consideration when evaluating the macro-level economic impacts of policy priorities. However, private investment is not a cost of net metering generation for the purpose of setting utility rates or charges. In fact, private investment in net metered systems that generate electricity system benefits adds an additional benefit in terms of avoided utility revenue requirements that would otherwise be recovered from customers as a whole through a rate of return paid for by customers.
- Understand that process matters. The untested assertions of any party submitted through comments should not form the basis for reducing compensation credit or changing the billing structure for net metered generation. The Commission should host a series of public workshops that explore the various costs and benefits of net metered generation (and other distributed energy resources). The Commission should consider the hiring of an independent third-party consultant to build confidence in the integrity of the process used to develop the evaluation methodology. Minnesota's work provides a useful example and nationally remains the gold standard for process.
- Provide adequate time and opportunity for comments and stakeholder engagement. The issues embedded in valuation are complex and challenging. Some parties will be unfairly disadvantaged if forced to engage in a rushed process that requires extensive analysis and response. These parties do not benefit from the opportunity to pass docket participation costs on to rate payers.
- Require utilities to provide real, metered data to support any asserted costs relating to "usage of the grid," "reliability costs," and "grid integration costs" before allowing

charges relating to those costs in rates. Sunk costs are not caused by customer-generation. Under utility rate making law and regulation, utilities bear the dual and distinct burdens of producing substantial evidence to support rate proposals and of proving that rates are just, reasonable, and in the public interest. Assertions of grid-related costs stemming from the operation of net metered facilities must be supported with actual, metered and measured data. The fact that net metering customers seek to reduce their electricity bills and use less utility-produced energy is undeniable. Reduction in use, and deviation from the class-average level of energy use do not create costs. At a sufficiently large penetration of distributed generation, cost shifts associated with revenue recovery for sunk utility fixed cost investments between participating and non-participating could arise and reach a level of materiality. Given the many other drivers of revenue volatility and the many offsetting benefits associated with the operations of a net metering facility over its entire lifetime, the net present value of such cost-shifts are likely to be tiny, and given the experience with value of solar studies across the United States over recent years, are even likely to be negative—all customers will see net benefits from the operation of net metered facilities.

- Avoid the creation of regulatory “cliffs” and customer uncertainty. Markets do not become self-sustaining or more cost competitive in a start-stop regulatory environment. The same applies to investment. Without certainty, the private capital that has driven the renewable energy revolution in Vermont will dry up.

V. Take the Time to Do Things Right

Net metering market growth represents an awesome potential step forward in customer empowerment and choice, economic development, job creation, and improved energy security for Vermont and its economy. There is no financial or technical crisis compelling a rush to

judgment on such a momentous issue, yet there is great potential for errors to further hobble this nascent market and cripple customer choice. A full BCA and the effort to conduct it will yield valuable understanding in assessing and establishing just and reasonable rates for the entire family of distributed energy resources, including stationary and mobile electricity storage (electric vehicles), demand response and energy efficiency, combined heat and power systems, rural electrification, and others.

VI. Address Issues of General Applicability before Development of Utility-Specific Tariffs

This process of developing a resource valuation framework and methodology first, and then determining compensation levels, rate design, and/or resource acquisition levels has been used for distributed generation (primarily solar) in Arkansas, California, Connecticut, Georgia, Mississippi, Minnesota, New York, North Carolina, Oregon, South Carolina, TVA, Utah, and Vermont.

VII. “In God We Trust; All Others Must Bring Data”

This W. Edwards Demming quote is especially appropriate to the tasks before the Commission. The only way to ensure that compensation rates for net metered generation are just and reasonable for all citizens of Vermont is to ensure that those rates are founded on credible, relevant data derived from real system operations. This data must be statistically significant and sourced from a sufficient number of sources over a sufficient period of time. It is important to retain traditional allocations of burdens—the utilities bear the burdens of production of evidence and proof that its proposed rates are just, reasonable, and in the public interest.

VIII. Cost-Effectiveness and Cost-Shifting Should be Addressed and Considered, but Not Together

They are not the same thing. Cost-shifting is ubiquitous in cost-of-service regulation. That is, assumptions made in rate cases about which customers will generate which revenues at what

time are only assumptions based on forecasts of sales, weather, economic conditions, and costs. Utilities are not and never have been guaranteed recovery of specific revenues from specific customers—the *Hope* and *Bluefield* standards¹¹ only provide for a reasonable opportunity to earn a reasonable return on prudent investments committed to public utility service.

Cost-shifting arises when actual revenue recovery departs from forecasted revenue recovery due to systemic changes that are addressed in a subsequent rate case. If the utility fails to forecast for reduced sales due to net metered generation installed by customers, reduced sales do not *create* costs, they only raise the prospect that the denominator in the basic rate making formula (the sales volume over which costs are distributed) is smaller and rates for remaining sales must be increased incrementally to recover the same revenue requirement.

Cost-shifting can result from net metering, and even though net metering does not create significant net shifts in costs, the law requires the Commission to determine whether these potentially shifted costs should be shifted to all customers, all customers in the class, or just to a limited set of net metering customers.

Deciding how to allocate potentially shifted costs requires a multi-part analysis, most of which is done through the BCA described earlier in these comments:

1. All cost and benefit impacts from net metering should be characterized and quantified.
2. The magnitude of the potential cost shift must be quantified. It is also important to recognize that net metered customers pay consumption charges for the grid-supplied electricity that they use, just as all customers do. As described above, co-located net

¹¹ Federal Power Comm'n v. Hope Natural Gas Co., 320 U.S. 591 (1944); Bluefield Water Works & Improvement Co. v. Pub. Serv. Comm'n of West Virginia, 262 U.S. 679 (1923).

metered customers produce much of their energy and are likely to export electricity during high-cost regional summer peak periods. A time-differentiated analysis of the value of net metering generation, both consumed on-site and exported, is likely to show that net metering customers make an above-average contribution to reducing both fixed and variable demand-related costs. These impacts will not be captured merely by extracting lost revenue calculations from cost-of-service studies done for consumption-only customers, although properly calculated time-variant rates may be more strongly indicative of the value of on-peak exports.

3. The Commission must make a decision about whether and to whom to allocate any remaining cost-shift amounts. At current and projected levels of net metering penetration in Vermont today, there is good reason to believe that any net and net-present value cost-shifting will be miniscule and will not justify the billing system calculations and administrative effort to recover it. Again, there is also a very good chance that under such analysis, net metering customers are actually subsidizing non-net metering customers. With a good reporting and BCA system in place, the Commission can revisit the issue any time if feels the effort is warranted.

IX. Keep Things in Perspective

Net metering challenges monopoly status; it reduces sales at a time when sales growth is low, flat, or even negative; it puts customers in control of their energy services and may lead to even more expectations for customer empowerment. The typical approach for yesterday's utilities is to impose charges, reduce credits, and frustrate interconnection for customers who want to install net metered customers who wish to manage their energy bills.

Another aspect of the typical approach for utilities and others that want to stop customer generation and virtual net metering is to assert that net metering requires payments in excess of

market prices for generation. This argument is wrong and intentionally misleading on several levels, but it is also an invitation to the Commission to waste valuable time and resources on questions that are nearly insignificant in importance.

The experience from other states that have fully assessed costs and benefits in the manner described in these comments is that compensation for distributed solar generation at the full retail rate results in net metering customers subsidizing the utility and other utility customers, because distributed solar generation is better and more valuable than the average kWh the utility delivers to its customers.

A mainstay of arguments by anti-customer solar advocates is that net metering gives customers more compensation than the wholesale avoided cost rate or the “market value of solar,” and therefore must give rise to a cross-subsidy to net metering customers and the creation of an unacceptable shifting of costs. This argument is fundamentally flawed on many levels. First, it falsely equates in-state distributed solar with remote wholesale generation from fossil or nuclear resources. Second, it ignores environmental benefits from clean distributed generation, including permanent in-state insurance against environmental costs relating to atmospheric pollution. This regulatory hedge value of distributed solar is not reflected in wholesale rates—because wholesale energy prices are fundamentally unhedged and more volatile. Third, it ignores the fact that customers make substantial private investments in net metered generation—investments that captive monopoly utility customers do not have to make. This means that unlike utility purchases or generation of wholesale power, it does not demand a utility rate of return and reflection in the rate base. Fourth, distributed solar provides an economic hedge value that helps ensure that the overall portfolio of electricity generation serving all citizens of Vermont has superior value and improved affordability. All these differences are ignored by the flawed argument that distributed solar is over-compensated at anything but wholesale or “market” rates.

X. The Commission Should Take the Long View

This includes taking a realistic view of the opportunity for encouraging an electricity system in Vermont that provides customers with a robust menu of choices and tools for managing energy bills, that grows the economy and renewable energy resource base of Vermont, and that encourages electric utilities and anti-net metering advocates to embrace innovation, customer preferences, and customer choices. Fairly considered in utility system planning, customer-owned and -financed distributed generation systems offer significant and highly cost-effective resource value that leverages private investment dollars, federal tax dollars, and the power of customer choice. As an attractive market for distributed energy resources and innovation, Vermont can, in time, rebuild the job base and economic development value that accompanies supply chain maturity and sector growth.

XI. Additional Responses to Commission Information Requests

1. Is the current net-metering compensation system causing a cost shift between customers who net-meter and those who do not? Please quantify this cost shift and provide all calculations supporting your response.

A. Cost shifts are unavoidable under cost of service regulation. The issue that the Commission should focus on is whether any cost shift resulting from net metering is: (1) material, (2) outweighed or offset by the benefits, and (3) remediable while ensuring achievement of statutory objectives for net metering.

Given the wide range and large magnitude of benefits from net metering, the likelihood of a material cost shift to non-net metering customers is very small.

As discussed in the body of these comments, any reliance on excess generation “costs” without consideration of excess generation revenues will dramatically overstate cost and cost shift estimates, as will the intentional ignoring of net metering generation benefits.

The Commission should conduct a comprehensive evaluation of the benefits and costs of net metering and a careful study of the magnitude and nature of allegedly shifted costs.

2. Please quantify the effect of current net-metering compensation on your retail rates. Please provide all calculations and information supporting your response.

A. As discussed in the body of these comments, any reliance on excess generation “costs” without consideration of excess generation revenues will dramatically overstate cost and cost shift estimates, as will the intentional ignoring of net metering generation benefits.

The evidence provided by the utilities themselves shows potential rate impacts ranging from zero to the small single digit percentiles. The Commission should conduct a comprehensive evaluation of the benefits and costs of net metering and a careful study of the magnitude and nature of allegedly shifted costs. Norwich Solar Technologies and

REV have provided the Commission with credible and substantial evidence that net metering is not having a significant adverse effect on retail rates. As previously discussed, when exported generation is eliminated from the calculation of impacts, the net impact of net metering is a benefit, not a cost—about \$500,000 in 2020.

3. *If current net-metering compensation is having a significant effect on retail rates, please describe how compensation should be changed so that the net-metering program does not have a significant effect on retail rates.*

A. See above. Norwich Solar Technologies and REV have provided the Commission with credible and substantial evidence that net metering is not having a significant adverse effect on retail rates. There is not substantial evidence in the record showing that current net metering compensation having a significant adverse effect on retail rates. Even GMP is not prepared to state that the Commission should change net metering compensation. As a result, no changes to reduce net metering compensation credits are prudent or would be just and reasonable.

4.

5.

6.

7. *For each benefit, please describe how the Commission should estimate the value of that benefit. Please identify what data sources the Commission should use to make such estimates. If you have an estimate of the value of a particular benefit, please provide the estimate, along with supporting documentation showing how the estimate was derived.*

A.

8. *When estimating the value of the benefits of net-metering, what time horizon should the Commission consider? Why?*

A. A reasonable evaluation of the costs and benefits of net metering resources requires a timeline set at the anticipated useful life of the net metered generator. For distributed solar, manufacturer warranties span 25 to 30 years and many systems operate for much longer. Distributed solar facilities will therefore likely avoid utility costs and provide system benefits for at least 25 years. It is important to note that one of the benefits of net metering is that if a generator fails to operate, it will not earn compensation credits.

9.

10.

11. Please compare the benefits of net-metering to the cost of net-metering under the current net-metering rule.

A. Such a comparison is properly the subject of a comprehensive benefit-cost analysis, preferably conducted by an independent consultant in a transparent fashion.

Modifications to the net metering rule should not be based on the unsubstantiated and untested assertions of any stakeholder in informal comments.

12. If the current net-metering compensation system does not balance the costs and benefits of net-metering, please describe how the compensation system could be changed to better balance costs and benefits.

A. A comprehensive assessment of costs and benefits is required in order to evaluate whether changes are necessary.

13.

14.

15. Should the Commission adopt a limit on the amount of new net-metering resources? If so, how should the Commission determine the amount?

A. No.

Appendix

Information about Karl R. Rábago, Rábago Energy LLC

Karl R. Rábago, Rábago Energy LLC

Solar Experience

General: Karl R. Rábago has 30 years of experience working with the regulatory, technology, and business issues associated with solar energy, energy efficiency, wind energy, and utility regulation. He is an attorney and has earned degrees in business management, law, military law, and environmental law. He is a veteran of more than twelve years of service in the US Army, in the Armored Cavalry and Judge Advocate General's Corps. He has been married to Pam Rábago for more than 40 years, and has three children and two grandchildren. Karl lives in Denver.

Key Relevant Experience:

As a public utility commissioner in Texas in the early 1990s, Mr. Rábago worked with utilities in Texas to craft line extension rules and supported utility pilot and demonstration projects in Texas.

As NARUC Energy Conservation Committee Vice Chair, he co-led, with stakeholders from around the country, efforts to establish the Photovoltaic Collaborative Market Project to Accelerate Commercial Technology ("PV-COMPACT"), a supporting organization to the Utility PhotoVoltaic Group ("UPVG"), funded by an innovative and successful new approach to public/private partnership in technology demonstration and deployment.

As Deputy Assistant Secretary at the U.S. Department of Energy, he was responsible for the solar photovoltaic research, development, and demonstration, and supervised research programs conducted at the National Renewable Energy Laboratory, Sandia National Laboratory, universities, and other organizations. He testified before and worked with Congress to grow solar research programs funded at the Department of Energy.

While at the Environmental Defense Fund, Mr. Rábago worked with all the major utilities in Texas on deliberative polling exercises in the context of integrated resource planning to gauge and report strong public support in Texas for solar energy, and to reflect that support in the RPS enacted in utility restructuring.

While with CH2M HILL, an engineering firm, Mr. Rábago co-authored electricity industry restructuring studies for both Colorado and Alaska that addressed, among many other things, potential for solar energy development in those states.

At Rocky Mountain Institute, as a managing director, Mr. Rábago co-authored "Small Is Profitable," a definitive reference that characterizes the operational, engineering, financial, and economic benefits of right-sized energy resources, including solar PV.

While leading the Energy Solutions Group at the Houston Advanced Research Center, Mr. Rábago also served as President of the Board of Directors for the Texas Renewable Energy Industries Association.

As a director for the Jicarilla Apache Nation Utility Authority, Mr. Rábago oversaw the installation and operation of a solar PV demonstration project on tribal land.

At Austin Energy, Mr. Rábago led the utility's \$5 million annual capital program for solar project development on public buildings, and managed commercial and residential rebate and net metering programs as well. While there, he developed a new performance-based Incentive program for commercial customers, and created the award winning "Value of Solar Tariff" now used in Austin for residential customers and subsequently adopted in Minnesota law.

Since 2012, Mr. Rábago has frequently provided advice to solar developers working throughout the United States.

As Executive Director of the Pace Energy and Climate Project, Mr. Rábago was an active participant in the New York "Reforming the Energy Vision" proceeding, including proceedings relating to the Value of Distributed Energy Resources.

As a consultant advisor to the National Audubon Society's Arkansas chapter, Mr. Rábago has worked and continues to work on several past and on-going dockets before the Arkansas Public Service Commission on matters relating to net energy metering and markets for distributed energy resources.

Mr. Rábago has testified and/or submitted formal comments on solar valuation in Arkansas, California, Connecticut, Georgia, Guam, Iowa, Kentucky, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Missouri, New York, North Carolina, Rhode Island, Vermont, and Virginia. (Case and docket citations available on request.)

Relevant Publications:

"Achieving 100% Renewables: Supply-Shaping through Curtailment," with Richard Perez, Marc Perez, and Morgan Putnam, PV Tech Power, Vol. 19 (May 2019).

"A Radical Idea to Get a High-Renewable Electric Grid: Build Way More Solar and Wind than Needed," with Richard Perez, The Conversation, online at <http://bit.ly/2YjnM15> (May 29, 2019).

"Reversing Energy System Inequity: Urgency and Opportunity During the Clean Energy Transition," with John Howat, John Colgan, Wendy Gerlitz, and Melanie Santiago-Mosier, National Consumer Law Center, online at www.nclc.org (Feb. 26, 2019).

"Revisiting Bonbright's Principles of Public Utility Rates in a DER World," with Radina Valova, The Electricity Journal, Vol. 31, Issue 8, pp. 9-13 (Oct. 2018).

"Achieving very high PV penetration – The need for an effective electricity remuneration framework and a central role for grid operators," Richard Perez (corresponding author), Energy Policy, Vol. 96, pp. 27-35 (2016).

"The Net Metering Riddle," Electricity Policy.com, April 2016.

"The 'Sharing Utility:' Enabling & Rewarding Utility Performance, Service & Value in a Distributed Energy Age," co-author, 51st State Initiative, Solar Electric Power Association (Feb. 27, 2015)

"Rethinking the Grid: Encouraging Distributed Generation," Building Energy Magazine, Vol. 33, No. 1 Northeast Sustainable Energy Association (Spring 2015)

"The Value of Solar Tariff: Net Metering 2.0," The ICER Chronicle, Ed. 1, p. 46 [International Confederation of Energy Regulators] (December 2013)

"A Regulator's Guidebook: Calculating the Benefits and Costs of Distributed Solar Generation," co-author, Interstate Renewable Energy Council (October 2013)

“The ‘Value of Solar’ Rate: Designing an Improved Residential Solar Tariff,” Solar Industry, Vol. 6, No. 1 (Feb. 2013)

“Jicarilla Apache Nation Utility Authority Strategic Plan for Energy Efficiency and Renewable Energy Development,” lead author & project manager, U.S. Department of Energy First Steps Toward Developing Renewable Energy and Energy Efficiency on Tribal Lands Program (2008)

“Small Is Profitable: The Hidden Economic Benefits of Making Electrical Resources the Right Size,” co-author, Rocky Mountain Institute (2002)

“Socio-Economic and Legal Issues Related to an Evaluation of the Regulatory Structure of the Retail Electric Industry in the State of Colorado,” with Thomas E. Feiler, Colorado Public Utilities Commission and Colorado Electricity Advisory Panel (April 1, 1999)

“Study of Electric Utility Restructuring in Alaska,” with Thomas E. Feiler, Legislative Joint Committee on electric Restructuring and the Alaska Public Utilities Commission (April 1, 1999)