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Nevada's Net Energy Metering Experience: The Making of a Policy Eclipse?

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Nevada's Net Energy Metering Experience: *The Making of a Policy Eclipse?*

Developments in Nevada pose important questions about the future of solar power and net metering in the United States.

What information and processes led to Nevada's decision?

Was the information that decision-makers considered consistent with best practices and with the information relied on by other states?

How does Nevada's decision compare with other states evaluating changes to their net metering policies?

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Introduction

Across the United States legal and policy treatment of distributed solar photovoltaic (PV) energy is beginning to change. For decades net energy metering or "net metering" (NEM) served as the leading state-level policy tool to promote distributed solar power in the United States. Under that policy, when a homeowner or business installed solar panels or other qualifying generation and placed extra electricity onto the grid, the utility paid that consumer the same price for the electricity the consumer would pay for electricity purchased from the grid. This policy encourages the installation of distributed power, especially solar photovoltaics, as it reduces the cost of owning or using PV panels.

Over the past several years, however, cracks appeared in the longstanding reign of net metering in the United States. Some utilities proposed new fees on distributed solar. Many states changed their overall caps on net metering programs. Several states adopted successor programs to net metering for residential and business solar power. Amid these changes, Nevada emerged as a prominent example of a state that implemented significant changes to its net metering policy.

In December 2015, the Nevada Public Utility Commission (PUC) unanimously adopted a successor program to its prior NEM scheme. Nevada's changes were so significant that some referred to it as "NEM 2.0"—while others said the new program is not net metering at all but rather "net billing."

Under the new program, Nevada's utilities no longer pay solar and other small-scale energy system owners the retail rate of electricity. Instead, they pay these owners the lower wholesale price of electricity. Accordingly, under this new program, compensation for electricity that NEM customers place on the grid will decrease from almost $0.09//kWh to less than $0.03/kWh in the northern part of the state by 2028, and from more than $0.11/kWh to under $0.03/kWh in the southern part of Nevada (Nevada Pub. Utils. Comm'n, 2016c). The new policy also added monthly fixed charges for each NEM customer. These will rise to $29.18/month in Nevada's northern service territory and $25.76/month in the southern service territory by the year 2028.[1]

The combination of these two changes significantly decreases compensation for the energy system owner and extends the payback period for a solar photovoltaic system. Further, the Commission announced that it would apply the new policy statewide to all NEM customers—even those who were compensated under the prior policy. Therefore, solar customers who purchased or leased PV panels on the premise that a full compensation net metering policy would be in place now find themselves subject to the new net billing policy.

Nevada's changes to its net metering policy had an immediate effect on solar developments within the state. As of 2014, Nevada hosted a thriving solar industry. In that year, Nevada enjoyed the third highest rate of solar photovoltaic deployment in the nation, behind only California and Arizona, with approximately two terawatt-hours of solar generation (U.S. EIA, 2014). SolarCity, Sunrun, and Vivint Solar employed thousands of Nevada workers. Following the changes to Nevada's net metering program, however, the state's solar industry quickly contracted. SolarCity announced that it would cease sales and installations in the state and relocate more than 550 jobs to "business-friendly states" (SolarCity, 2016). Both Sunrun and Vivint Solar similarly announced that they would withdraw operations from the state (St. John, 2016). Meanwhile, new solar installations dropped 92 percent in the first quarter of 2016 following the Commission's decision (Muro and Saha, 2016).

Developments in Nevada pose important questions about the future of solar power and net metering in the United States. What information and processes led to Nevada's decision? Was the information that decision-makers considered consistent with best practices and with the information relied on by other states? How does Nevada's decision compare with other states evaluating changes to their net metering policies?

In this report, we evaluate these questions by first putting Nevada's experience in the context of broader U.S. trends. We then provide three case studies giving greater detail about how Nevada reached its decision, and what changes California and Colorado have made to their NEM programs when they have considered similar questions as Nevada in recent years.

Broader Trends: NEM Under Fire

Net energy metering first appeared in the United States in the early 1980s. Since then, nearly all states adopted this practice. NEM policies allow customers to connect their small energy system—typically solar but also other renewable energy resources—to the electric grid. When the small system owner has excess production, the owner can dispatch the electricity into the grid and receive credit for generation at the retail rate of electricity.

NEM policies proved important in encouraging solar use in the United States (Carley, 2009).[2] Solar PV deployment increased significantly in the U.S. as more states adopted NEM policies. In recent years as solar prices also fell, financing options became more innovative, and jurisdictions adopted other policies that encourage solar deployment, including tax credits and renewable portfolio standards (RPSs) (Darghouth et al., 2016). As of May 2016, one million solar installations operated within the United States. Highlighting just how quickly solar growth is occurring, the Solar Energy Industries Association predicts that the second million installations will be completed within two years, by 2018 (SEIA, 2016).

Prior to the solar boom discussions about NEM policies tended to focus on the nuances of policy design (Bird et al., 2013). As installations increased, however, the focus of these discussions shifted and broadened. In many jurisdictions, conversations now occur on the overall value of solar; the degree to which compensation for solar generation, particularly rooftop solar, is greater or less than this resource's value; the degree to which there is cross-subsidization between solar and non-solar owners; whether fixed costs on consumers' bills actually leads to under-recovery of a utility's true fixed costs; and whether modifications to tariff design are needed (NC Clean Energy Technology Center, 2016a, 2016b; Bird et al., 2013).

Despite the longstanding use of NEM in the United States, many jurisdictions continue to revisit their policies. In 2015, at least 24 states conducted or commissioned formal benefit-cost evaluations of the value of solar and other forms of small-scale energy systems (Blackburn, 2013; NC Clean Energy Technology Center, 2016a).

Beyond these studies evaluating the benefit of solar, many states are considering the redesign of tariff rates or overhauling NEM policies.[3] In fact, over the course of 2015, 27 states, including California, Hawaii, and Nevada, took legislative or regulatory action on their net metering policies. Overall, states are considering six key types of changes for NEM programs:

1) Modifying the overall program caps for NEM policies;
2) Changing the rules for the size of PV systems that qualify for NEM;
3) Imposing charges specifically on solar users;[4]

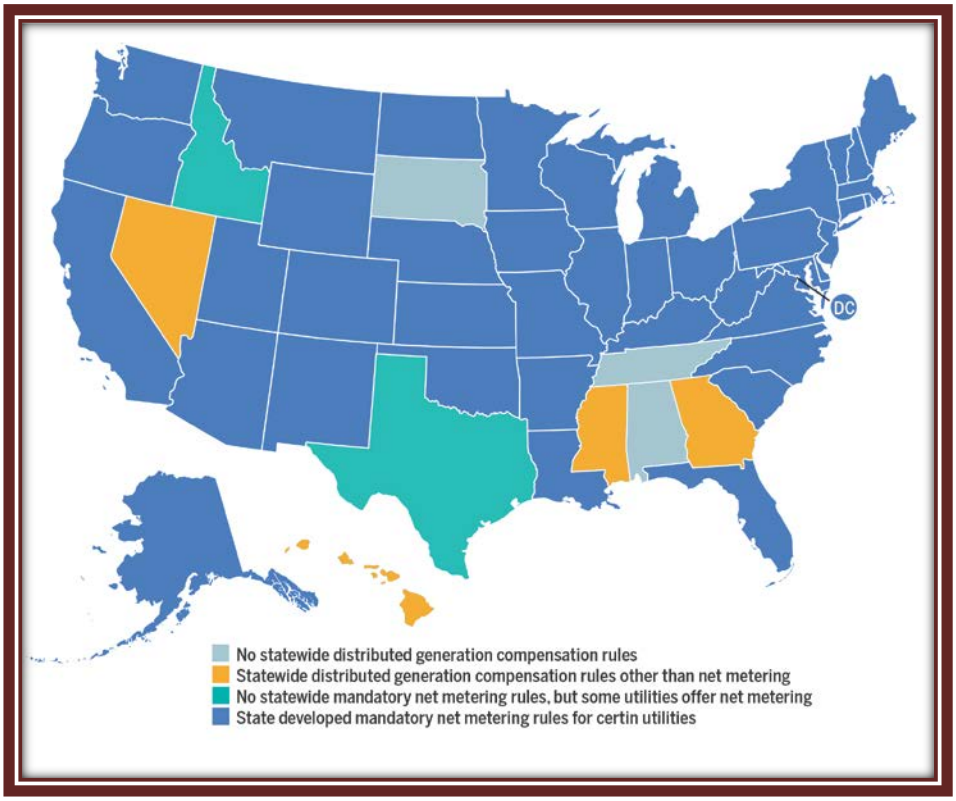
4) Increasing fixed charges for all customers, which can have a negative impact on solar installations;[5]

5) Adjusting the rates at which net excess generation or real-time excess generation is compensated; and

6) Imposing alternative pricing models entirely, such as bidirectional rates.[6]

In addition to these changes, some states adopted net energy policies for the first time in 2015. Notably, South Carolina adopted a NEM policy, and Mississippi adopted a net billing policy. The state of U.S. NEM policy today is thus already different from only a few years ago, as detailed in Figure 1.

Figure 1
Status of States' Net Metering Policies as of March 2016



(adapted from NC Clean Energy Technology Center, 2016)

Until California, Hawaii, and Nevada adopted successor policies to their NEM regimes last year, the most visible attacks on distributed solar came in the form of proposed charges specifically for consumers who installed solar panels. Indeed, in 2015 and 2016, utilities made 17 of these proposals. At the same time, numerous utilities pushed for increased fixed charges system-wide (i.e., not specific to solar). These changes are viewed by some as detrimental to solar deployment because they undermine the economics of PV installations, which rely on variable-rate NEM policies.

As a result of these proposals, several states adopted fixed charges, demand charges, or standby charges that apply to solar NEM customers. Table 1 documents resolved and pending (as of early 2016) cases for both fixed and solar charges. As this table makes evident, while Nevada approved these charges, the majority of states rejected proposed charges altogether, especially those that involved an independently owned utility rather than a municipal or cooperative utility (see Table 1).

Table 1
Resolved and Pending Solar Charges and Fixed Charges, as of March 2016

Year	State	Utility	Solar Charge Proposed ($/kW)	Solar Charge Approved ($/kW)	Fixed Charge Proposed ($)	Fixed Charge Approved ($)	Status
2016	NC	Duke Energy Carolinas	19.91	19.91			Resolved
2015	SC	Santee Cooper	4.20	4.20	17.00		Resolved
2015	CO	Intermountain Rural Electric Association	4.13	4.13			Resolved
2015	AZ	Arizona Public Service	3.00	0.70			Resolved
2015	NV	Sierra Pacific Power Company (d/b/a NV Energy)	8.63	0.00			Resolved
2015	NV	Nevada Power (d/b/a NV Energy)	14.33	0.00			Resolved
2015	KS	Westar Energy	3.00	0.00	50.00	14.50	Resolved
2016	MT	Montana - Dakota Utilities	1.50	0.00	7.50	5.40	Resolved
2016	CA	Pacific Gas and Electric	3.00	0.00			Resolved
2016	CA	San Diego Gas and Electric	9.19	0.00			Resolved
2016	CA	Southern California Edison	3.00	0.00			Resolved
2015	WI	Wisconsin Electric Power	3.79	0.00			Resolved
2015	NE	Omaha Public Power District			35.00	30.00	Resolved
2015	NV	Sierra Pacific Power Company (d/b/a NV Energy)			9.25	29.18	Resolved
2015	NV	Nevada Power (d/b/a NV Energy)			5.40	25.76	Resolved
2015	WI	Wisconsin Public Service Corporation			25.00	21.00	Resolved
2015	NY	Orange and Rockland			25.00	20.00	Resolved
2015	CO	Colorado Springs Utilities			15.24	15.24	Resolved
2015	PA	PPL Electric Utilities			20.00	14.13	Resolved
2015	KS	Kansas City Power and Light			19.00	14.00	Resolved

2015	WI	Northern States Power Company			18.00	14.00	Resolved
2016	IN	Indianapolis Power and Light			11.25	11.25	Resolved
2015	NY	PSEG Long Island			19.80	10.80	Resolved
2015	OR	Portland General Electric			11.00	10.50	Resolved
2016	MD	SMECO			13.44	9.50	Resolved
2016	TX	Southwestern Public Service Company			9.50	9.50	Resolved
2015	PA	PECO Energy			12.00	8.45	Resolved
2016	AR	Entergy Arkansas			9.00	8.40	Resolved
2015	SD	NorthWestern Energy			9.00	6.00	Resolved
2015	ID	Avista Utilities			8.50	5.25	Resolved
2016	RI	National Grid			13.00	5.00	Resolved
2016	AZ	Tucson Electric Power	7.40		20.00		Pending
2016	AZ	UniSource Energy Services (UNS Electric)	6.00		20.00		Pending
2016	CO	Xcel Energy			20.34		Pending
2016	FL	Florida Power and Light			10.00		Pending
2015	IL	Illinois			12.87		Pending
2016	IN	Northern Indiana Public Service Company			20.00		Pending
2016	MA	National Grid (Massachusetts Electric Company and Nantucket Electric Company)			15.00		Pending
2016	MD	Baltimore Gas & Electric			12.00		Pending
2016	MI	Consumers Energy			7.75		Pending
2016	MI	DTE Electric			9.00		Pending
2016	MI	Upper Peninsula Power Co (UPPCO)			15.00		Pending
2016	MN	Northern States Power Company			10.00		Pending
2016	MO	Kansas City Power & Light Greater Missouri Operations			14.50		Pending
2016	NM	El Paso Electric	3.89		10.00		Pending
2016	NM	Public Service Company of New Mexico			13.14		Pending
2016	NY	New York State Electric & Gas			18.89		Pending
2016	NY	Rochester Gas & Electric			26.73		Pending
2016	OH	Dayton Power and Light			13.73		Pending
2016	OK	Oklahoma Gas and Electric	2.68		26.54		Pending
2016	TX	El Paso Electric	3.89		10.00		Pending
2016	WA	Avista Utilities			9.50		Pending

The contrast between Nevada's choice to adopt a high solar fee and the decisions of other jurisdictions to reject such fees, or only adopt modest fees, raises deeper questions about why and how Nevada made these decisions, and how the Silver State compares to other states. We next explore that contrast through case studies of three states that all recently decided to reconsider their NEM policies—Nevada, California, and Colorado.

Nevada

While Nevada's overhaul of its NEM program is recent, the story actually began several years ago. In 2013, the Nevada State Legislature passed a law—A.B. 428—directing the Public Utilities Commission to evaluate "the comprehensive costs of and benefits from net metering in this State" (Nevada Legislature, 2013). On July 8, 2013, the PUC opened an investigatory docket to assess NEM costs and benefits in Nevada (Nevada Public Utilities Comm'n, 2013).

The E3 Cost-Benefit Study

The Nevada Public Utilities Commission (PUC) engaged Energy + Environmental Economics (E3) to conduct a benefit-cost study analysis. E3 defined the scope of the study as projecting the impacts of NEM in Nevada from 2014 onward. To do so, E3 built a base case in collaboration with both the PUC and a "stakeholder advisory group composed of experts from the solar industry, ratepayer advocates, and electric utility representatives" (E3, 2014). In addition, E3 developed five sector-specific analyses consistent with solar benefit-cost analysis best practices outlined in Box 1, including the PCT, the RIM, the PACT, the TRC, and the SCT.

E3 weighed a wide scope of benefits and costs. Benefits evaluated included customer bill savings, RPS compliance value, health benefits from reduced criteria pollutant emissions, and avoided electricity costs from reduced energy bills, ancillary services, transmission capacity savings, transmission loss savings, system capacity savings, and distribution capacity savings.[7] Costs included program implementation and administration costs by the utility, grid integration costs, and costs of distributed generation, less tax credits and other incentives. Although NEM policies may also provide economic development opportunities, E3 did not attempt to measure such benefits; instead it summarized existing literature on the topic.

Analysts of the E3 study relied on data and existing literature. They reviewed over 3,300 solar PV installations, as identified by address, although these data included both those systems that sell back to the grid and those that do not. The analysts also used data from the National Renewable Energy Laboratory to model the likely output for these installations. However, analysts did not model actual grid integration costs. Rather, they surveyed the literature, determined a range of $0 to $18/MWh for this cost, and then decided to use an adder of $2/MWh for all NEM generation.

Box 1: Solar Benefit-Cost Valuation Studies

Although most solar valuation analyses employ distinctive frameworks, several guides and meta-analyses helped identify the most rigorous, transparent, and comprehensive methods that should be used in such studies (Vermont Public Service Department, 2012; California Public Utility Commission, 2001; National Renewable Energy Laboratory, 2014; Synapse Energy Economics, 2014; Interstate Renewable Energy Council, 2013). Principal among these criteria are: (1) an appropriate level of granularity; (2) consideration of various stakeholder perspectives; and (3) a comprehensive coverage of the value—both benefits and costs—of distributed solar.

Granularity is key in evaluating solar. As a distributed resource its impacts are inherently local. Yet, it is often the case that data are not available at the local level, and thus studies are not able to accurately evaluate geographically dispersed impacts. When this is the case, it is important for analysts to clearly outline their assumptions about local and geographic trends, and to note these limitations in their analyses.

Second, in evaluating any set of benefits and costs, it is essential to include the full array of potential implications from a policy change. Notably, which benefits and costs are assessed in evaluating solar policy varies perhaps more than anything in solar cost-benefit studies. The Rocky Mountain Institute's (Hansen et al., 2013) meta-analysis of 16 studies between 2005-2013 outlined a set of 14 costs and benefits that are most frequently used in value of solar studies, summarized, with some additions, in Table 2.

Table 2. Benefit and Cost Categories used in Solar Valuation Studies

Benefit and Cost Categories	Description
Energy	Displaced need to generate energy from another source
System Losses	Energy that would have been lost through the transmission and distribution (T&D) system
Generation Capacity	Deferred or avoided central generation capacity
T&D Capacity	Net change in T&D infrastructure
Grid Support Services	Ancillary services required to enable reliable operation of distributed solar
Fuel Price Hedge	Offset utility cost to guarantee fixed electricity supply costs
Market Price Hedge	Difference in electricity and commodity prices due to lower demand for energy
Security	Change in grid reliability and resiliency
Carbon	Reduced carbon emissions
Health and Criteria Air Pollutants	Reduced criteria NO_x, SO_2, and particulate matter
General Environmental	Reducing water, land use, and value of displaced changes planned to achieve the state's renewable portfolio standard
Social	Net impact on economic development
Technology	Cost of system, land, permitting, and interconnection
Solar Penetration	Change in retail rate revenues and incentives

Third, objective analysis requires consideration of benefits and costs from various points of view. Derived primarily from the California Standard Practices Manual (California Public Utility Commission, 2001), studies increasingly seek to identify impacts on a variety of parties and across multiple dimensions. These include: effects on participants ("Participant Cost Test"); effects on all ratepayers, including solar owners ("Ratepayer Impact Measure"); the total net impact without externalities ("Total Resource Cost"); the effect on utilities ("Program Administrator Cost"); and the net societal impact with externalities included ("Societal Cost Test"). These perspectives enrich our understanding of how policy changes might actually influence society, making the analysis both more transparent and rigorous.

Based on these data and other assumptions, E3 found that NEM systems installed from 2004-16 provide a net benefit of roughly $36 million to Nevada's electricity ratepayers who do not use NEM at their homes or businesses. The analysis highlighted, however, that how and whether NEM provides these benefits depends in part on the state's renewable portfolio standard, which affords substantial additional compliance credit to distributed solar panels. Overall, the E3 study reached five core conclusions:

1) NEM in Nevada creates a net present value benefit of roughly $36 million to *non-NEM ratepayers* in the state;
2) On average, *NEM users* in Nevada pay about $0.02/kilowatt-hour (kWh) more to self-generate electricity than non-NEM users, which creates a net present value of *negative* $135 million dollars over the 25-year lifetime of the systems *for these users*;
3) Before 2014, NEM increased utility bills slightly. However, going forward, NV Energy bills should "decrease substantially due to the self-generation," representing a net present value decrease of "$716 million for all systems installed through 2016 over their 25-year life;"
4) NEM moderately increases electricity costs—by about $0.02/kWh—in the state, due primarily to the lower cost of utility-scale solar rather than distributed solar. However, if the multiplier in Nevada's RPS that gives extra credit to NEM is removed, the costs increase even more;
5) Including societal benefits in the equation "does not significantly" alter E3's other findings, primarily because of Nevada's 25 percent RPS. In fact, because NEM resources get extra credit under the RPS, E3 determined that NEM actually increases emissions within the state (E3, 2014).

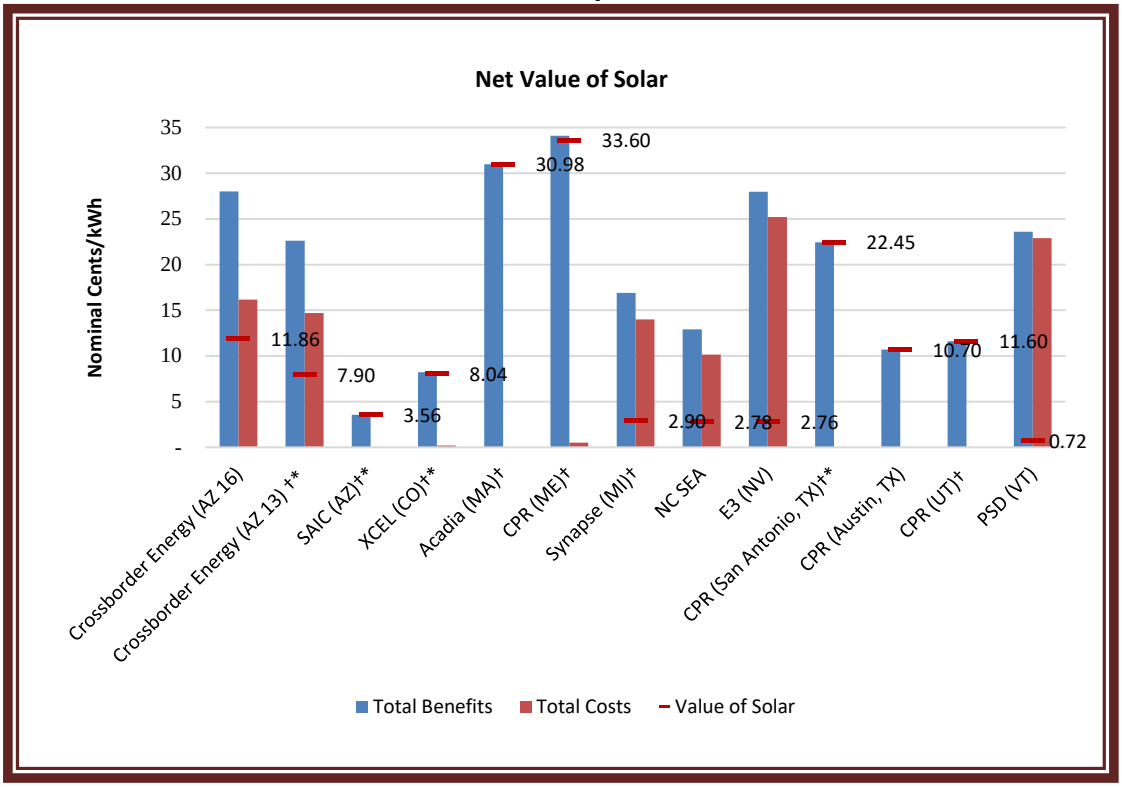
In addition to its primary analyses, E3 ran several sensitivity analyses that demonstrated significant differences in results with a variety of assumptions about whether distribution savings should be included, how rates are designed, alternative electricity prices, and the cost of utility-scale solar. For example, E3 found that altering rates to increase system (fixed) costs and decrease energy (variable) costs would increase the benefit to non-NEM users from $36 million to $95 million. Likewise, if E3's assumed cost of $100/MWh for utility-scale solar decreased to $80/MWh, "the answer on the overall economic proposition of NEM" (E3, 2014) in Nevada would change.

It is important to understand the conclusion of Nevada E3's study in the context of other recent cost-benefit analyses of NEM programs across the nation. Tables 3 and 4 list all benefit-cost analyses conducted on distributed solar since 2013. Specifically, Table 3 presents benefits and Table 4 presents costs and net benefits, both in nominal cents/kWh. The Nevada study is highlighted in grey in both tables. Three of the studies included in this table are missing their corresponding values because their cost and benefit categories were too aggregated in the public version of their report and data to

identify a dollar value for each category listed in the table. Table 4 reveals that Nevada considered a similar range of cost and benefit categories compared to other states' studies. Table 4 also reveals that the majority of studies did not include the cost of purchasing and deploying a solar PV system for the private owner; those that did include this cost—such as Nevada—had much higher overall cost estimates than those that did not.

Figure 2 provides further context for the Nevada study. This table contains these states' benefit, cost, and net benefit-cost values. Nevada offers one of the highest total benefit estimates of all studies reviewed—likely attributable to the inclusion of all distributed solar generation rather than just that generation dispatched to the grid. Nevada's data showed the single highest estimate of total costs. This high cost is driven by the estimate that the study attributed to private solar installation and maintenance costs, a category of costs that the majority of other studies did not include at all.

Figure 2
Total Benefits, Total Costs, and Net Benefits Minus Costs for all State Solar Valuations with Publicly Accessible Data, 2013-2016



Though parties had some criticisms, the E3 study was well received among the public and a variety of interest groups. The Nevada PUC adopted it and issued a report to the state legislature based on its findings (Nevada Public Utilities Comm'n, 2014a; Nevada Public Utilities Comm'n, 2014b).

Table 3

Benefit Values included in States' Solar Valuation Studies

Study Information				Benefits (nominal cents/kWh)												
				Grid Services					Financial Risk		Security	Environmental			Social	
Study	Commissioned by	Year	Currency	Energy	System Losses	Gen Capacity	T&D Capacity	Grid Support Services	Fuel Price Hedge	Mkt Price Hedge	Security Risk	Carbon	Criteria Air Pollutants	General Env	Social	Total Benefits
Crossborder Energy (AZ 16)	AZ Corporation Commission	2016	2016 $	6.2	-	6.95	4.13	-	0.9	1	-	3.3	1.1	0.2	4.23	28.02
Crossborder Energy (AZ 13) †*	AZ Corporation Commission	2013	2014 $	6.95	-	7.15	2.4	1.5	-	-	-	-	-	4.6	-	22.6
SAIC (AZ)†*	AZ Corporation Commission	2013	2012 $	2.57	-	0.72	0.27	-	-	-	-	-	-	-	-	3.56
Vote Solar (CA)*	Vote Solar Initiative	2013	2012 $	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	-
E3 (CA)	CA Public Utilities Commission	2013	2012 $	UA	UA	UA	UA	UA	- UA	UA	UA	UA	UA	UA	UA	-
XCEL (CO)†*	Public Service Company of Colorado	2013	2012 $	5.21	0.62	1.15	0.07	-	0.66	-	-	0.51	-	-	-	8.22
E3 (HI)	HI Public Utilities Commission	2014	-	UA	UA	UA	UA	UA	UA	- UA	UA	UA	UA	- UA	UA	-
Acadia (MA)†	Acadia Center	2015	2014 $	6.64	-	5.6	5.18	-	-	4.84	-	3.11	3.57	2.04	-	30.98
CPR (ME)†	ME Public Utilities Commission	2015	2013 $	8.1	-	4.5	1.6	-	3.7	6.6	-	2.1	7.5	-	-	34.1
Synapse (MI)†	MI Public Service Commission	2014	2013 $	8.1	0.9	1.2	4	-	-	1.5	-	-	-	1.2	-	16.9
NC SEA	NC Sustainable Energy Association	2013	2013 $	6.07	-	3.18	1.22	-	-	-	-	-	-	2.45	-	12.92
E3 (NV)	NV Public Utilities Commission	2014	2014 $	12.38	0.99	4.82	0.78	-	-	-	-	-	0.09	8.9	-	27.96
CPR (San Antonio, TX)†*	CPS Energy	2013	-	10.6	-	1.6	0.3	0.2	2.6	-	-	7.15	-	-	-	22.45
CPR (Austin, TX)	Austin Energy	2014	-	6	-	1.7	1	-	-	-	-	-	-	2	-	10.7
CPR (UT)†	Utah Clean Energy	2014	2014 $	5.6	-	1.4	1.1	-	2.6	-	-	-	-	0.9	-	11.6
PSD (VT)	VT Legislature	2014	2014 $	6.49	-	6.53	4.27	3.1	-	0.11	-	-	-	3.1	-	23.6
			Mean	6.99	0.84	3.58	2.02	1.6	2.09	2.81	-	3.23	3.07	2.82	4.23	19.51

A=Unavailable information due to the report containing only aggregated data
†Reviewed in Hallock and Sargent (2015)
*Reviewed in Hansen et al. (2013)
Source of data: Hallock and Sargent (2015); Hansen et al. (2013); individual benefit-cost analyses.

Table 4:

Cost Values and Net Benefits included in States' Solar Valuation Studies

	Study Information			Costs (Nominal centskWh)				Net Benefits (Benefits - Costs)
Study	Commissioned by	Year	Currency	Solar PV Tech	Grid Support	Solar Penetration	Total Costs	Value of Solar
Crossborder Energy (AZ 16)	AZ Corporation Commission	2016	2016 $	-0.2	-0.3	-15.66	16.16	11.86
Crossborder Energy (AZ 13) †*	AZ Corporation Commission	2013	2014 $	-0.2	-	-14.5	14.7	7.9
SAIC (AZ)†*	AZ Corporation Commission	2013	2012 $	-	-	-	-	3.56
Vote Solar (CA)*	Vote Solar Initiative	2013	2012 $	UA	UA	UA	-	-
E3 (CA)	CA Public Utilities Commission	2013	2012 $	UA	UA	UA	-	-
XCEL (CO)†*	Public Service Company of Colorado	2013	2012 $	-	-0.18	-	0.18	8.04
E3 (HI)	HI Public Utilities Commission	2014	-	UA	UA	UA	-	-
Acadia (MA)†	Acadia Center	2015	2014 $	-	-	-	-	30.98
CPR (ME)†	ME Public Utilities Commission	2015	2013 $	-	-0.5	-	0.5	33.6
Synapse (MI)†	MI Public Service Commission	2014	2013 $	-13	-1	-	14	2.9
NC SEA	NC Sustainable Energy Association	2013	2013 $	-	-	-10.14	10.14	2.78
E3 (NV)	NV Public Utilities Commission	2014	2014 $	-19.5	-	-5.7	25.2	2.76
CPR (San Antonio, TX)†*	CPS Energy	2013	-	-	-	-	-	22.45
CPR (Austin, TX)	Austin Energy	2014	-	-	-	-	-	10.7
CPR (UT)†	Utah Clean Energy	2014	2014 $	-	-	-	-	11.6
PSD (VT)	VT Legislature	2014	2014 $	-	-	-22.88	22.88	0.72
	Mean			-8.23	-0.5	-13.78	12.97	11.53
	Standard Deviation (for values ≠ 0)			9.64	0.36	6.43	9.17	10.87
	Standard Deviation (for all values)			6.23	0.3	7.9	9.6	10.87

UA=Unavailable information due to the report containing only aggregated data
†Reviewed in Hallock and Sargent (2015)
*Reviewed in Hansen et al. (2013)
Source of data: Hallock and Sargent (2015); Hansen et al. (2013); individual benefit-cost analyses.

In response, the legislature adopted Senate Bill 374 (S.B. 374), which became law on June 5, 2015. S.B. 374 changed the cap for all net metering in the state from 3 percent of statewide peak generation capacity to 235 MW. The law also empowered the PUC with new authority to "establish one or more rate classes for customer-generators" (Nevada Legislature, 2015). Further, the bill forbade the PUC, after the 235 MW cap is met, from approving NEM tariffs that "unreasonably shift costs from customer-generators to other customers of the utility" (Nevada Legislature, 2015).

Overhaul of NEM in Nevada

S.B. 347 generated immediate controversy in Nevada. On July 31, 2015, less than two months after legislators passed S.B. 347 into law, NV Energy filed with the PUC seeking to fundamentally alter net metering in the state. Specifically, NV Energy's rate filing sought three core changes to Nevada's NEM program.

First, NV Energy requested that the PUC create a separate customer class for NEM customers, distinguishing them as partial requirements customers. Second, NV Energy sought approval of a new and different kind of compensation scheme for NEM customers. Rather than paying NEM customers full retail rates, NV Energy asked to put a three-part rate schedule in place for NEM: (1) a high, solar-specific service charge for fixed costs; (2) a demand charge for distribution costs; and (3) an energy charge reflecting the cost of providing standby service to NEM customers. Third, NV Energy proposed implementing a new way of billing electricity based on the time of day it is used—a so-called "time of use" (TOU) program.

In support of its proposed rate filing, NV Energy did not directly rely on the E3 Study. Rather, NV Energy submitted a marginal cost of service study (MCSS) as it would with a regular rate filing, which it said was consistent with its prior rate filings. NV Energy stated that the E3 CBA study was irrelevant to rate proceedings: "A cost-benefit study does not estimate marginal costs or prices of any kind. . . . [I]t focuses on whether a specific investment, policy or program is desirable or not" (NV Energy, 2015).

NV Energy's filing marked the start of a contentious, heated proceeding. Numerous parties took issue with NV Energy's proposed plan, lodging a wide range of complaints. Several parties attacked both the concept and specifics of NV Energy's MCSS analysis. Others urged the Commission to consider the E3 study as part of its analysis. The PUC's Regulatory Operations Staff suggested that the Commission reject NV Energy's filing, because it is not appropriate to create new rate classes between general rate cases. Finally, many parties urged the Commission to grandfather existing NEM customers and not apply NV Energy's proposal to them. In fact, NV Energy initially agreed that these customers should be grandfathered (Nevada Public Utilities Comm'n, 2015).

Despite the wide-ranging opposition to NV Energy's proposal, the Nevada PUC largely approved it, creating a very new and different net metering regime for the state. Thus,

many observers began referring to this new regime as NEM 2.0. The PUC found NV Energy's MCSS consistent with regulations and prior cost studies provided by the company to support rate filings. It also found NEM ratepayers sufficiently different from non-NEM ratepayers to put them in a new rate class. The Commission reasoned that NEM customers are only partial requirements customers and that their usage profiles differ on an hourly basis from non-NEM customers, making the cost of serving them different from full-requirements residential customers: "Separate rate classes will address the inequity between NEM and non-NEM ratepayers . . . . The subsidy to NEM ratepayers [today] is not paid by the utility as some parties incorrectly suggest; rather, the subsidy flows from non-NEM ratepayers to NEM ratepayers, with the utility collecting the same amount regardless of how costs are allocated among the different ratepayers" (Nevada Public Utilities Comm'n, 2015).

The Commission also rejected the notion that the E3 study should be relied on to st NEM rates. Although the E3 study found that net metering provided non-NEM customers with a $36 million benefit, the PUC said that the MCSS showed a $9 to $114 per month subsidy from non-NEM customers to NEM customers. Further, the Commission reasoned, the E3 study's conclusion that utility-scale solar would cost $100/MWh was undermined by a recent power purchase agreement that NV Energy entered into for $50/MWh (Nevada Public Utilities Comm'n, 2015).

Nor was the PUC persuaded by requests to grandfather existing NEM customers, or that its decision was likely to hurt the solar industry. On the first point, the Commission said there is "no difference" between old and new NEM customers in terms of their usage and NV Energy's costs of serving them (Nevada Public Utilities Comm'n, 2015). On the second point, the PUC called the "exodus of small-scale (rooftop) solar vendors" from the state "unfortunate[]" but said it reflected their "short-sighted business strategy that is harmful to the long-term viability of solar energy" (Nevada Public Utilities Comm'n, 2016b).

Thus, the PUC put a new net billing scheme in place for Nevada. The PUC announced that this new program would be implemented in five stages over twelve years. Although the PUC generally approved NV Energy's proposal, it rejected the idea of imposing a demand charge as NV Energy suggested. Instead, the PUC decided that NEM customers would now pay two charges: (1) an increased "basic" service charge for fixed costs, higher than what other retail customers pay; and (2) a volumetric rate for energy, less the energy provided by the customer back to NV Energy. However, rather than compensating NEM customers at the fully bundled retail rate for the electricity, these customers will only receive the levelized cost of avoided energy. NEM customers might be able to further reduce their cost of electricity by using time of use rates, approved by the PUC. The PUC also ordered NV Energy to include a line item on every customer's bill in the state for the amount of the "NET ENERGY METERING SUBSIDY" they pay each month (Nevada Public Utilities Comm'n, 2016a).

Overall, the PUC's decision substantially reduced compensation to Nevada's NEM customers. For instance, prior to 2016, NEM customers in the Nevada Power Company service territory would have paid a $12.75/month basic service charge and just over $0.11/kWh for electricity. They would also receive $0.11 for every kWh of electricity the put back to the grid. By the time the PUC's order takes full effect in 2028, however, the same customer will pay a $38.51/month basic service charge and roughly $0.10/kWh for electricity. However, when that customer sends power back to the grid, they will receive just over $0.02/kWh in compensation (Nevada Public Utilities Comm'n, 2016c).

However, as is also true in California and Colorado, the story of net metering in Nevada is not yet over. In July 2016, NV Energy made a filing with the Nevada PUC asking that customers who had submitted applications to interconnect their NEM systems prior to January 1, 2016 be grandfathered into the old NEM payment scheme. Meanwhile, Nevada Governor Brian Sandoval reinstated the state's New Energy Industry Task Force, which recommended that the PUC grandfather preexisting NEM customers and, on September 16, 2016, the PUC reversed its approach to grandfathering. It unanimously ordered that over 30,000 pre-NEM 2.0 customers receive original NEM rates. Meanwhile, a state court found that the PUC had illegally forbidden grandfathering in the first instance, and the Task Force went a step further, recommending that the state legislature consider a bill in 2017 that would "authorize a reasonable minimum bill structure as a compromise interim measure" while reinstating "retail rate net metering" as a way to "resurrect the residential and small commercial solar market in Nevada" (Nevada New Energy Task Force, 2016).

California

In many ways, California's recent revision of its net metering program marks a middle path from Nevada's dramatic move away from traditional NEM, and other states decisions keeping traditional NEM in place. Like Nevada, California's PUC made significant changes to how net metering will operate. Unlike Nevada, however, the California PUC left the fundamental structure of its prior net metering program in place, including payment to NEM customers of the full retail price of electricity. Thus, while many observers have labeled California's new program a kind of NEM 2.0, it is different from Nevada's new program.

As in Nevada, California's decision to keep its NEM program mostly in place must be understood in the context of statutory evolution in the state. On October 7, 2013, Governor Brown signed into law Assembly Bill 327 (A.B. 327), which gave the PUC a number of new obligations. Among these was a charge to revisit the NEM program. Specifically, A.B. 327 obligated the PUC to develop a new "standard contract or tariff" for NEM "no later than December 31, 2015" (California Legislature, 2013). In doing so, A.B. 327 charged the PUC with achieving several separate but interrelated objectives:

1) Ensuring that "customer-sited renewable distributed generation continues to *grow sustainably*";
2) Basing the program on "*the costs and benefits of the* renewable electrical generation *facility*"; and
3) Making sure that the NEM program has "*total benefits . . . to all customers* and the electrical system [that] are *approximately equal to* the [its] *total costs*."

Importantly, lawmakers did not employ this language in the original version of A.B. 327. Until almost the end of the legislative session, they considered a different draft of the bill. The original version contained more aggressive language than Nevada's in pointing the PUC toward reducing the amount paid to NEM customers. It stated that the PUC must "ensure" that NEM rates are "based on the electrical system costs and benefits received *by nonparticipating customers of the electrical corporation*" and also "*reserve nonparticipant ratepayer indifference*" (California Public Utilities Comm'n, 2016).

Two fundamental differences distinguished California's amended bill as ultimately adopted, from Nevada's legislation. First, the legislature removed any reference to "nonparticipants" and "nonparticipating customers." By its very nature, this virtually guaranteed that the PUC would need to look at the benefits and costs of NEM more broadly than the Commission in Nevada did. Indeed, the legislature underscored this point by revising A.B. 327 to state that NEM tariffs must reflect the "total benefits . . . to all customers and the electrical system" rather than the "benefits received by nonparticipating customers" as the draft bill had originally read. Second, the amended bill added an affirmative obligation for the PUC to ensure that customer-sited renewable generation will "continue to grow sustainably." This entirely reoriented the scope of the bill toward promoting distributed solar—and away from a debate over "who pays what" within the system.

Potential Visions of California NEM 2.0 – Four Different Paths

A.B. 327 obligated the California PUC to modify its net metering program through a rulemaking proceeding rather than by adjudicating any specific utility's tariffs or rates. The PUC initiated this proceeding on July 17, 2014. That order invited public comment and made the state's three largest utilities, Pacific Gas & Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E), respondents (California Public Utilities Comm'n, 2014).In the rulemaking, the parties offered different solutions for reformulating NEM in California. These proposals coalesced into four different possible paths forward.

First, some parties, including solar interests, suggested that the PUC simply leave the existing NEM program in place, specifically by keeping the full retail rate of electricity as the form of compensation for NEM generation.

Second, some parties argued to retain the full retail rate of electricity as the amount of NEM compensation and to require NEM users pay a demand or installed capacity charge. Under this proposal, NEM customers would still receive a high level of payment for generated electricity, but they would be subject to an additional charge for their use of the grid. The Natural Resources Defense Council and the Office of Ratepayer Advocates advocated this path.

Third, the state's three large utilities argued for an approach much like that ultimately adopted in Nevada. Specifically, they urged the Commission to reduce the amount that NEM ratepayers receive for electricity. Retail rates in California average about $0.17/kWh, and PG&E wanted to pay NEM customers $0.10/kWh, and SCE wanted to pay them $0.08/kWh. In addition, the utilities suggested that NEM customers pay a $3/kW-month demand charge, as well as a one-time interconnection fee for connecting to the grid.[8]

Finally, three parties, including SDG&E, proposed that the Commission adopt a form of NEM where customers would be paid a rate that reflects the "value of renewables." For instance, Californians for Renewable Energy (CARE) suggested that customers with facilities up to 3MW pay for all of their energy consumption from their utility, but then sell back all of the power they generate at the utility's levelized avoided cost in a "buy all, sell all" arrangement (California Public Utilities Comm'n, 2016).

The Role of Costs and Benefits in California's Proceeding – The "Public Tool"

As in Nevada, how to treat NEM costs and benefits figured prominently in the California PUC's decision. To implement A.B. 327's charge that it ensure the "total costs" of NEM are "approximately equal" to the program's "total benefits," the PUC created what became known as the "Public Tool." This tool was a spreadsheet model that allowed parties to create their own cost-benefit scenarios.

The Public Tool took a fairly wide view of NEM benefits and costs. It relied on an avoided cost model, with some simplifications, created by E3. That model included electricity system benefits and costs, California carbon allowances, and RPS procurement. It also accounted for the cost of distributed power, interconnection costs, billing and metering costs, and integration costs. The tool expressly did not include any societal benefits of NEM, although it included a dimension where users could populate that data. The tool also provided outputs for the RIM, PCT, PACT, TRC, and SCT tests, as well as metrics for distributed power adoption rates, greenhouse gas reductions, and participant cost-benefit ratios and payback periods (California Public Utilities Comm'n, 2015).

The California PUC's Decision

In an order issued January 28, 2016, the PUC voted 3-2, to retain the primary parts of the pre-existing NEM program in place, with some changes.

A key consideration, of course, was how to treat benefits and costs. Despite its importance, the Commission decided to defer this question. The PUC observed that while the costs of NEM are concrete and well known, system benefits are less explored and harder to quantify. The PUC had two other ongoing proceedings to garner further information about NEM benefits, and believed that its primary obligation under A.B. 327 was to ensure sustainable growth of NEM resources. The PUC declined to determine the actual proportion of NEM costs and benefits. Instead, the PUC highlighted the need to fulfill the statutory obligation to institute a new NEM program by December 2015 (California Public Utilities Comm'n, 2016). The Commission also rejected the California utilities' claims that A.B. 327 must be read as prohibiting cost-shifting from NEM customers to non-NEM customers. To the contrary, the Commission noted that both the plain language and the legislative history of A.B. 327 foreclosed that reading of the law. Finally, the Commission said it did not matter that the Public Tool showed that non-NEM customers incurred more costs than benefits from NEM in the state, because the statute mandates looking at "total" benefits, not benefits by customer class.

With these issues settled, the Commission determined that it was important to keep the existing structure of NEM—including payment of the full retail rate—in place, particularly given that the policy was working well. As of September 2015, the solar industry installed nearly 3,241 MW of NEM capacity from 410,350 projects—nearly 400,000 of which were residential (California Public Utilities Comm'n, 2016). The PUC also rejected proposals to impose demand or installed capacity charges on NEM customers.

The Commission did, however, make several changes to California's NEM program. First, it ruled that all new NEM customers must use TOU rates. Second, it held that customers must pay a reasonable interconnection fee, perhaps on the order of $100. Third, NEM customers will now have to pay all "nonbypassable" charges for distributed generation owners, such as the Nuclear Decommissioning Charge or the Competition Transition Charge. Finally, the Commission said it would revisit this new NEM program in 2019.

Although it made these changes, the PUC expressly decided that all NEM customers will be grandfathered into their current programs. Thus, NEM customers that are already connected to the grid will receive payment under their current program for 20 years from interconnection—and new NEM 2.0 customers will be able to take advantage of that program for 20 years after they connect, even if NEM 2.0 becomes NEM 3.0 in 2019 (California Public Utilities Comm'n, 2016).

Almost immediately, California's decision received acclaim from distributed solar advocates, particularly in contrast to Nevada's actions. The state's decision, however, is not yet fully resolved. Several parties, including California's investor-owned utilities, have sought rehearing, and the PUC has not yet ruled on those motions.

Colorado

Two key differences distinguish Colorado's experience from Nevada's and California's. First, unlike in Nevada and California, Colorado's revisiting of its net metering program was not in response to a new legislative mandate. Second, unlike in Nevada and California, Colorado decided to simply leave its net metering program unchanged. This decision was hailed by many as a major victory for distributed solar. As it turns out, however, the fate of net metering in Colorado may still be in question.

Similar to Nevada, Colorado's reassessment of NEM started well before the Colorado PUC opened a proceeding specifically on the topic. Rather, it began in 2013, when the PUC began considering Public Service Company of Colorado's (PSCo) renewable energy compliance plan. Eventually, that proceeding led to a later one, opened by the PUC on March 12, 2014 to assess emerging issues in the state's NEM program (Colorado Public Utilities Comm'n, 2014). As part of this proceeding, the PUC convened four separate stakeholder roundtable panel sessions over the course of more than a year.

Distributed Solar Generation Studies

In the 2013 proceeding, PSCo submitted a detailed study assessing the benefits of net metering to its system. In response, the Vote Solar Initiative and The Alliance for Solar Choice submitted their own analysis, commissioned from the consulting group Crossborder Energy. PSCo's study expressly limited itself to benefits and costs on the utility's system. Thus, the study did not address societal costs or benefits, did not weigh NEM's impacts on PSCo's customers, and did not assess whether NEM creates any cross-subsidization among customer classes (Public Service Co. of Colorado, 2013). Overall, PSCo found that net metering provides somewhere between $63.90/MWh (the low gas price case) to $103.80/MWh (the high gas price case) in net benefits to its system, with a base case estimate of $80.20/MWh. Across the board, the bulk of these benefits came in the generation aspect of the company's business, primarily from avoided energy costs. Specifically, PSCo estimated that avoided energy costs accounted for 63% of net metering's benefits in the base case.

The study did not find large distribution- and transmission-related benefits from NEM, in part because PSCo determined that distributed solar tends to produce power in average rather than peak system conditions. It also found that solar installed on commercial structures tends to provide more distribution benefits, because commercial installations correlate better to heavy loads on the distribution system. However, the study found very low costs for integrating NEM resources. These ranged from $0.50/MWh in the low

gas case to $1.80/MWh in the base case to $4.40/MWh in the high gas case. Finally, as an "additional observation" at the end of its study, PSCo stated that "customers who install DSG use the Company's transmission, distribution, and generation systems more than non-DSG customers." (Public Service Co. of Colorado, 2013). However, PSCo did not explain how this observation related the assessment of NEM's overall net benefits.

Crossborder (2013) subsequently submitted an analysis to the PUC critiquing the assumptions and results of the PSCo analysis. Crossborder's core argument was that PSCo undervalued the benefits of net metering both by failing to account for some benefits and for not giving full credit to others. Crossborder agreed that PSCo accurately and fully valued the avoided energy costs, as well as avoided transmission and distribution line losses and fuel hedging. However, Crossborder suggested that PSCo undervalued NEM's benefits in avoiding generation capacity, transmission, and distribution additions, and in reducing criteria air pollution. Crossborder also criticized PSCo for not accounting at all for a variety of other benefits of net metering, including: grid support services, avoided RPS compliance costs, grid security and resiliency, reduced water use, avoided land costs, and general social benefits (job creation, economic development, and health impacts).

Adjusting for these perceived deficiencies Crossborder recalculated PSCo's estimates, including a 10% adder for societal benefits. Specifically, according to Crossborder, NEM's net benefits in Colorado range from $163.50/MWh in the low gas case to $181.60/MWh in the base case to $207.50/MWh in the high gas case. In these figures, generation benefits play a much smaller role than PSCo estimated: for instance, only 31% of overall benefits in the base case (Crossborder Energy, 2013). Ultimately, after deducting the cost of paying NEM users, Crossborder estimated that Colorado NEM provides roughly $13.6 million in net benefits to PSCo and its ratepayers per year.

The 2014-15 Informational Proceeding

The PSCo and Crossborder analyses featured prominently in the 2014-15 informational proceeding convened by the PUC. However, that proceeding expanded its scope beyond an assessment of NEM's benefits and costs.

In the 2014-15 proceeding, PSCo argued that non-NEM ratepayers are subsidizing NEM users. PSCo contended that the Crossborder study overestimated NEM benefits by more than $100/MWh, and that non-NEM customers pay NEM customers a subsidy of $18 million per year (Public Service Co. of Colorado, 2014). The study raised two key questions (1) Does Colorado law allows for NEM customers to be put into a separate rate class?, and (s) Should NEM customers be compensated at the full retail rate? Parties agreed that different residential rate classes can be created, but they differed on whether that was warranted for NEM users.

On the second question of NEM compensation, the 2014-15 proceeding participants sharply disagreed. PSCo and the Office of Consumer Counsel, for example, contended that Colorado law does not require full retail rate payments to NEM customers. Instead, they said, the law simply requires a credit, and this credit can be for energy only. Other parties, including the Commission's trial staff, read the Colorado statute as requiring full retail rate compensation.

At the end of the 2014-15 proceeding, in August 2015, the PUC decided simply to take no action at all. This meant that the existing NEM program requiring payment of full retail electricity prices to NEM customers remained in place. "The scope of this proceeding was informational," the Commission wrote, "therefore, we defer consideration of specific claims and requests for relief to future adjudicated proceedings, as proposed by many of the participants" (Colorado Public Utilities Comm'n, 2015).

Despite the PUC's decision, its ruling appears not to have marked the end of the story for net metering in Colorado. On January 25, 2016, PSCo filed a new case to revise substantially its overall retail rates. Among other changes, PSCo requested to increase the amount of its basic fixed services charge and to decrease the amount of its variable energy charges—two of the very proposals it had suggested in the 2014-15 proceeding. This rate case is still in litigation, and distributed solar advocates are actively participating.

Discussion and Conclusion

As distributed solar installations increase across the U.S. so too, do state and utility discomfort with NEM policies. This trend may increase if costs of installing PV panels continue to decrease and the success of solar companies continues to grow. In this respect, then, the State of Nevada should not be seen as an outlier, but rather, as a bellwether for utilities increasingly pushing back against the growth of distributed solar. Indeed, in recent years a majority of states have reviewed their net metering policies, either by conducting formal cost-benefit analyses of NEM programs, or by taking regulatory or legislative action on their NEM policies. Yet, the experience in Nevada fundamentally differs from other states NEM activities in several regards.

One difference concerns how Nevada dealt with its treatment of the cost-benefit analysis conducted within the NEM program. After requesting and conducting this analysis of distributed solar—and finding net positive overall benefits of the state's NEM program despite quite high estimates of overall system costs—the Nevada PUC did not use this study to inform their decisions about the NEM amendments. Instead, it eschewed the study on the premise that it was irrelevant to a ratemaking discussion. The PUC also suggested the study contained erroneous assumptions that resulted in positive net benefits of the NEM program. This stood in contrast to the approaches of both California and Colorado, which decided to effectively keep net metering in place,

with California deciding it would be imprudent to abandon a program that was working until all benefits of NEM could be determined more concretely.

Even more starkly, Nevada stands out against other states for the sharp break it made from traditional net metering policy. The fact that so many states question net metering as evidenced by the deep examinations that regulators in California, Colorado, and Nevada all made into their programs, shows that the course of NEM in the United States may be beginning to change. However, unlike Colorado, which chose to maintain its program, or California, which modified its scheme only around the edges, Nevada struck a very different path away from what has long been understood to be net metering—so much so that many observers decline to even refer to Nevada's NEM 2.0 regime as net metering at all. This can be seen clearly in the steep decrease in compensation Nevada chose to implement, as well as in the highest-in-the-nation charges it chose to impose, as Table 1 above reveals. Certainly, Nevada's new program sends a much less welcoming message to rooftop solar interests than the jurisdiction had previously offered.

Perhaps just as important, the context in which Nevada made its decision was both quite telling and divergent from other jurisdictions. Unlike California, which by statute used rulemaking procedures to revisit its NEM program, or Colorado, whose PUC instigated an exploratory, informational proceeding, Nevada chose to revamp its program in the context of a utility-specific adjudication. It bears noting that once NV Energy made its rate filing, the PUC was obliged to act on it in some way, and the legislative background in that jurisdiction appeared to at least invite an application like the one NV Energy made. Nonetheless, the difference in procedures matters, because procedure determines context. Nevada had commissioned a cost-benefit analysis, and that analysis seemed to point toward keeping NEM in place in the state. The decision whether to use net metering at all is clearly a policy choice that any given state is free to make. Indeed, as the Nevada PUC rightly noted, cost-benefit analyses are most useful in the policymaking context. However, once the framework in Nevada shifted from a broad policymaking one, like California and Colorado used, the decision-making context did as well. Given this shift, it perhaps was unsurprising that the focus of the Nevada PUC's analysis changed as well. Moving Nevada's assessment of NEM out of a public-focused policy context to a utility-specific ratemaking explains, at least in part, the state's choice to move from net metering to net billing. Because it zeroes in on specific utilities rather than looking statewide, the ratemaking context is, by nature, less focused on the overall public good than the policymaking context.[9]

Yet, arguably the most important change that Nevada made was declining to grandfather existing NEM users in the state, even if the decision was only temporary. Research has shown that one of the most crucial features of renewable energy support regimes is stability (Couture et al., 2010; Davies and Allen, 2014; Wiser and Pickle, 1998). The Nevada PUC's decision stands in direct contrast to this showing. It also stood in contrast to California's choice to protect the expectations of that state's consumers, who, as residential customers, are less sophisticated than investor-owned utilities or

merchant generators that devote their businesses full-time to buying and selling power. Perhaps most surprising of all, the Nevada PUC made its original decision to not grandfather in contravention of the utility's proposal, which suggested that existing NEM customers should be grandfathered. Given this, it should not be surprising that many advocates cast the PUC's decision as anti-rooftop solar, even with the present modifications.

In the end, Nevada's choice to abandon net metering may raise as many questions as it answers. The decision makes clear that Nevada has, for now, chosen to take a different path than other jurisdictions. Whether other jurisdictions will follow suit—or whether they will choose paths more akin to California or Colorado, or another path entirely—remains to be seen. Indeed, only time will tell, just as the world will continue to watch, keenly, any developments that may further unfold in Nevada.

Endnotes

[1] The basic services charge for all customers in these service territories is $15.25/month and $12.75/month, respectively. The solar charges listed above are in addition to these basic services charges.

[2] As with most state energy policies in the United States, NEM policy design varies from state to state. Key NEM policy design features include: the system capacity size that is allowed, the total NEM program capacity, which energy resources are eligible, whether community solar is allowed, and the degree to which credits can be rolled over across months and years. Given the variety in state policies, and the rapid changes in the solar industry, jurisdictions naturally seek to modify and tailor their policies over time.

[3] It is important to note here that states have varied in their rationales for pursuing these changes. While some states are responding to concerns vocalized by stakeholders about declining utility recovery of fixed costs, others are attempting to expand solar penetration through broader regulatory reforms; others yet are investigating the value of solar, and how to accurately price it through tariffs according to its value (Funkhouser et al., 2015).

[4] A solar charge is a charge that is levied on the solar PV owner, and can be based on a fixed dollar value ($), can vary according to the maximum demand that the customer had in a given month ($/kWh), or can be based on the size of a costumer's solar PV system ($/kW).

[5] A fixed change is a specific charge that is added on to consumers' electricity bill each month. When state utility commissions increase these fixed charges, they typically also reduce variable energy charges, which can undermine the economics of distributed solar that relies on NEM. NEM payments are based on energy production and do not reduce the fixed charge portion of the customer's bill.

[6] A bidirectional rate prices all consumer services as separate from producer services. A variation of this rate is the "buy-all, sell-all" model, in which the utility purchases all of the solar PV owner's electricity and the solar PV owner purchases all of his/her electricity from the grid. For more detail on these alternative tariff designs, see Linvill et al. (2013), Bird et al. (2013), and Blackburn et al. (2013). For studies that compare the effects of different policy designs, see Darghouth et al. (2016) and Eid et al. (2014).

[7] E3 did not include distribution savings in the base case but did assess them in a sensitivity analysis.

[8] SDG&E's proposal was similar but used different rates and was more complicated.

[9] Although NV Energy is the parent company for the only two investor-owned utilities in the state, and thus a ratemaking decision applicable to NV Energy has wide effect, NEM programs vary from state to state and do not always apply only to investor-owned utilities. Moreover, parties have questioned the appropriateness of changing NEM rates in standalone, NEM-specific dockets, rather than in general ratemaking proceedings.

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