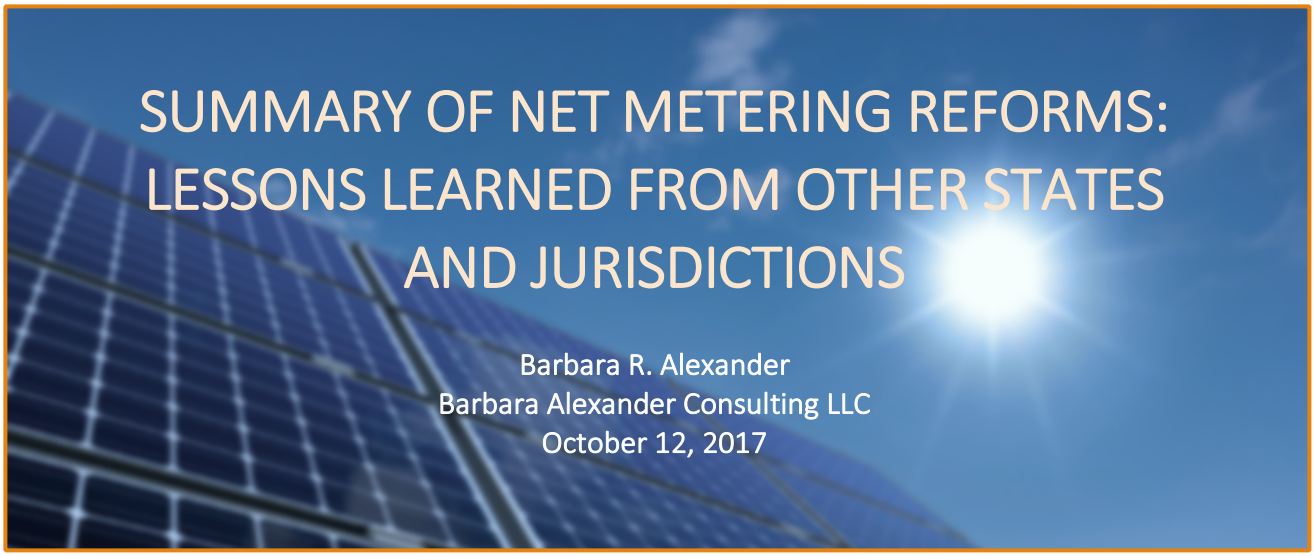

SUMMARY OF NET METERING REFORMS: LESSONS LEARNED FROM OTHER STATES AND JURISDICTIONS

Barbara R. Alexander
Barbara Alexander Consulting LLC
October 12, 2017

Overview of Net-Metering Policy Changes

Active regulatory proceedings as well as legislative efforts seeking to correct the issues that arise from net-metering policy are taking place in many jurisdictions. There is a clear trend to amend the historical net metering rule that provided a credit equal to the full retail rate for excess generation produced by rooftop solar customers. While the options for reform vary widely—from establishing a separate rate class with higher fixed cost rate design to lowering the credit from the full retail rate without any change in rate design—the growing trend is to require net metering or rooftop solar customers to contribute more to the actual costs incurred by utilities to serve these customers.

This debate and policy reform proposals are a reflection of the tension that exists from solar advocates who urge regulators to pay for excess generation based on a long term avoided cost or "value of solar" study. Opponents argue that the payment for excess generation should be based solely on the actual and current avoided costs for excess generation, pointing out that paying for excess generation based on estimates of long term avoided costs that include societal attributes or benefits result in a subsidy by current ratepayers who cannot afford or who cannot install a rooftop solar system. Other debates reflect the argument that grid scale solar projects are far cheaper than rooftop solar customers. A recent report by the National Renewable Energy Laboratory[1] for the Department of Energy concluded, for example, that grid scale solar costs have dropped to an average of 6 cents per kWh, far less than the full retail rate (or close to the full retail rate) paid under net metering policies in most states.

The information presented in this Report demonstrates that numerous other regulators have concluded that the historical practice of crediting net-metering customers for their excess generation delivered to the grid at the full retail rate fails to recover the cost of providing service to those customers. Consequently, those costs will ultimately be recovered from the non-net-metering

[1] https://energy.gov/articles/energy-department-announces-achievement-sunshot-goal-new-focus-solar-energy-office

customers through normal ratemaking procedures. Numerous regulators across the United States are modifying policies for the crediting of excess generation to provide less than a full retail rate credit. To date, these activities have predominantly occurred in states with higher levels of net-metering penetration, as the magnitude of the costs recovered from non-net metering customers required that action be taken.

Hawaii

Hawaii halted its previous policy of paying the full retail rate to net metering customers. The current policy requires a fixed monthly charge and payments of less than the full retail rate for excess generation provided by rooftop solar customers.

The state of Hawaii has among the highest electricity rates in the United States.[2] This high cost, coupled with net-metering policy, led to Hawaiian customers adding significant amounts of net-metering systems in recent years. These significant net-metering additions began to cause operational problems with the grid, and it became clear that addition of net-metering at the levels being seen was unsustainable for the utility and its customers.

In 2014, the Public Utilities Commission of the State of Hawaii (Hawaii PUC) issued an Order instituting a proceeding to investigate the technical, economic, and policy issues associated with distributed energy resources as they pertained to the electric operations of four Hawaiian utilities.[3] In an October 2015 Order in that proceeding, the Hawaii PUC issued an order closing its existing net-metering program to new customers, and instead put in place two options for customers installing new net-metering systems: a grid supply option and a self-supply option.[4] The grid-supply option allows a customer with net-metering to deliver excess generation to the grid, although they are credited at a rate less than the full retail rate. Under the self-supply option, customers are not credited for incidental amounts of excess energy delivered to the grid (this option would be advantageous when considering storage), but they are subject to a lower monthly fixed fee than a customer that elects to take service under the grid-supply option.

The following describes one of the two replacement programs adopted by the Hawaii PUC:

> *The **"Grid-Supply" option** is intended to provide customers with the option to export excess energy to the grid in exchange for energy credits against the customer's bill, to the extent such energy export provides benefits to the electric system. The grid-supply option is therefore functionally similar to the existing NM program (see, e.g., HECO's Tariff Rule 18), with the difference that the energy credit rate under the grid-supply option need not be tied to the retail electricity price, but rather can be set at a rate that approximates the relative value of such exported energy to the system.*[1]

[2] U.S. Department of Energy, EIA Form 826 data for May 2017.

[3] Docket No. 2014-0192.

[4] Hawaii PUC Docket 2014-0192, Decision and Order No. 33258, issued October 12, 2015.

In its October 2015 Order, the Hawaii PUC emphasized that "the interim options approved herein provide near-term balance, customer choice, and value to both participating and non-participating customers. This balance affords stakeholders the time to conduct more granular analysis and propose new policy designs during Phase 2."[5] Thus, Hawaii, as the state with the highest net-metering system penetration in the U.S., appears to be the first state to have offered an option to its residents similar to a 2-Channel Billing framework. However, Hawaii does not use the term "2-Channel Billing," instead, it refers to its successor policy as the "Customer Grid-Supply Option."[6] Availability of the Customer Grid-Supply option to Hawaiian customers is capped and, once the cap is reached, new customers would be required to take service under the Customer Self-Supply Option.

In the Hawaii Commission's October 2015 Order as described above, it approved the self-supply and grid-supply tariffs for HECO. The self-supply option, among other aspects, contains a minimum charge of $25 per month and no credit mechanism for incidental exports to the grid. The grid-supply option has a minimum charge of $25 per month and credits exports to the grid at a rate below the full retail rate.

Similar to those considerations recognized by the Arkansas Commission in Order No. 10 of Docket No. 16-027-U, the Hawaii PUC did grant grandfathering of existing net-metered customers to avoid changing the economics of investments that already had been made by those customers.

Nevada

Net-metering policy revisions in the state of Nevada have been controversial and the current policy is a result of recently adopted legislation that overturns the prior Nevada Commission reform that significantly reduced payments for excess generation from net metering customers.

In June 2017, the Nevada state legislature voted to pass Assembly Bill 405 aimed at restoring the credit rate for excess energy closer to, but still less than, the full retail rate for new net-metering customers. The legislation made other changes to existing policy as well including mandating that net-metering customers not be put into a separate rate class and reversing the phased-in rate structure changes involving higher fixed and lower volumetric charges that were put in place earlier. The legislation also mandated that the credit residential customers receive for excess energy they export to the grid will be on a declining, sliding scale tied to the prevailing retail electricity rate.[7] In accordance with Assembly Bill 405, for the first 80 MW of new installations after the law takes effect, customers will be credited at 95% of the retail rate, decreasing in 7% steps tied to 80 MW "tiers" and eventually reaching 75% of the retail rate after the final tier of new DG capacity is added across Nevada.

NV Energy made a compliance filing regarding how their two electric utilities proposed to comply with Assembly Bill 405 that drew immediate criticism from solar advocates. Most recently, the PUCN issued a draft order on August 31, 2017, providing specific directions to NV Energy's two electric

[5] *Id.* at 168.
[6] *See* Hawaii PUC Docket 2014-0192, Decision and Order No. 33258, issued October 12, 2015.
[7] *See* AB405, https://www.leg.state.nv.us/App/NELIS/REL/79th2017/Bill/5487/Overview

utilities to come into compliance with Assembly Bill 405.[8] Most notably, the PUCN draft order requires NV Energy to modify its net-metering billing to allow intra-month netting in lieu of the current practice that follows 2-Channel Billing. In other words, if a net-metering customer produces less electricity than they consume in a given billing period, the customer will receive a full retail rate credit for the kWhs delivered to the grid as recorded on Channel 2. It is only in the scenario where the net-metering customer produces more electricity than consumed on a monthly basis (Channel 2 is greater than Channel 1) that the customer receives a less than full retail rate credit.

Several studies document the cost shift associated with payments to net metering customers in Nevada, namely two studies performed by Energy + Environmental Economics, Inc. (E3). An initial study performed by E3 in 2014 was updated in 2016 and the newer study found that Nevada customers with rooftop solar served under a net-metering tariff will impose an annual net cost on customers without net-metering systems of $36-$43 million from 2017 to 2046. This cost shift occurs because these customers served under net metering tariffs do not pay the full cost for the services they obtain from the utility.[9]

Arizona

As another state with a high penetration of net-metering customers, Arizona has been working to address the issues that arise from net-metering policies for more than 5 years. Most recently, the Arizona Corporation Commission (ACC) undertook a rulemaking to set the framework for addressing the issues that arise from net-metering policy.[10] On January 3, 2017, the ACC issued an order that eliminated the 1:1 full retail credit policy for new net-metering systems and replaced it with a 2-Channel Billing framework where excess energy delivered to the utility would be credited based on a five-year weighted average price of utility-scale solar power purchase agreements (PPAs).[11] The order required the initial excess energy rate to be set in pending utility rate cases, and indicated an avoided cost-based methodology could provide the basis for the credit in the future.

In August 2017, a Settlement Agreement was approved by the ACC in Arizona Public Service Company's (APS') rate case that set the initial rate for new rooftop distributed net-metering customers at $0.129/kWh.[12] This credit rate for excess generation may decrease by up to 10% per year until such time that the credit rate is equal to the average cost of utility-scale PPAs into which APS has entered. This will ensure that, once that level is reached, DG customers will not be credited at rates such that it forces the utility to acquire power at costs above those for a similar resource (larger-scale solar). The

[8] PUCN Docket No. 17-07026, Order Granting in Part and Denying in Part Joint Application by NV Energy on Assembly Bill 405, August 31, 2017.

[9] The major reasons for the reversal in net benefits to net costs between this study and a 2014 study in Nevada include natural gas price declines, utility-scale solar cost declines and their effect on Renewable Portfolio Standard requirements, and updated data from the two investor-owned utilities in Nevada: Nevada Power (covering southern Nevada) and Sierra Pacific Power (covering northern Nevada). *See* E3 *Nevada Net Energy Metering Impacts Evaluation 2016 Update*, August 17, 2016.

[10] ACC Docket No. E-00000J-14-0023, Initiated on January 24, 2014.

[11] *See* December 20, 2016 Amendment, ACC Docket No. E-00000J-14-0023.

[12] *See* March 1, 2017 Settlement Term Sheet, ACC Docket No. E-01345A-0036/ Docket No. E-01345A-0123.

Settlement Agreement also offers customers who add DG systems after a specific date a limited selection between time-of-use (TOU) and other demand-based rate options. The Settlement Agreement grandfathered existing solar customers for 20 years under the previous net-metering policy.[13]

Tucson Electric Power (TEP) has also proposed to change the value for excess energy sent to the grid by new net-metering customers.[14] In accordance with the ACC's decision described above, TEP will determine its credit rate for excess energy delivered to the utility and measured through Channel 2 of the meter within its pending rate case. TEP has proposed the initial excess energy credit rate for new rooftop solar net-metering customers be set at $0.0973/kWh based upon market prices for solar power over the last five years. TEP has also proposed that future net-metering customers choose between two new rate options that incorporate TOU energy pricing coupled with either a grid access charge or demand charge.

Phase 1 of TEP's rate case closed in February 2017, while Phase 2 is ongoing and will address the excess energy credit rate.[15] UniSource Energy Systems, a separate utility in Arizona that is operated by the same parent company as TEP, has proposed similar changes for new net-metering customers within an open rate case that is also still pending ACC approval.[16]

California

The California legislature passed a bill (AB 327) in 2013 requiring the California Public Utilities Commission (CPUC) to study "who benefits, and who bears the economic burden, if any, of the net energy metering program." The CPUC initiated a study, which was conducted by E3 on behalf of the CPUC. The E3 study estimated that because the current net-metering rates do not recover the costs of serving the net-metering customers from those customers, by 2020, approximately $1.1 billion would be shifted annually from net-metering customers to non-net-metering customers if California's current practices (and rate structures) remain unchanged.[17]

In conjunction with AB 327, in order to address the identified issues associated with their existing net-metering policy, Pacific Gas & Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E) each proposed different successor policies in a CPUC Rulemaking (R. 14-07-002). The proposals from these three California investor-owned utilities varied, but each utility incorporated minimum bill charges, grid access charges, and changes to the credit for excess energy delivered to the grid from net-metering customers to help mitigate the subsidy that is imposed upon

[13] ACC Docket No. E-01345A-16-0036 AND E-01345A-16-0123, Recommendation of Assistant Chief ALJ Teena Jibilian, July 26, 2017; https://ofchq.snl.com/Cache/B0E4A340AE389633061.PDF?Y=&CachePath=%5c%5cdmzdoc1%5cwebcache%24%5c&O=PDF&D=&T=&reqFrom=SNL3

[14] ACC Docket No. E-01933A-15-0322, Application originally filed November 5, 2015. *See also*: https://www.tep.com/proposed-pricing-for-new-solar-customers/

[15] ACC Docket No. E-01933A-15-0239 AND Docket No. E-01933A-15-0322, Decision No. 75975 February 24, 2017; http://docket.images.azcc.gov/0000177572.pdf

[16] ACC Docket No. E-004204A-15-0142, Application originally filed May 5, 2015.

[17] Energy + Environmental Economics, Inc., *California Net Energy Metering Ratepayer Impacts Evaluation*, October 28, 2013.

customers without DG systems. Other stakeholders including solar advocates, consumer advocates, etc. proposed alternative approaches and successor tariffs to the CPUC. The CPUC eventually adopted a net-metering successor tariff that continues the existing net-metering structure with some adjustments for new NEM customers (existing customers are grandfathered under previous net-metering rules). New elements to the successor tariff, referred to as Net Energy Metering (NEM) 2.0, relate to non-by-passable charges and time-of-use rates. Under the new tariff, net-metering customers must pay certain non-by-passable charges on each kilowatt-hour (kWh) of electricity they consume from the grid equivalent to approximately 2-3 cents per kWh.[18] In addition, pre-existing residential NEM customers are required to take service on a TOU rate once DG capacity caps are reached for each investor owned utility in California. As of June 1, 2017 all three major investor owned utilities had reached their prescribed cap.[19]

The new tariff did not impose any demand charges, grid access charges, installed capacity fees, standby fees, or similar fixed charges on residential net-metering customers, at least for the purposes of this version of the net-metering successor tariff, although the CPUC committed to revisit the issues again in 2019. At that time, the CPUC will consider further adjustments to its net-metering tariff, including an energy export credit rate for net-metering tariff customers, taking into account values differentiated by the time solar energy is produced and locations of solar net-metering systems from which the energy is exported onto the grid.[20]

The CPUC successor tariff decision was not unanimous, but rather a split 3-2 vote. One of the dissenting Commissioners (Michael Florio) included the following statement in his dissent:

> *"I respectfully disagree with the majority of my colleagues on this decision adopting a Net Energy Metering Successor Tariff … My reasoning is as follows. First, I think there is sometimes a misconception that somehow the Investor Owned Utilities are paying whatever Net Energy Metering customers receive for their solar generation. This is not correct; the utilities are just a conduit. Other customers – the people who do not or even cannot have solar – pay the compensation that the Net Energy Metering customers receive … Going forward, I favor a compensation structure that reflects the value of exported generation. Participating customers should be compensated at the retail rate for generation consumed on site. Exports should be compensated in a way that reflects their value, which should at minimum be differentiated by time and location…"*[21]

[18] In California, all utility customers, except grandfathered NEM customers, pay non-bypassable charges on all energy they consume from the grid. Grandfathered NEM customers only pay on usage from the grid after NEM exports are subtracted. For more information regarding the CPUC NEM successor tariff and proceeding, see here: http://www.cpuc.ca.gov/General.aspx?id=3934

[19] CPUC Net Energy Metering Informational page: http://www.cpuc.ca.gov/General.aspx?id=3800.

[20] *See* pgs. 60-61 of CPUC Decision 16-01-044, Decision Adopting Successor to Net Energy Metering Tariff, 2/5/2016. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M158/K181/158181678.pdf

[21] Dissent of Commissioner Michel P. Florio on CPUC Decision 16-01-044, Adopting a Net Energy Metering Successor Tariff, 2/3/2016.

The California utilities' NEM successor tariffs were approved with modification on June 23, 2016 and are currently in effect in SDG&E, PG&E, and SCE's service territories.[22]

Maine

Maine is a restructured state with unbundled generation (procured in the wholesale market pursuant to competitive contracts for default service customers) and transmission and distribution rates regulated by the Maine Public Utilities Commission (MPUC). In March 2017, the MPUC issued an order[23] that amended the current net-metering policy to reflect a "buy-all, sell-all" crediting structure, which is fundamentally different than 2-Channel Billing. The MPUC's rule requires the utility to install a separate meter at the customer's expense. In Maine, "nettable energy" is defined as the entire amount of energy generated by the customer's system, including the amount ordinarily consumed by the customer behind the meter, minus the amount of energy consumed by the customer from the utility. Each year until December 31, 2026, a new customer will receive a credit equal to 100% of the applicable generation supply charge and a decreasing credit for the transmission and distribution (T&D) charges. The T&D credit will decrease by 10% per year for a 10-year period. Customers are grandfathered for a 15-year period after they are connected. The gradual reduction in nettable energy will begin for new customers with net-metering facility in-service dates beginning on January 1, 2018.[24]

New Hampshire

The New Hampshire Public Utilities Commission (NH PUC) recently established new net-metering rules that will become effective September 1, 2017.25 As part of that process, the NH PUC denied utilities' (plus other stakeholders) proposal for a 2-Channel Billing framework when deciding that intra-month netting should be maintained. All new net-metering systems installed after the new rules begin must pay non-by-passable charges (e.g., system benefits, stranded cost recovery) based on the full amount of electricity the customer uses (Channel 1) without netting any excess energy delivered to the grid (Channel 2). Under the new rules, small net-metering systems ≤ 100 kW will receive a 1:1 intra-month credit. Any excess kWh balance remaining at the end of the month will receive a lower credit based on 100% of retail energy and transmission charges, but only 25% of applicable distribution charges.

It should be noted that New Hampshire is a restructured state with customer choice in which utility costs have been unbundled into generation, transmission, distribution, etc. Larger net-metering systems >100kW are still credited for monthly excess at the default energy rate. As applicable, a new net-metering customer will receive a monetary bill credit instead of a kWh credit (the new rules allow a cash payment if the customer moves and closes their account or the annual credit balance exceeds

---

[22] *See* Resolution E-4792, Decision 16-01-044, http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M163/K978/163978119.PDF

[23] March 1, 2017 Order, Maine PUC Docket No, 2016-00222.

[24] *See* http://programs.dsireusa.org/system/program/detail/280; It should be noted that the Maine Legislature's attempt to amend the MPUC's net metering rules was not adopted.

[25] New Hampshire June 23, 2017 Order 26,029, Docket # DE 16-576.

$100). The NH PUC decision also eliminated the existing statewide net-metering cap of 100 MW. Utilities will also have the opportunity to estimate and recover total lost revenues attributable to net-metering customers pursuant to the mechanism and process approved in Order No. 25,991 in Docket DE 15-147 dated February 21, 2017. Finally, existing net-metering systems will be grandfathered under the current full 1:1 retail credit framework through 2040, while any new net-metering systems installed after September 1, 2017, will be grandfathered under the new rate structure through 2040 as well.

Indiana

In May 2017, Indiana Governor Eric Holcomb signed Senate Bill (SB) 209 which phases out 1:1 full retail net-metering in the state effective July 1, 2017.[26] SB 309 allows residential customers and small businesses that have already installed solar panels or other renewable energy net-metering systems before the end of 2017 to be credited at the full retail rate for their excess energy for another 30 years. Customers who install net-metering facilities within the next five years will receive the full retail rate for any excess energy until 2032. Afterwards, a customer who installs distributed generation after 2022 will receive credit for excess energy at a lower rate that reflects a 25% premium above the prevailing wholesale value of energy. Finally, customer-owned net-metered systems are not allowed to be sized larger than 1 MW nameplate capacity.

Massachusetts

Massachusetts adopted a statutory mandate to reform net-metering that will reduce the full retail rate credit given to solar customers. On April 11, 2016, Governor Baker signed into law Chapter 75 of the Acts of 2016, An Act Relative to Solar Energy (Solar Act). Among other things, the Solar Act amended General Laws Chapter 164 by adding Section 139(j). The new statutory provision requires electric distribution companies to submit for Commission approval minimum charges that ensure that all distribution company customers contribute to the fixed costs of ensuring the reliability, proper maintenance and safety of the electric distribution system. The statute further requires the minimum charge to recover all reasonably and prudently incurred costs necessary to maintain the reliability, proper maintenance and safety of the electric distribution system.

Since Massachusetts has unbundled its generation from T&D rates, similar to Maine, the Massachusetts distribution utilities are in the process of submitting tariffs that will require that credit for excess generation from net-metering customers will be less than the full distribution service rate.

Vermont

The Vermont Public Service Board recently adopted reforms to its net-metering rule.[27] In this new rule, effective January 1, 2017, all net-metering customers must pay "non-bypassable charges"

[26] Indiana Senate Bill No. 309; March 31, 2017.

[27] The Vermont's newly amended net metering rule is available at:
http://psb.vermont.gov/sites/psbnew/files/doc_library/rulemaking-5100-attachment-a-on-reconsideration-08292016.pdf

(and such charges cannot be included in credits for excess generation), which include the customer charge, energy efficiency charge, energy assistance program charge, any on-bill financing payment, and any equipment rental charge.

Review of Cost-Benefit Studies

A number of organizations have undertaken efforts in recent years to research and evaluate the appropriateness of net-metering policies. These efforts include studies that were commissioned or conducted by state regulators and other stakeholders as well as a number of scholarly articles. For example, the 2014 article in *Energy Law Journal* written by David Raskin addresses the failure of the existing structures to recover the costs of serving the net-metering customers from those customers will impose an annual net cost on other non-net-metering customers:

> *"It is not necessarily the case . . . that distributed generation owners who remain connected to the grid use less of the other unbundled services. Utilities must be ready to serve the entire customer load whenever a distributed generator is not producing energy, such as during the evening peak and on rainy afternoons…In addition, the variability of solar energy (without adequate storage) may increase the utility's cost to supply balancing services because, as variable energy is added to the system, utilities must invest in or acquire a larger proportion of balancing resources relative to their total load.*
>
> *[T]he cost shifting associated with net-metering will, at some point, become so large that regulatory action will almost certainly be taken to redress the impacts on remaining utility customers. . . . [I]f policymakers wait too long to address the issue, they will face the politically uncomfortable fact that substantial investments in behind-the-meter generation were made in reliance on net-metering, and the politics of fixing the subsidy will be problematic. Existing net metered customers will claim that they relied on the prior rate practice and potential new customers will ask why their neighbors got a better deal than will be available to them."* [28]

As noted above, the failure of a 1:1 full retail credit to recover the costs of serving net-metering customers has been documented in other jurisdictions and in various scholarly articles and studies commissioned to find solutions to the problem. As noted above, E3 found, in a 2016 study, that the failure of the existing structures in Nevada to recover the costs of serving the net-metering customers from those customers will impose an annual net cost on other non-net-metering customers of $36-$43 million from 2017 to 2046.[29]

Similarly, pursuant to a Louisiana Public Service Commission's (LPSC) directive, the Acadian Consulting Group performed a study to quantify the impacts and implications of Louisiana's net-metering policy currently being utilized by the LPSC for smaller-scale residential and commercial solar

[28] *Getting Distributed Generation Right: A Response to "Does Disruptive Competition Mean A Death Spiral for Electric Utilities*," Energy Law Journal, December 2014 (Volume 35). See Appendix, Tab 1.

[29] E3 *Nevada Net Energy Metering Impacts Evaluation 2016 Update*, August 17, 2016.

energy installations.[30] The final report including a lengthy response to critiques of Acadian's February 2015 draft report was released by the LPSC in September 2015; the final report reiterated that the cost-of-service analysis estimated that over $2 million in typical year utility costs of serving net-metering customers were not being recovered from those customers and were being picked up by the non-net-metering customers. This failure to recover the costs of serving net-metering customers from those customers in typical year was estimated to increase from between $5 million to $31 million in 2020, across all LPSC-jurisdictional utilities, pursuant to two respective solar net-metering installation forecasts. The final report also stated that solar net-metering installations, on average, are estimated to make a 64 percent contribution on average toward recovering the costs of serving those net-metering customers across all LPSC-jurisdictional utilities. Any level below 100 percent indicates that net-metering customers are estimated to pay less than 100 percent of their full cost of service. Under normal utility ratemaking, if the rates paid by the net-metering customers do not recover the cost of serving them, those costs will have to be recovered from other utility customers.

Other studies performed across the United States have yielded similar findings: net-metering customers are not paying rates that recover the costs to serve them as reflected in their respective utility's embedded cost of service.

In a recent proceeding, the staff of the Arizona Commerce Commission noted similar findings.[31] In New York, the NYSERDA 2011 Study estimated the rate impact of displaced distribution cost, and found that the net-metering program will create a direct cross-subsidy of participating net-metering customers by non-net-metering customers of nearly $400 million in 2038, which is the forecasted peak year for energy *production* before projects begin to reach the end of their useful lives.[32] In Massachusetts, the Department of Energy Resources published a 2013 report addressing the economic benefits and costs of the state's solar renewable portfolio standard set-aside that has implications for net-metering installations. That study estimated rate impacts of between $500 and $933 million over a 32-year period.[33]

[30] *Estimating the Impact of Net Metering on LPSC Jurisdictional Ratepayers*, Acadian Consulting Group, September 2015.

[31] Arizona Commerce Commission, Open Meeting re: Arizona Public Service Company-Application for Approval of Net Metering Cost Shift Solution (Docket No. E-0135A-13-0248). Sept. 30, 2013.

[32] NYSERDA 2011 Study, pgs. 7-4 through 7-5. (The Power New York Act of 2011 directed the New York State Energy Research and Development Authority ("NYSERDA") to conduct a study evaluating the costs and benefits of increasing the State's solar generation capacity to 5,000 MW by 2025.

[33] Department of Energy Resources 2013 Study, pg. 17.