Energy+Environmental Economics
101 Montgomery Street | Suite 1600 | San Francisco, CA 94104 | 415.391.5100 |

Stephanie Mullen
Executive Director
Public Utilities Commission of Nevada
1150 E. William St
Carson City, Nevada 89701

Dear Ms. Mullen,

Please find attached an updated study, *Nevada Net Energy Metering Impacts Evaluation 2016 Update,* which was requested by the Nevada Legislative Committee on Energy.

As you know, E3 conducted a study in 2014 to quantify the cost impacts of Net Energy Metering in Nevada using the best data available at the time. The 2014 study was conducted through the Public Utilities Commission of Nevada (PUCN) and a stakeholder process that included participation from the Nevada utilities, the solar industry, ratepayer advocates, and the PUCN staff.

Using the same methodological framework, E3 has updated the 2014 study with the latest costs and data as described within the revised study. In order to update many of the study inputs we requested updated datasets from NV Energy from their Integrated Resource Planning processes through PUCN. The analysis behind this study was performed independently by E3 staff without any involvement of PUCN staff or any other outside groups.

Thank you for the opportunity conduct this update. We look forward to working with the Nevada Legislative Committee, the PUCN, and other stakeholders to describe the study, results, and to provide any additional support that might be helpful.

Sincerely,

Snuller Price, Senior Partner

Nevada Net Energy Metering Impacts Evaluation 2016 Update

August 2016

Energy+Environmental Economics

Nevada Net Energy Metering Impacts Evaluation 2016 Update

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Energy and Environmental Economics, Inc.
101 Montgomery Street, Suite 1600
San Francisco, CA 94104
415.391.5100
www.ethree.com

This report is prepared by:

Snuller Price

Zachary Ming

Alison Ong

Sheridan Grant

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1 Executive Summary

1.1 Study Overview

This study provides an update to the 2014 report "Nevada Net Energy Metering Impacts Evaluation," which calculated the costs and benefits of renewable generation systems under the state's net energy metering (NEM) program. Energy + Environmental Economics (E3), hereafter referred to as "we", completed the 2014 study with input from the Public Utilities Commission of Nevada (PUCN) and a stakeholder advisory group composed of experts from the solar industry, ratepayer advocates, and electric utility representatives.

This 2016 update follows the same methodological framework while incorporating the most up-to-date utility data. At the end of 2015, the Nevada PUC adopted reforms to the NEM tariff that included an increase in fixed charges, a decrease in the variable energy rate, and a separate, lower compensation rate for energy exported back to the grid. All costs and benefits in this updated study are calculated under the NEM structure as it existed prior to the reforms instituted at the end of 2015. This perspective allows the study to address the question "what *would* the cost impacts of NEM have been if *no* reforms had been enacted." This perspective also allows the study to estimate the impacts of "grandfathering" systems installed prior to the reforms.

NEM is an electricity tariff designed to encourage installation of customer-sited renewable generation. Under the NEM tariff, a customer can self-generate electricity, reducing purchases from the utility, and sell excess electricity back to the utility at retail rates. Customers with solar photovoltaic (PV), solar thermal electric, wind, biomass, geothermal electric, or hydroelectric distributed generation (DG) installations are eligible for Nevada's NEM tariff, although the vast majority of installations are solar PV. For this reason, this study focuses solely on solar PV.

A number of complimentary programs in Nevada also serve to encourage DG installations in the state. Some DG systems receive financial incentives through NV Energy's RenewableGenerations program. Generation from these incentivized systems can be counted towards Nevada's renewable portfolio standard (RPS), which requires NV Energy (Nevada's two electric utilities, Nevada Power Company and Sierra Pacific Power Company, jointly) to produce 25% of its generation from eligible renewable resources by 2025. Lastly, the Federal Investment Tax Credit (ITC) works to incentivize DG installations by offsetting 30% of eligible installed system capital costs.

As of June 2016, over 30,000 individual solar PV systems were installed or in the pipeline of NV Energy's NEM program, totaling over 265 Megawatts (MW), approximately 3% of NV Energy peak demand. These systems produce about 472 Gigawatt-hours (GWh) of energy annually, approximately 1.5% of NV Energy electricity generation.

1.2 Updates to 2014 Study

This update generally follows the same framework and methodology as the 2014 study while incorporating the most up-to-date data from NV Energy. Much of the data used in this study is *substantially* different than what was used in the 2014 study. Unsurprisingly, many of the results and final conclusions are different as well. The following list provides a brief overview of the key data inputs that drive changes in the results between the 2014 and 2016 studies.

- Natural gas price declines
  - Lower natural gas prices decrease in the avoided cost of energy by approximately 50%, making self-generated electricity relatively less economic
- Utility-Scale RPS cost declines
  - Lower costs of utility-scale renewable resources, from \$100/MWh in 2014 to \$36/MWh in 2016, decreases the 'RPS Value' benefit by nearly 95% and make self-generated electricity relatively less economic

Additionally, this 2016 study incorporates a few methodological changes, none of which have a substantial impact on the results.

- Solar generation data is now provided by NV Energy instead of simulated by E3
- Demand charge savings are now included in the base case bill savings since customer load data is now available from NV Energy
- Distribution avoided costs are now included in the base case while the exclusion of these costs is presented as a sensitivity

+ Simplify the three vintages in the 2014 study to two vintages by combining pre-2014 and 2014/2015 into an "existing" vintage category since both categories have now been installed.

Finally, the scope of this study is slightly narrower than the 2014 study. In this iteration, we do not analyze wind NEM systems, do not conduct a demographic analysis of NEM customers, nor conduct a review of the macroeconomic impacts of NEM in Nevada.

1.3 Scope of Analysis and Results

In this study, we investigate the impact of existing NEM PV systems as well as the projected impact of future NEM PV systems. Both vintages of installations are analyzed under the rate structure of the old NEM tariff before the reform at the end of 2015. For consistency with the previous report, results are presented in 2014 dollars. This allows results to be compared side-by-side.

1.3.1 COSTS AND BENEFITS OF NEM

We evaluate the cost-effectiveness of NEM generation from five different perspectives to provide a comprehensive assessment of the costs and benefits of the NEM program. These tests are typically applied when assessing the cost-effectiveness of distributed resources and reflect the industry standard used in all 50 states.[1] The core questions the cost-effectiveness tests answer are the following:

[1] The 'cost tests' are defined in the California Standard Practice Manual used nationwide which is available for download at: http://www.cpuc.ca.gov/NR/rdonlyres/004ABF9D-027C-4BE1-9AE1-

1) Is renewable self-generation cost-effective for the customers who install systems? (Participant Cost Test or "PCT")
2) What is the cost impact on non-participating utility customers? (Ratepayer Impact Measure or "RIM")
3) Recognizing that some utility bills may go down and others may go up, does the NEM program reduce utility bills overall? (Program Administrator Cost Test or "PACT")
4) Does NEM generation reduce the overall cost of energy for Nevada? (Total Resource Cost Test or "TRC")
5) Does NEM generation provide net societal benefits considering the cost and externalities such as the health impacts from NEM? (Societal Cost Test or "SCT")

The cost-effectiveness analysis of existing systems (June 2016 and earlier) incorporates all of the changes that have occurred in the past that affect NEM-eligible systems. Several of the most notable changes include:

- A significant reduction in RenewableGenerations incentives in 2014
- The elimination of payment for the public purpose charge portion of the rate for energy that is exported back to the grid beginning in 2014
- The elimination in 2016 of both a 2.4x RPS multiplier for utility-scale solar generation toward RPS compliance as well as a 2.45x RPS multiplier for distributed solar generation

CE56ADF8DADC/0/CPUC_STANDARD_PRACTICE_MANUAL.pdf**.** The cost tests described in the manual are used throughout the United States.

Systems installed in July 2016 and beyond are assumed to *not* receive a RenewableGenerations utility incentive.

For future systems, there was no forecast of installations as would have been expected under old NEM rate structure. Therefore, for comparability to existing systems, an equivalent assumed installed capacity used for future systems as for current existing systems.

- Existing systems (through June 2016): 265 MW
- Assumed future systems (beyond 2016): 265 MW

Results for both existing and future installations are presented on a levelized basis (\$/kWh), a net present value dollar basis (\$ NPV), and an annualized basis (\$/yr).

1.3.2 BASE CASE RESULTS

In the Base Case we find the following results for each of the five perspectives of cost-effectiveness.

1. **Is renewable self-generation cost-effective for the customers who install systems? (Participant Cost Test or "PCT")**

Based on the installation cost data collected through the RenewableGenerations program, Solar PV is not cost effective from the participant perspective for existing systems or for future systems. However, the net cost to participating customers is relatively small at \$0.02/kWh for existing systems and \$0.04/kWh for future systems. Although the installation cost of solar has dropped precipitously in recent years which increases the cost effectiveness for future systems, these systems are not assumed to collect a RenewableGenerations utility incentive.

Table 1: Base Case Results of NEM Generator Participant Cost-Effectiveness; Participant Cost Test (PCT)

Benefit (cost) to customers who participate in NEM	Existing Installations	Future Installations
Lifecycle NPV ($MM 2014)	($118)	($201)
Annual ($MM 2014)	($10)	($17)
Levelized ($/kWh 2014)	($0.02)	($0.04)

2. Does renewable self-generation impact the other NV Energy ratepayers? (Ratepayer Impact Measure or "RIM")

There is a cost-shift from NEM customers to non-participating customers for both existing installations and future installations. In total, existing installations shift approximately $36 million per year while an equivalent amount of hypothetical future installations would shift an additional $15 million per year. For existing systems, $20 million of the $36 million per year is a "sunk cost" that has already been spent in the form of incentive payments. Therefore, we estimate the cost of grandfathering existing systems to the old NEM rate structure to be approximately $15 million per year[2]. This amounts to a levelized cost shift of $0.08/kWh for existing installations and $0.04/kWh for future installations. The cost-shift is larger

[2] Numbers do not add up due to rounding

for existing installations almost entirely because of the utility funded RenewableGenerations incentive which is assumed to expire and not be available to future installations.

Table 2: Base Case Results of NEM Generator Non-Participating Ratepayer Cost-Effectiveness; Ratepayer Impact Measure (RIM)

Benefit (cost) to non-participating ratepayers	Existing Installations	Future Installations
Lifecycle NPV ($MM 2014)	($423)	($179)
Annual ($MM 2014)	($36)	($15)
Levelized ($/kWh 2014)	($0.08)	($0.04)

3. **Overall, do the bills NV Energy collects from all customers (both participants and non-participants) increase or decrease due to NEM systems? (Program Administrator Cost Test or "PACT")**

Existing and future NEM systems both cause total bills collected by NV Energy to decrease. Because future systems do not receive a RenewableGenerations incentive, these systems cause total bills to decrease more than for existing systems. Of course, all of the bill savings accrue to those who install self-generation. Nonetheless, bill savings to participants are larger than bill increases to non-participants.

Table 3: Base Case Results of NEM Generator Program Administrator (Utility) Cost-Effectiveness; Program Administrator Cost Test (PACT)

Reduction (increase) in aggregate customer bills	Existing Installations	Future Installations
Lifecycle NPV ($MM 2014)	$151	$379
Annual ($MM 2014)	$13	$32
Levelized ($/kWh 2014)	$0.03	$0.08

4. **Is self-generation a cost-effective resource for Nevada? (Total Resource Cost Test or "TRC")**

Overall, NEM generation of both existing and future systems increases total energy costs for Nevada. We estimate a net cost to the state of Nevada of $0.13/kWh for existing systems and $0.08/kWh for future installations. Future installations have a smaller net cost largely due to the recent decline in distributed solar installation costs.

Table 4: Base Case Results of NEM Generator Total Resource (State) Cost-Effectiveness; Total Resource Cost (TRC) Test

Benefit (cost) to the state of Nevada	Existing Installations	Future Installations
Lifecycle NPV ($MM 2014)	($660)	($380)
Annual ($MM 2014)	($56)	($32)
Levelized ($/kWh 2014)	($0.13)	($0.08)

5. How does this conclusion change if we consider non-monetized benefits of renewables? (Societal Cost Test or "SCT")

The societal perspective, which includes externalities and non-monetized health benefits of reduced air emissions from self-generation, does not significantly change the results of our findings for the costs and benefits of NEM for Nevada overall. The primary reason is that since distributed solar counts toward the state RPS requirement, if more NEM systems are installed then less utility-scale renewable generation will be installed to meet the standard. Therefore, there is no substantial net emissions reduction or additional health benefits attributable to NEM systems.

We estimate a net cost to the state of Nevada of $0.13/kWh for existing systems and $0.08/kWh for future installations.

The driver behind the difference in Lifecycle NPV between the Total Resource Cost Test and the Societal Cost Test is the difference in discount rates. As is standard utility practice, we use a lower societal discount rate (3% real) for the societal perspective than for the utility (4.7% real) which is used in the TRC. It is conventional for societal cost-effectiveness analyses to put more emphasis on future time periods and future generations.

Table 5: Base Case Results of NEM Societal (State) Cost-Effectiveness; Societal Cost Test (SCT)

Benefit (cost) to the state of Nevada, including externalities	Existing Installations	Future Installations
Lifecycle NPV ($MM 2014)	($764)	($446)
Annual ($MM 2014)	($55)	($32)
Levelized ($/kWh 2014)	($0.13)	($0.08)

1.3.3 SENSITIVITY RESULTS: NO DISTRIBUTION AVOIDED COSTS

In addition to the base case, we evaluate NEM cost-effectiveness under an assumption that does not assume the utility will defer or avoid investment in distribution system infrastructure due to the installation of solar. We calculate this sensitivity because NV Energy distribution engineers think the intermittent output of NEM systems may not be reliable enough to avoid the need for distribution system upgrades. Therefore, removing the distribution component of avoided costs provides a conservative estimate of net metered systems' benefits to the grid. Table 6 shows the results of each affected cost test with the inclusion of distribution benefits. Removing distribution benefits decreases net benefits under each of the cost tests as there are fewer benefits to non-participants if the utility cannot capture distribution benefits.

Table 6: Results without Distribution Avoided Costs – Existing Systems Only

Cost Test	Primary Question What is the....	Base Case ($MM/yr)	No Distribution Avoided Costs ($MM/yr)
RIM	Benefit (cost) to non-participating ratepayers	($36)	($43)
PACT	Reduction (increase) in aggregate customer bills	$13	$5
TRC	Benefit (cost) to the state of Nevada	($56)	($63)
SCT	Benefit (cost) to the state of Nevada, including externalities	($55)	($62)

1.3.4 SUMMARY OF KEY FINDINGS

The following points summarize the key findings of this analysis:

- Solar NEM causes a cost-shift of approximately $36 million per year for the 265 MW of existing NEM installations, and an additional 265 MW of hypothetical future installations would increase this cost-shift by $15 million per year.
- We estimate the cost of grandfathering existing NEM systems to the old rate structure is approximately $15 million per year. This is because of the $36 million per year cost-shift that is attributable to existing systems,

$20 million[3] has already been spent through incentive payments and is a sunk cost.

- We estimate the total cost-shift of existing NEM systems will cause an increase in rates of 1.2%[4]. Given that much of these costs have already been spent through incentive payments, we estimate that the incremental cost of grandfathering existing systems to the old NEM rate will cause an increase in rates of 0.5%[5].
- Overall, for the state of Nevada, NEM generation is a costlier approach for encouraging renewable generation than utility-scale renewables. This is mainly due to utility-scale solar PPA prices having dropped precipitously in recent years, greatly lessening the costs avoided by NEM generation, while distributed solar costs have not dropped commensurately.

[3] Numbers do not add up due to rounding
[4] $36 million cost-shift divided by the 2014 NV Energy revenue requirement of $3.05 billion (source: EIA Form 861)
[5] $15 million cost-shift divided by the 2014 NV Energy revenue requirement of $3.05 billion (source: EIA FORM 861)

2 Introduction

2.1 Analysis Overview

This study is an update to the 2014 "Nevada Net Energy Metering Impacts Evaluation," which calculated the costs and benefits of renewable generation systems that qualify for the state's NEM program. The 2014 study was completed with input from a stakeholder advisory group composed of experts from the PUCN, the solar industry, ratepayer advocates, and electric utility representatives. This 2016 update follows the same methodological framework while incorporating the most up-to-date utility data.

NEM is an electricity tariff designed to encourage installation of customer-sited renewable generation. Under the NEM tariff, a customer can self-generate electricity, reducing purchases from the utility, and sell excess electricity back to the utility at retail rates.

At the end of 2015, the Nevada PUC adopted reforms to the NEM tariff that included an increase in fixed charges, a decrease in the variable energy rate, and a separate, lower compensation rate for energy exported back to the grid. All costs and benefits in this updated study are calculated under the NEM structure as it existed *prior* to the reforms instituted at the end of 2015. This perspective allows the study to address the question "what *would* the cost impacts of NEM have been if *no* reforms had been enacted."

This study evaluates the comprehensive costs and benefits of generation systems eligible for NEM in Nevada including the impact to:

- customer-generators who participate in NEM
- utility customers who do not participate in NEM
- all utility customers overall
- the State of Nevada
- the State of Nevada including non-monetized health benefit.

This analysis considers existing net metering systems installed through June 2016 which totals over 265 MW. This is approximately equal to 1.5% of all NV Energy generation and 3% of peak demand. This analysis also considers the cost impacts of potential future net metering systems. For ease of comparison between the total cost impacts of existing systems with these hypothetical future systems, we assumed the installed capacity of future systems was also 265 MW.

2.2 NEM Program

2.2.1 NEM RATE STRUCTURE FOR CUSTOMER-GENERATORS

In Nevada, customers with qualifying distributed renewable energy systems can participate in the NEM program. Under NEM tariffs, customer-generators are billed based on their monthly net electricity consumption. For each month in which a NEM customer's usage exceeds the customer's generation, the kWh generation credits are applied directly against the customer's usage to reduce the month's electricity bill. Any excess kWh credits remaining in a billing month are carried forward, and they may be used only to offset future electricity charges.

Under this system, only the variable cost portion of the bill ($/kWh usage) and demand charge portion ($/Kilowatt (kW) of peak demand during the billing period) can be avoided. Any portion of the bill based on fixed charges ($/month) cannot be avoided by NEM. In addition, NEM customers cannot avoid public purpose charges for NEM generation in excess of usage. Public purpose charges are additional $/kWh charges applied to customers' bills. Funds collected through these charges are used to facilitate alternative and renewable energy projects, incentivize higher energy efficiency, and provide energy assistance to those in need.[6] These charges generally account for less than 5% of a customer's total bill.

At the end of 2015, the Nevada PUC adopted reforms to the NEM tariff that included an increase in fixed charges, a decrease in the variable energy rate, and a separate, lower compensation rate for energy exported back to the grid. All costs and benefits in this updated study are calculated under the NEM structure as it existed ***prior*** to the reforms instituted at the end of 2015. This perspective allows the study to address the question "what ***would*** the cost impacts of NEM have been if ***no*** reforms had been enacted."

2.2.2 RENEWABLEGENERATIONS PROGRAM

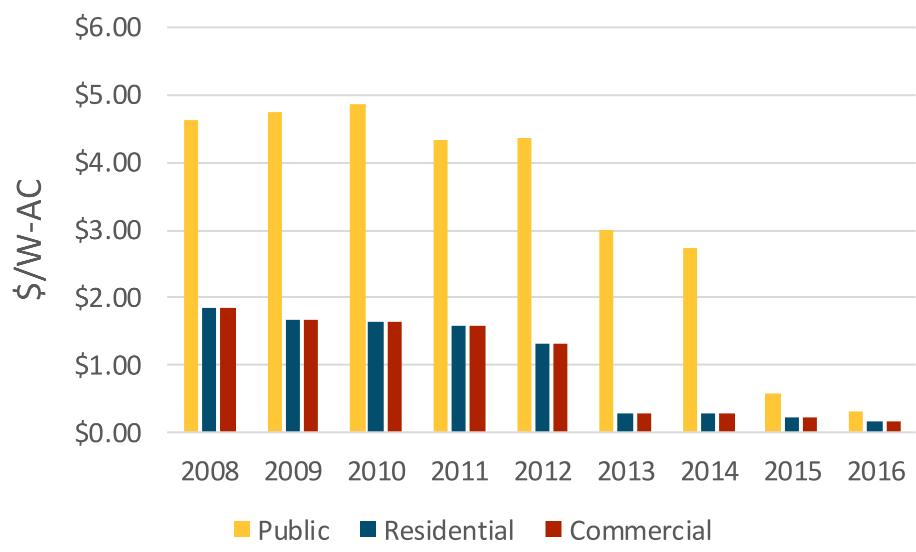
In adherence with AB 431,[7] NV Energy began offering rebates to customers installing NEM-eligible solar PV generators in 2004. The RenewableGenerations program was later expanded to include wind and small hydroelectric systems.

[6] NV Energy's public purpose charges are comprised of the following bill components: Temporary Green Power Financing (TRED), Renewable Energy Program (REPR), Energy Efficiency Charge (EE), and Universal Energy Charge (UEC).

[7] AB 431 information: http://www.leg.state.nv.us/Session/72nd2003/Bills/AB/AB431_EN.html

Incentive amounts vary by customer sector and are required by law to decline along with installed costs. Incentive levels began at $5 per Watt-Alternating Current and have declined as the installed cost of solar PV has declined. Incentive levels are now below $0.50/W-AC for all customer sectors.

Table 7: Historical RenewableGenerations Incentive Levels



As the RenewableGenerations incentive program is nearing the end of it $255 million spending limit[8], future vintage NEM systems are not assumed to be eligible for this incentive.

[8] NV Energy Annual Renewable Plan Vol. 1 (2016).

2.3 Analysis Framework

2.3.1 COST TEST OVERVIEW

This analysis evaluates the costs and benefits of the NEM generators from five perspectives established in the Standard Practice Manual (SPM). Each perspective is defined by a "cost test" and collectively they define a broad assessment of the cost-effectiveness. There is not a single correct cost test to use in general, each SPM cost test aims to answer a different question as follows:

- The *Participant Cost Test (PCT)* analyzes the financial proposition of purchasing and installing a NEM system from a NEM participant's perspective. If a customer's bill savings are greater than the customer's post-incentive capital costs paid, then the customer experiences a monetary gain from installing a NEM system.
- The *Ratepayer Impact Measure* (RIM) measures the impact of NEM on non-participating utility customers. The RIM test compares the utility avoided costs from not having to provide the energy generated by the NEM system (reduction in revenue requirement) to the incremental utility system costs such as incentives and program administration and the lost utility revenue due to reductions in NEM customer bills. If there is a net shortfall, over time in the next rate setting proceeding the utility would be allowed to increase customer rates to make up for the shortfall, which results in a cost-shift form participants to non-participants.
- The *Program Administrator Cost Test (PACT)* calculates the cost-effectiveness of NEM from the perspective of all customers of the program administrator, the NV Energy utilities. Note that this cost test is also commonly known as the *Utility Cost Test (UCT)*. This test addresses the

question, "Will customer bills need to increase because of NEM?" If NEM reduces the utility revenue requirement, or total cost of providing service, then the average customer bill including both participants and non-participants will decrease.

- The *Total Resource Cost Test (TRC)* captures the total direct monetary impact of NEM on the state of Nevada. The test includes the net impacts of participants, non-participants, and utility administrators. Cost shifts between parties within Nevada and benefits that cannot be directly monetized through existing channels are excluded from this analysis. Note that this test does include the net costs of emissions to the extent that emissions costs are embedded in energy prices and utility costs.
- The *Societal Cost Test (SCT)* aims to quantify the total impact of NEM on the state of Nevada when externalities are included. In this analysis, the SCT differs from the TRC only in its inclusion of the societal net health benefits due to a change in emission levels.

Table 8 describes the cost and benefit components of each of the cost tests. Each component is described in detail in Section 3. Note that some cost test components, such as customer bill reductions, are transfers from participants to non-participants. This occurs because lower bills for participants reduce the revenue the utility collects, and to the extent these bill reductions are greater than any cost-savings, the next utility rate case would increase rates to make up the shortfall, increasing bills of non-participants. Transfers may be treated as a cost in some tests and a benefit in others due to differences in the cost test perspectives.

Table 8: Benefit and Cost Components of Cost Tests

	Benefits	Costs
Participant Cost Test (PCT)	Customer Bill Reductions + Utility Incentives + Federal Tax Credits	NEM Generation System Costs
Ratepayer Impact Measure (RIM)	Utility Avoided Costs +RPS Value	Customer Bill Reductions + Utility Incentives + Utility Integration Costs + Utility Administration Costs
Program Administrator Cost Test (PACT)	Utility Avoided Costs + RPS Value	Utility Incentives + Utility Integration Costs + Utility Administration Costs
Total Resource Cost (TRC)	Utility Avoided Costs + Federal Tax Credits + RPS Value	NEM Generation System Costs + Utility Integration Costs + Utility Administration Costs
Societal Cost Test (SCT)	Utility Avoided Costs + Federal Tax Credits + RPS Value + Health Benefits	NEM Generation System Costs + Utility Integration Costs + Utility Administration Costs

Future costs and benefits are discounted back to 2014 dollars. The PCT, RIM, PACT, and TRC all use the average utility after-tax weighted average cost of capital (WACC) for NVE North and NVE South of 4.7% real (6.8% nominal) as the discount rate for this net present value (NPV) calculation. We use a lower societal discount rate of 3% real (5.1% nominal) to account for the societal cost test that includes externalities. Using a lower discount rate is standard practice in the SPM and reflects a longer-term emphasis on costs and benefits from a societal perspective and a lower cost of borrowing of the state than the utility. This notion of using a lower social discount rate relative to a private discount rate is well established in the literature.[9]

We say that a program "passes" each of these five tests if the present value of the relevant benefits is greater than the present value of the relevant costs. Table 9 summarizes the interpretation of each set of cost test results.

Table 9: Cost Test Result Interpretations

	Benefits GREATER than Costs	Benefits LESS than Costs
Participant Cost Test (PCT)	NEM customers spend less on utility bills than had they not installed NEM	NEM customers spend more on utility bills than had they not installed NEM
Ratepayer Impact Measure (RIM)	Average utility rates decrease, decreasing bills of non-participants	Average utility rates increase, increasing bills of non-participants
Program Administrator Cost Test (PACT)	Total bills (revenue requirement) collected by the utility decrease	Total bills (revenue requirement) collected by the utility increase
Total Resource Cost (TRC)	There is a positive economic benefit to the state of Nevada	There is an economic cost to the state of Nevada
Societal Cost Test (SCT)	There is a positive economic benefit to the state of Nevada INCLUDING benefits of criteria pollutant reductions	There is an economic cost to the state of Nevada INCLUDING benefits of criteria pollutant reductions

[9] See generally, http://yosemite.epa.gov/ee/epa/eerm.nsf/vwAN/EE-0568-06.pdf/$file/EE-0568-06.pdf

2.3.2 RESULTS FRAMEWORK

In this analysis, we consider both existing NEM installations (installed through June 2016), as well as hypothetical future NEM installations. For existing systems, all policy changes that occurred over the historical timeframe are captured through the analysis. Several of the most notable policy changes of this time period include:

- A significant reduction in RenewableGenerations incentives in 2014
- The elimination of payment for the public purpose charge portion of the rate for energy that is exported back to the grid beginning in 2014
- The elimination in 2016 of both a 2.4x RPS multiplier for utility-scale solar generation toward RPS compliance as well as a 2.45x RPS multiplier for distributed solar generation

Systems installed in 2017 and beyond are assumed to *not* receive a RenewableGenerations utility incentive.

For future systems, there was no forecast of expected installations as would have been expected old NEM rate structure. Therefore, for comparability to existing systems, an equivalent assumed installed capacity used for future systems as for current existing systems.

- Existing systems (through June 2016): 265 MW
- Assumed future systems (beyond 2016): 265 MW

2.3.3 GENERATION ATTRIBUTABLE TO THE NEM PROGRAM

This analysis attributes the costs and benefits of all NEM generation to the NEM program. Some studies attribute only exported electricity generation to the program; for example, the 2013 California Public Utility Commission NEM study includes both the all generation and the export only electricity in its framework.[10] To the extent that NEM compensation enables the viability of DG installations, all generation is the appropriate measure to use for cost and benefit accounting.

[10] The 2013 CPUC NEM evaluation is available for download at: http://www.cpuc.ca.gov/PUC/energy/Solar/Comments_on_the_Draft_NEM_Report.htm.

3 Methodology

3.1 Data and Participant Grouping

This analysis draws on individual installation data of more than 30,000 existing NEM generators installed through June 2016. For most generators, data on customer class, utility rate tariff, location, install year, and installation capacity were available. For generators that have received utility incentives, installed costs were also available.

All calculations were performed on as granular a level as data allowed. In aggregating the results, systems were grouped along the following dimensions:

- Vintage
  - Existing Installations (through June 2016)
  - Future Installations (post June 2016)
- Customer Class
  - Residential
  - Non-Residential
- Utility
  - NVE North
  - NVE South
- Utility Incentive Status
  - Incentivized

- Non-Incentivized

We chose these dimensions and categories in order to represent a manageable number of total results while still providing insight into how impacts vary across key customer groups.

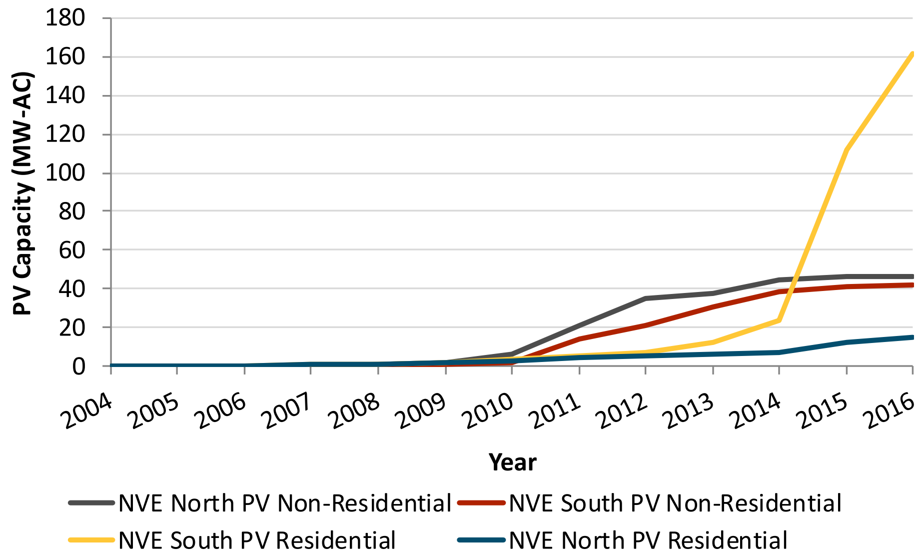
3.2 Installed NEM Capacity

We drew on NV Energy's database of existing net metered systems to determine the total installed NEM capacity in Nevada through June 2016.

3.2.1 SOLAR INSTALLATIONS

NV Energy's RenewableGenerations incentive program had a targeted goal of incentivizing 250 MW of NEM PV capacity installations by 2020. Current PV installed and pipeline capacity sits at just over 265 MW with the majority of these installations occurring after 2012. Figure 1 shows the cumulative installed PV trajectory through 2016 by utility and customer class.

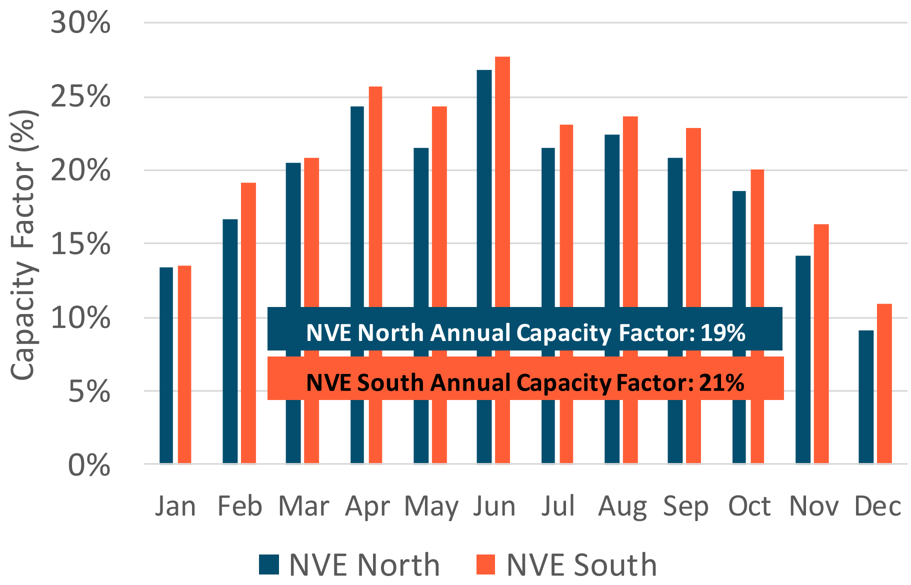
Figure 1: Historical Cumulative NEM PV Installed Capacity



3.3 Solar Output Profiles

Calculations of bill savings and avoided costs depend on the hourly generation profiles of solar. This data was provided NV Energy for a representative system in NVE North and a representative system in NVE South. Each of these representative systems is based the aggregate output from all systems in these regions from actual customer data.

Figure 2: Solar Generation Profiles



3.4 Bill Savings

Bill savings are calculated as the difference between what a NEM customer's bill would be without NEM generation and the same customer's bill with NEM generation. To quantify these savings, we created a custom bill calculator using current Nevada electric utility rates, solar output profiles from NV Energy, and load shapes from NV Energy. We modeled bill savings for each individual NEM installation based on customer rate information provided by NV Energy.

Figure 3: Existing NEM Installations by Rate Class and Technology

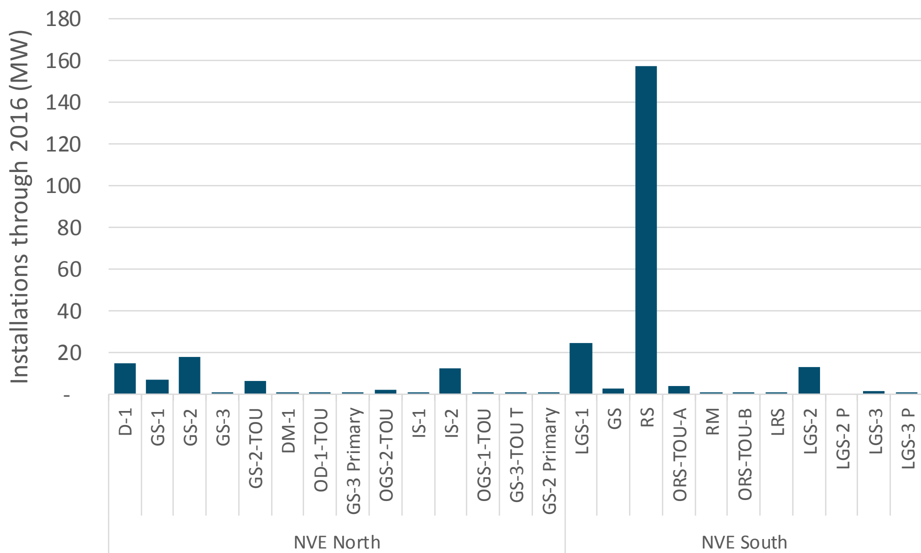


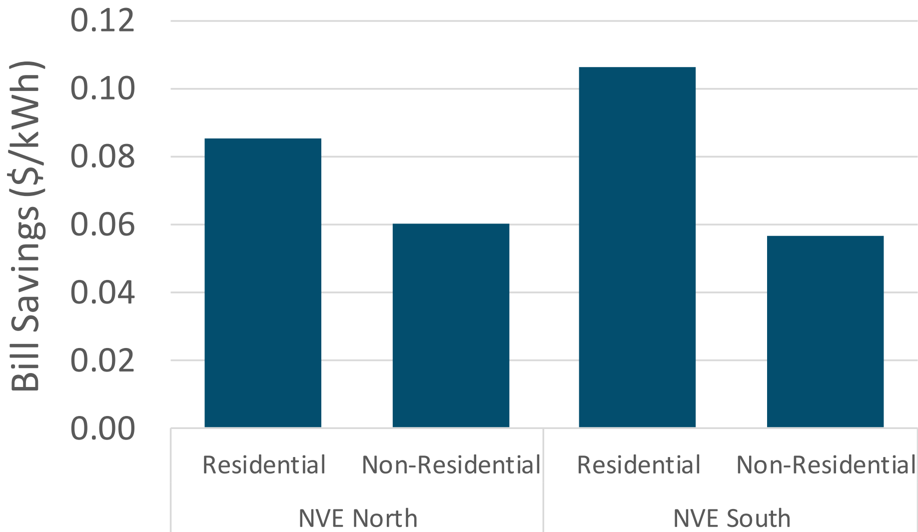
Table 10: Description of NV Energy Rate Classes

NVE North	D-1	Single Family Residential
	GS-1	Small Commercial
	GS-2	Medium Commercial
	GS-3	Large Commercial
	GS-2-TOU	Medium Commercial Time-of-Use
	DM-1	Multi-Family
	OD-1-TOU	Optional Residential Time-of-Use
	GS-3 Primary	Large Commercial High Voltage
	OGS-2-TOU	Optional Medium Commercial Time-of-Use
	IS-1	Irrigation Service
	IS-2	Interruptible Irrigation Service
	OGS-1-TOU	Optional Small Commercial Time-of-Use
	GS-3-TOU T	Large Commercial Time-of-Use

	GS-2 Primary	Medium Commercial
NVE South	LGS-1	Large Commercial
	GS	Small Commercial
	RS	Single Family Residential
	ORS-TOU-A	Optional Single Family Residential Time-of-Use
	RM	Multi-Family
	ORS-TOU-B	Optional Single Family Residential Time-of-Use
	LRS	Large Residential Service
	LGS-2	Large Commercial Medium Demand
	LGS-2 Primary	Large Commercial Medium Demand, High Voltage
	LGS-3	Large Commercial High Demand
	LGS-3 Primary	Large Commercial High Demand, High Voltage

Using the utility rate tariff assigned to each NEM generator, we calculated annual bill savings by multiplying the output of each NEM generator in every hour of the year by the corresponding electric rate. The blue bars in Figure 4 show annual savings per kW-AC of installed capacity aggregated across relevant customer classes. The orange bars represent bill savings per kWh generated. Differences in bill savings across categories are predominantly due to differences in rate design, although NEM generation profiles between NVE North and NVE South also play a small role.

Figure 4: Bill Savings



Bill savings estimates also include any reductions in demand charges that might result from NEM generation for non-residential customers. The demand charge portion of a customer's bill is calculated by multiplying a fixed $/kW charge by the customer's peak load during a specific time period, typically the billing period. 2% of Nevadan NEM systems and 26% of installed NEM capacity are currently on rate tariffs with demand charges (generally only large commercial customers in Nevada pay demand charges).

Using commercial customer load and renewable output shapes, we calculate the change in peak net demand within each month-TOU period, and multiply it by the demand charge per kW in the given month-TOU period. The sum of these month-TOU period demand charge reductions is the total demand charge reduction for a commercial rate class.

3.5 Avoided Costs

Avoided costs represent the value that a distributed resource provides to the electric grid. Electricity generation from NEM installations serves utility load, allowing the utility to reduce its overall costs of providing service. In other words, for every kWh of energy generated by a NEM system, the utility has to produce or purchase one less kWh from a dispatchable fossil fuel plant. Thus, the utility "avoids" the variable cost of generating that kWh. Enumerated below, there are multiple other cost components that the utility avoids through NEM generation.

We used utility data from NV Energy in June 2016 to develop hourly avoided costs for NV Energy's two subsidiaries. The planning horizon for the data provided spans from 2016 through 2047, which captures the full lifetimes of all NEM systems included in this analysis. Using hourly avoided costs captures the varying value to the grid of energy produced during periods of high demand relative to periods of low demand. Section 5.2 in this report's appendix describes our avoided cost methodology, including all key assumptions, in more detail.

We build up hourly avoided costs by combining several different cost components. Table 11 describes each cost component and the data source used to generate values in each category. Section 5.3 in the Appendix includes additional information about avoided cost calculation methodology by component.

It is important to note that we include distribution capacity avoided costs in the base case. We examine a sensitivity in which distribution capacity avoided costs are not included, due to the high generation intermittency of the relatively small number of PV and wind NEM systems that lie behind any single distribution feeder.

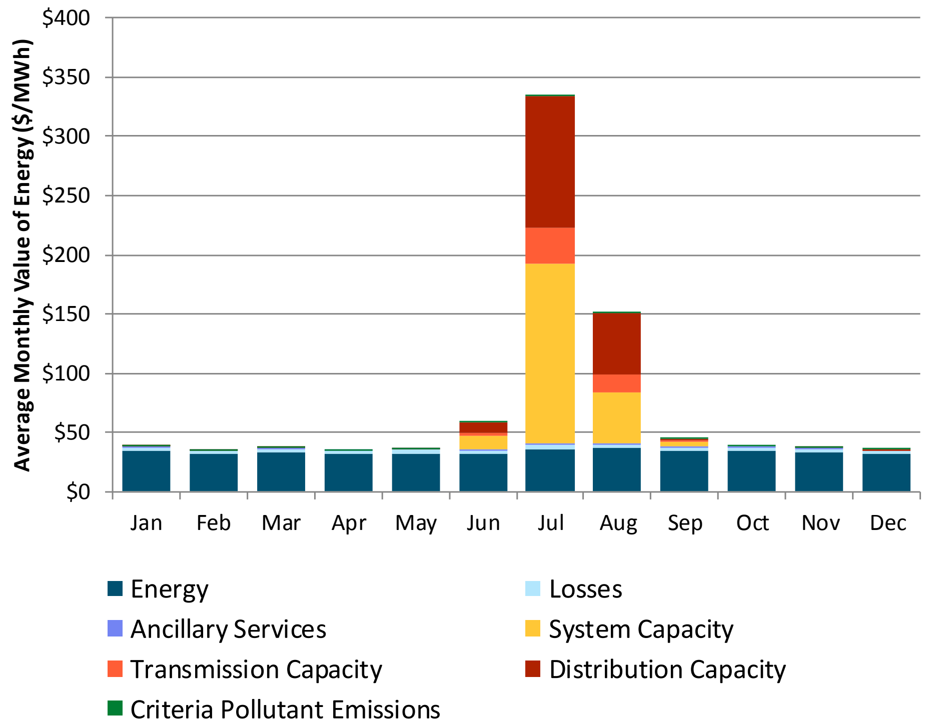
Table 11: Avoided Cost Components and Data Sources

Component	Description
Energy Generation	Estimate of hourly marginal wholesale value of energy, excluding the regulatory price of carbon dioxide emissions. Source: Production simulation runs from NV Energy. These simulations produced energy prices for each utility from 2017 through 2046.
Carbon	Estimate of the hourly marginal value of carbon. This value is calculated using the implied marginal heat rate as determined from the marginal energy cost as well as a carbon price forecast provided by NV Energy.
Distribution Losses	Energy generation avoided costs are adjusted to account for losses between the point of wholesale transaction and the point of delivery. Source: Losses as a function of hourly load from NV Energy.
Ancillary Services (A/S)	Marginal cost of providing spinning reserves for electricity grid reliability. Source: NV Energy provided a summary of total energy production cost spending and spinning reserve spending from 2014 to 2018. On average, spinning reserves represented 0.5% and 2% of total energy spending over that time period for NVE South and NVE North, respectively. We used those proportions to calculate A/S avoided costs as a share of energy generation avoided costs.
Transmission Capacity	Cost of expanding transmission capacity to meet customer peak loads. The annualized cost of transmission is grossed up to include transmission level losses (assumed to equal distribution losses plus 2%) and then allocated to individual hours using the hourly Normalized Probability of Peak (POP). Source: Annualized cost of transmission and annual hourly POPs from NV Energy.
Distribution Capacity	Cost of expanding distribution capacity to meet customer peak loads. The annualized cost of distribution upgrades scaled up by distribution losses and allocated to individual hours using the POP. These values were provided on an average system-wide $/kW basis for each utility. Source: Annualized cost of distribution and POPs from NV Energy.
System Capacity	Marginal cost of meeting system peak loads. While NV Energy has a capacity surplus, this is equivalent to the fixed O&M cost of a capacity resource, assumed to be a natural gas combustion turbine because of its low cost. After NV Energy would otherwise need to build new capacity, the capacity cost represents additional cost of building new generation capacity above what can be earned in

	energy and ancillary service markets. The annualized capacity value is grossed up to include transmission level losses and allocated to individual hours using hourly Normalized Loss of Load Probability (LOLP). Source: Annualized cost of system capacity and annual hourly LOLPs from NV Energy. LOLPs were provided for years 2017-2046.

The following figures show a 2025 snapshot of monthly avoided costs for NVE North and NVE South:

Figure 5: NV Energy Average Monthly Avoided Costs (2025 Snapshot)



To calculate the total avoided costs of a net metered system, we multiply the hourly solar generation profiles by the hourly avoided cost values. The sum of the hourly values represents the total annual avoided cost value of the NEM installation.

3.6 RPS Compliance Value

3.6.1 RPS COMPLIANCE VALUE OVERVIEW

The RPS compliance value is the value that NEM provides by preventing or delaying utility purchases of renewables that would otherwise be needed to comply with Nevada's RPS. NEM generation provides NV Energy with RPS compliance value in two ways: (1) by providing energy credits for RPS compliance; and (2) by reducing utility load and, thereby, NV Energy's RPS compliance obligation. RPS value is an avoided cost component. We present the RPS avoided costs separately from the other avoided cost components in the results because we want to highlight how the RPS policy impacts avoided cost value (note that in the 2014 study this component had a much larger impact).

As part of the RenewablesGeneration program, NV Energy receives the portfolio energy credits (PECS), measured in thousands of PECS (kPCs), associated with generation from incentivized NEM systems. NV Energy receives 1 kPC for each MWh of incentivized NEM wind generation. Because of Nevada's 2.45 RPS solar DG multiplier, NV Energy received 2.45 kPCs for each MWh of NEM solar generation from systems installed through 2015. PV systems installed after 2015 do not receive a multiplier.

In addition, incentivized and non-incentivized NEM generation provides a load reduction RPS value. The Nevada RPS establishes NV Energy's annual compliance obligations as fixed percentages of retail sales. As a result, any NEM generation that reduces net retail sales reduces NV Energy's compliance obligation. NV Energy is required to meet at least 25% of its retail load by 2025, meaning that 1 MWh of non-incentivized NEM generation in 2025 would decrease NV Energy's RPS compliance obligation by 0.25 kPC in that year.

In any given year, the reduction in RPS compliance obligation is multiplied by the calculated RPS premium. The RPS premium is defined as the levelized cost of the marginal renewable resource ($/MWh) less any energy value that resource provides as calculated using the energy avoided cost data above. Note that the marginal renewable resource is assumed to be an "energy-only" resource and therefore generation capacity benefits are not netted off the premium nor are incremental transmission costs added to the premium. In the 2014, the base case assumed an RPS cost of $100/MWh, while this 2016 study assumes an RPS cost of $36/MWh. This dramatic decrease in price nearly eliminates the RPS premium. As the results show, this benefit has decreased by approximately 95%.

3.7 Program Costs

Program costs are the costs to the utility of implementing and maintaining the NEM program. NV Energy's program costs include a one-time setup cost associated with installing a bi-directional meter necessary for net metering, as well as ongoing annual costs of staff and other expenses required to maintain the program. Using spreadsheet data provided by the utility, we estimated the initial, one-time costs of installing a NEM system in NVE North and NVE South service territories to be $32/kW, respectively. While these costs are more a function of absolute number of system installations as opposed to capacity, these cost estimates are unitized in $/kW so that they can be applied to installation forecasts, which are defined in kW. We estimate ongoing costs of maintaining the NEM program to be $250,000 annually. Ongoing costs are allocated between NVE North and NVE South in proportion to total installed NEM capacity in each year. Table 12 shows the NEM program costs used in our analysis.

Table 12: NEM program costs

	NEM Program Costs (2014$)
Total annual fixed cost (ongoing)	$250,000
NVE North *$/kW installed ($2014)* (one-time cost at installation)	$32.00
NVE South *$/kW installed ($2014)* (one-time cost at installation)	$32.00

3.8 Integration Costs

Solar energy is inherently a non-dispatchable, intermittent resource. The utility incurs additional operational costs when it acts to adjust to sudden changes in renewable output, referred to as integration costs. These costs typically manifest through increases in regulation reserve requirements, load following reserve requirements, and other ancillary services. In other words, the utility must keep more back-up generation online in case the energy output from the NEM systems unexpectedly decreases.

After conducting a literature review of several renewable integration cost studies in the western US,[11] we selected an integration cost adder of $2/MWh, applied to all NEM generation. Estimates within these studies range from $0/MWh to $18/MWh while the vast majority of estimates were in the single digits. We intentionally selected an integration cost lower that those reported in many studies for two primary reasons: 1) Nevada's renewable energy penetration level is lower than the penetrations in many of the western states studied, and 2) most of the available literature focuses on large-scale solar installations, which present larger intermittency problems than DG because it is less geographically diverse.

The scale of forecasted NEM in Nevada is small enough that there is no substantial need for in-depth studies on voltage risks or distribution upgrades to accommodate backflow. Current installed NEM capacity is only 3% of Nevada's peak demand. FERC's Small Generator Interconnection Process[12] and California Rule 21[13] use a 15% penetration trigger for in-depth interconnection studies. DG penetration levels lower than 15% of peak circuit load are not considered at risk for causing voltage or backflow issues. Moreover, high DG penetration studies in Hawaii find that much larger penetration levels do not cause voltage issues. Even when Kauai Island Utility Cooperative supplies 90% of distribution load with PV during the day, voltage remains within the +/- 5% tariff limit.[14]

[11] *Large-Scale PV Integration Study*, Navigant Consulting, 2011
Integrating Solar PV in Utility System Operations, Argonne National Laboratory, 2013
Solar Photovoltaic Integration Cost Study, Black and Veatch, 2012
Distributed Generation Study, Navigant Consulting, 2010
[12] FERC SGIP § 2.2.1.2
[13] See http://www.cpuc.ca.gov/PUC/energy/Procurement/LTPP/rule21.htm
[14] Bank, J, B. Mather, J. Keller, and M. Coddington (2013). "High Penetration Photovoltaic Case Study Report." National Renewable Energy Laboratory Technical Paper.

3.9 Societal Benefits

This report includes an SCT analysis, which seeks to quantify the health benefits associated with renewable distributed generation. We used criteria pollutant health impact costs from NV Energy's 2013 IRP to evaluate the monetary health net benefits of avoiding or increasing fossil fuel combustion. Because of Nevada's RPS, NEM generation reduces utility-sited renewable generation that would have otherwise been built to meet the RPS obligation. We include the foregone health benefits associated with this reduced utility-sited renewable generation in our calculations in the SCT.

The IRP reports total portfolio costs of nitrous oxides, particulate matter, sulfur dioxide, and mercury for NVE North and NVE South, from 2014 through 2043. Using those values and the IRP's forecast of total utility generation in each year, we calculated the average costs per MWh of the combined health impacts of all of the pollutants. We calculated one average $/MWh of NEM generation cost and another $/MWh of utility-sited renewable generation cost. These costs only vary due to losses.

As previously mentioned, distributed solar displaces utility-scale solar and therefore does not result in substantial health or criteria pollutant benefits.

3.10 DG Installation Costs

NEM participants have the option of purchasing their DG installations outright or contracting with a third party system owner and installer. Participants sign a PPA, in which the third party owns the system and the participant purchases the generated energy. Over time, the third party ownership model has become increasingly common, likely because it presents little financial hurdle and relieves customers of maintenance obligations.

As a simplifying assumption, we assume that all NEM systems are installed and financed through a third-party provider where the customer purchases generated electricity over the lifetime of the system. We expect the third-party provider ownership model to be the most common form of ownership going forward. For systems installed in the past using different financing mechanisms, this is a simplifying assumption that enables a cost-effectiveness analysis without reconstructing the individual financing of historical systems or evaluating historical bill savings and avoided costs. We believe this a reasonable simplification because this analysis aims to inform the NEM policy going forward and not necessarily reconstruct cost-effectiveness of systems already installed for past years.

We use a pro forma model to convert upfront installation costs, operations and maintenance (O&M) costs, tax credits, and utility incentives into an expected PPA price paid by the NEM participant to a third party installer. The model takes into account the tax benefits and financing costs incurred by the third party owner. The pro forma methodology and inputs are described in more detail in Section 5.2 in the Appendix.

3.10.1 CAPITAL COSTS

To calculate historical capital costs, we used RenewableGenerations program data provided by NV Energy. Excluding outliers and missing data, we used the average installed cost for each customer group to represent historical installation costs.[15] For systems installed after 2016, we assume installation costs will equal the costs of systems installed in 2016.

3.10.2 OPERATIONS AND MAINTENANCE COSTS

We approximated O&M costs from the NREL estimate of DG renewable energy costs.[16] We assume a fixed O&M cost of $20/kW-yr for all rooftop solar ($2013).

3.10.3 FEDERAL TAX CREDITS

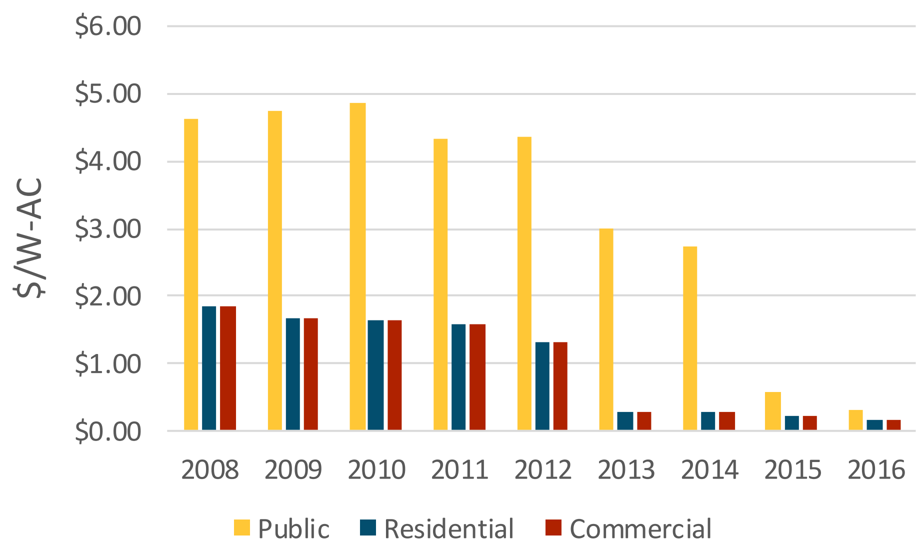
The federal investment tax credit (ITC) is available to solar installations. The ITC began in 2006 for customer-sited solar generators. The credit value is 30% of eligible installed system capital costs, and is available through the end of 2019, when it begins to ramp down. We assume that third party system owners are always able to fully access the ITC tax benefits.

3.10.4 UTILITY INCENTIVES

In addition to federal tax credits, NV Energy offers incentives to owners of new renewable DG through the RenewableGenerations program. We calculated all incentives as if they are paid on an upfront basis, even though NV Energy compensates large solar generators based on production which is designed to be equivalent to an upfront incentive. Due to the declining capital cost of renewable DG, incentive levels have decreased over time.

[15] Approximately 10% of systems had missing or clearly incorrect data.
[16] NREL O&M cost estimates are available at: http://www.nrel.gov/analysis/tech_lcoe_re_cost_est.html

Figure 6: Historical Utility Incentive Levels



Because we show aggregate results for all non-residential participants, we use a capacity-weighted average of the public and private incentive levels for non-residential installations. NV Energy provided information on the type of incentive received by each existing NEM system.

NEM participants can receive RenewablesGenerations incentives even if their systems are third-party owned. For example, a school can install a NEM PV system through a third party, and the project will receive both the public incentive level and the full ITC (the tax credit is absorbed by the third party).

4 Results

4.1 Results Framework

This section defines the metrics we use to present results for each of the five cost tests using Net Present Value (NPV) and levelized $/kWh costs and benefits by component. We then illustrate each cost test and its components through example graphs and explanations on the interpretation of these results. We recommend becoming familiar and comfortable with these examples before viewing the actual results in following sections.

4.1.1 KEY METRICS

We use two key metrics to present results: NPV and levelized $/kWh. The NPV metric is computed via the following steps:

1. Add up all of the benefits and costs for each year (in nominal $)
2. Subtract the costs from the benefits for each year to obtain the annual net benefit (in nominal $)
3. Using the appropriate discount rate, calculate the NPV of the full net benefit stream in 2014 dollars

Levelized $/kWh values are calculated for one cost or benefit component as follows:

1. Add up all of the costs or benefits to be analyzed by year (in nominal $)

2. Using the appropriate discount rate, calculate the NPV of the cost/benefit stream in 2014 dollars

3. Add up all of the NEM generation to be analyzed by year (in nominal kWh)

4. Using the appropriate discount rate, calculate the NPV of the generation stream in 2014 kWh

5. Divide the value obtained in step 2 by the one obtained in step 4

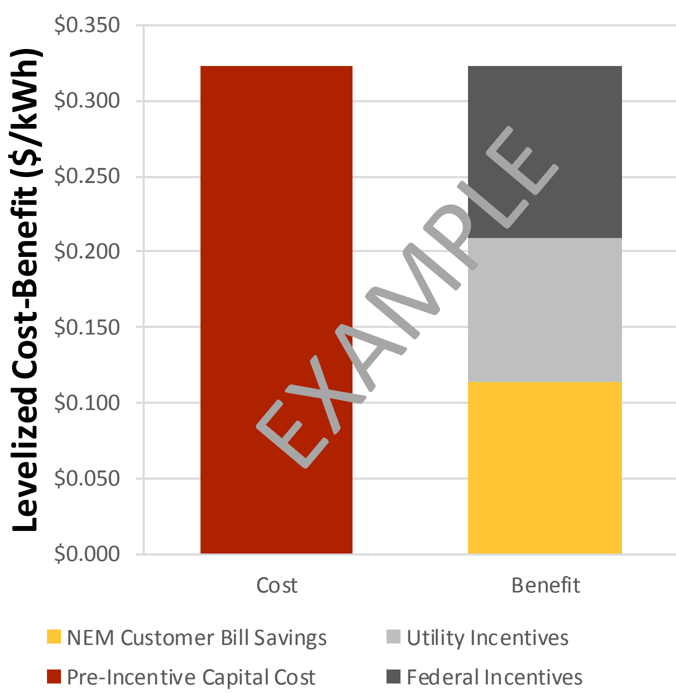
The NPV metric captures the total magnitude of the impact of NEM throughout the lifetimes of the analyzed NEM systems. This metric is largely driven by installed NEM capacity and generation, and it does not indicate how much of the overall benefit (or cost) is driven by program size versus cost-effectiveness of individual NEM systems. As a result, it is difficult to use this metric to understand how the impact of NEM may scale with additional NEM capacity and generation, or to compare the per-kW or per-kWh impacts across NEM vintage groups or other subgroups. It is an effective metric for capturing the total magnitude of the impacts.

The levelized $/kWh metric normalizes the NPV results for NEM generation. Consequently, this metric offers more insight into comparisons of costs and benefits across NEM vintage groups and other various subgroups. Unlike the NPV metric, it does not capture the aggregate NEM impacts or indicate the relative magnitudes of total net benefits across subgroups.

4.1.2 PARTICIPANT COST TEST (PCT)

The PCT analyzes the average customer's financial proposition when purchasing and installing a NEM system. Costs to the participant are simply the PPA costs paid to a third-party solar provider, shown in the charts as 'pre-incentive capital cost'. Benefits to the participant are reduced utility bills plus incentives received from NV Energy and the federal government that are passed on to the customer through the PPA price. Figure 7 shows an example of the levelized $/kWh costs and benefits.

Figure 7: Example PCT Levelized Results



In this example, the customer incurs a total cost of $0.32/kWh and a total benefit of $0.32/kWh. As portrayed in Figure 7, the total benefit is comprised of a

$0.11/kWh bill reduction, a $0.11/kWh ITC, and an $0.10/kWh utility RenewableGenerations incentive. In this example, the net PCT benefit would be $0/kWh: the total benefits less the total costs. The total NPV would also be $0. All of these costs and benefits are in 2014 dollars.

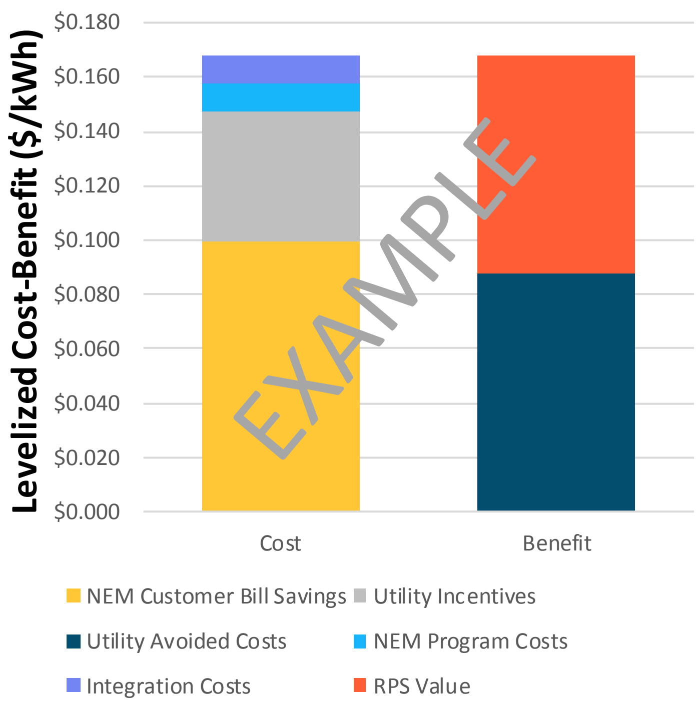
Comparing total costs to total benefits in the PCT test should be interpreted as follows:

	Benefits GREATER than Costs	Benefits LESS than Costs
Participant Cost Test (PCT)	The average NEM customer incurs a net economic benefit. The customer's electricity bill reduction is large enough to outweigh the PPA payments to a third-party provider.	The average NEM customer incurs a net economic cost. The customer's bill reduction combined with any incentives received does not outweigh the PPA costs.

4.1.3 RATEPAYER IMPACT MEASURE (RIM)

The RIM cost test measures the impact of NEM on NV Energy customers who are not participating in the NEM program. A net RIM cost means that average NV Energy electricity rates will increase, while a benefit indicates a reduction in average rates. Costs included in this test are costs to the utility of the NEM program, including: 1) lost utility revenue due to a reduction in NEM customers' utility bills, 2) the cost of paying utility incentives to NEM customers, and 3) NEM program and integration costs. The benefits are utility system costs that are avoided due to NEM generation. These avoided costs are outlined in Section 3.5 and include avoided energy, losses, system capacity, transmission capacity, ancillary services, and RPS compliance costs. One of the sensitivities also includes distribution avoided costs. Figure 8 shows the total levelized $/kWh costs and benefits flowing to non-participating ratepayers as a result of NEM.

Figure 8: Example RIM Levelized Results



In the above example, the total benefit to customers not participating in NEM is $0.17/kWh. Of this total, $0.08/kWh comes from the utility's avoidance of RPS compliance costs thanks to their ability to count NEM towards the Nevada RPS. The other $0.09/kWh benefit from NEM is the sum of all of the other avoided utility costs. The hypothetical costs to utilities and therefore non-participating customers are driven by the $0.10/kWh bill revenue reduction from NEM customers, the $0.05/kWh RenewableGenerations rebate paid by utilities, as well as the $0.01/kWh from integration costs and $0.01/kWh from NEM program costs. The net levelized benefits in this example would be \$0.17/kWh - \$0.17/kWh = \$0/kWh. The NPV would also be \$0.

Comparing total costs to total benefits in the RIM test should be interpreted as follows:

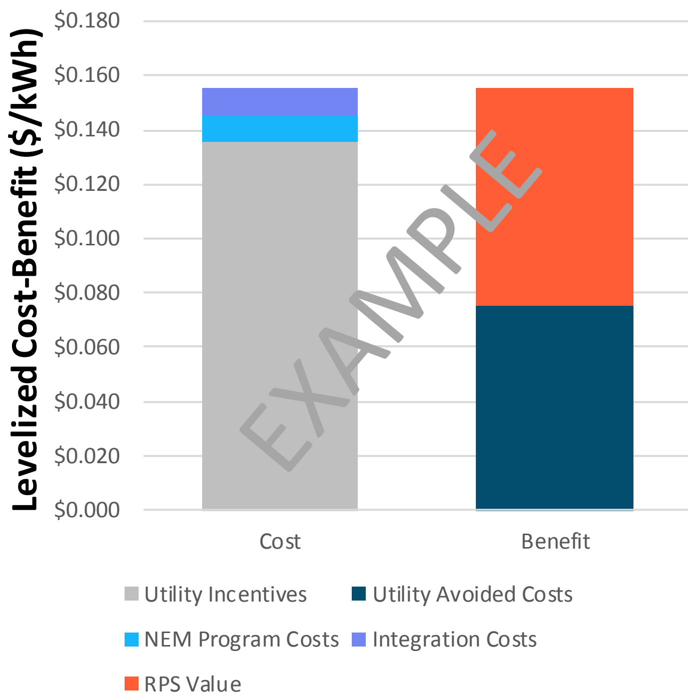
	Benefits GREATER than Costs	Benefits LESS than Costs
Ratepayer Impact Measure (RIM)	Average utility rates decrease for all utility customers. Non-participating customers benefit from the NEM program.	Average utility rates increase for all utility customers. Non-participating customers have to pay more as a result of the NEM program.

An increase in average utility rates is a cost-shift from NEM customers to non-participating utility customers.

4.1.4 PROGRAM ADMINISTRATOR COST TEST (PACT)

Also known as the Utility Cost Test (UCT), the PACT calculates the impact on NV Energy's revenue requirement, or the total bills paid to NV Energy. Costs and benefits are identical to the RIM test except that NEM customer bill savings are no longer included as a cost because they only represent a cost transfer between utility customers. Under this test, revenues not collected from NEM participants are not considered a cost to utilities because the revenues are collected instead from non-participants. Figure 9 portrays example PACT levelized \$/kWh costs and benefits by component.

Figure 9: Example PACT Levelized Results



Comparing total costs to total benefits in the PACT should be interpreted as follows:

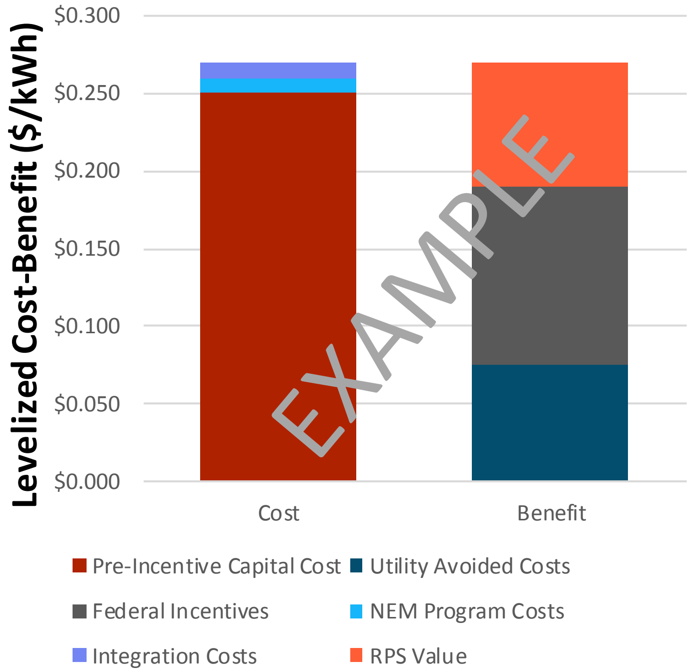
	Benefits GREATER than Costs	Benefits LESS than Costs
Program Administrator Cost Test (PACT)	Total utility bills and utility revenue requirement decreases as a consequence of NEM	Total utility bills and utility revenue requirement increases as a consequence of NEM

The NPV result represents the total increase or decrease in collected bills in 2014 dollars. A positive value means total bills paid is *reduced* while a negative value means total bills paid *increases.*

4.1.5 TOTAL RESOURCE COST TEST (TRC)

The TRC captures the total direct monetary impact of NEM on the state of Nevada. Under this test, the costs include NEM system capital costs as well as NEM program and integration costs. The benefits include the ITC for small solar and wind systems and utility avoided costs attributable to NEM, including RPS compliance avoided costs. In the example outlined in Figure 10, the state of Nevada incurs $0.27 in costs and receives $0.27 in benefits for every levelized kWh of NEM generation. The associated NPV would be $0.

Figure 10: Example TRC Levelized Results



Comparing total costs to total benefits in the TRC test should be interpreted as follows:

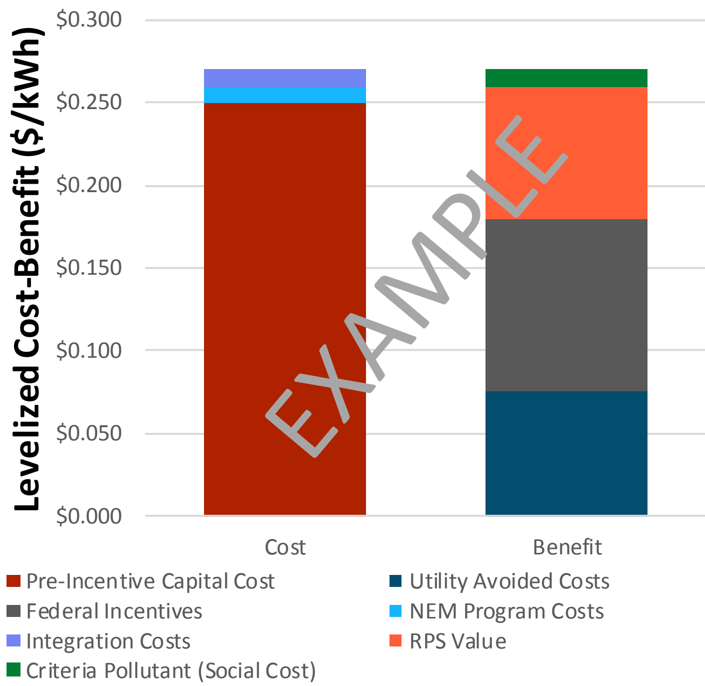
	Benefits GREATER than Costs	Benefits LESS than Costs
Total Resource Cost (TRC)	The state of Nevada receives a net economic benefit from NEM	The state of Nevada incurs a net economic cost from NEM

4.1.6 SOCIETAL COST TEST (SCT)

The SCT aims to quantify the total impact of NEM on the state of Nevada when externalities are included. All costs and benefits included in the TRC test outlined above are included in the SCT, and the SCT also adds a criteria pollutant reductions benefit. The other key difference between the TRC and the SCT is the discount rate used in the NPV and levelized $/kWh cost and benefit calculations. We do not estimate a social carbon cost, although monetized carbon costs are included in avoided energy costs.

Figure 11 displays example levelized $/kWh costs and benefits by component for the SCT.

Figure 11: Example NPV Benefit-Cost Summary Chart



Comparing total costs to total benefits in the SCT should be interpreted as follows:

	Benefits GREATER than Costs	Benefits LESS than Costs
Societal Cost Test (SCT)	NEM results in a net economic benefit to the state of Nevada when externality health benefits from criteria pollutant reductions are included	NEM results in a net economic cost to the state of Nevada INCLUDING when externality health benefits from criteria pollutant reductions are included

The NPV result represents the total lifetime net benefit (or cost) of NEM systems to the state of Nevada *including benefits of criteria pollutant reductions* in 2014 dollars.

4.2 Base Case Assumptions

Our set of base case assumptions were developed during the 2014 study in collaboration with the PUCN stakeholder advisory group. Together, we chose assumptions based on plausibility and regulatory precedence. The base case assumes a NEM tariff policy without the reforms enacted at the end of 2015. For this revised 2016 report, we modify the base case to also include distribution capacity avoided costs. We also assume rate escalation to be 0.5% real, whereas the 2014 study assumed rate escalation was 0.5% real until 2021 at which point it was 1.4% real. Along with the general methodology assumptions described in Section 3, the following assumptions hold across all scenarios and sensitivities:

Table 13: Key Base Case Assumptions

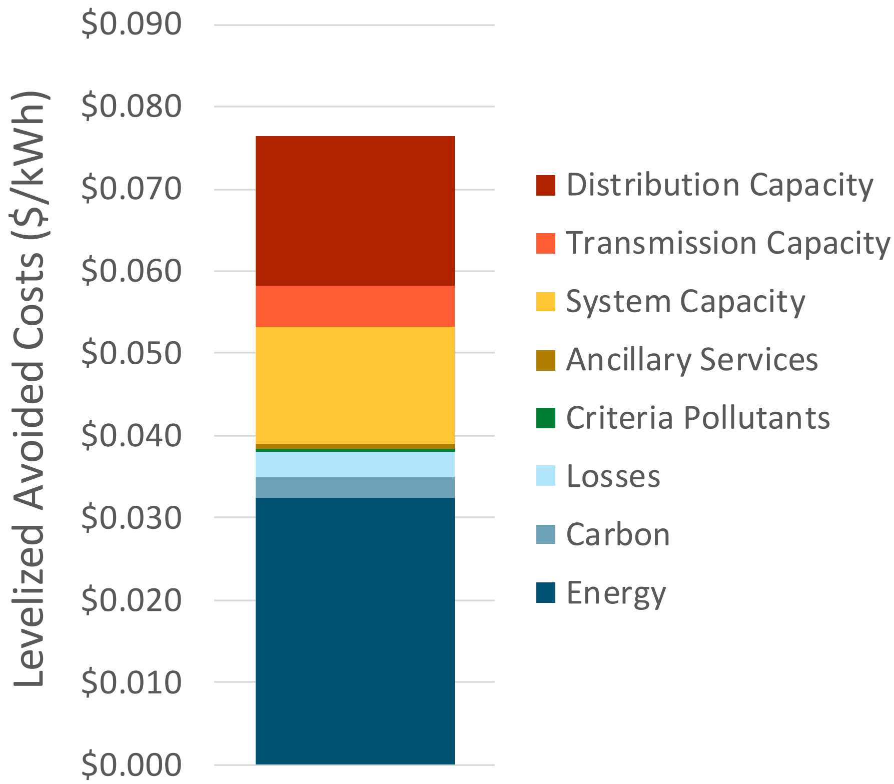
Component	Value
Annual Inflation	2%
Utility After-Tax WACC (real) (Used to discount PCT, RIM, PACT, and TRC costs and benefits)	4.7%
Societal Discount Rate (real) (Used to discount SCT costs and benefits)	3%
Annual PV Panel Degradation Rate	0.5%
Annual Wind Turbine Degradation Rate	0.5%
PV System Lifetime	25 years
PV Economic Lifetime	25 years
Integration Cost ($2014/MWh)	$2/MWh

Section 1.3.3 provides sensitivity results showing the exclusion of distribution system avoided costs.

4.3 Base Case Avoided Utility Costs

For each kWh generated by NEM systems, the utility avoids certain costs related to serving that load. For more detailed information on avoided costs, see Section 3.5. A breakdown of these avoided cost components by technology type and customer class is shown in Figure 12. The sum of these cost components are represented by “Utility Avoided Costs” throughout the results section. PV generally avoids more costs to the utility for each kWh generated due to its coincidence with utility load, allowing it to avoid more system capacity and higher cost energy and displace higher losses. RPS avoided costs are also excluded from these charts since they are accounted for as a separate, stand-alone benefit.

Figure 12: Base Case Levelized Avoided Cost Components by Customer Class

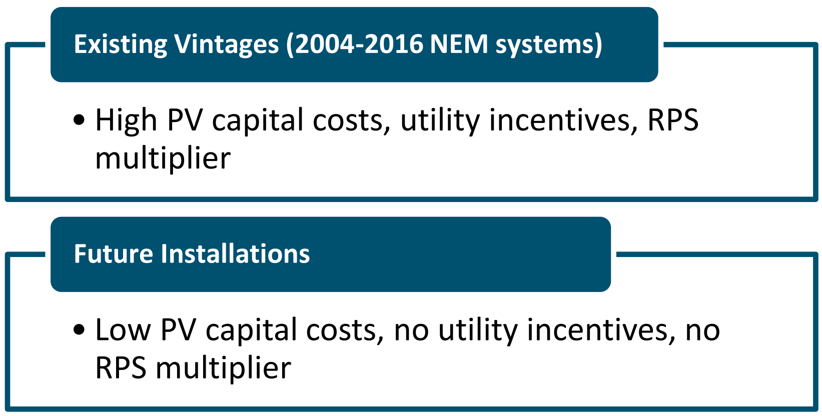


4.4 Base Case Results

4.4.1 RESULTS BY VINTAGE

Through June 2016, over 265 MW of NEM capacity has been installed in Nevada. This section shows the costs and benefits for all systems installed through 2016 as well as projected results for future installations. Comparing the results from these two vintage groups is important for understanding the future impacts of existing and forecasted systems. Figure 13 delineates the vintage groups and the key policy modifications and considerations for cost-effectiveness analysis.

Figure 13: Key Drivers of NEM Costs and Benefits by Vintage



4.4.1.1 Participant Cost Test (PCT)

As shown in Table 14, analysis of existing systems installed through 2016 indicates that participants experience an NPV cost of $118 million and a levelized net cost of $0.02/kWh.

Figure 14: Participant Cost Test Levelized Results by Vintage

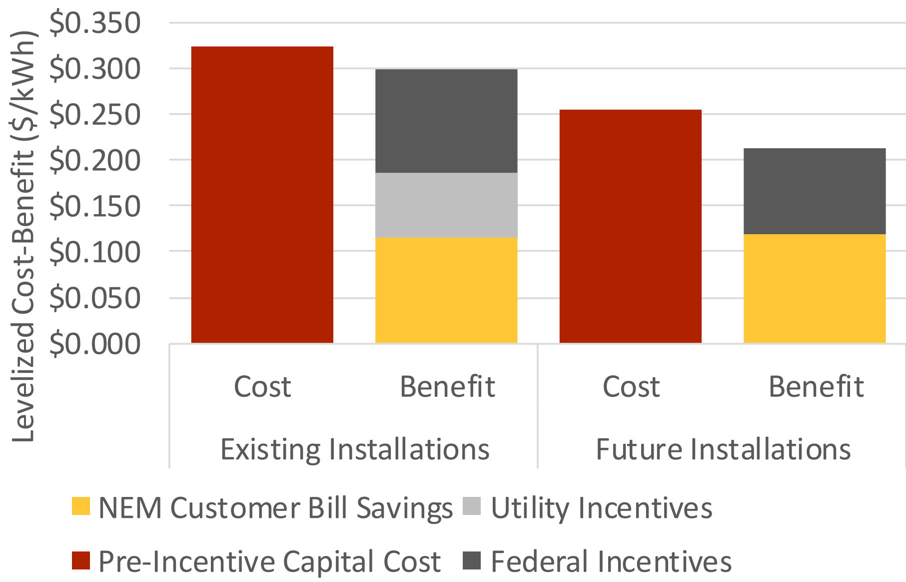


Table 14: Participant Cost Test Results by Vintage

Benefit (cost) to customers who participate in NEM	Existing Installations	Future Installations
Lifecycle NPV ($MM 2014)	($118)	($201)
Annual ($MM 2014)	($10)	($17)
Levelized ($/kWh 2014)	($0.02)	($0.04)

Historically, the levelized installed capital costs of distributed NEM systems were relatively high. However, there were utility incentives to help with these costs as well as a federal tax credit. As the installed cost of solar has dropped, so has the federal incentive (since it is a fixed of installed costs) and utility incentives have also declined. Future installations do not receive any utility incentives. Therefore, we do not calculate solar PV to be cost-effective from the participant's perspective for either existing or future installations.

4.4.1.2 Ratepayer Impact Measure (RIM)

We calculate a cost-shift from NEM customers to non-participating customers for both existing installations and future installations. In total, existing installations shift approximately $36 million per year while future installations would hypothetically shift an additional $15 million per year. We calculate a net cost (cost-shift) of $0.08/kWh to non-participating customers for existing installations and $0.04/kWh to non-participants for future installations. The cost-shift is larger for existing installations almost entirely because of the utility funded RenewableGenerations incentive.

Figure 15: Ratepayer Impact Measure Levelized Results by Vintage

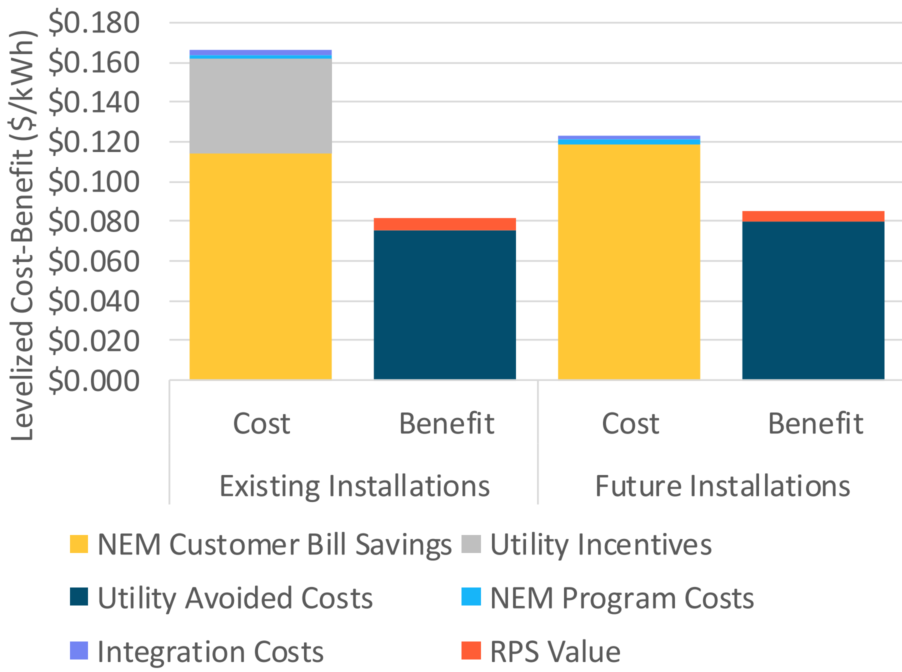


Table 15: Ratepayer Impact Measure Results by Vintage

Benefit (cost) to non-participating ratepayers	Existing Installations	Future Installations
Lifecycle NPV ($MM 2014)	($423)	($179)
Annual ($MM 2014)	($36)	($15)
Levelized ($/kWh 2014)	($0.08)	($0.04)

Previously, we showed that there was a lifetime net economic *benefit* to ratepayers of NEM systems installed in 2014/2015 of $0.05 per kWh generated and $168 million overall. This was largely due to RPS compliance value which was based on an estimate of the cost of a marginal RPS resource *at that time*. The

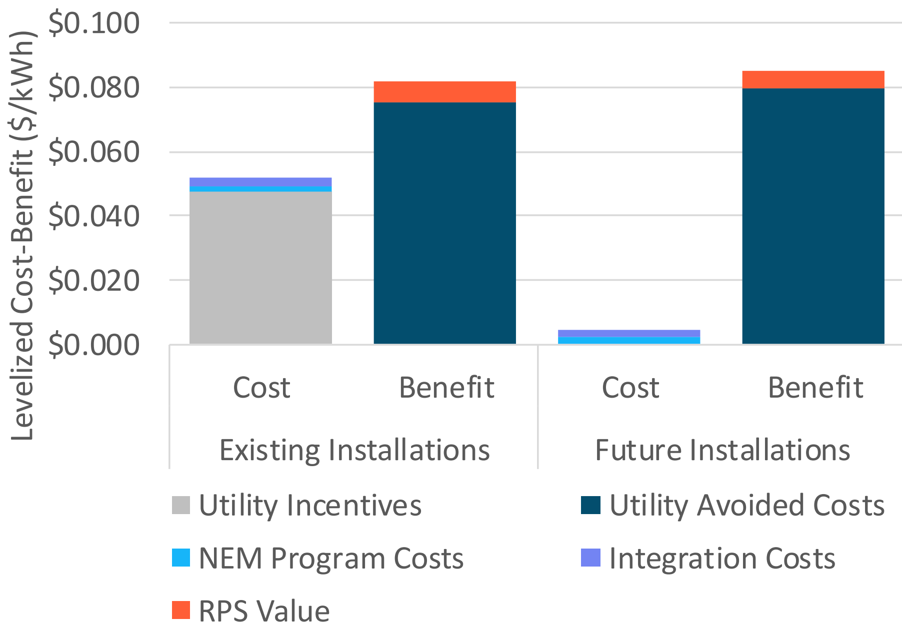
2014 base case marginal RPS resource cost was $100/MWh while the updated 2016 marginal RPS resource cost was $35.55/MWh. All of this leads to a dramatic reduction in the “RPS Value” benefit of NEM installations relative to the 2014 study. In turn this is a large reason why we now forecast NEM systems to induce a cost-shift to non-participants. The other large driver behind this change is a steep decrease in natural gas prices which reduces the avoided cost of NEM generation.

4.4.1.3 Program Administrator Cost Test (PACT)

The PACT measures NV Energy’s revenue requirement reduction and the corresponding, equivalent aggregate bill reductions that accrue to NV Energy customers. The PACT includes all of the same cost components as the RIM with the exception of NEM participant customer bill savings. NEM customer bill savings that exceed the avoided utility costs, if there are any, from NEM are collected by increasing the bills of other customers, so they have no impact on NV Energy’s total bill revenue. The PACT measures the utility system costs that are avoided by NEM generation against the NEM program costs, integration costs, and incentive payments.

We estimate that solar NEM decreases NV Energy’s revenue requirement by approximately $13 million per year for existing installations and by an additional $32 million per year for hypothetical future installations. This is equivalent to a net benefit of $0.03/kWh for existing installations and $0.08/kWh for future installations.

Figure 16: Program Administrator Cost Test Levelized Results by Vintage



Beyond 2016, utilities will no longer provide an incentive to NEM customers. NEM generation still provides many utility system benefits, but NV Energy only needs to recover the relatively small NEM program costs and integration costs through its revenue requirement. Table 16 summarizes the NPV of total utility customer bill savings due to NEM. Once again, note that a positive value represents a reduction in customer bills while a negative value represents an increase.

Table 16: Program Administrator Cost Test Results by Vintage

Reduction (increase) in aggregate customer bills	Existing Installations	Future Installations
Lifecycle NPV ($MM 2014)	$151	$379

Annual ($MM 2014)	$13	$32
Levelized ($/kWh 2014)	$0.03	$0.08

4.4.1.4 *Total Resource Cost Test (TRC)*

The TRC shows that overall, the state of Nevada incurs an annual economic *cost* of about $56 million per year, or $0.13/kWh, from all existing NEM installations. As shown in Figure 17, the NEM system capital costs exceed the utility avoided costs even with the assistance of the ITC.

Figure 17: Total Resource Cost Test Levelized Results by Vintage

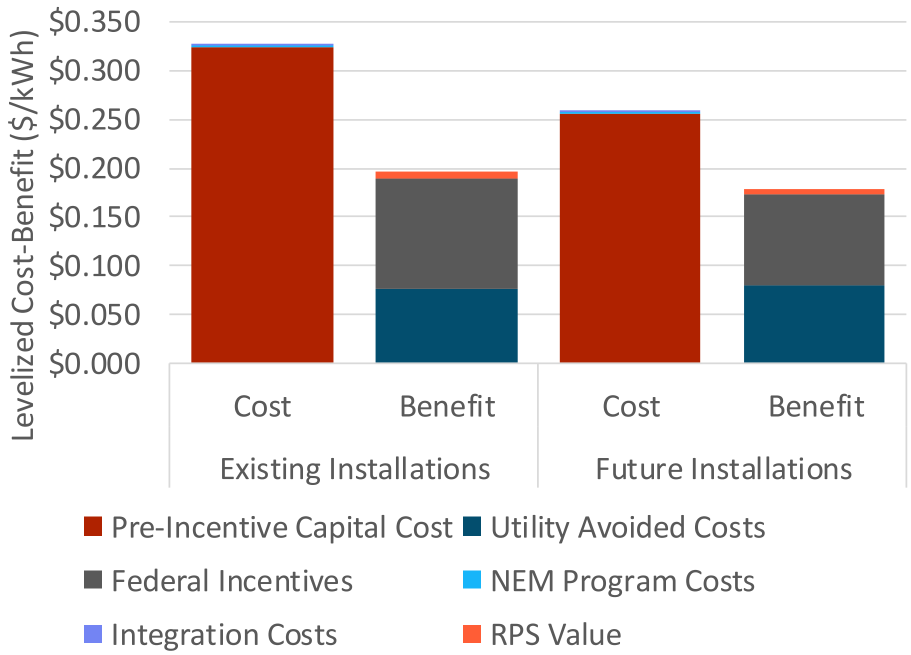


Table 17: Total Resource Cost Test Results by Vintage

Benefit (cost) to the state of Nevada	Existing Installations	Future Installations
Lifecycle NPV ($MM 2014)	($660)	($380)
Annual ($MM 2014)	($56)	($32)
Levelized ($/kWh 2014)	($0.13)	($0.08)

Future NEM systems still show a net economic cost to the state of Nevada, despite continued reduction of NEM capital cost. We estimate this cost to be $32 million per year or $0.08/kWh of NEM generation.

4.4.1.5 Societal Cost Test (SCT)

The SCT calculations are identical to those used in the TRC above, except that the SCT employs a lower discount rate and includes the additional monetized impact of criteria pollutant reductions.

We calculate a net cost of $55 million per year to the state of Nevada, including externalities, which is equivalent to a levelized net cost of $0.13/kWh.

As shown in Table 18, the lower discount rate increases the net present value cost to the state of Nevada but not the annualized or levelized results. The NPV costs and benefits of NEM increase because they are both assumed to accrue on an annual basis (PPA financing assumed for all NEM owners). Therefore, the increase in NPV net cost is due to an increase in magnitude of total costs and benefits and thus an increase in the absolute difference between the two. For the annualized and levelized values, there is not a significant change because the NPV is annualized and levelized using the societal discount rate as well.

We find that the overall health impacts of NEM are very small and negative. Because of Nevada's RPS, the installation of NEM systems avoids and defers utility-sited renewable development.

Figure 18: Societal Cost Test Levelized Results by Vintage

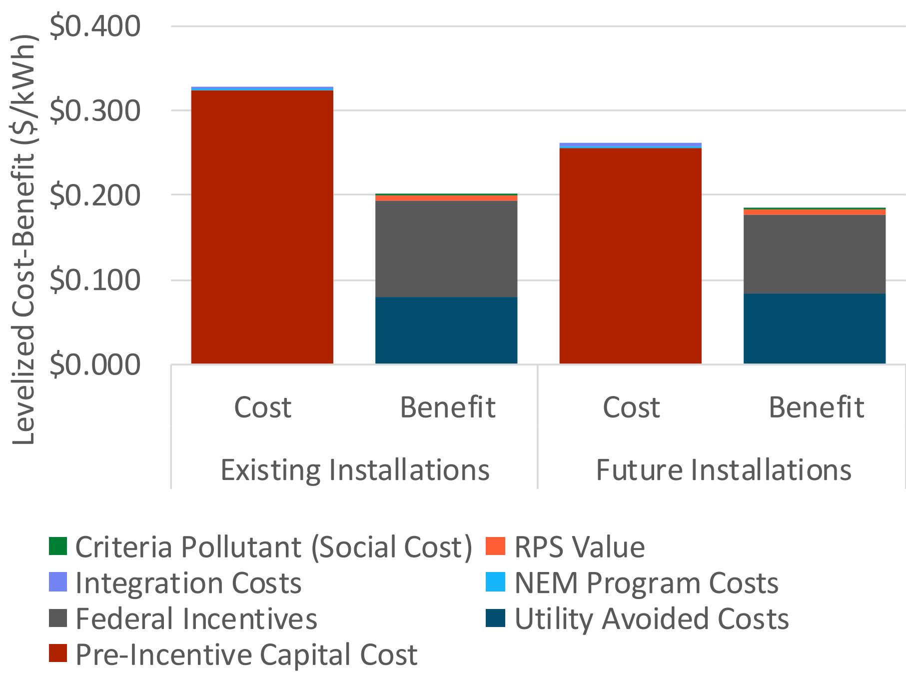


Table 18: Societal Cost Test Results by Vintage

Benefit (cost) to the state of Nevada, including externalities	Existing Installations	Future Installations
Lifecycle NPV ($MM 2014)	($764)	($446)

Annual ($MM 2014)	($55)	($32)
Levelized ($/kWh 2014)	($0.13)	($0.08)

4.4.2 RESULTS BY UTILITY INCENTIVE STATUS

In an effort to promote renewable energy and meet certain statewide policy goals, NV Energy offers financial incentives to customers who purchase and install qualifying NEM generators. The cost of these incentives is ultimately borne by ratepayers, as NV Energy is allowed to recover these costs through rates.

This section compares the cost-effectiveness of incentivized and non-incentivized *existing* NEM systems under the PCT, RIM, and TRC cost tests. We exclude the PACT and SCT results from this section because we do not think they add any information not reflected in the RIM and TRC results. We do not analyze hypothetical future systems installed after 2016 in this section.

4.4.2.1 Participant Cost Test (PCT)

In aggregate, NEM customers who receive utility incentives experience a small net levelized cost of $0.01/kWh, while non-incentivized NEM customers experience a levelized cost of $0.08/kWh. This difference is almost entirely driven by the $0.07/kWh levelized utility incentive, although other characteristics of incentivized vs. non-incentivized system installations, such as installation years and residential proportion, also impact the results.

Figure 19: Participant Cost Test Levelized Results by Incentive Status

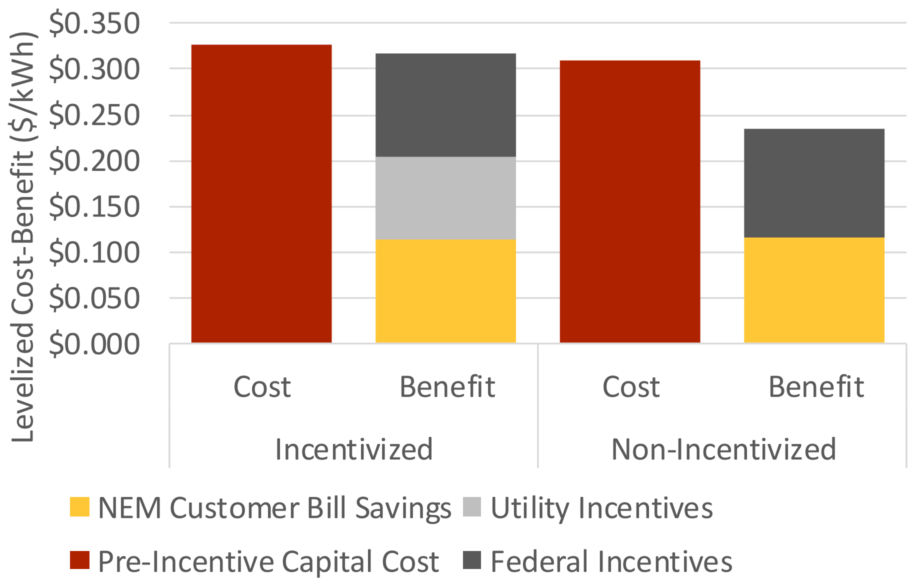


Table 19 shows the NPV and total annual cost to participants with incentivized and non-incentivized systems. Note that these non-levelized results are also driven by the MW quantity of each block, and there are many more incentivized systems than non-incentivized systems.

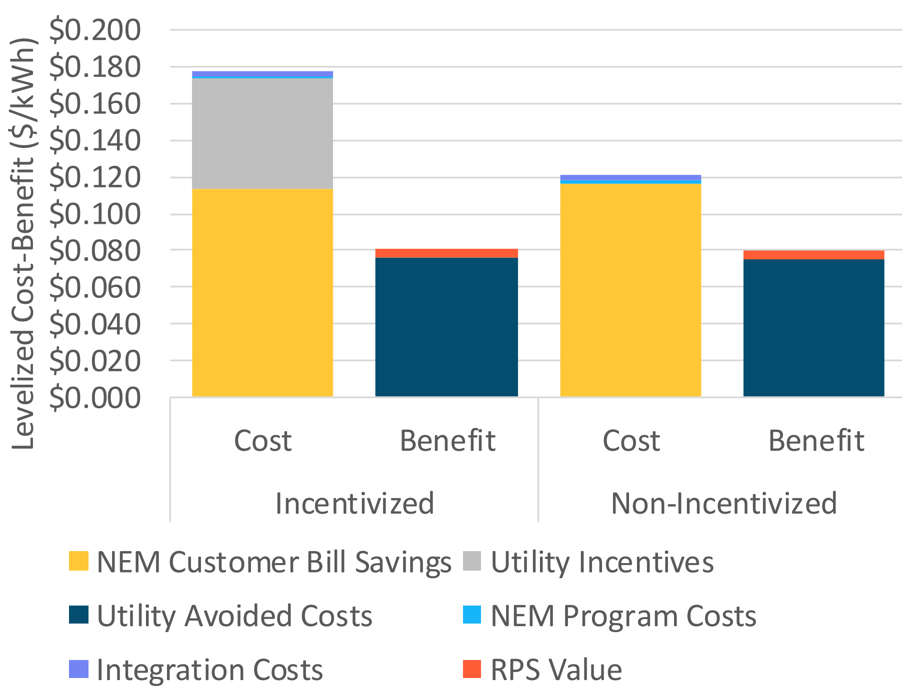
Table 19: Participant Cost Test Results by Incentive Status

Benefit (cost) to customers who participate in NEM	Incentivized	Non-Incentivized
Lifecycle NPV ($MM 2014)	($41)	($77)
Annual ($MM 2014)	($3)	($6)
Levelized ($/kWh 2014)	($0.01)	($0.08)

4.4.2.2 Ratepayer Impact Measure (RIM)

Using the base case assumptions, we estimate that both incentivized and non-incentivized NEM systems cause a cost-shift to non-participating customers. Incentivized systems cause a cost-shift of $0.10/kWh while non-incentivize systems cause a cost-shift of $0.04/kWh. This difference is almost entirely driven by the $0.06/kWh levelized utility incentive.

Figure 20: Ratepayer Impact Measure Levelized Results by Utility Incentive Status



We estimate that incentivized systems cause a cost-shift of approximately $32 million per year while non-incentivized systems cause an additional cost-shift of $3 million per year. These results are driven by a combination of the larger levelized-cost shift for incentivized systems as well as larger installed quantity (MW) of incentivized systems.

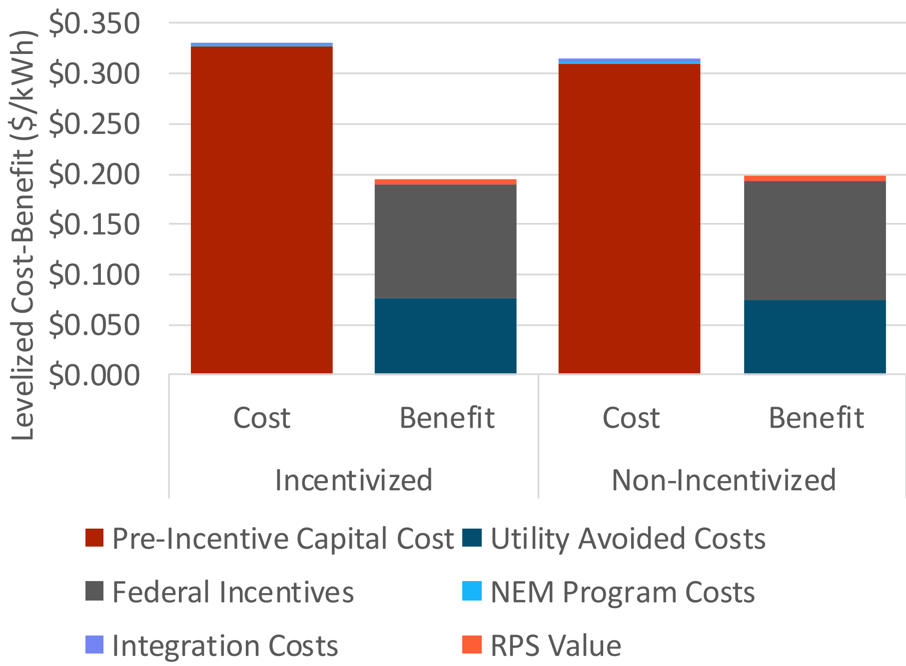
Table 20: Ratepayer Impact Measure Results by Utility Incentive Status

Benefit (cost) to non-participating ratepayers	Incentivized	Non-Incentivized
Lifecycle NPV ($MM 2014)	($384)	($40)
Annual ($MM 2014)	($32)	($3)
Levelized ($/kWh 2014)	($0.10)	($0.04)

4.4.2.3 Total Resource Cost Test (TRC)

We find that both incentivized and non-incentivized NEM impose a similar net cost to the state of Nevada. Because utility incentive payments are transfers between parties within Nevada, there is no statewide cost of incentivizing NEM systems. The levelized net cost of non-incentivized NEM is about $0.12/kWh, while the net cost of incentivized NEM is $0.14/kWh.

Figure 21: Total Resource Cost Levelized Results by Utility Incentive Status



As with previous results, the discrepancy between the NPV and annualized results in the table below is largely driven by the large installed quantity of incentivized systems.

Table 21: Total Resource Cost Results by Utility Incentive Status

Benefit (cost) to the state of Nevada	Incentivized	Non-Incentivized
Lifecycle NPV ($MM 2014)	($544)	($116)
Annual ($MM 2014)	($46)	($10)
Levelized ($/kWh 2014)	($0.14)	($0.12)

4.5 Sensitivity Results

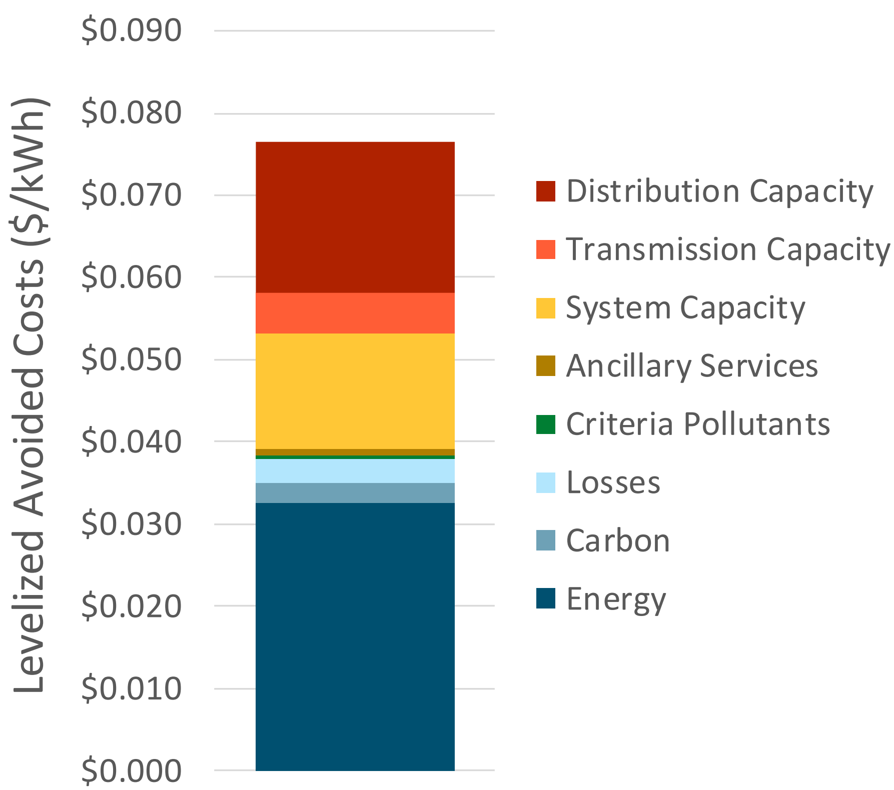
In addition to the base case, we evaluate NEM cost-effectiveness for one sensitivity assuming *no* distribution avoided costs. At the end of the section, we describe several additional sensitivities that users can run using the publically available models that can downloaded online.

4.5.1 DISTRIBUTION AVOIDED COSTS SENSITIVITY

Our base case awards the full value of avoided distribution upgrades to NEM generation, representing an upper bound of distribution benefits. This sensitivity, in contrast, evaluates how much utility avoided costs would decrease if distribution capacity upgrades cannot be reliably avoided by NEM generation, due to the intermittency of renewable generation. Intermittency is especially problematic when considered in the context of a single distribution circuit, without the aggregation that occurs when DG installations are considered over a larger geographic area. Indeed, the NV Energy distribution engineers that we spoke with think the intermittent output of NEM systems may not be reliable enough to avoid the need for distribution system upgrades.

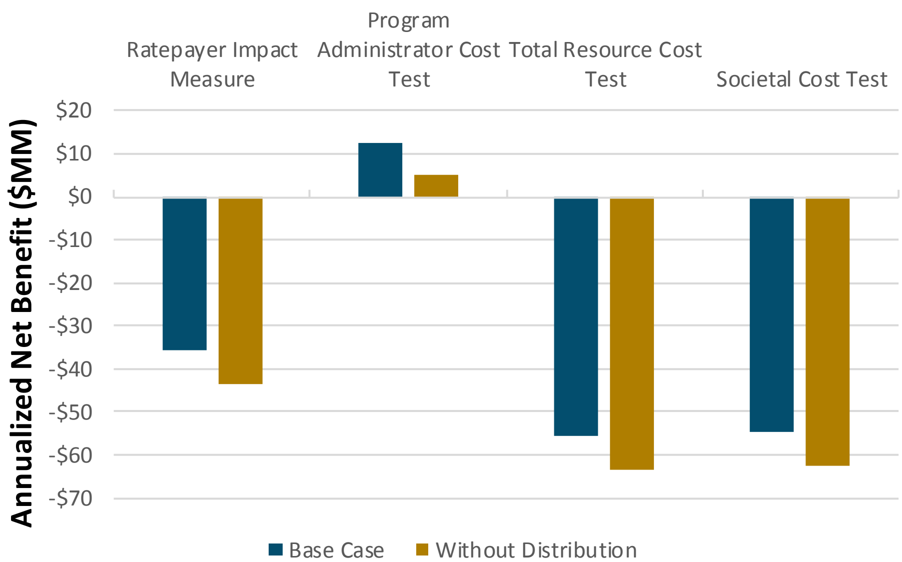
Only the cost tests that include the utility avoided cost component are affected by this sensitivity (RIM, PACT, TRC, and SCT). Figure 22 shows the avoided costs by component. Distribution avoided costs compose 1.8 cents/kWh of the entire 7.7 cents/kWh avoided cost (24%).

Figure 22: Avoided Cost Breakdown



Not including distribution avoided costs decreases benefits by approximately $8 million per year. Figure 23 shows how the annualized net benefit (aggregate benefits minus costs) in each affected cost test changes with the exclusion of the distribution benefit. The distribution benefit is not large enough to change the sign result of any cost test, but does have an impact on each one's magnitude.

Figure 23: Annualized Net Benefits, Distribution Sensitivity



5 Appendix

5.1 Additional Results

To complement the general results section, this section shows the levelized net benefit and NPV results for each major categorical breakdown and vintage group. The categories are:

- Customer Class
    - Residential
    - Non-residential
- Utility
    - NVE North
    - NVE South
- Utility Incentive Status
    - Incentivized
    - Non-Incentivized

5.1.1 RESULTS BY CUSTOMER CLASS

PCT

	Residential	Non-Residential

Lifecycle NPV ($MM 2014)	($123)	$5
Annual ($MM 2014)	($10)	$0.4
Levelized ($/kWh 2014)	($0.04)	$0.003

RIM

	Residential	Non-Residential
Lifecycle NPV ($MM 2014)	($228)	($195)
Annual ($MM 2014)	($19)	($16)
Levelized ($/kWh 2014)	($0.07)	($0.12)

PACT

	Residential	Non-Residential
Lifecycle NPV ($MM 2014)	$224	($73)
Annual ($MM 2014)	$19	($6)
Levelized ($/kWh 2014)	$0.07	($0.04)

TRC

	Residential	Non-Residential
Lifecycle NPV ($MM 2014)	($366)	($294)
Annual ($MM 2014)	($31)	($25)
Levelized ($/kWh 2014)	($0.11)	($0.18)

SCT

	Residential	Non-Residential
Lifecycle NPV ($MM 2014)	($425)	($339)
Annual ($MM 2014)	($30)	($24)
Levelized ($/kWh 2014)	($0.11)	($0.17)

5.1.2 RESULTS BY UTILITY

PCT

	NVE North	NVE South
Lifecycle NPV ($MM 2014)	($14)	($104)
Annual ($MM 2014)	($1)	($9)
Levelized ($/kWh 2014)	($0.01)	($0.03)

RIM

	NVE North	NVE South
Lifecycle NPV ($MM 2014)	($137)	($286)
Annual ($MM 2014)	($12)	($24)
Levelized ($/kWh 2014)	($0.12)	($0.07)

PACT

	NVE North	NVE South
Lifecycle NPV ($MM 2014)	($45)	$196
Annual ($MM 2014)	($4)	$17
Levelized ($/kWh 2014)	($0.04)	$0.05

TRC

	NVE North	NVE South
Lifecycle NPV ($MM 2014)	($217)	($443)
Annual ($MM 2014)	($18)	($37)
Levelized ($/kWh 2014)	($0.19)	($0.11)

SCT

	NVE North	NVE South
Lifecycle NPV ($MM 2014)	($250)	($514)
Annual ($MM 2014)	($18)	($37)
Levelized ($/kWh 2014)	($0.19)	($0.11)

5.2 System Cost *Pro Forma*

The *pro forma* financial model calculates the levelized NEM system capital and O&M costs, including all utility and federal incentives. The financial calculations assume that all systems are owned by third parties and financed with PPAs, where the PPA price that the customer pays is equal to the net system costs levelized over the PPA contract length.

Table 22 shows our active financing cost assumptions. The Nevada NEM Pro Forma Financial Calculator model optimizes debt and equity shares in order to reach a target debt service coverage ratio of 1.4.

Table 22: WACC and Cost of Debt Assumptions

	After Tax WACC	Cost of Debt
2004	9.00%	7.25%
2005	9.00%	7.25%
2006	9.00%	7.50%
2007	9.00%	7.50%
2008	8.70%	6.75%
2009	8.50%	6.50%
2010	8.50%	6.50%
2011	8.25%	6.05%
2012	8.25%	5.40%
2013	8.25%	5.40%
2014	8.25%	6.05%
2015	8.50%	6.50%
2016	8.50%	6.50%

Table 23 lists other key financing input assumptions to the pro forma model. These inputs apply to all system types modeled.

Table 23: Additional Financing Inputs

Input	Value
MACRS Depreciation Term	5 years[17]
Federal Income Tax	35%
State Income Tax	0%
Property Tax	0%[18]
Insurance Cost	0.5% of CapEx
O&M Cost Escalation	2%/year
PPA Term	25 years

Table 24 provides a summary of the capacity factors used in the model. Our bill and avoided cost calculations use hourly generation profiles in order to capture the importance of differences in renewable generation shapes. In the pro forma model, we use simplified representative capacity factors for each technology type and utility to calculate levelized costs.

[17] Department of the Treasury Internal Revenue Services Publication 946, available at: http://www.irs.gov/pub/irs-pdf/p946.pdf
[18] Nevada Renewable Energy Systems Property tax Exemption , available at: http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NV02F&re=1&ee=1

Table 24: Capacity Factor Assumptions

	NVE South	NVE North
Solar PV	21%	19%

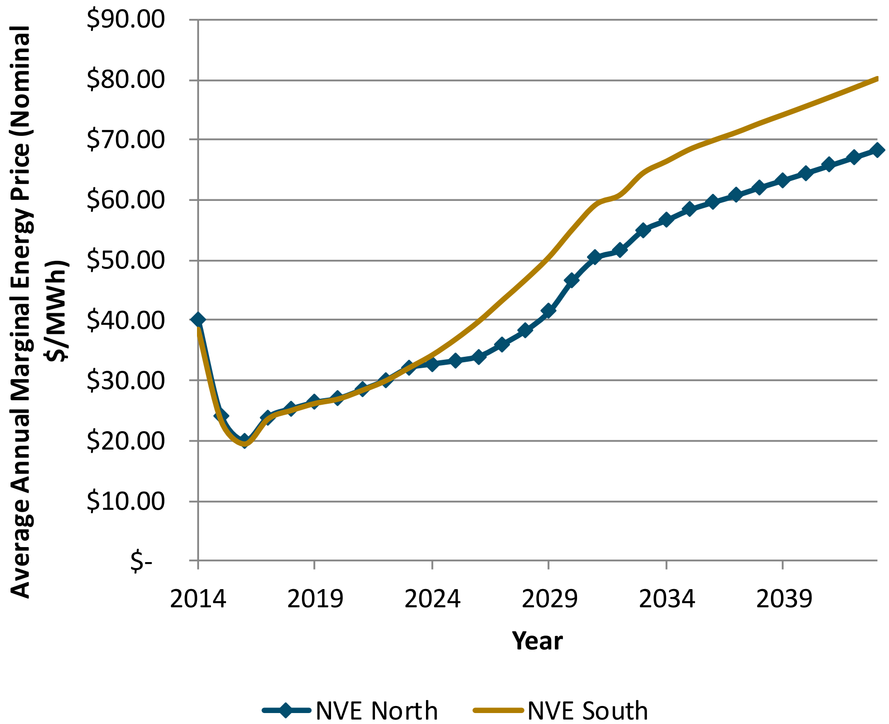
5.3 Avoided Costs

This appendix provides additional information regarding certain critical avoided cost components.

5.3.1 ENERGY COMPONENT

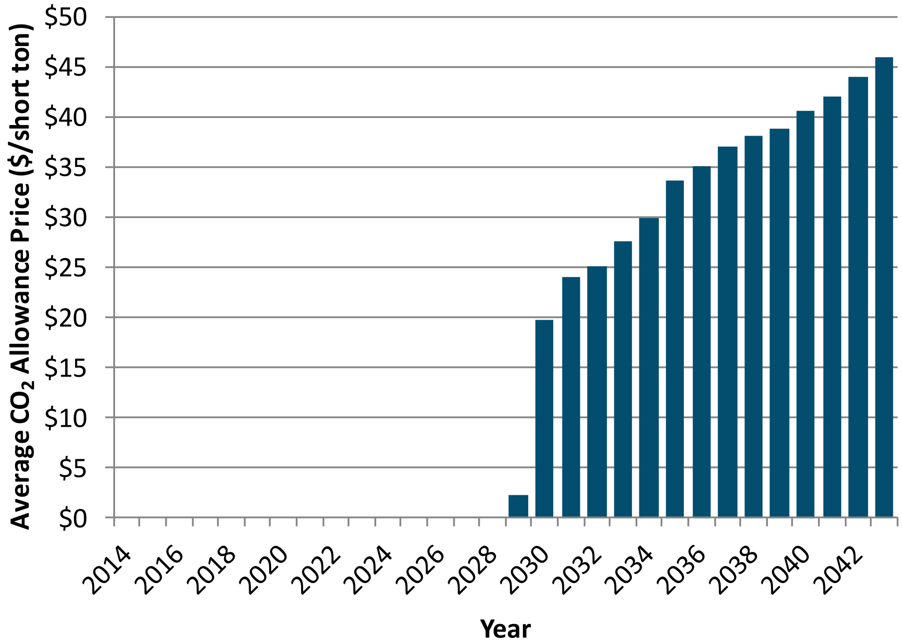
Hourly marginal energy prices from NV Energy's production simulation runs increase over time, as a function of increasing gas prices and the introduction of a carbon allowance price in 2029. Figure 24 below shows the average annual marginal cost of energy for each utility (excluding carbon), from 2014 to 2043.

Figure 24: Average Annual Marginal Energy Prices (No Carbon)



NV Energy's average energy prices increase significantly in 2029 with the introduction of a regulatory CO_2 emission allowance price. Figure 25 shows NV Energy's IRP carbon price forecast through 2043.

Figure 25: Annual CO_2 Allowance Prices



5.3.2 SYSTEM CAPACITY COMPONENT

The capacity component of avoided costs is defined by a short run value that transitions into a long run value over time. The short run value reflects the fact that both NVE North and NVE South currently have a surplus of available generating capacity; the utilities expect to reach resource balance and add new capacity resources in 2027. The short term capacity value is approximated using the estimated fixed O&M cost of a gas combustion turbine (CT), representing the cost of maintaining an existing capacity resource. As the utilities approach resource balance, the capacity value gradually approaches its long run value, defined as the capacity residual of a new capacity resource.

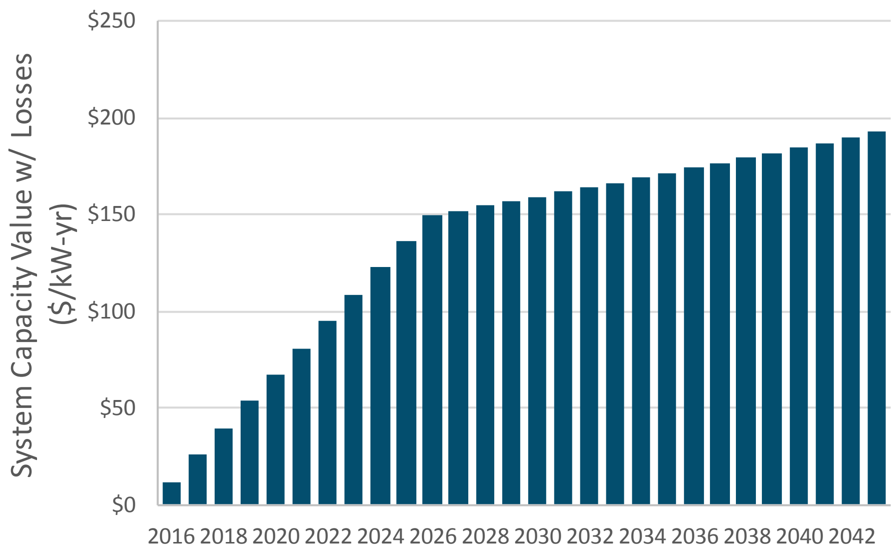
We assume that the new capacity resource for each utility is a natural gas CT. We calculate the capacity residual of the CT by subtracting energy and A/S revenues earned by the resource from the CT's annualized fixed cost. Expected energy and A/S revenues are calculated by dispatching the CT against the production simulation energy prices from NV Energy (the same prices used to generate the energy component of the avoided costs, including a carbon allowance price). Table 25 lists our assumptions regarding a new gas CT's performance, which determine the resource's dispatch pattern when compared to production simulation prices. The table includes specific assumptions for each utility, as well as the data source for each input value.

Table 25: New Capacity Resource Performance Metrics

Component	NVE North Value	NVE South Value	Data Source
Variable O&M Cost	$11.93/MWh (2016$)	$11.93/MWh (2016$)	E3 Assumption
Plant Cost Escalation Rate	2%/year	2%/year	E3 assumption
Resource Balance Year	2027	2027	NV Energy
New Capacity Resource Annualized Fixed Cost	$174.42/kW-yr (2015$)	$174.42/kW-yr (2015$)	NV Energy
Annual Energy Revenues	$50/kW-yr (2016$)	$50/kW-yr (2016$)	E3 assumption
Plant Cost Escalation Rate	2%/year	2%/year	E3 assumption

Figure 26 shows the resulting annual system capacity value for each utility. The values gradually increase until reaching the capacity residual in the resource balance year, and then escalate at inflation through the end of the study period.

Figure 26: Annual System Capacity Value



5.3.3 TRANSMISSION AND DISTRIBUTION COMPONENTS

NV Energy provided transmission and distribution annualized fixed costs from each utility's most recent marginal cost of service study.

Table 26: Transmission and Distribution Capacity Annualized Fixed Costs

	NVE North (2015$)	NVE South (2015$)
Transmission Capacity ($/kW-yr)	$28.82	$27.53
Distribution Capacity ($/kW-yr)	$107.11	$55.63

5.3.4 AVOIDED RPS VALUE

As described in Section 3.6, NEM generation earns value by avoiding utility purchases of utility-sited renewables to meet the Nevada RPS policy. The avoided RPS value is defined by the net cost of the avoided renewable generation, meaning its total cost minus its total value to the system. Our analysis assumes that the avoided renewable resource is central-station PV. The total costs of the RPS resource are the busbar cost (PPA price) and resource integration cost. The benefit of the RPS resource is energy, calculated using hourly avoided costs.

Table 27: RPS Value Inputs

Component	NVE North Value	NVE South Value	Data Source
Marginal Resource Busbar Cost ($/MWh)	$35.55	$35.55	NV Energy
Marginal Resource Integration Cost ($/MWh)	$2	$2	Literature review (see Integration Costs section)

5.3.5 EXAMPLE ANNUAL AVOIDED COSTS BY COMPONENT

Figure 27 shows the annual average avoided costs by component of a representative DG solar installation in NVE North's territory. The annual avoided costs look very similar for DG installations in NVE South's territory.

Figure 27: Example Annual Avoided Cost by Component of a DG Solar Installation in NVE South