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BEFORE THE IDAHO PUBLIC UTILITIES COMMISSION

IN THE MATTER OF THE APPLICATION OF IDAHO POWER COMPANY FOR AUTHORITY TO ESTABLISH NEW SCHEDULES FOR RESIDENTIAL AND SMALL GENERAL SERVICE CUSTOMERS WITH ON-SITE GENERATION.	CASE NO. IPC-E-17-13

IDAHO POWER COMPANY

REBUTTAL TESTIMONY

OF

DAVID M. ANGELL

Q. Please state your name.

A. My name is David M. Angell.

Q. Are you the same David M. Angell that previously presented direct testimony?

A. Yes.

Q. Have you had the opportunity to review the pre-filed direct testimony of the City of Boise's witness Stephan L. Burgos; the Idaho Clean Energy Association, Inc.'s ("ICEA") witnesses Kevin King, Michael Leonard, and Stephen White; the Idaho Conservation League's ("ICL") witness Benjamin J. Otto; Sierra Club's witness R. Thomas Beach; the Idaho Irrigation Pumpers Association, Inc's witness Anthony J. Yankel; the Snake River Alliance and NW Energy Coalition's ("SRA/NW Energy") witness Amanda M. Levin; Vote Solar's witness Briana Kober; Auric Solar, LLC's witness Elias Bishop; and the Idaho Public Utilities Commission ("Commission") Staff's ("Staff") witnesses Michael Morrison and Stacey Donohue?

A. Yes, I have.

Q. What is the scope of your rebuttal testimony?

A. The purpose of my rebuttal testimony is to present evidence that the load service requirements and usage characteristics of residential and small general service ("R&SGS") customers who install on-site generation are different than that of R&SGS customers without on-site generation, and to respond to various arguments raised by intervening parties and Staff in their direct testimonies. My testimony is comprised of three sections.

In Section I, I explain in detail, the additional analyses performed by the Company and how the Company has demonstrated that the load service requirements and pattern of use are distinctly different for residential customers with on-site generation as compared to residential customers without on-site generation.

In Section II, I explain how the utilization of the grid by customers with on-site generation is distinct and discuss the impacts to the grid.

In Section III, I explain why the proposed changes to Schedule 72 are very minor and can easily be addressed as part of this case. I will also explain that the Commission and Staff will have the opportunity to review the Institute of Electrical and Electronic Engineers ("IEEE") requirements before it is adopted.

I. <u>ANALYSIS SUPPORTING ESTABLISHMENT OF SEPARATE CLASSES</u>

Q. Did other parties agree with Idaho Power Company ("Idaho Power" or "Company") that R&SGS customers with on-site generation are different than standard R&SGS customers and therefore require a separate customer class?

A. No. Several parties[1] suggested that the Company did not provide sufficient evidence to justify that R&SGS customers with on-site generation are different than R&SGS customers without on-site generation.

Q. What factors does the Company believe distinguish customers with on-site generation from those without on-site generation?

A. The Company continues to believe that the load service requirement and the pattern of use should be used to evaluate whether a segment of customers is different from their current customer classification.

1. Load Service Requirement

Q. How does the load service requirement of a customer with on-site generation differ from that of a standard service residential customer?

A. The load service requirements of a customer with on-site generation is fundamentally different than that of a customer without on-site generation. Customers with on-site generation are "partial requirements" customers. A partial requirements customer is one who generates all or some of their own electricity. The utility provides only part of the customer's energy needs. Partial requirements customers still require a variety of

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[1] Levin DI, p. 7, ll. 9-10; Kobor DI, p. 32, l. 18 through p. 33, l. 5; Donohue DI, p. 5, l. 5.

services from the utility even though they provide some or all their own energy. So long as these customers remain connected to the utility, they continue to take other services from the utility. As described in my direct testimony, the ancillary services they require typically include: capacity to meet the in-rush current requirements for starting motor loads such as air conditioning compressors, supplemental services when solar is not available at night, and frequency services to maintain power quality. Idaho Power can economically provide partial requirements service that allows customers with on-site generation flexibility in meeting their energy needs with the reassurance that the utility is available to handle all their electrical needs should their on-site generation be interrupted or fail.

Q. What analyses did the Company perform to evaluate the load service requirement?

A. The Company studied the load factor for both groups of customers.

Load Factor

Q. Why is the load factor an important measure to determine that residential customers with on-site generation are different than residential customers without on-site generation?

A. The load factor is the average load divided by the peak load in a specified time period. It is a measure of variability of consumption; a low load factor indicates that load is highly variable, compared to consumers with steady consumption. The more consistent the consumption, the higher the load factor. A low load factor identifies a customer with infrequent high demand and the capacity required to serve that peak demand sits idle for long periods. Thus, customers with a lower load factor use the Idaho Power system capacity less efficiently and, when considering the existing rate design which collects most fixed costs for system capacity, through the volumetric kilowatt-hour ("kWh") charge, are subsidized by customers with higher load factors.

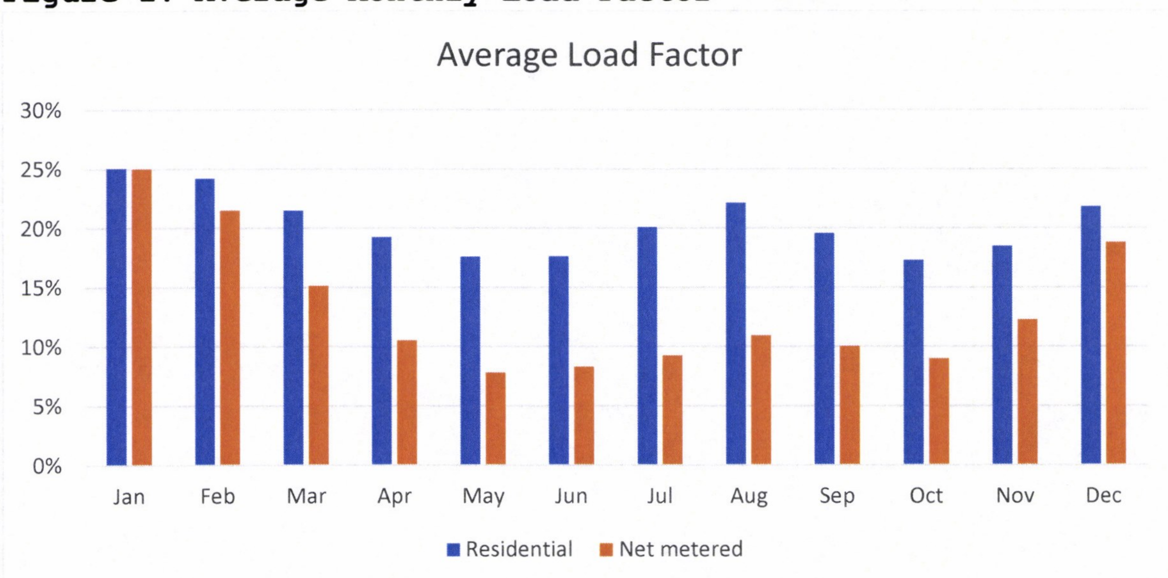
Q. Please describe the load factor analysis that was performed by the Company.

A. The Company calculated the monthly load factors for residential customers with on-site generation and residential customers without on-site generation who were billed for energy in the 2016 calendar year. The analysis included all Idaho residential customers and all Idaho residential customers with on-site generation. To calculate the monthly average kWh, the billed energy was divided by the number of days in the billing period which was then divided by 24 hours. For each customer, the average kWh was then divided by the segments largest kWh for each billing period.

Q. What did the Company's load factor analysis conclude?

A. The Company's load factor analysis demonstrated that residential customers with on-site generation have notably lower load factors than residential customers without on-site generation. The monthly load factors for both groups are provided in Figure 1.

Figure 1. Average Monthly Load Factor



Q. Please summarize your conclusions of the load factor analysis.

A. Residential customers with on-site generation consistently have notably lower load factors than residential customers without on-site generation. In fact, for months May through August, the load factor for the customers with on-site generation is less than half of the residential customers without on-site generation. The Company also compared the annual load factor of both groups of customers. While the annual load factor was generally better for both groups, 21 percent for residential customers with on-site generation and 45 percent for residential customers without on-site generation, the annual load factor for residential customers with on-site generation was still less than half of the residential customers without on-site generation.

2. Pattern of Usage

Q. Did the Company perform additional analyses on the use patterns of residential customers with on-site generation and residential customers without on-site generation?

A. Yes.

Q. What analyses did the Company perform to evaluate the pattern of use of both groups?

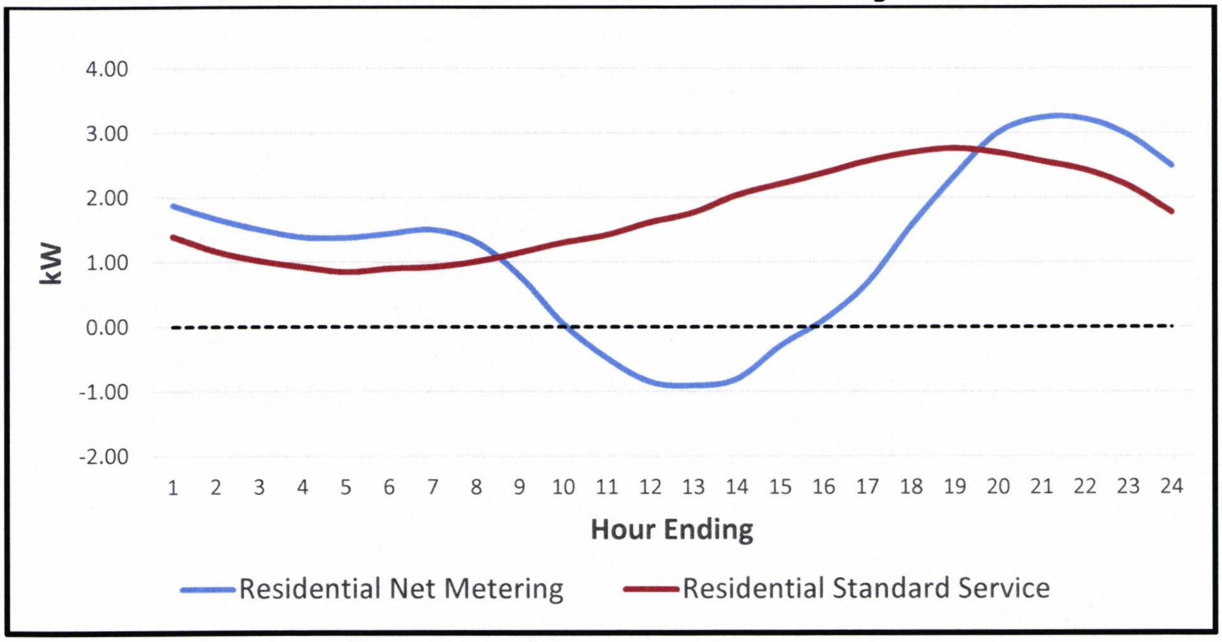
A. The Company studied the load profile, system-coincident demands ("SCD"), and non-coincident demands ("NCD"), for both groups of customers.

Load Profile

Q. Regarding the load profile for both groups, did the Company initially perform any analyses of the load profile of either group?

A. Yes. In her direct testimony, Connie A. Aschenbrenner presented a graph comparing the average hourly consumption of a customer with on-site generation to that of a residential customer without on-site generation on June 29, 2016.[2] I have reproduced Ms. Aschenbrenner's graph as Figure 2.

Figure 2. Average Load Shapes for Residential Standard Service Customers and Residential Net Metering Customers.



Q. Does Staff agree with the Company that customers with on-site generation are different than standard service customers?

A. No. Dr. Morrison states that "there are no meaningful differences between net metering and non-net metering customers in the quantities of electricity used, differences in conditions of service, time, nature, and

[2] Aschenbrenner DI, p. 28, Figure 3.

pattern of use."[3] Dr. Morrison goes on to say "the distribution of individual consumption patterns from both groups is nearly identical" and "[c]onsumption patterns of both groups are similar . . . ."[4]

Q. Do you agree with this assessment that the consumption patterns of both groups are similar?

A. No. I believe that the two load profiles shown in Figure 2 above are distinctly different. They are different for many reasons. The first and most obvious difference is that an average customer with on-site generation has negative consumption, meaning that energy flows to the utility. The second difference is that the average customer with on-site generation has a higher demand for energy during the evening and nighttime hours. The third difference is that the rate of change in usage by customers with on-site generation during the day is significantly larger than for customers without on-site generation.

Q. Did Commission Staff study the load patterns of both groups of customers?

A. Yes. Dr. Morrison of Commission Staff presented a graph comparing the consumption patterns of

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[3] Morrison DI, p. 4, l. 25 - p. 5, l. 4.

[4] Morrison DI, p. 17, ll. 2-6.

average residential customers with on-site generation to that of a residential customer without on-site generation.[5]

Q. Was the graph that Dr. Morrison provided consistent with the graph that Ms. Aschenbrenner included in her testimony to illustrate the hourly consumption of an average customer with on-site generation compared to an average customer without on-site generation?

A. Yes. In fact, the values that each plotted appear to be the same. The only difference between the two graphs is that Ms. Aschenbrenner created a line chart and Dr. Morrison created a bar chart. Other than that, the charts are virtually the same.

Q. Did the Company perform additional analyses to study the load profile of both groups of customers?

A. Yes. Because the Company's initial analysis focused on a single day, the Company's summer peak day, the Company performed additional analyses to study the load profile of both groups over the course of a month. The Company analyzed all 12 months of 2016 and has shared the results for a winter month, a spring month (also representative of fall), and a summer month in Figures 3, 4, and 5 respectively. For the three graphs, each hour data point is the average for that hour throughout the month.

[5] Morrison DI, p. 15, Figure 2.

Figure 3. January 2016 Average Hourly Use - Winter Peak

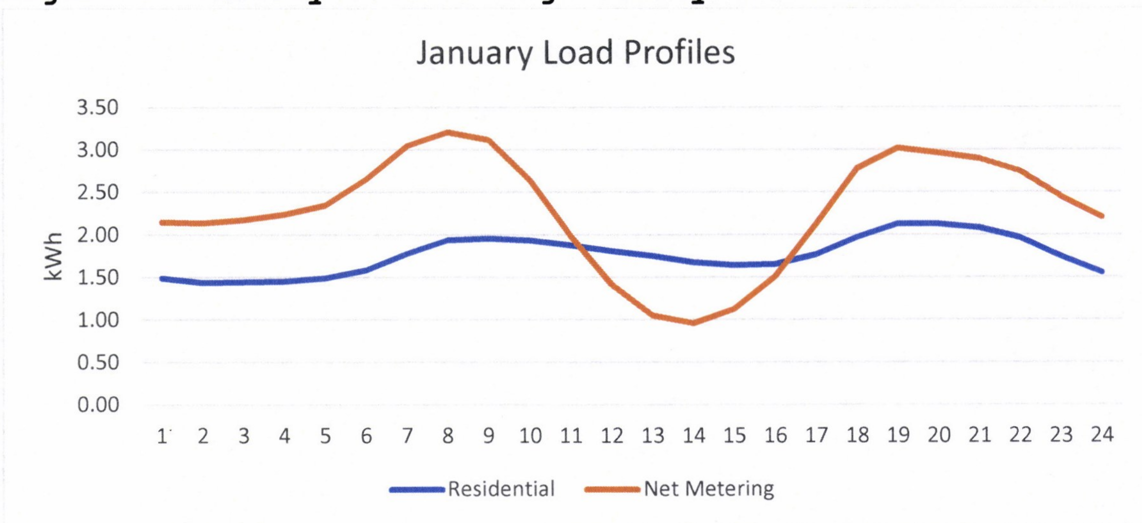


Figure 4. April 2016 Average Hourly Use - Shoulder Month

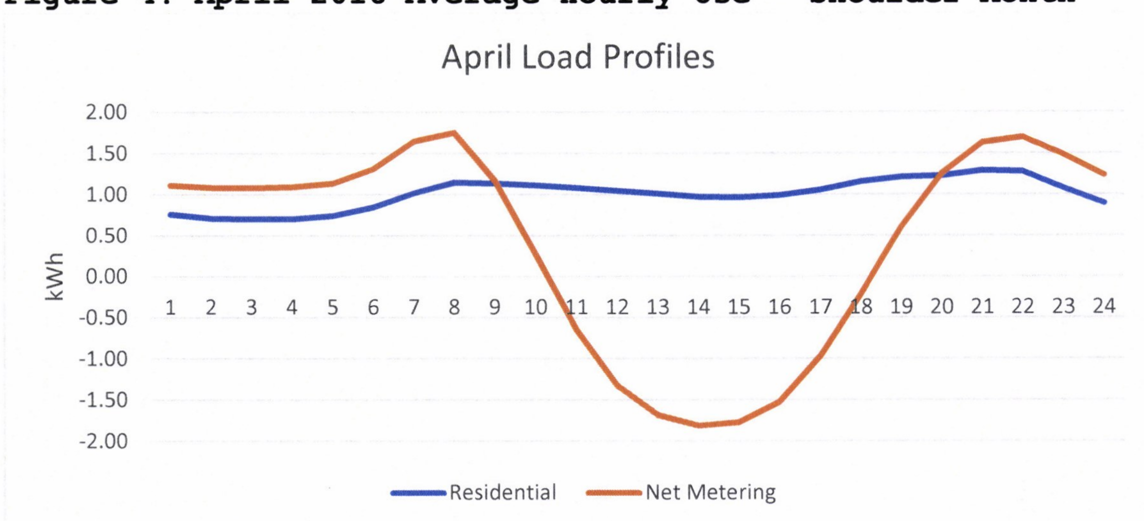
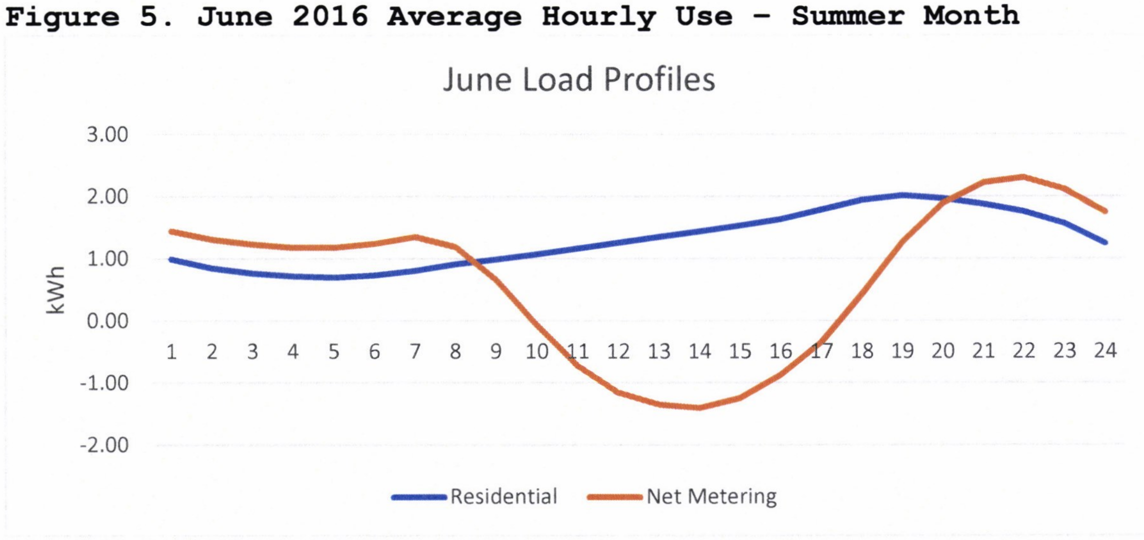


Figure 5. June 2016 Average Hourly Use - Summer Month



Q. Do you believe the load profiles of each group in Figures 3, 4, or 5 are nearly identical or even similar?

A. No. Once again, for the reasons I noted regarding Figure 2, the load profiles continue to be different.

Q. Please summarize your conclusions of the load profile analysis.

A. For all three months, customers with on-site generation had a higher demand for energy during the evening and nighttime hours than customers without on-site generation and their rate of change in usage during the day is larger than for customers without on-site generation.

Q. What other differences were discovered in the analysis of the load profiles?

A. The obvious difference is that customers with on-site generation have negative consumption -- that is energy flows to the utility. This represents the amount of excess energy produced by the customers' on-site generation. The Company did notice that the amount of excess generation varies from month to month.

During January, as a class, the customers with on-site generation do not generate excess energy. Of particular interest, the results for the month of April demonstrate that, not only do the customers with on-site generation generate excess energy, they generate more excess energy on a per-customer basis than in June. This large spring excess occurs when the electrical market is flooded with excess energy and energy prices are significantly depressed. The rate of change in usage during the days in April is greater than during June. It also comes as no surprise that during June, customers with on-site generation do generate excess energy. The Company noted that, when looking at the entire summer month, the magnitude of excess energy was larger than when looking at the peak day only (as was done in Figure 2).

Q. Why is the rate of change significant?

A. As described in my direct testimony, the Company schedules and dispatches generation along with automatic generation control to balance generation to load at every instant in time. Maintaining this balance during high rate of change periods requires more generation dispatches compared to other slower changing periods. Additionally, the highly economic hydroelectric system is constrained in its ability to balance such rapid changes due to river flow ramping limits. This constraint causes the Company to dispatch less economic resources resulting in higher energy costs for retail customers.

System-Coincident and Non-Coincident Demands

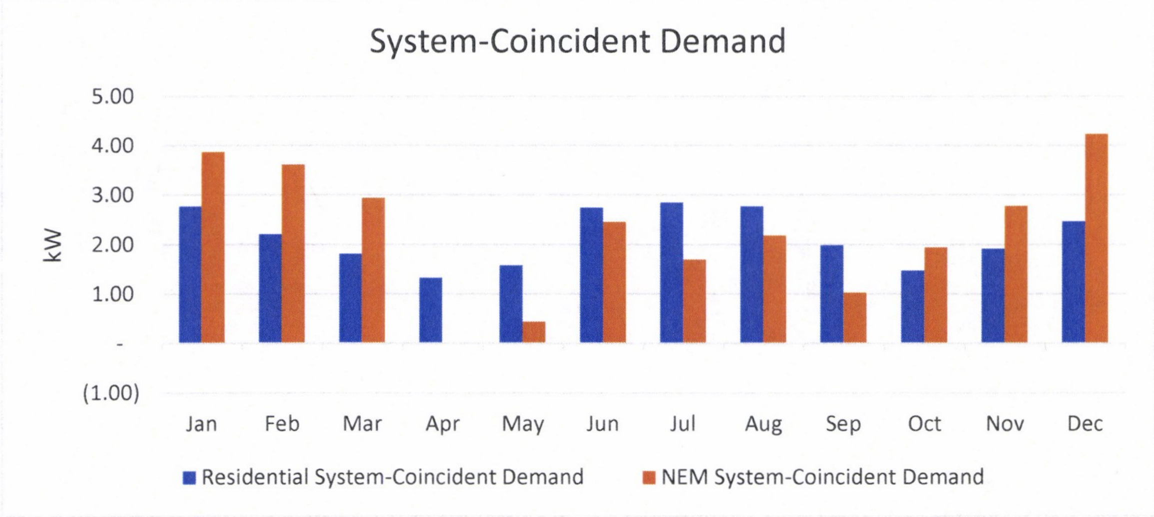
Q. You mentioned that an analysis was performed on the system-coincident and NCDs of residential customers with on-site generation and residential customers without on-site generation. What analysis did the Company perform?

A. The Company calculated the 2016 system-coincident and NCDs for both groups of customers. The SCD is the average demand for the customer class at the time of Idaho Power's system peak. The NCD is the maximum average demand for the customer class regardless of when it happens. System-coincident and NCDs were calculated for each month.

Q. What did you observe from your analysis of the SCDs for both groups of customers?

A. The monthly SCD of customers with on-site generation is lower than customers without on-site generation from April through September; however, it is higher than customers without on-site generation from October through March. The monthly SCDs for both groups of customers are shown in Figure 6.

Figure 6. 2016 System-Coincident Demands by Month



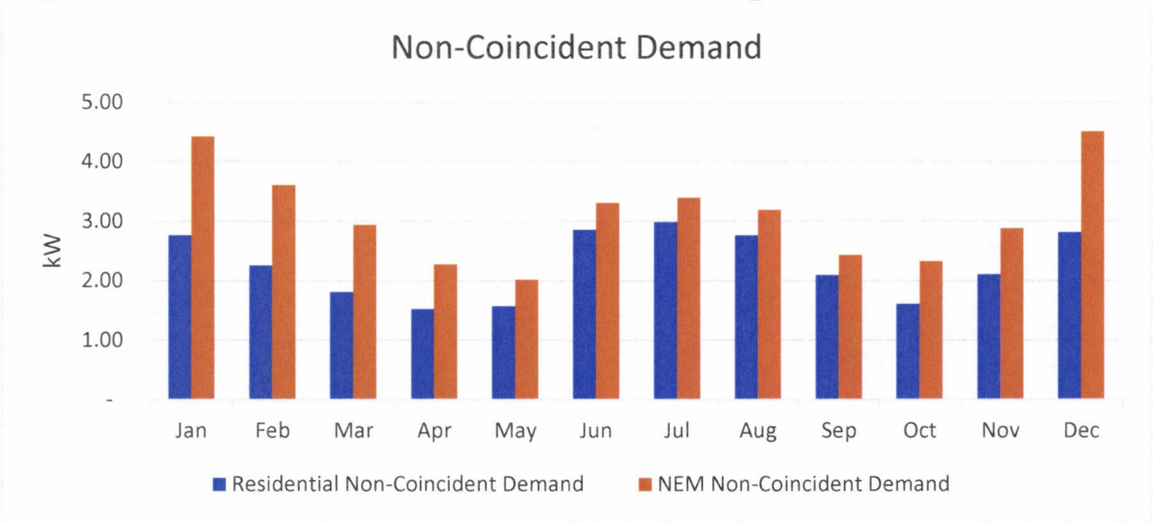
Q. Why is the SCD an important measure when evaluating whether a segment of customers is different from their current customer classification?

A. SCDs are used to allocate costs amongst the Company's different customer classes. Ms. Aschenbrenner explains how costs are allocated using the SCDs.[6]

Q. What observations are drawn from the analysis of the NCDs for both groups of customers?

A. The NCD of customers with on-site generation is higher than customers without on-site generation for all 12 months of the year. During the winter months, the non-coincident of customers with on-site generation is more than 60 percent higher than the NCD of customers without on-site generation. The NCDs for both groups of customers are shown in Figure 7.

Figure 7. 2016 Non-Coincident Demands by Month



[6] Aschenbrenner REB, p. 12, l. 14 through p. 13, l. 2.

Q. Why is the NCD an important measure when evaluating whether a segment of customers is different from their current customer classification?

A. The non-coincident group peak demand is used to allocate costs among the Company's different customer classes. Ms. Aschenbrenner explains costs are allocated using the non-coincident group peak demand.

Q. Did any other parties conduct an analysis of system-coincident and NCDs for both groups?

A. Yes. Dr. Morrison of Commission Staff calculated the system-coincident and NCDs for both groups.[7]

Q. Were the results of Dr. Morrison's study consistent with the results of the Company's study?

A. Yes. Dr. Morrison filed a revision to his direct testimony on January 11, 2018, and with Dr. Morrison's revised computation, the results of his study are consistent with the results of the Company's study.

Q. Please summarize the conclusions the Company has made after having performed these various analyses.

A. The results of additional analyses performed by the Company demonstrate that the load factor, the load profile, the SCDs and the NCDs for R&SGS customers with on-site generation are distinctly different than R&SGS customers without on-site generation. The Company has

[7] Morrison DI, p. 18, l. 13; p. 19, ll. 2-4.

clearly demonstrated that the load service requirement and the pattern of use are distinctly different for residential customers with on-site generation as compared to residential customers without on-site generation.

II. UTILIZATION OF THE GRID

1. Impact on the Grid

Q. Ms. Donohue claims that "net metering has minimal grid impacts . . . ."[8] Does the Company agree with Ms. Donohue's statement?

A. No. Each net metering installation has a small impact on the voltage management of a distribution circuit. Low net metering penetration on a circuit is accommodated without changes to the voltage management. However, large penetration has significant grid impacts that require mitigation measures and is discussed in my Direct Testimony.

Q. Several witnesses[9] assert that the excess energy generated by customers with on-site generation is consumed by neighboring loads. Do you agree with this assertion?

A. In a broad, general sense this is true. The assertion that the excess energy is consumed by neighboring

[8] Donohue DI. p. 7, ll. 7-8.

[9] Kobor DI, p. 63, ll. 7-8; Otto DI, p. 5, l. 18; Beach DI, p. 20, ll. 18-19.

loads assumes that neighbors are consuming in unison with the customer's on-site generation excess production. Figure 4 demonstrates the difference in on-site generation excess production and consumption of customers without on-site generation. The 2:00 p.m. hour reflects the customer without on-site generation load at 1 kWh and the excess on-site generator production at 1.8 kWh. Therefore, on average, two customers without on-site generation are required to consume the excess generation of one customer with on-site generation. When the excess energy exceeds the neighbors' consumption, which is likely to occur in the spring and fall months, the excess flows through the distribution system, and at times, to the transmission system.

Q. Mr. Leonard claims that: "There are also extremely good grid benefits by lowering line losses on the distributed energy side and increasing power quality."[10] Do you agree with his claim?

A. I agree that some line losses may be reduced with distributed generation ("DG") as described in the Company's community solar case.[11] In that case, my testimony identified that the transmission, substation, and

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[10] Leonard DI, p. 5, ll. 2-3.

[11] *In the Matter of Idaho Power Company's Application to Approve New Tariff Schedule 63, A Community Solar Pilot Program,* Case No. IPC-E-16-14.

distribution primary losses would be offset but the secondary losses will continue to be present. This outcome was determined by comparing the load profile of the customers located near the proposed community solar project to the projected solar production profile. The Company determined that local customer load would consume the projected solar generation at all times. The existing DG energy production, forecasted DG production, DG locations, forecasted DG locations, and annual feeder load profiles would need to be analyzed to determine the proper line loss allocation.

I do not agree with the assertion of increased power quality. Distribution circuit voltage variability increases with DG, resulting in reduced power quality. In fact, the Company performs voltage flicker analysis (a power quality issue) during the small and large generator interconnection study process when distribution system interconnection is requested. This condition is described in Section IV of my direct testimony,[12] related to the request for requiring smart inverter functionality in the future and described in the next section of this testimony.

Q. Does on-site generation have a similar impact to the grid as when a customer installs an energy efficiency ("EE") measure?

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[12] Angell DI, pp. 23-27.

A. No. The grid impact is different because, when a customer with on-site generation is generating excess energy, their system can stop generating at any moment. When this occurs, the Company must instantaneously supply not only their load that was supplied by their own generation, but also the excess generation they were contributing to the system. This change in the direction of supply will also negatively impact the distribution system voltage.

Q. How does an instantaneous loss of supply by the customer with on-site generation impact the grid?

A. The Company and its grid must always maintain the balance of generation and load. When a loss of supply from on-site generation occurs, the grid must supply the customer load and any excess generation that was being produced. As shown in Figure 4, during the 2:00 p.m. peak export hour, the grid may have to instantaneously supply the customer energy and excess generation of greater than 2.81 kWh (assuming 1 kWh or greater energy consumption by the customer with on-site generation).

Additionally, a change in the direction of supply will change the circuit voltage. This results from voltage drop -- the decrease in the voltage along a conductor due to the flow of current through the conductor. The voltage at the current source location will be higher than other locations along the distribution circuit. When a customer with on-site generation is sourcing current (exporting energy) to the distribution circuit, its voltage, including its neighbors' voltage, will be higher than other locations on the circuit due to voltage drop. Once the customer stops sourcing (e.g., when a cloud passes over the solar panels), the local higher voltage immediately drops to a lower voltage based on voltage drop from the substation to the customer location. These quick changes result in reduced power quality.

Q. Several parties compare on-site generation to EE.[13] Some even suggest that on-site generation "will reduce a customer's long-term consumption from the grid, just as an energy efficiency measure . . . ."[14] Do you agree that on-site generation reduces a customer's long-term consumption from the grid similar to that of an EE measure?

A. No. On-site generation is significantly different than EE. On-site generation will produce energy based on the profile of the generating resource. Solar production varies daily and throughout the year based on the angle of incidence of the sun to the solar panels and weather conditions. This solar production is not related

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[13] Beach DI, p. 11, ll. 7-8; Donohue DI, p. 18, ll. 2-4; Kobor DI, p. 50, l. 20 through p. 51, l. 1.

[14] Beach DI, p. 5, ll. 3-4.

to the energy consumed by the customer. EE measures directly reduce the consumption of the electrical equipment all the time it is operating throughout the year. When the equipment is running, one can count on EE occurring. The efficiency does not ramp in and out of operation like a solar generation system.

Q. How does the load shape of a customer who participates in EE compare to that of a customer who installs on-site generate on?

A. As discussed by Dr. Ahmad Faruqui[15] of the Brattle Group in his rebuttal testimony, the load shape of customers with on-site generation differs significantly from those of customers who participate in EE programs. I previously discussed the significance of the rate of change and how that impacts grid operations. The greater the rate of change, the more volatile the load shape. EE measures may reduce energy use through the day or just reduce the peak use periods. Either outcome is not likely to increase the load volatility.

This is in contrast to a customer who installs on-site generation -- which would increase the volatility of the customer's load profile. This can be explained by looking at both the level of demand (kW) placed on the system and the amount of energy (kWh) consumed over time.

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[15] Faruqui REB, p. 10, l. 8 through p. 13, l. 3.

When a customer installs an EE measure to reduce their energy consumption, they may reduce both the instantaneous demand (kilowatts ("kW")) that they place on the grid and reduce the amount of energy consumed over time. This is not the case with a customer who reduces their energy consumption using on-site generation. When an on-site generation system is not generating, and the utility is called upon to provide the energy, the customer's load requirement is the same as it was before the on-site generation system was installed. In other words, there is generally no reduction of the instantaneous demand (kW) placed on the utility's system. The customer with on-site generation does, however, reduce the amount of energy (kWh) they consume from the Company but not achieve any reduction in total energy use.

Q. Other than having different impacts on the grid, what other differences exist between customers who reduce their energy usage by installing EE measures and by installing on-site generation?

A. A customer with on-site generation has the opportunity to net their billed energy all the way to zero while still utilizing the grid; whereas, a customer who reduces their energy consumption by installing EE measures is not able to do that unless they consume no energy from the utility for the entire month.

Q. Did any parties disagree with you in your assertion that customers with on-site generation who net their usage to zero are not the same as a vacation home with no kWh usage in a month?

A. Yes. Commission Staff witness Donohue disagrees.[16] She suggests that, because both groups of customers are subsidized by other customers, customers with on-site generation who net their usage to zero are not different than a vacation home with no kWh usage in a month.

Q. In what ways does the Company assert that a vacation home with no kWh usage is different than a net zero customer, a customer who generated either the same amount or more energy from their system than they consumed over the course of the month?

A. In addition to the differences listed by Ms. Aschenbrenner in her direct testimony,[17] there are substantial differences in the services that the Company provides the vacant home and net zero customer over the course of the month. The Company provides no services to the vacant home that consumes no energy. However, in addition to providing energy to the customer with on-site generation when their system is not generating or is not

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[16] Donohue DI, p. 16, ll. 18-25.

[17] Aschenbrenner DI, p. 30, l. 8. - p. 31. l. 13.

generating enough energy to meet their demand, the Company also provides regulated voltage for inverter operation, motor starting current, and energy balancing when the customer is generating electricity.

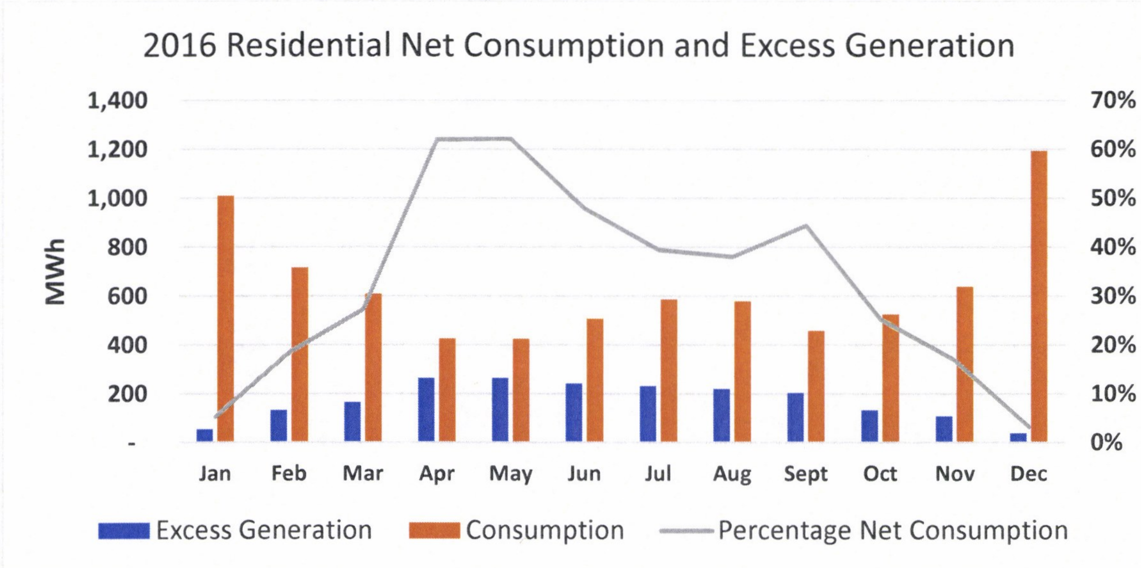
2. Excess Generation

Q. Ms. Donohue suggests that "most of the energy produced [by net metering customers] is consumed on-site rather than pushed back onto the grid."[18] Does the Company agree that most of the energy produced by customers with on-site generation is consumed on-site rather than flowing back onto the grid?

A. Yes. However, the Company performed an analysis to quantify how much energy generated from residential on-site generation flowed onto the grid. Figure 9 provides the monthly net consumption and the excess generation produced by the 565 net metering customers who had 12 months of billing data during 2016. The graph also includes the monthly percentage of excess generation as compare to the net consumption. As you can see, there are months when the residential customers with on-site generation generated in excess of 60 percent of their net consumption.

[18] Donohue DI, p. 7, ll. 8-9.

Figure 9. 2016 Net Consumption and Excess Generation



Q. How much excess generation does the average residential customer with on-site generation exchange with the grid each month?

A. The Company's analysis shows that, in January and December, the average residential customer with on-site generation consumes most of their generation and has very little excess generation; however, for the remaining months, particularly April through September, customers have anywhere from 678 to 1,005 kWh of excess generation per month. Table 2 lists the average excess generation produced by a residential customer with on-site generation, by month.

Table 2. Average Monthly Excess Generation per Customer

Month	Average Excess Generation (kWh)
January	0
February	336
March	480
April	1,005
May	936
June	773
July	678
August	693
September	759
October	327
November	161
December	0

3. Net Zero Customers

Q. Ms. Donohue references Dr. Morrison's analysis showing that only about 11.5 percent of customers with on-site generation are net zero.[19] Do you agree with the results of his analysis?

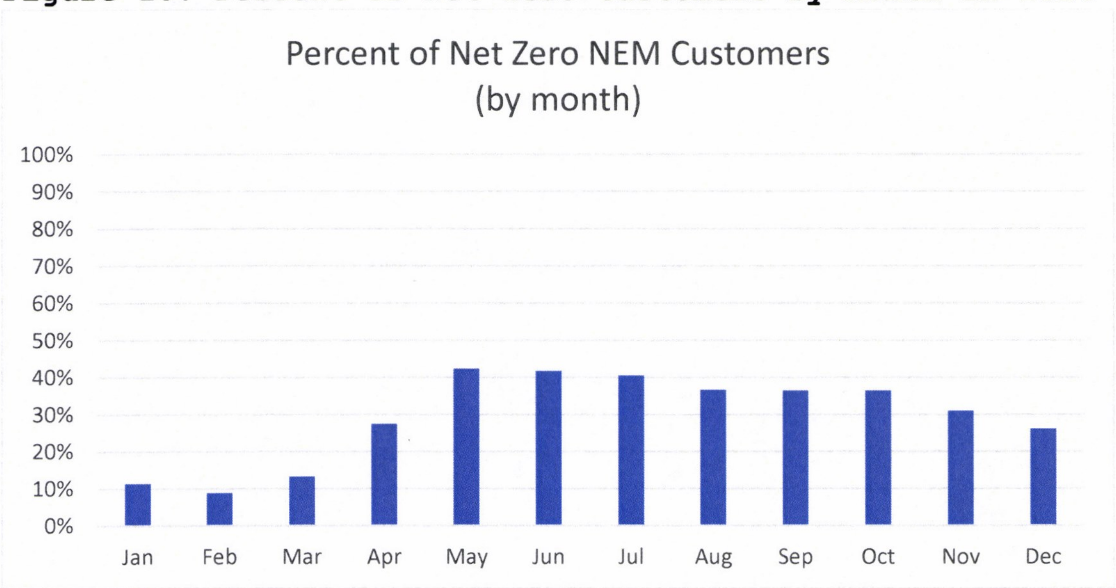
A. I agree that on an annual basis, there are approximately 11.5 percent of customers with on-site generation who are net zero; however, that number does not represent the number of customers with on-site generation who are nearly net zero or who are net zero on a monthly basis.

Q. Has the Company performed an analysis of the number of customers with on-site generation who are net zero on a monthly basis?

[19] Donohue DI, p. 19, ll. 4-7.

A. Yes. Using the same 2016 dataset for the 565 residential net metering customers who had 12 months of billing data during 2016, the Company calculated that, for three of the 12 months, more than 40 percent of customers with on-site generation netted their usage to zero and for an additional four months, more than 30 percent of customers with on-site generation netted their usage to zero. Figure 10 shows the percentages of net zero customers for each month.

Figure 10. Percent of Net Zero Customers by Month in 2016



4. Two-Way Flow is Distinct to Customers with On-Site Generation

Q. Do any parties disagree with your assertion that customers with on-site generation have a two-way relationship with the grid?

A. Yes. Ms. Levin of SRA/NW Energy suggests that: "With advanced metering infrastructure ("AMI"), any customer can have a two-way relationship with the grid.

AMI allows all customers, and any of their "smart" (grid-enabled) devices, to follow and track customer usage, system conditions, and energy prices *and respond* to this information . . . ."[20]

Q. Do you agree with Ms. Levin that this "two-way" flow of information is the same as the "two-way" flow of energy?

A. No. AMI allows the utility two-way communication with customer meters and, depending on the technology deployed, may provide the customer with information as Ms. Levin described. The customer may even act based on the information provided. However, the customer is not in a two-way relationship with the grid. The customer is simply making informed energy use choices that may decrease or increase their demand. This is not at all similar to the production of energy by R&SGS customers with on-site generation whose production is driven by daily solar irradiance, not information that might be provided by an electric utility.

Q. Do any other parties disagree with you that customers with on-site generation use the grid in a bi-directional manner?

A. Yes. Sierra Club witness Mr. Beach suggests that the Company's thinking is flawed. He claims that:

> [W]hen a solar customer exports power to the utility, it is the solar customer

[20] Levin DI, p. 4, ll. 13-16 (emphasis in original).

> that is providing a service - generation - to the utility. Once the exported power passes the DG customer's meter, the utility takes title to the exported power. It is the utility that delivers the exported DG power to the DG customer's neighbors. It is the utility that is compensated by the neighbors for the service that the utility provides in delivering the DG exports to them. Thus, it is the utility and the neighboring customer that use the distribution system to deliver the DG exports. The DG customer is in no way responsible for the delivery of their exported power, has no control over who receives their exports, and receives no compensation for the delivery of the exports.[21]

Q. Do you agree with Mr. Beach that it is the utility that is utilizing the grid when a solar customer exports power to the utility?

A. Mr. Beach is correct in the DG customer has no responsibility for the grid or the delivery of energy through the grid. However, the DG customer relies on the grid voltage for the inverter to produce alternating current for the export of energy and the grid's ability to receive and distribute this energy to other loads while maintaining a balance between energy and load. Further, my statement of "uses the grid in a bi-directional manner"[22] pertains simply to the ability to receive power from the grid and supply power to the grid at any time, collectively

[21] Beach DI, p. 20, ll. 15-24 (emphasis in original) (footnote omitted).

[22] Angell DI, p. 10, ll. 22-23.

referred to as "exchange." The R&SGS customers with on-site generation exchange more energy with the grid than a R&SGS standard service customer.

Q. Did the Company perform analysis to assess when R&SGS customers with on-site generation exchange more energy with the grid?

A. Yes. The Company analyzed the hourly exchange for all 565 net metering customers who had 12 months of billing data during 2016 and compared that to the exchange of the residential customers without on-site generation. The Company analyzed all 12 months of 2016 and has shared the results for a winter month, a spring month (also representative of fall), and a summer month in Figures 11, 12, and 13 respectively. For the three graphs, each hour data point is the average of the absolute value for that hour throughout the month. The absolute value of each hour captures the amount of the energy exchange, regardless of which direction the energy is flowing.

A comparison of Figures 11, 12, and 13 with Figures 3, 4, and 5, respectively, reveal the export of energy during the daylight hours when net metering customers are exporting to the grid. The net metering customers on average are consistently exchanging more energy with the grid every hour of each month. This energy exchange, when combined with their lower load factor, results in less efficient use of grid capacity.

Figure 11. January 2016 Average Hourly Energy Exchange

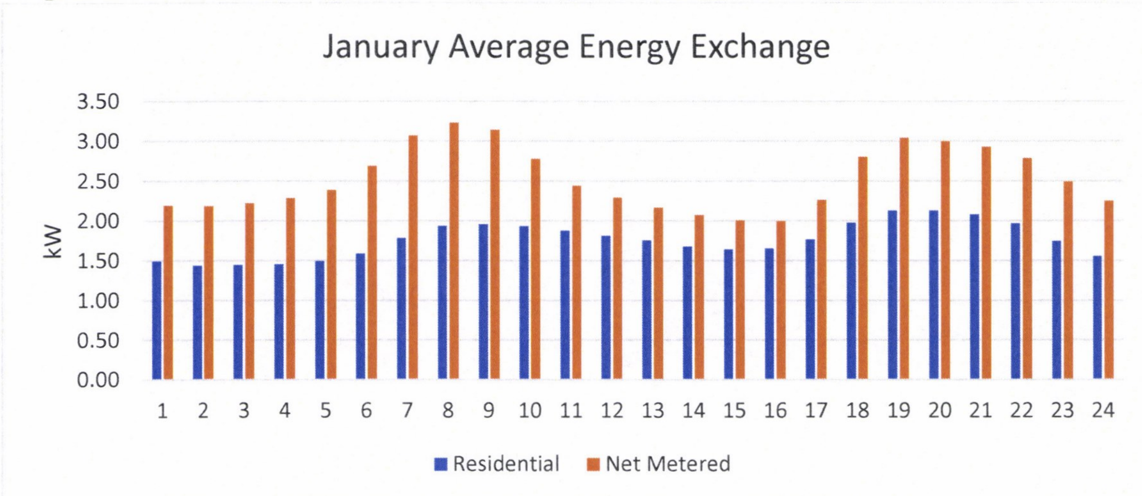


Figure 12. April 2016 Average Hourly Energy Exchange

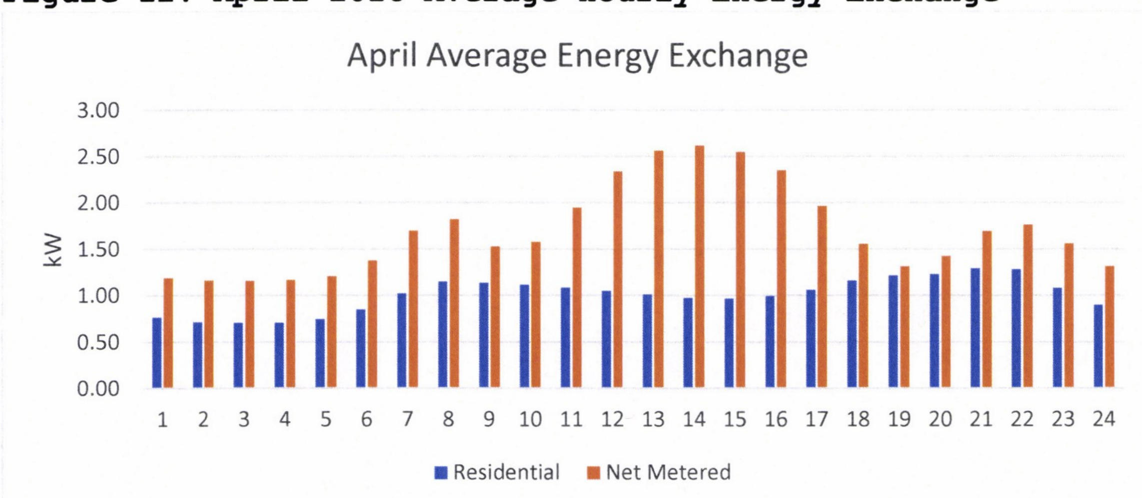
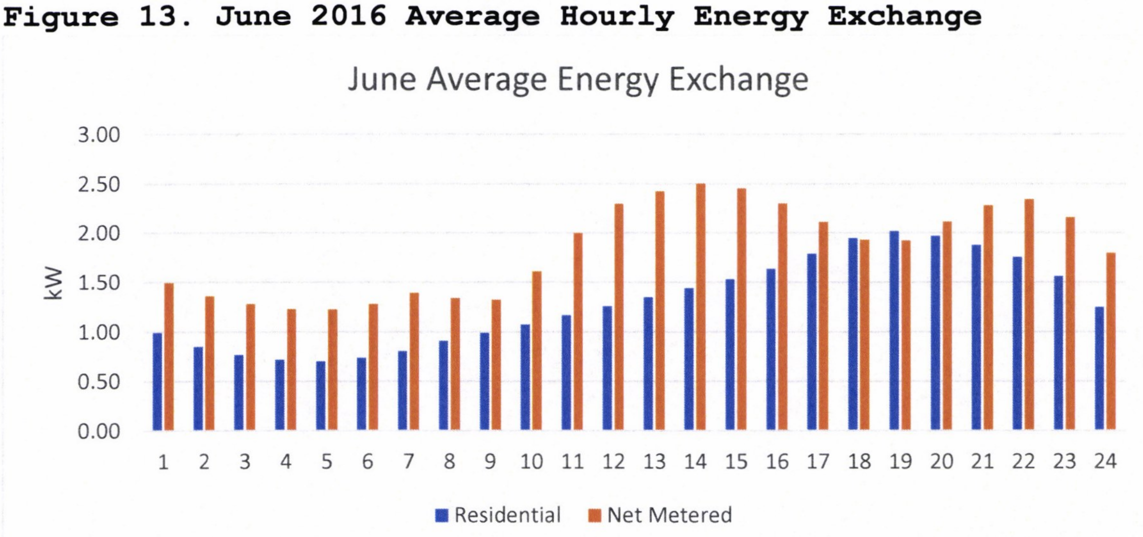


Figure 13. June 2016 Average Hourly Energy Exchange



Q. Did Mr. Beach conduct any analyses to support his argument that it is not the customer with on-site generation that is utilizing the grid when generating excess energy?

A. No. However, Mr. Beach describes a study to determine the distribution benefits provided by DG. The study calculated a peak capacity allocation factor for 12 substations' 2016 loads and combined this factor with two Boise solar profiles. The study concludes that 0.22 kW and 0.31 kW of marginal distribution capacity costs can be avoided by one kW of south-facing and west-facing solar DG, respectively.[23]

Q. Do you agree with Mr. Beach's conclusions from this analysis?

A. No. Mr. Beach's conclusion of marginal distribution capacity costs avoidance from DG solar is inconsistent with the Company provided substation capacity and 2016 load data. I believe this is due to the generalized summation approach used within the study which discounts the capacity and loading of a single substation. For example, the 12 substations' 2016 non-coincident peak load hours are only 70 percent of the total installed

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[23] Beach DI, p. 30, l. 14 - p. 31, l. 2.

capacity. Based on this, one could conclude that no capacity additions are required.

Analysis of the load data of each substation reveals specifics that are lost in the generalized approach of the study. Six of the 12 substations serve predominately irrigation customers who have a consistent 24-hour load profile during the irrigation season. Two of the substations supply winter peaking loads. Based on the Company's and the electric utility industry's experience with solar and battery DG technology, eight of the 12 substation capacity upgrades would not be avoided by solar DG or solar with battery DG. First solar DG cannot provide power to supply irrigation load through the night nor supply the winter morning peak loads of the winter peaking substations. Additionally, solar combined with batteries is not an economically viable option to supply loads lasting more than four hours based on present and near-term battery technology.

Mr. Beach's generalized approach likely overstates the realizable capacity avoidance. It should also be noted that the discussion regarding the value of DG is beyond the scope of this docket. In Order No. 33946, the Commission denied ICEA's alternate recommendation to decide the value of DG prior to addressing reclassification of R&SGS

customers with on-site generation. Idaho Power has requested that the Commission open a generic docket at the conclusion of this case where stakeholders and other utilities can collaborate to assess the benefits and costs that DG brings to the electric system.

Q. Were there any other suggestions made by Mr. Beach that you would like to address?

A. Yes. Mr. Beach mischaracterized a statement from my direct testimony. Mr. Beach claimed that I asserted:

> any distribution benefits will be limited to the five-year period in which Idaho Power plans distribution upgrades and expansions."[24] To clarify, the statement I made was "Idaho Power is able to forecast distribution circuit and substation capacity requirements with some certainty five years into the future. This planning horizon period allows the Company to investigate options to avoid facility overloads, select more cost-effective options, and design and construct improvements to meet the identified overloads.[25]

I did not suggest that distribution benefits resulting from customers with on-site generation will be limited to a five-year period as such benefit determination is outside the scope of this docket.

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[24] Beach DI, p. 27, ll. 24-25.

[25] Angell DI, p. 18, ll. 4-10.

Q. Please summarize the impact that customer on-site generation has on the grid.

A. Customer on-site generation is not like EE. The grid must be able to absorb excess generation when supplied, supply the customer's load, and replace the excess generation when called upon, all while minimizing distribution circuit voltage variability to maintain customer power quality.

III. MODIFICATIONS TO SCHEDULE 72

1. Smart Inverter Requirement

Q. Do parties support the Company's proposal to require all new net metering customers to use smart inverters within 60 days following the adoption of an industry standard definition of smart inverters as defined by the IEEE?

A. In general, yes. Mr. Otto of ICL recommends the Commission approve Idaho Power's request to require smart inverters according to industry standard definitions.[26]

Q. Do any parties oppose the Company's proposal to require all new net metering customers to use smart inverters within 60 days following the adoption of an

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[26] Otto DI, p. 10, ll. 14-15.

industry standard definition of smart inverters as defined by the IEEE?

A. Yes. Staff witness Dr. Morrison opposes the Company's proposed smart inverter requirement.

Q. Why does Dr. Morrison oppose the smart inverter requirement for all new net metering customers?

A. Dr. Morrison states that, "the Company is requesting that Commission adopt IEEE 1547 and IEEE 1547.1 before these standards have been released"[27] and the Company "didn't provide any hard information about either of the proposed smart meter [inverter] standards."[28]

Q. Will the Commission and Staff have the opportunity to review the IEEE 1547 and IEEE 1547.1 standards before approving them?

A. Yes. The Company's request regarding the inverter requirement was that the Commission order the Company to submit a compliance filing in the form of a tariff advice within 60 days of the adoption of the revised IEEE standards, or 60 days of the conclusion of this case, whichever occurs later. This tariff advice will seek to modify its interconnection tariff to require that customers with on-site generation install a smart inverter that meets the requirements defined in the revised IEEE standards.

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[27] Morrison DI, p. 20, ll. 16-18.

[28] Morrison DI, p. 21, ll. 1-2.

The Commission and Staff would have the opportunity to review the standard in the tariff advice filing.

Q. Should the current lack of a defined standard by IEEE prevent the Commission from adopting the Company's inverter proposal?

A. No. The current lack of a defined standard by IEEE should not prevent the Commission from acknowledging that smart inverters provide functionality that is necessary to support the ongoing stability and reliability of the distribution system and that the industry adoption of a smart inverter requirement will help mitigate circuit voltage deviation.

2. <u>Other Minor Revisions to Schedule 72</u>

Q. The Company has requested to modify Schedule 72 as part of this case. Do any parties object to the proposed changes to Schedule 72?

A. Yes. Staff witness Dr. Morrison states that the Company's proposed modifications to Schedule 72 are not minor and would constitute a major revision to the tariff. He goes on to suggest that "the Company's proposed modifications to Schedule 72 go far beyond the scope of its application . . . ."[29]

Q. Do you agree with Dr. Morrison's suggestion that the proposed revisions are major?

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[29] Morrison DI, p. 21, ll. 20-22.

A. No. The proposed revisions to Schedule 72 are in fact very minor. Most of the revisions to Schedule 72 are to incorporate the defined terms necessary to sync the interconnection requirements between Schedule 72 and the newly proposed Schedules 6 and 8 and to make one minor revision to allow the Company additional time to complete the on-site inspection of a newly installed on-site generation system when circumstances beyond the Company's control arise (e.g., large snowfall). If the addition of proposed Schedules 6 and 8 were removed, there is only one revision under Section 2, step 5. All other revisions are due to the addition of proposed schedules 6 and 8. None of the proposed revisions affect any other energy providers who are subject to Schedule 72.

IV. CONCLUSION

Q. Please summarize your rebuttal testimony.

A. In response to the direct testimony of other witnesses, I have explained in detail the additional analyses performed by the Company. The Company provided additional analyses in the following areas:

- Customers with on-site generation are partial requirements customers and therefore their load service requirements are different than full requirements customers.

- The load profile of customers with on-site generation is distinct from the load profile of customers without on-site generation.
- The rate of change in usage by customers with on-site generation during the day is significantly larger than customers without on-site generation.
- Customers with on-site generation have notably lower load factors than customers without on-site generation.
- The system-coincident and NCDs for customers with on-site generation are different than customers without on-site generation.

In summary, the results of additional analyses performed by the Company demonstrate that the load factor, the load profile, the SCDs and the NCDs for R&SGS customers with on-site generation are distinctly different than R&SGS customers without on-site generation. The Company has clearly demonstrated that the load service requirements, and the pattern of use, are distinctly different for residential customers with on-site generation as compared to residential customers without on-site generation. I have explained that the two-way flow of energy is distinct to customers with on-site generation and have also explained the limited scope of revisions to and the process of approving the proposed revisions to Schedule 72 and smart inverter requirement.

Q. What is your recommendation for the Commission?

A. I recommend that the Commission issue an order to establish two new classifications of customers applicable to R&SGS customers with on-site generation, to approve the proposed revisions to Schedule 72, and to acknowledge that smart inverters provide functionality that is necessary to support the ongoing reliability of the distribution system by ordering the Company to amend its applicable tariff schedules to require the installation and operation of smart inverters for all new customer-owned generator interconnections within 60 days following the adoption of an industry standard definition of smart inverters as defined by the IEEE.

Q. Does this conclude your testimony?

A. Yes, it does.

ATTESTATION OF TESTIMONY

STATE OF IDAHO)
) ss.
County of Ada)

I, David M. Angell, having been duly sworn to testify truthfully, and based upon my personal knowledge, state the following:

I am employed by Idaho Power Company as the Senior Manager of T&D Engineering and Construction and am competent to be a witness in this proceeding.

I declare under penalty of perjury of the laws of the state of Idaho that the foregoing rebuttal testimony is true and correct to the best of my information and belief.

DATED this 26th day of January, 2018.

David M. Angell

SUBSCRIBED AND SWORN to before me this 26th day of January, 2018.

Notary Public for Idaho
Residing at: Boise, Idaho
My commission expires: 12/20/20

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on the 26th day of January 2018 I served a true and correct copy of REBUTTAL TESTIMONY OF DAVID M. ANGELL upon the following named parties by the method indicated below, and addressed to the following:

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Kimberly Towell

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