PACIFIC POWER
A DIVISION OF PACIFICORP

825 NE Multnomah, Suite 2000
Portland, Oregon 97232

March 26, 2021

VIA ELECTRONIC FILING

Public Utility Commission of Oregon
201 High Street SE, Suite 100
Salem, OR 97301-3398

Attn: Filing Center

RE: Advice 16-04—Compliance Filing—2020 Report on Pacific Power's Irrigation Load Control Pilot Program

PacifiCorp d/b/a Pacific Power submits the attached 2020 Irrigation Load Control Pilot Program Report. The report is provided in compliance with the terms of PacifiCorp's Irrigation Load Control Pilot Program that was approved by the Public Utility Commission of Oregon on May 4, 2016.

Pacific Power requests that all formal information requests regarding this matter be addressed to:

By E-mail (preferred): datarequest@pacificorp.com.

By regular mail: Data Request Response Center
PacifiCorp
825 NE Multnomah, Suite 2000
Portland, OR 97232

Informal inquiries may be directed to Cathie Allen at (503) 813-5934.

Sincerely,

Etta Lockey
Vice President, Regulation

Enclosure

2020 Irrigation Load Control Pilot Program in Oregon

Issued March 26, 2021

PACIFIC POWER
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Overview

On May 3, 2016, the Public Utility Commission of Oregon (Commission or OPUC) approved PacifiCorp d/b/a Pacific Power's (PacifiCorp or the Company) request to implement a pilot irrigation load control program for customers within the Oregon portion of the Klamath Basin. The Irrigation Load Control Pilot Program (Pilot Program) was filed to test the design characteristics of the Company's existing irrigation load control program for its Oregon customers.

In 2016, the Pilot Program focused on enrolling a small number of initial participants, testing and related logistics and one two-hour event was called during the season. In 2017, the focus was on maintaining engagement with enrolled growers, increasing the number and duration of events during the season and seeking updated market pricing for program delivery beyond the 2017 season. In 2018, the Company focused on transitioning the program to the new delivery provider, Connected Energy.

During 2019, the Company proposed changes to expand and extend the program and filed them on July 22, 2019.[1] Additional customers, sites and pumps were enrolled and available capacity and impact per event increased compared to 2018.

On February 14, 2020, changes to extend days and hours and add a shorter dispatch notification options were approved by the Commission.

This report summarizes 2020 Pilot Program activity and presents the key findings from the third program year. In its Pilot Program application, the Company identified key elements that would be provided annually. The following table describes where each of these elements is addressed in this report.

[1] Advice 19-008

Element	Start Page	Section
1. Review of annual enrollment		
a. Total program enrollment	14	Enrolled Customers
b. Sites added and removed	14	Enrolled Customers
c. Customer outreach	9	2020 Activities to Address Key Challenges
d. Crop(s)	15	Customer Crop/ Operations and Pumping Equipment
e. Weather data from local weather station(s)	15, 17	Weather and Drought Impact
f. Available information on water restrictions	15, 17	Impact of Irrigation Technology and Water Availability
2. Customer satisfaction a. Customer requests for retirement b. Site reassignment management	4	Participant Behavior *There were no customer requests for retirement or reassignments in 2020
3. Incentive payments	14 30	Customer Payment Structure Appendix B: Customer Payments
4. Review of annual program performance		
a. Weekly available load reduction	18	Available Load Reduction
b. Load control events	19	Load Control Events
c. Availability and load reduction comparison	8	Availability
5. Key observations	4	Key Findings

In 2020, the same small group of customers from 2019 continued to participate. Six events were called through July, August and September 2020, each with a four-hour duration for a total of 24 event hours. Key findings from 2020 focus on participant behavior, especially the interest and ability to participate with hour ahead notice in place of day ahead from the prior season.

Key Findings

Participant behavior

Grower interest and engagement was maintained amongst prior participants. Attempts to enroll new customers was impacted by the COVID-19 pandemic. New customers engaged in preliminary discussions with the Company and the delivery team, but paused further analysis while they managed the logistics of their ongoing business. The 2020 program year included six events (compared with four in 2019), all called with one-hour ahead notification. Events were called on two consecutive days in two different weeks. Three events were called in one week. The 2020 event schedule reinforces prior season observations around the propensity for growers to participate in events even if they are near each other. All customers participated in all events and fulfilled their commitment to curtail irrigation usage.

Logistics

The 2020 events were all four hours and near each other; Thursday in a July week, Monday, Tuesday and Thursday in one August week and Thursday Friday in a September week. This further supports the learning from prior years indicating the kilowatts (kW) available for load control events can be utilized in rapid succession during the season when an experienced delivery provider works with an engaged set of customers.

Event notification worked as designed and customers participated when called (i.e., did not opt out of events). Event information including baseline, load curtailed and post event load was successfully captured by program devices and the network operations center. Data on connected load for these sites during the irrigation season were also transmitted from the devices and archived at the network operations center. Timely access to the 15-minute AMI information for the medium voltage pumps was improved. Converting the 15-minute AMI data to five-minute intervals so it could be directly compared to device data took longer than expected.

<u>Delivery Costs</u>
2020 was the third year of the Connected Energy delivery contract. Incentive costs increased slightly compared to 2019 which reflects the higher incentive rate for the hour-ahead dispatch option.

<u>Assessing Costs and Benefits</u>
The Pilot Program is intended to test designs, provide market feedback, and generate information about delivery. The Company continues to monitor costs and potential benefits of the annual program performance. Appendix 2 provides a discussion of potential benefits utilizing demand response cost-effectiveness protocols from California.

Background

The pilot, filed as Advice 16-04, was approved by the Commission on May 3, 2016, and has operated for three growing seasons. Activities in the prior four seasons were outlined in the annual reports filed on March 31, 2017, March 30, 2018, March 29, 2019, and March 27,2020. On July 22, 2019, the Company filed Advice 19-008 to extend and expand the program consistent with the recommendation provided in the year three report. The changes were approved on February 14, 2020.

The Company filed the 2017 Integrated Resource Plan update on May 1, 2018, and included the potential impacts of the Pilot Program.[2] The 2019 Integrated Resource Plan (IRP) filed on October 18, 2019 included the potential impacts of the Pilot Program as originally filed since approval of the extension and expansion was pending when the 2019 IRP was filed.[3] The Company did not prepare a 2019 IRP Update. Oregon irrigation load control information is included in the Demand Response Request for Proposals that was released in early 2021.

The 2020 timeline of key program activities is outlined below.

[2] 2017 Integrated Resource Plan Update, Table 4.4, page 34
[3] 2019 Integrated Resource Plan, Table 5.12, page 115

2020 Timeline

Week of May 25	Pre-season communication to existing participants
Week of June 1	Website updated to include 2020 season specific messages
July 27	Refresh training for PacifiCorp portfolio optimization team (day ahead)
July 30	Hour-ahead notification to participating customers for July 30 event
July 30	Four-hour event conducted between 3pm-7pm, Pacific time
August 12	Training for PacifiCorp short-term energy supply management team (hour ahead)
August 17	Hour-ahead notification to participating customers for August 17 event
August 17	Four-hour event conducted between 5pm-9pm, Pacific time
August 18	Hour-ahead notification to participating customers for August 18 event
August 18	Four-hour event conducted between 4pm-8pm, Pacific time
August 20	Hour ahead notification to participating customers for August 20 event
August 20	Four-hour event conducted between 5pm-9pm, Pacific time
September 3	Hour-ahead event notification to participating customers for September 3 event
September 3	Four-hour event conducted between 5pm-9pm, Pacific time
September 4	Hour-ahead event notification to participating customers for September 4 event
September 4	Four-hour event conducted between 4pm-8pm, Pacific time
September 5	End of season
January 2021	Incentives paid to participating customers

Anticipated Pilot Size

The Company's 2015 IRP helped inform the original 3 megawatt (MW) size of the Pilot Program. Year 5 (2020) availability maintains the 2019 increase while implementing two more events and utilizing hour-ahead notification. A further increase, up to 5 MW was forecast in the information provided in Advice 19-008, but was directly impacted during the 2020 season by COVID-19 and competing customer priorities.

Anticipated Duration

PacifiCorp originally proposed a five-year pilot period to provide sufficient time to test a variety of parameters and align with grower input favoring a multi-year program. In February 2020, the Commission approved Advice 19-008, including the extension of the pilot for an additional three years, through the 2023 season with the requirement that a third-party evaluation inform an "expand or cancel" recommendation after the 2021 season.

Program Parameters /Design

Participation in the Pilot Program requires irrigators to allow their pumps to be interrupted under conditions specified in Schedule 105 and summarized in Table 1. Changes proposed in Advice 19-008 were applicable to the 2020 season.

Table 1. Irrigation Load Control Pilot Program Parameters in place during 2020

Program Parameters	**Description**
Eligible Customers	Irrigation Customers on Schedules 41 or 48 in and around ~~Klamath Falls~~ targeted areas posted on the Company web site.
Program Period	Week including June 1 through week including ~~August 15~~ September 1[4].
Program Hours	~~Weekdays,~~All days 12:00 p.m. to ~~8~~ 10:00 p.m. Pacific Time.
Dispatch Limitations	52 hours per year, 20 events per year, up to 4 hours per event or 12 hours per week.
Dispatch notification	Day ahead and hour ahead
Incentive Rate	~~Estimated at $23-$27/kw per year.~~ Day ahead at $18/kW per year. Hour ahead at $30/kW per year. The program vendor may adjust the incentive rate based upon the needs of the program.
Opt-Outs	Participants may opt out of dispatches. Opting out will lower participation payments proportionally.
Incentive Payments	The incentive payment is calculated at the end of the irrigation season and paid to each participant after the season ends. Participant incentives will be determined by multiplying the average load (kW) a customer can reliably shut-off during program hours by the incentive rate, adjusted for event participation (opt-outs).

Notes for Table 1: Modifications requested in Advice 19-008 modify many of the listed parameters for the 2020 season. The modifications approved by the Commission on February 14, 2020, are displayed in red font.

Additional information about 2020 customers, dispatch events, incentive rates and payments, and event opt-outs is provided in Appendix One.

[4] ~~In addition, voluntary events may be dispatched separately through September 30.~~ Voluntary events eliminated.

2020 Performance

Availability

Program availability in 2020 increased slightly even with added events and shorter notice. Potential customer additions while promising early in the season were directly impacted by their increased focus on operational challenges from the COVID-19 pandemic.

A total of six events were called through July, August and September. Each event was four hours. The average kW available from all events was 574 kW, a slight increase compared to 2019. There was 100 percent customer participation in all events and all customers opted for the hour-ahead dispatch notification (and higher incentive). Load control equipment performed as expected. Access to 15-minute AMI data improved, but conversion to 5-minute data still required additional time.

Table 2. Oregon Irrigation Load Control Pilot – 2016–2020 Performance

	Year 1 (2016)	Year 2 (2017)	Year 3 (2018)	Year 4 (2019)	Year 5 (2020)
Estimated kW	0 - 2,000	3,000	3,000	3,000	3,000
Proxy/Available kW	565	546	563	945	969
kW (average all events)	281	432	258	554	574

Notes for Table 2

- kW values are at customer site
- For 2020 the five-minute interval data from the Connected Energy devices and 15/5-minute AMI data was available for the entire season from all customers. The available kW value represents the highest value during all program hours when the switches were installed.
- For 2019, the five-minute interval data from the Connected Energy devices was available for the entire season from legacy customers. A combination of device data and AMI data for the new customers was available from their connect dates of July 20 and July 25 to the end of the season. The available kW value represents the highest value during all program hours when the switches were installed.
- For 2018, the five-minute interval data from the Connected Energy replacement devices was available from July 26 to the end of the season. The available kW value represents the highest value during program hours when the switches were installed.
- For 2017, five-minute interval data was available for all enabled customers for the entire season. Available kW represents the highest five-minute interval demand reading during all program hours for the season.
- For 2016 only, average available load was set at customers; peak demand from June 2015 as a proxy for available load given the event occurred at the end of the season and a lack of five-minute interval load data until customers were enabled with site specific hardware.

Program Costs

Program costs in 2020 shown in Table 3 were associated with the Connected Energy delivery contract and included equipment costs, customer incentives and customer engagement expenses.

Table 3. Irrigation Load Control Pilot – 2016–2020 Costs

	Year 1 (2016)	Year 2 (2017)	Year 3 (2018)	Year 4 (2019)	Year 5 (2020)
Estimated Program Costs (Calendar Year)	$150,000	$225,000	$225,000	$225,000	$225,000
Actual Program Costs (including corrections for prior years)	$150,000	$125,000	~~$179,634~~ $180,819	~~$157,082~~ $181,631	175,704

Notes for Table 3

- During preparation of the 2020 report, some minor cost corrections to prior years were identified. These corrections align prior reports with final accounting information and are displayed in red font.
- For 2018, accounting data reflects $169,985 in costs but does not include $10,834 for 2018 incentives which are reflected in 2019 accounting data. Program cost for 2018 should be $180,819. The difference of $1,185 and explanations for the difference was identified by the Company in their November 8, 2019 response to OPUC Request 11 in Advice 19-008. Removing $185 labor charges remains an open item and will be completed in 2021.
- The 2019 costs were prepared with preliminary accounting data which did not fully capture all costs and the impacts of accruals and their reversals. In addition, there were $76.50 in labor charges that should not be included. Labor charges will be removed in 2021. Final delivery and incentive costs total $181,631.

2020 Activities to Address Key Challenges

The February 14, 2020 approval of Advice 19-008 requesting authorization to extend and expand the program provided needed programmatic tools to address the challenges identified after the 2018 season and outlined in year three recommendations. The filing requested to:

- Extend the program through 2023;
- Offer the program to a broader targeted set of customers beyond the Klamath Basin;
- Expand the hours, days, and weeks the load control events may be called;
- Add an hour-ahead notice option with a higher incentive than events called with a day-ahead notice; and
- Test a new method of dispatch and analysis by creating an option for selected large loads to participate in the program using Automated Meter Infrastructure (AMI) data and manual control.

In 2020, the geographic area was expanded beyond areas in and around Klamath Falls, Oregon, to areas south of Medford. Outreach to a large customer with multiple pumps and a different type of irrigation system (drip) was promising, but the customer ultimately needed to prioritize operational concerns related to COVID-19 and chose to pause further engagement during the 2020 season.

During the 2020 season, Hour 21 (8:00 p.m.-9:00 p.m.), was made available through the approved changes and this additional flexibility was utilized by the Company during three events: August 17, August 20, and September. Three events were called on added days enabled by the changes: August 20, September 3, and September 4. Hour-ahead notification was utilized for all six events and all customers fully participated.

Oregon irrigation resources are included in the Demand Responses Request for Proposals (RFP) that will be released in early 2021. Information from this RFP will be useful in informing the post 2021 season recommendation to either expand or cancel the Pilot Program.

Appendix 1: 2020 Connected Energy Pacific Power Irrigation Load Control Pilot Program Report

In support of Pacific Power's regulatory activities related to the Irrigation Load Control Pilot Program in Oregon, Connected Energy prepares an annual report on program activities including total program enrollment, sites added, customer outreach, crops, weather data, and any available information on water restrictions, incentive payments, load control events and key observations. Connected Energy's report is provided as Appendix 1 to this report.

CONNECTED ENERGY

PACIFIC POWER
A DIVISION OF PACIFICORP

2020 Pacific Power Irrigation Load Control Pilot Program Report

Connected Energy
651 Holiday Drive
Foster Plaza 5, Suite 400
Pittsburgh, PA 15220
www.connectedenergy.com

Pacific Power
825 NE Multnomah
Portland, OR 97232
www.pacificorp.com

Date: March 6, 2021

Contents

Overview of the 2020 Irrigation Load Control Pilot Program

This report provides an overview of the Irrigation Load Control Pilot (ILCP) Program in the Klamath Falls, Oregon region of the Pacific Power service territory as implemented and administered by Connected Energy. This report is intended to document program results, accomplishments, and challenges, including lessons learned that will be leveraged to enhance program going forward.

Regulatory approval for the ILCP Program in Oregon was initially granted by the Public Utility Commission of Oregon on May 4, 2016. The ILCP Program was initially transitioned to Connected Energy in 2018 and was made available to irrigation loads in the Klamath Falls, Oregon region of the Pacific Power service territory for customers that were not already participating in the time of use program. Approval to expand the program to areas beyond Klamath Falls and dispatch events with less notification was received on February 14, 2020. All customers that had participated in the program from 2016 through 2019 remained in the program during 2020. In 2020, the program delivered an average load reduction across the six events of 574 kilowatts (kW), an increase of 27% over the 2019 average of 452 kW and 122% over the 2018 average of 258 kW.

Due to COVID restrictions the Connected Energy/Pacific Power delivery team was unable to expand the program in 2020, resulting in the same five customers from 2019 with a total of nine sites and 17 pumps participating in the program in 2020. Maximum load available for curtailment was 969 kW and occurred on September 5, 2020 between 12:00 p.m. and 1:00 p.m. Participating sites were compensated for shutting off irrigation load for specific time periods determined by Pacific Power and were provided either day-ahead or hour-ahead notice of load control events, based on participants option selection. For 2020, all program participants opted to select the hour-ahead program event notification. Customers had the opportunity to opt-out of (i.e., choose not to have their pumps curtailed) for events as necessary to suit their day-to-day business operations, although no customer opt-outs were enacted.

Customer incentives in the ILCP Program are based on the site level average available load during load control program hours adjusted for the number of opt outs or non-participation in load control events. For 2020, the program hours were expanded to 12:00 p.m. to 10:00 p.m. for all days from June 1, 2020 through and including September 6, 2020.

Per Oregon Schedule 105, the load control season starts on the Monday of the week including June 1st and ends on the Sunday of the week including September 1st. For the 2020 load control season, the first day of the program season was Monday, June 1, 2020 and the last day was Sunday, September 6, 2020.

Pacific Power initiated six load control events during the 2020 load control season on the following dates and times:

- July 30, 2020 between hours of 3:00 p.m. - 7:00 p.m.
- August 17, 2020 between hours of 5:00 p.m. - 9:00 p.m.
- August 18, 2020 between hours of 4:00 p.m. - 8:00 p.m.
- August 20, 2020 between hours of 5:00 p.m. - 9:00 p.m.
- September 3, 2020 between hours of 5:00 p.m. - 9:00 p.m.
- September 4, 2020 between hours of 4:00 p.m. - 8:00 p.m.

Load reductions for the events are calculated using five-minute interval metering data from Connected Energy's direct load control devices and from Pacific Power Advanced Metering Infrastructure (AMI) data for the one large customer with medium voltage (2300V) pumps. In 2020, the performance factor for all customers was 100%, which indicates that no customer opted out of an any event during the program year.

Review of 2020 Customer Enrollment and Enablement

Customer Payment Structure

In 2020 the added hour-ahead notice option offered a higher incentive ($30/kW per year) than the day-ahead notice option incentive ($18/kW per year). All program participants were offered and accepted the higher hour-ahead incentive rate option. The incentive payment provided to participants was based on the measured available load for curtailment throughout the program season adjusted for any opt-outs or non-performance in load control events. This payment structure is designed to provide fair and consistent treatment for all sites.

Enrolled Customers

For the 2020 load control season, Connected Energy was unable to enroll any new customers as a direct result of COVID related restrictions and activities. All previously installed customers remained active in the program, resulting in a total of 17 pumps, across five different customers. For one of the customers enrolled in the program in 2019, no physical load control devices could be installed due to the complexity of the installation and high voltage at the installation site. The pump load was still enrolled with the customer agreeing to manually curtail the participating loads based on a phone call notification.

Data Quality

Connected Energy's load control devices are designed with an integrated metering chip that provides near real-time interval metering data during both ILCP events and normal operation of the customer participating loads. This metered data is used to validate when the pump is running and when the pump has been successfully curtailed. Thus, there is no need to create a statistical methodology or tool to validate participation of enrolled loads in the program. In cases where participants power down pumps when they are not being used, Connected Energy will see no metering data coming into the platform and will treat that load as being powered off. When the load is powered up again, Connected Energy will then either see positive load data (load is running) or zero load data (load is not running).

Connected Energy's load control devices utilize 4G (LTE) cellular communications which provides added benefits as the minimum projected network life for 4G (LTE) is currently year end 2028.

Review of 2020 Program Participants and Performance

Customer Crop/Operations and Pumping Equipment

For the 2020 ILCP season, customer crop types/operations included alfalfa, potatoes, and grass fields for cattle and livestock grazing. Two customers move water for other users. Pump sizes at these locations ranged from 40 horsepower (HP) to 750 HP.

Impact of Irrigation Technology and Water Availability

While pump size is a clear determinant of total availability in the Irrigation Load Control Pilot program, irrigation technology and water availability also impact irrigation pump run-time and thus can affect customer success in the ILCP Program. Pivot irrigation systems are operationally easier to manage for load control events than a wheel line or hand line irrigation system. During the 2020 season irrigators did not raise issues or questions about current or potential future water restrictions impacting their ability to participate in the program.

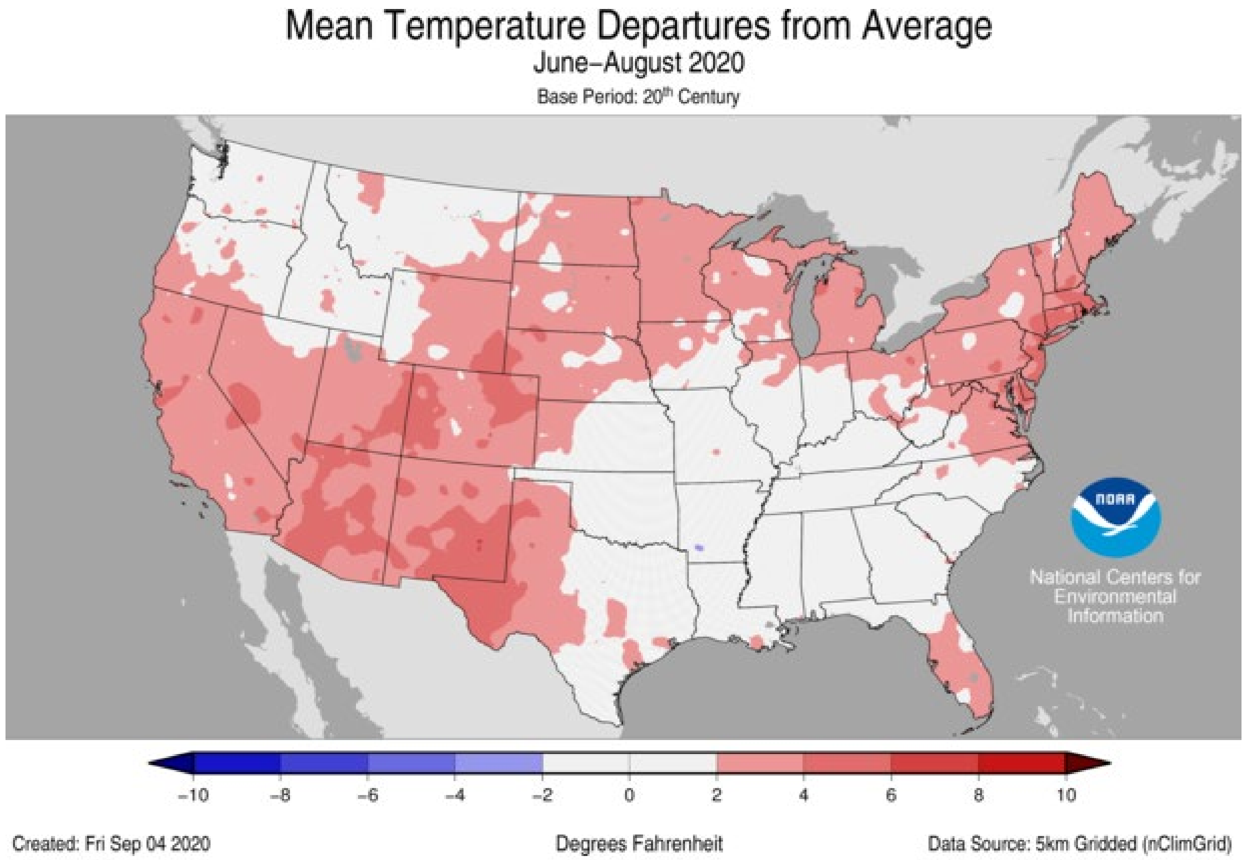
As we entered 2020, available information indicated that there would likely be water restrictions imposed on the Klamath Basin farmers and ranchers due to low available water supply. Any imposed restrictions could adversely impact water pumping needs of program participants which would reduce pumping loads enrolled in the irrigation load control program.

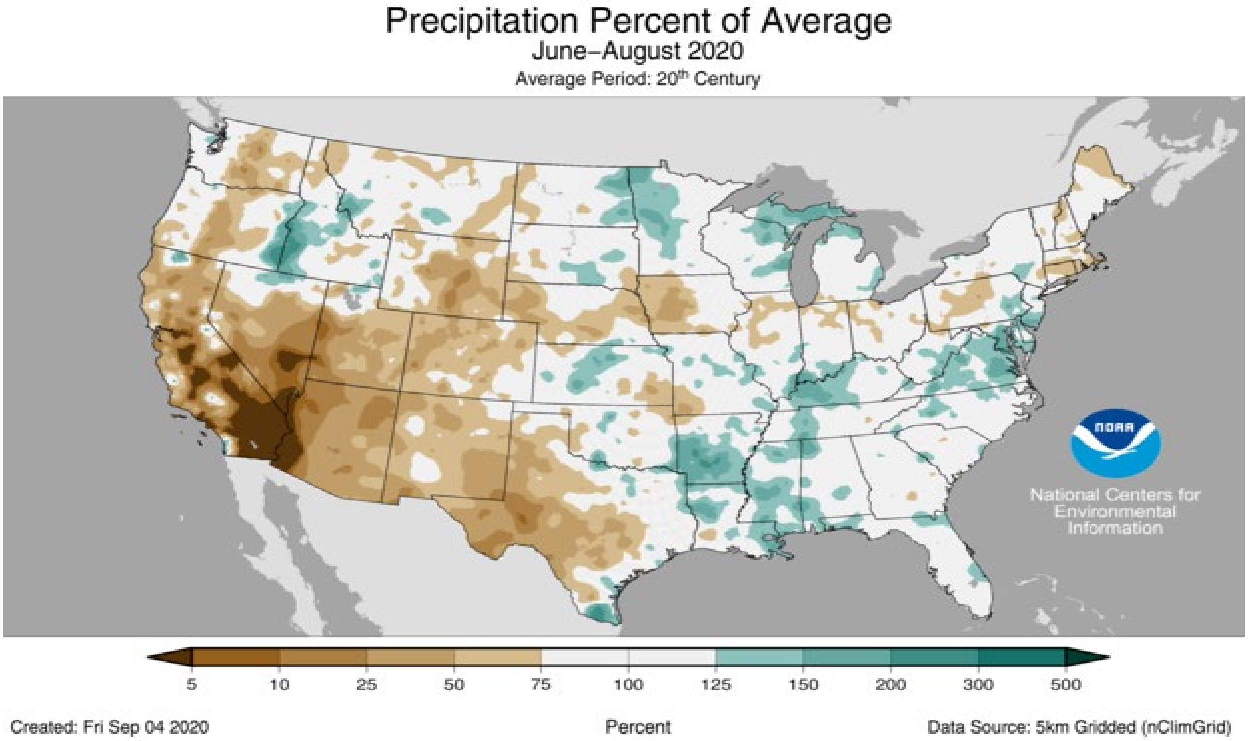
Despite lower than average water availability in the Klamath Basin, participants in the irrigation load control program were able to continue operating their enrolled pumps resulting in available program loads higher than 2019.

Weather & Drought Impact

Similar to 2018 and 2019, 2020 was warmer and dryer than normal in the ILCP geographical area, leading to greater irrigation needs and higher available loads versus historical averages.

The two images below highlight the above average temperatures and below average precipitation across much of the western part of the country including the ILCP program region during the 2020 program season.



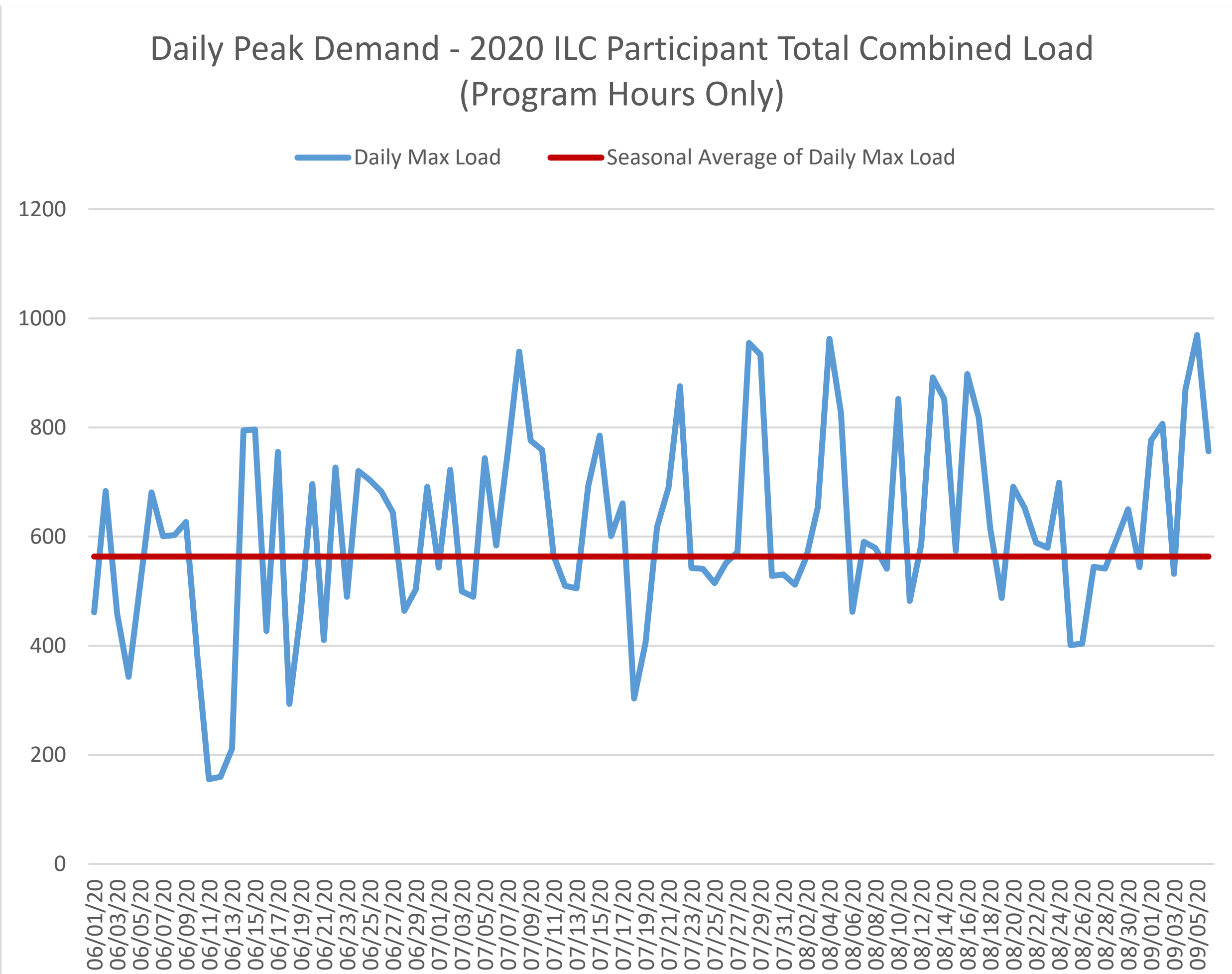


Source: NOAA Mean Temperature Departures from Average (June-August) and Precipitation Percent of Average (June-August), available online: https://www.ncdc.noaa.gov/sotc/national/202008#season-precip

Available Load Reduction

The Oregon ILCP Program is evaluated based upon average available load reduction (kW) during the program year, from June 1, 2020 through September 6, 2020. All participants from 2019 remained in the program in 2020.

For the 2020 program year, the portfolio average available load reduction was 574 kW. The chart below shows daily available demand during active program hours (12:00 p.m. – 10:00 p.m., all days) and active program months in 2020. Consistent with previous years, customers stopped their irrigation activities in line with the end of the growing season in late September / early October with load dropping to ~0 kW in early October. The shape of the seasonal load curve is in keeping with expectations that the highest load should align with the active growing season and the warmest seasonal periods.

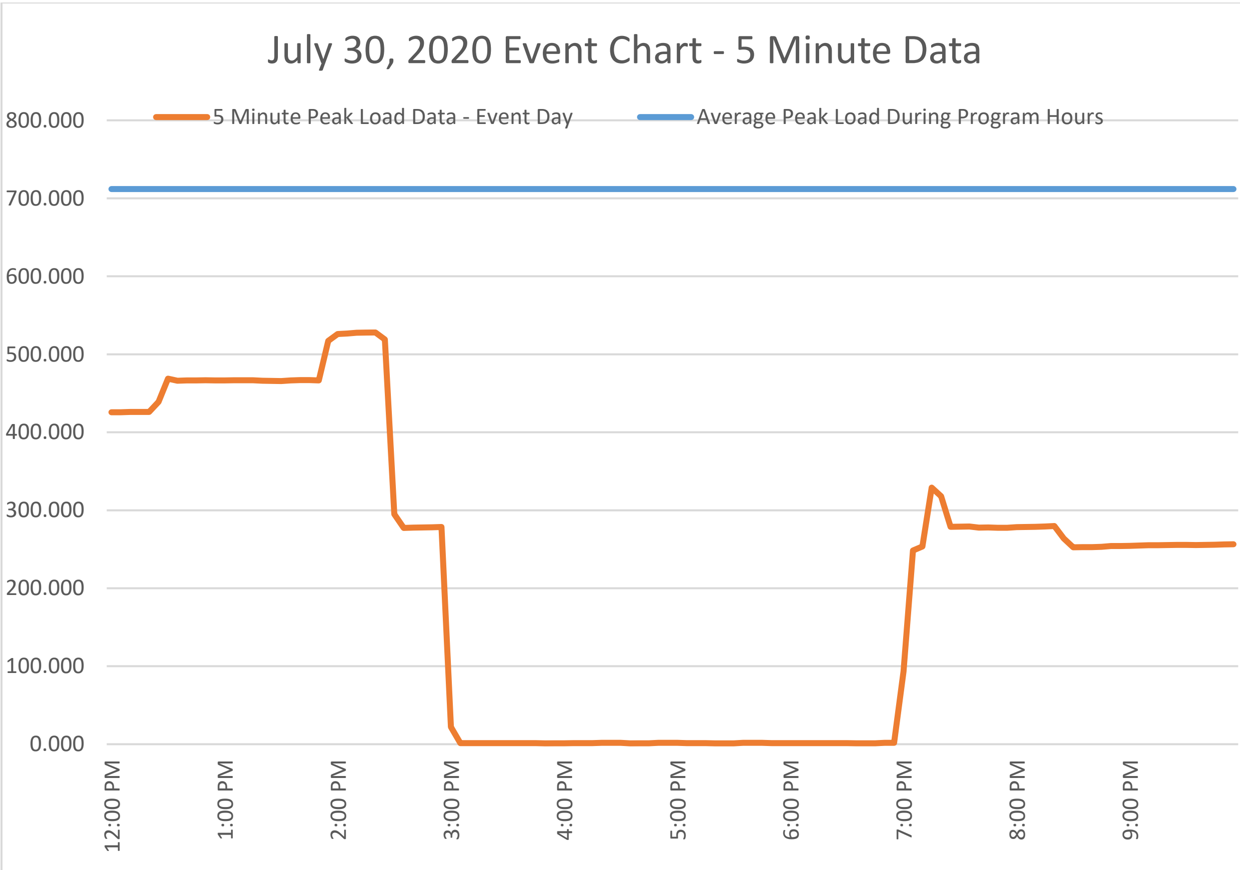


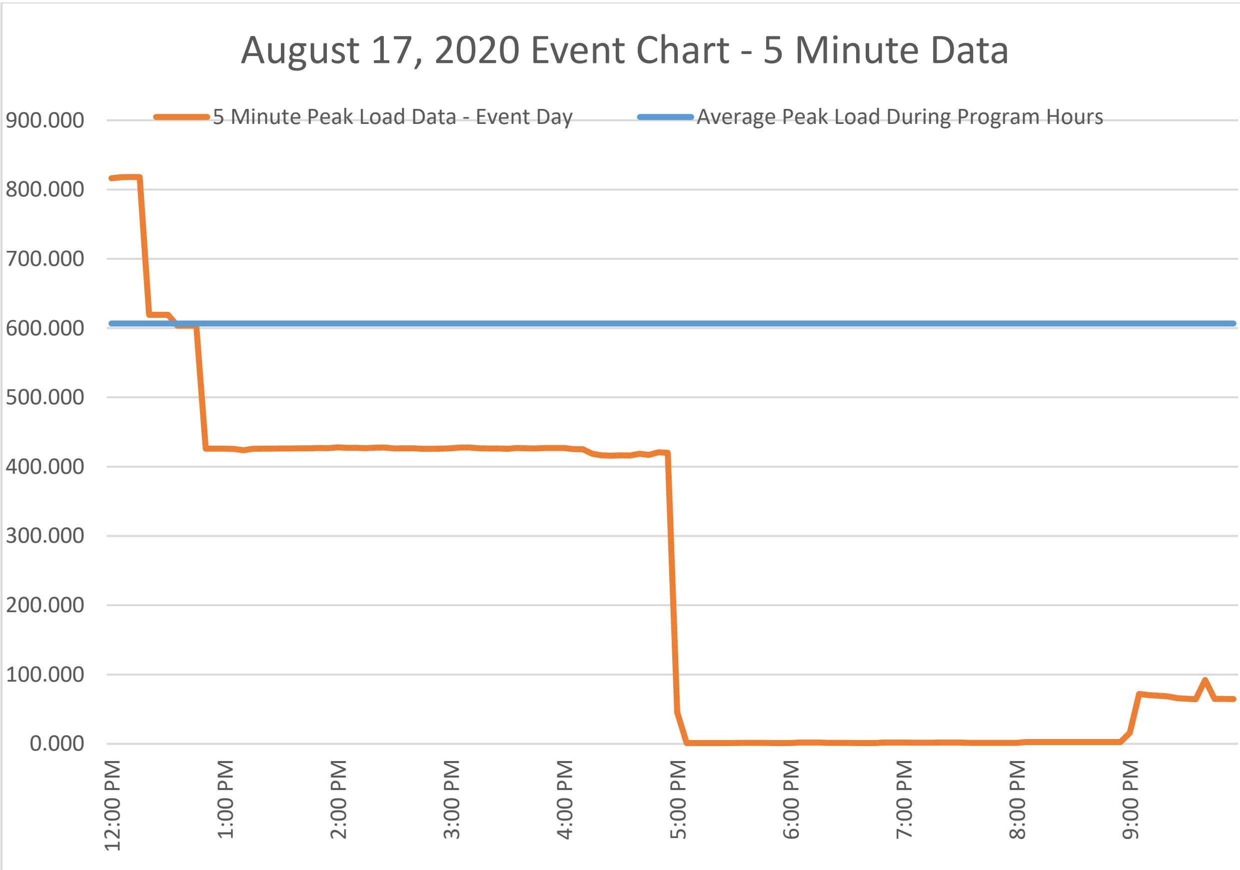
Load Control Events

Pacific Power activated the Irrigation Load Control Pilot program for six irrigation load control events in 2020. Actual load reduction was measured as the difference between actual demand remaining on the system during the event and baseline demand. Baseline demand is the average demand during program hours (12:00 p.m. to 10:00 p.m.) on the most recent non-event, program day. Actual Load Reduction (kW), Baseline Demand (kW) and Load Reduction Performance Factor as reported here correspond to five-minute interval energy usage measurements from Connected Energy's field installed equipment at customers' sites and five-minute Pacific Power AMI data for the one customer with medium voltage equipment.

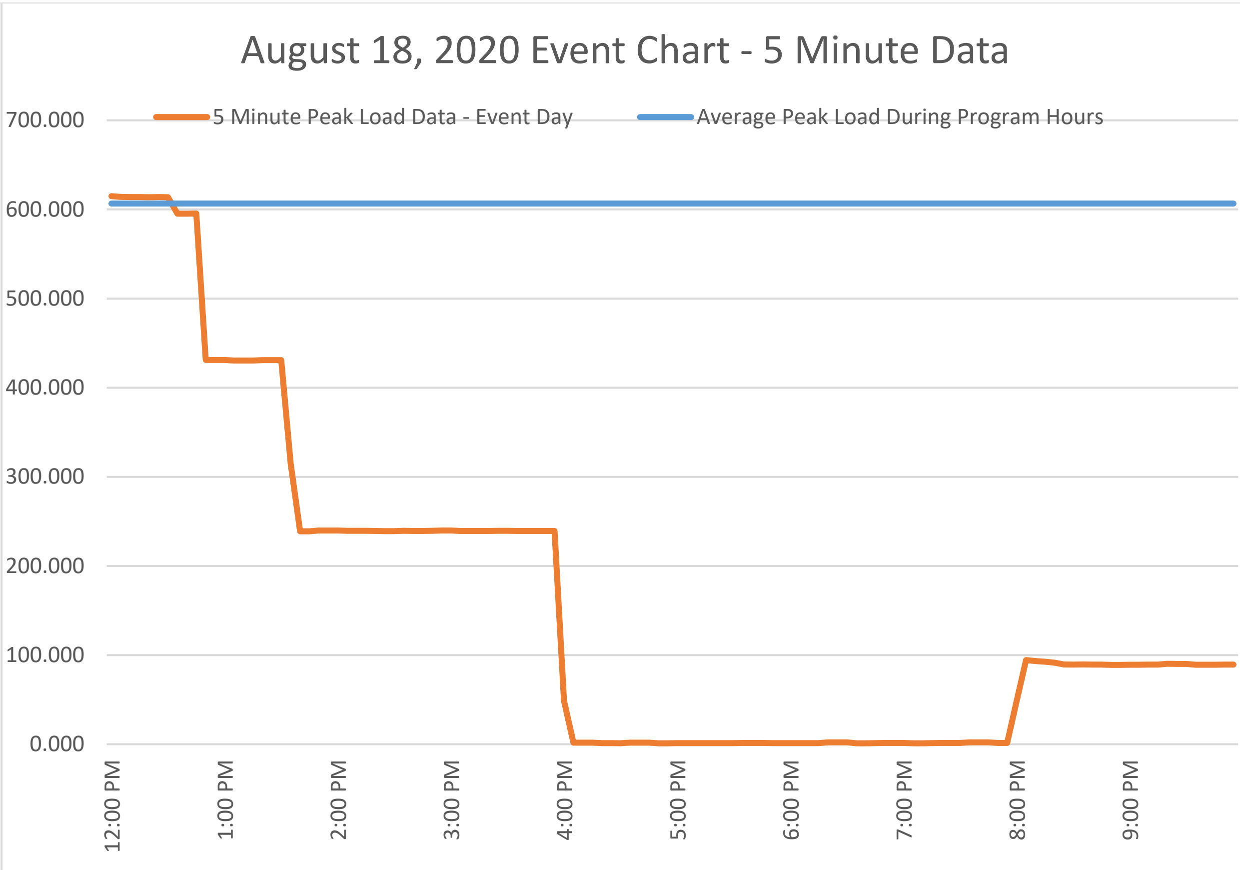
The 2020 portfolio delivered an average of 574 kW across the six load control events called during the 2020 program season. Load Reduction Performance Factor, the measure of actual load reduction compared to baseline demand, was 99.7% for the portfolio. A customer participation factor is also calculated for each participating site and is designed to measure customers' choices to opt-out of participating in events. This customer participation factor is used to adjust availability payments in accordance with the pay-for-performance nature of the program. In the 2020 program season the customer performance factor was 100%, indicating that no customers opted out of any events.

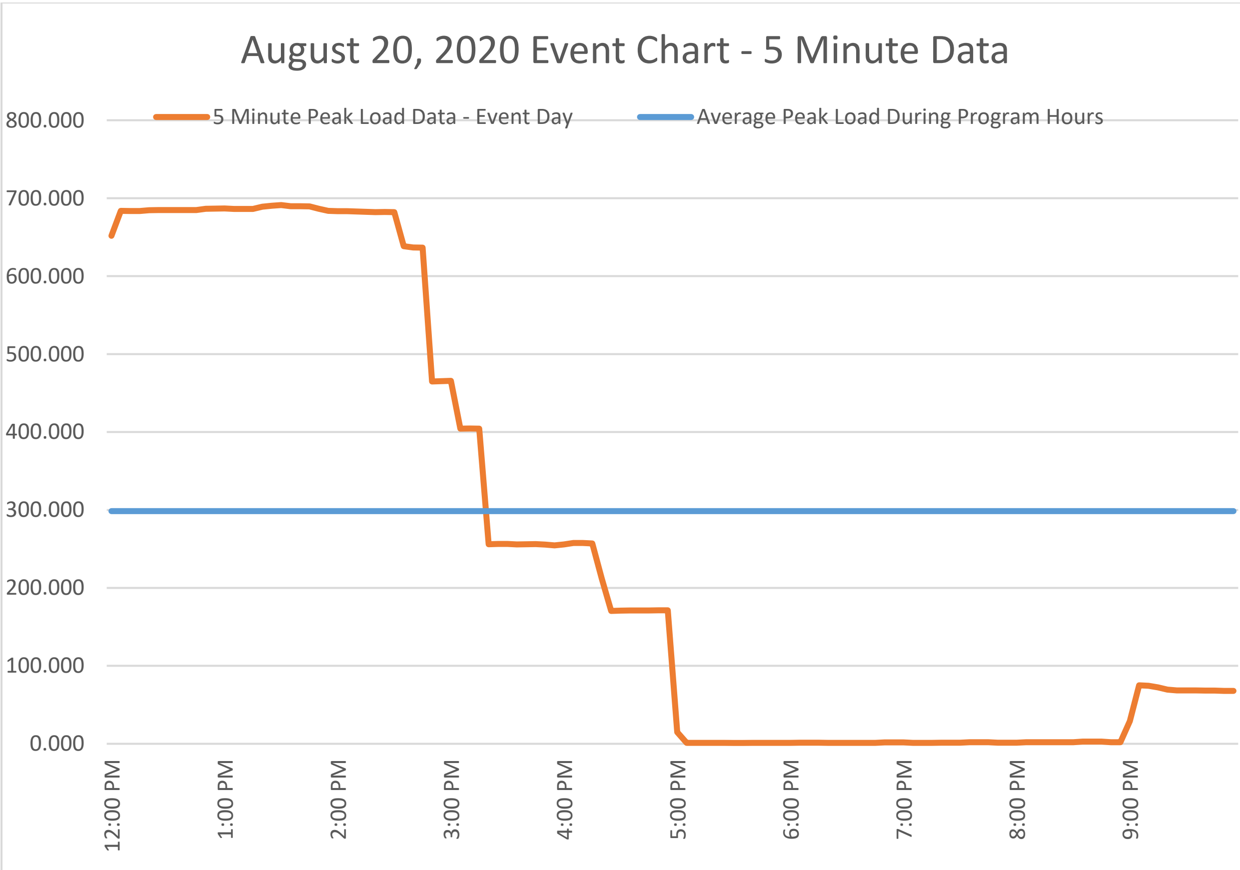
Images below are visual representations of the six load control events showing the participating load's demand relative to the prior non-event day baseline. The red line shows the five-minute Peak Load Data on the day of the event and the blue line shows the Average Peak Load During Program Hours for the baseline day:


July 30, 2020 Event Chart - 5 Minute Data
5 Minute Peak Load Data - Event Day
Average Peak Load During Program Hours
800.000
700.000
600.000
500.000
400.000
300.000
200.000
100.000
0.000
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM

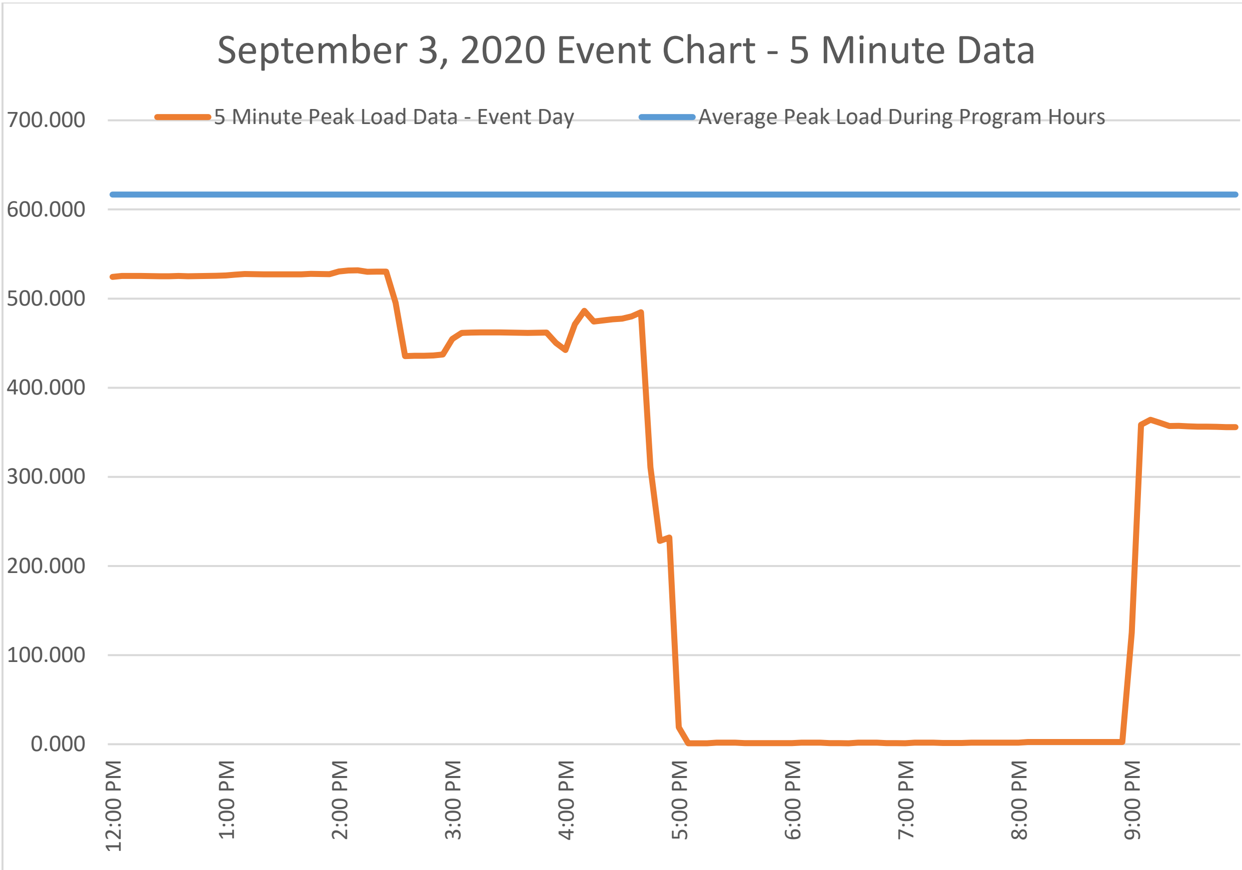


August 17, 2020 Event Chart - 5 Minute Data
5 Minute Peak Load Data - Event Day
Average Peak Load During Program Hours
900.000
800.000
700.000
600.000
500.000
400.000
300.000
200.000
100.000
0.000
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM

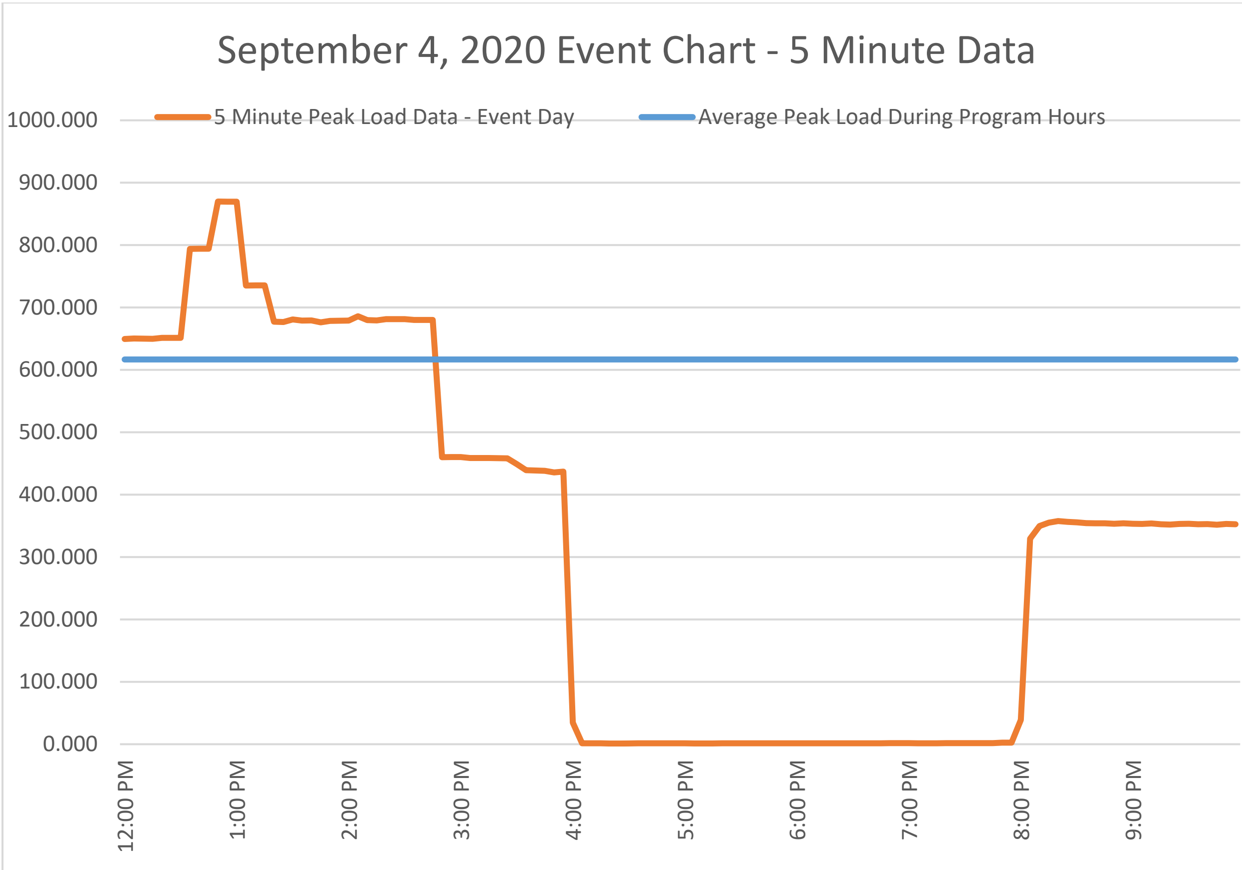

August 18, 2020 Event Chart - 5 Minute Data
5 Minute Peak Load Data - Event Day
Average Peak Load During Program Hours
700.000
600.000
500.000
400.000
300.000
200.000
100.000
0.000
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM



August 20, 2020 Event Chart - 5 Minute Data
5 Minute Peak Load Data - Event Day
Average Peak Load During Program Hours
800.000
700.000
600.000
500.000
400.000
300.000
200.000
100.000
0.000
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM



September 3, 2020 Event Chart - 5 Minute Data
5 Minute Peak Load Data - Event Day
Average Peak Load During Program Hours
700.000
600.000
500.000
400.000
300.000
200.000
100.000
0.000
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM



September 4, 2020 Event Chart - 5 Minute Data
5 Minute Peak Load Data - Event Day
Average Peak Load During Program Hours
1000.000
900.000
800.000
700.000
600.000
500.000
400.000
300.000
200.000
100.000
0.000
12:00 PM
1:00 PM
2:00 PM
3:00 PM
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Table 1 below details the actual load reduction, baseline demand, and performance factor (Actual Load Reduction / Baseline Demand) for each of the six called events.

Table 1: Actual Load Reduction, Baseline Demand, and Performance Factor, by Event and Region

Date	Region	Actual Load Reduction (kW)*	Baseline Demand (kW)*	Load Reduction Perf Factor (%)*
30-Jul-20	Oregon	710.00	711.87	99.74%
17-Aug-20	Oregon	604.05	606.61	99.58%
18-Aug-20	Oregon	604.22	606.61	99.60%
20-Aug-20	Oregon	296.69	298.53	99.39%
3-Sep-20	Oregon	614.66	616.71	99.67%
4-Sep-20	Oregon	614.52	616.71	99.64%
Avg of 6 Events	Oregon	574.02	576.17	99.70%

* Actual Load Reduction (kW), Baseline Demand (kW) and Load Reduction Performance Factor as reported here correspond to 5-minute interval energy usage measurements from Connected Energy's equipment at customers' sites and five-minute data from the Pacific Power system, for the one customer with medium voltage equipment. These measurements may or may not correspond to realized load reduction on Pacific Power's system.

Table 2 below provides details for each of the events in 2020. No events were called and then subsequently cancelled in 2020.

Table 2: List of 2020 Event Activity

Event	Start Time (PDT)	End Time (PDT)	Notes / Comments
Event #1	7/30/2020 15:00	7/30/2002 19:00	• Baseline demand was 711.9 kW • Total load reduction was 710.0 kW • Performance factor was 99.7%
Event #2	8/17/2020 17:00	8/17/2020 21:00	• Baseline demand was 606.6 kW • Total load reduction was 604.1 kW • Performance factor was 99.6%
Event #3	8/18/2020 16:00	8/18/2020 20:00	• Baseline demand was 606.6 kW • Total load reduction was 604.2 kW • Performance factor was 99.6%
Event #4	8/20/2020 17:00	8/20/2020 21:00	• Baseline demand was 298.5 kW • Total load reduction was 296.7 kW • Performance factor was 99.4%
Event #5	9/3/2020 17:00	9/3/2020 21:00	• Baseline demand was 616.7 kW • Total load reduction was 614.7 kW • Performance factor was 99.7%
Event #6	9/4/2020 16:00	9/4/2020 20:00	• Baseline demand was 616.7 kW • Total load reduction was 614.5 kW • Performance factor was 99.6%

Key Lessons Learned from 2020

Connected Energy operated the program for the full irrigation season with all participants from 2019 remaining in the program for 2020. Because of COVID, we were unable to add any new participants in 2020. Due to the complexity of field conditions (including high voltage equipment), Connected Energy was not able to install direct load control devices at four of the seven pump sites. The four pumps were included in the program by establishing a manual notification process that enabled the customer to receive an event notification and then manually turn off the participating pumps. Connected Energy used customer billing data to both validate that the pumps were curtailed as required and to calculate the customer incentive payment.

1. With 100% participation in six events in 2020 from customers that have been in the program since 2016, it indicates strong interest and willingness for irrigators in the Klamath region to continue to participate in an irrigation load control program.

2. Expanding the program hours from (12:00 p.m. – 8:00 p.m.) to (12:00 p.m. – 10:00 p.m.) and including all days, as opposed to only Monday through Friday (non-holidays) had no adverse impact on the program participants

involvement in the program for 2020. Five events occurred on days (past the week containing August 15) that were available as result of changes approved in February 2020. Three events utilized hour 21 (8:00 p.m. – 9:00 p.m.) that were available as the result of the approved changes.

3. Adding an hour-ahead dispatch notification option (in addition to retaining the day-ahead dispatch notification) proved informative. All the program participants were offered and accepted the hour-ahead option which provided a premium incentive payment of $30/kW per year compared to $18/kW per year for day ahead notification. All six events were conducted as hour-ahead notification events.

APPENDIX A: Customer-Facing Irrigation Load Control Pilot Activity

Table 3 below lists all major activity involving program participants related to the ILCP Program that occurred in 2020, excluding ILC events.

See Tables 1 and 2 above for dates and detail related to the called ILCP events.

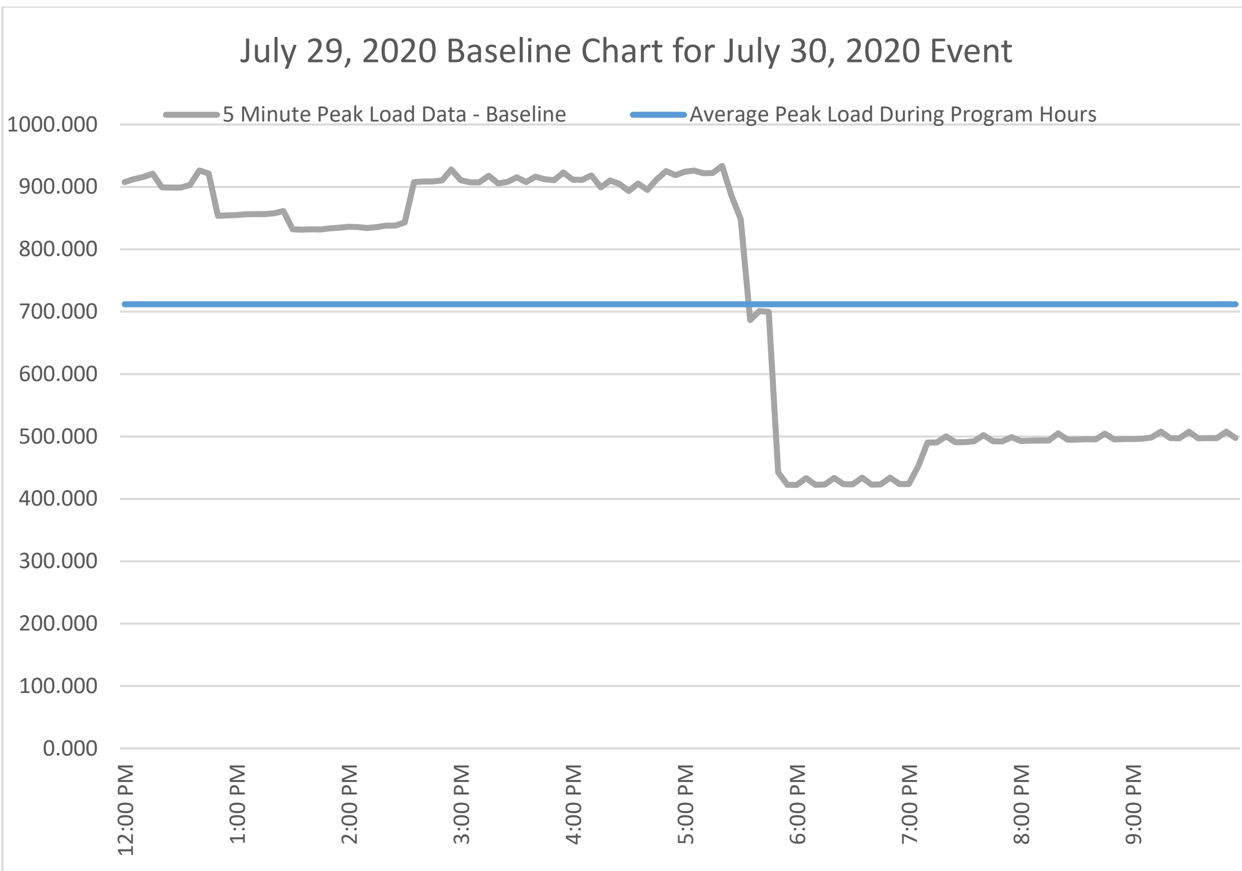
Figure 4: Participant-Facing Irrigation Load Control Activity in 2020

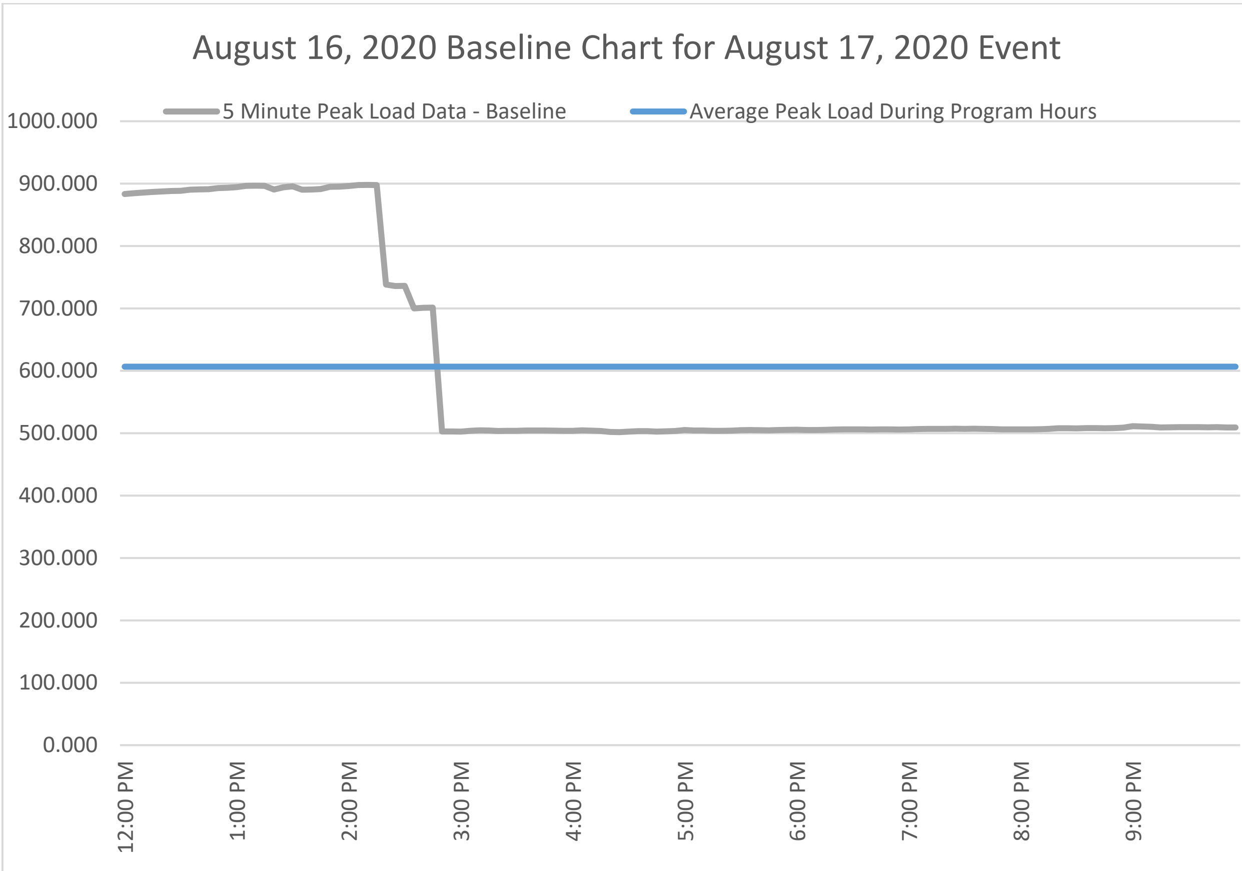
	Activity	Date	Description
1	**Welcome calls placed to previous year participants**	During month of May 2020	Connected Energy contacted all the 2019 participants to notify them of the 2020 program year start as well as the program enhancements (addition of hour-ahead notification and expanded program hours). All participants were pleased that the program was continuing.
3	**Courtesy calls to customers in advance of events**	Prior to each event	Connected Energy placed Dispatch Notification phone calls to each participant in advance of an event (in addition to electronic notifications) to ensure they were aware of scheduled events.
4	**Incentive payments mailed to participants**	Complete	Incentive checks were mailed to enrolled customers for participation in the 2020 Irrigation Load Control program the week of January 18, 2021.

APPENDIX B: Customer Payments

Five customers received incentive payments for their participation in the 2020 ILC Program season. Incentives payments totaled $13,454.10 and were based on available load that could participate in events multiplied by the participation factor. Customer billing data for 2020 was used for one of the customers where direct load control devices were not able to be installed. The participation factor was 100% for all customers and all customer incentives were calculated utilizing a $30/kW rate since all customer selected the hour-ahead dispatch notification option.

APPENDIX C: Detailed Baseline Charts





August 16, 2020 Baseline Chart for August 17, 2020 Event
5 Minute Peak Load Data - Baseline
Average Peak Load During Program Hours
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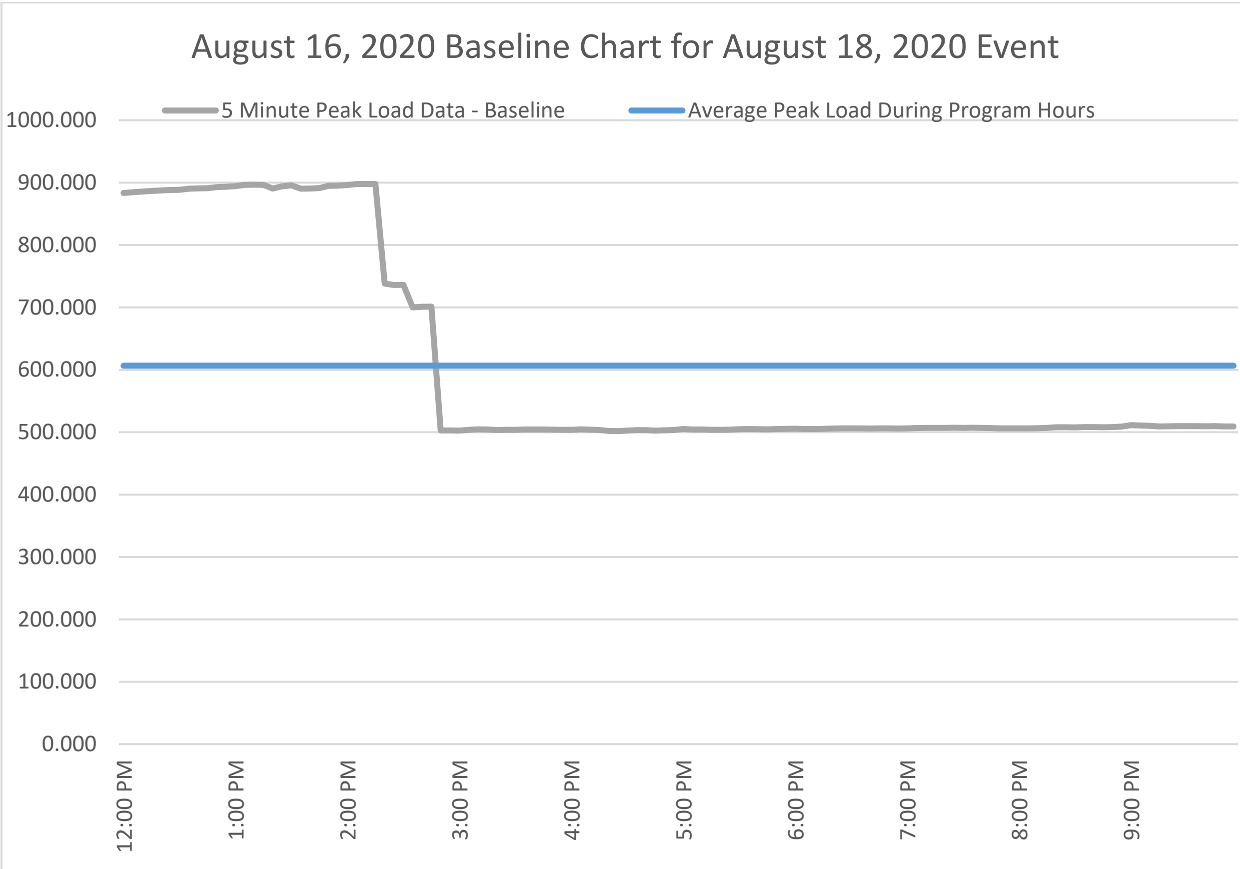
August 16, 2020 Baseline Chart for August 18, 2020 Event
5 Minute Peak Load Data - Baseline
Average Peak Load During Program Hours
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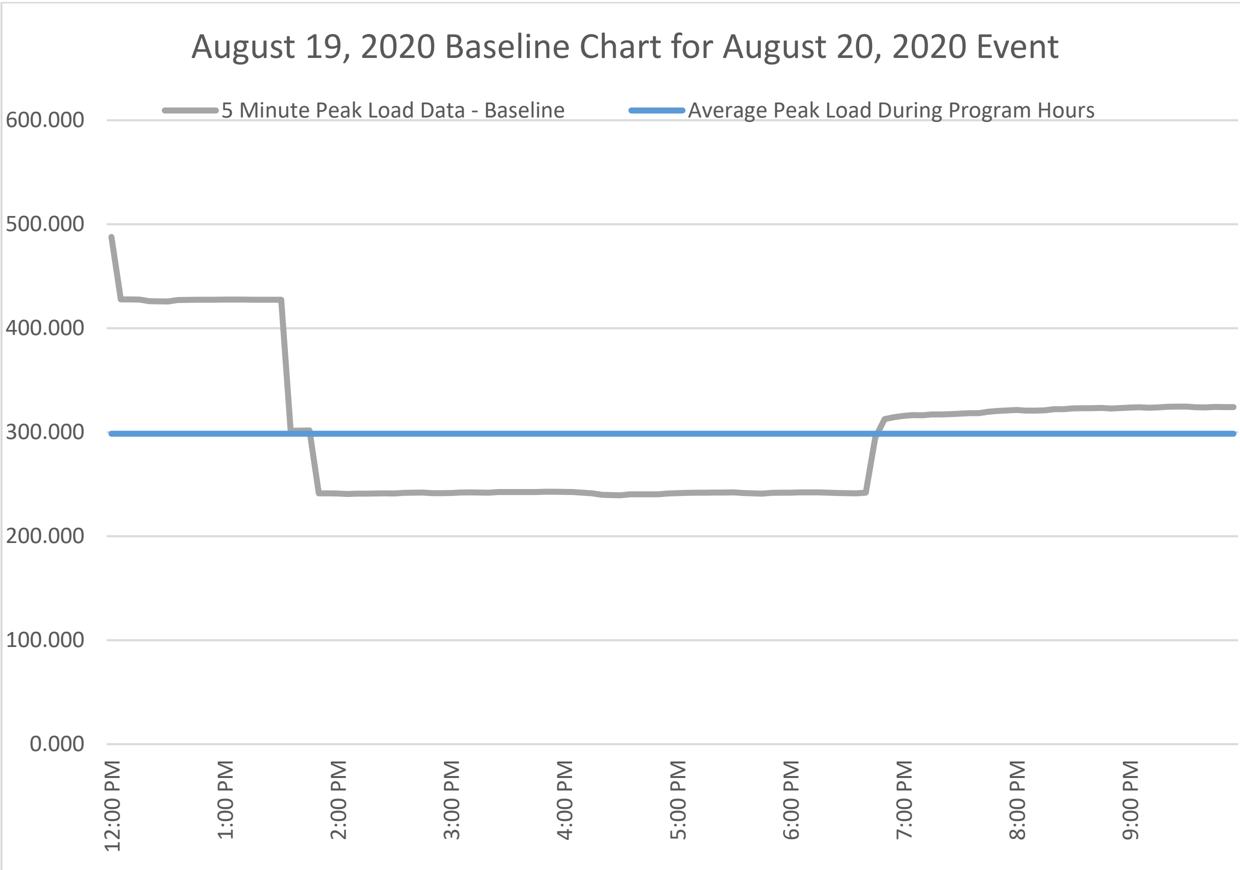

August 19, 2020 Baseline Chart for August 20, 2020 Event
5 Minute Peak Load Data - Baseline
Average Peak Load During Program Hours
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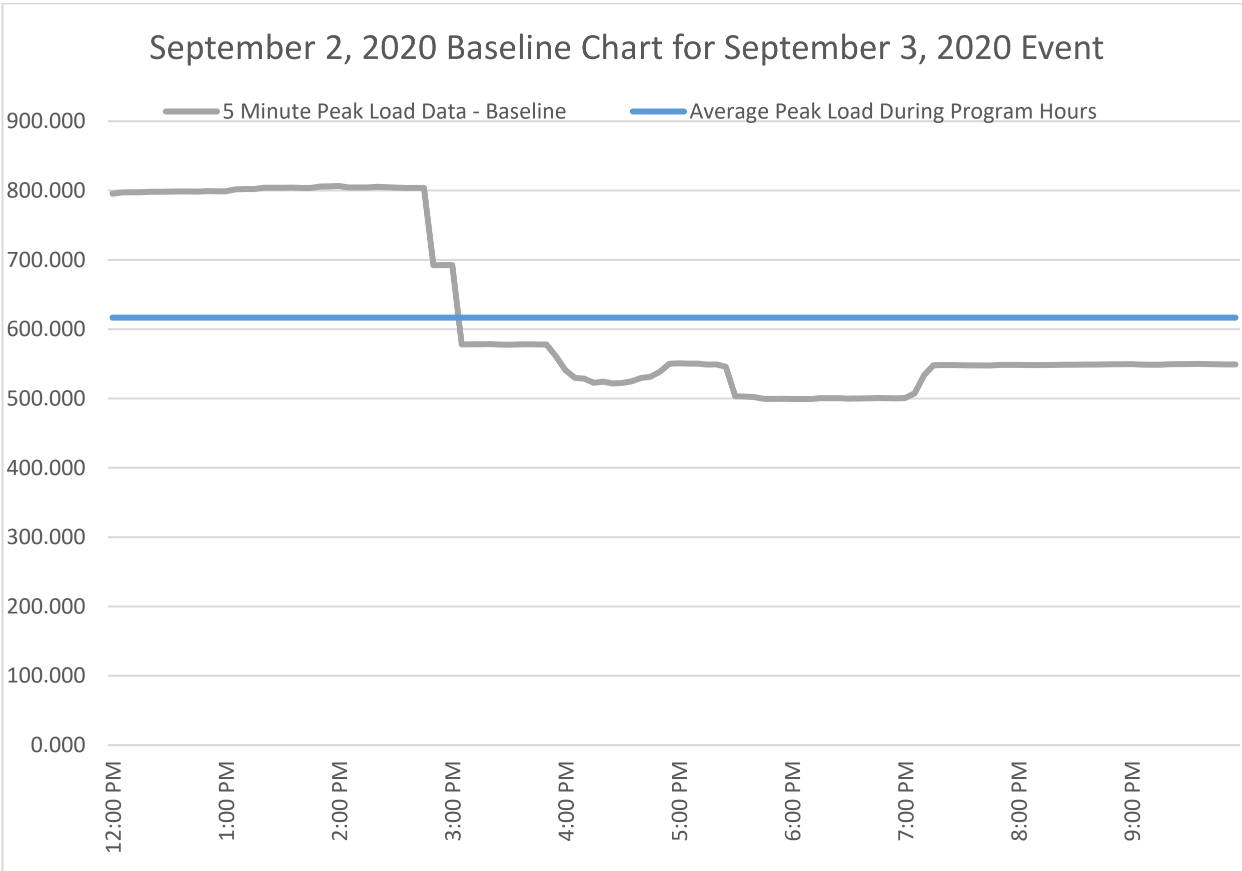
September 2, 2020 Baseline Chart for September 3, 2020 Event
5 Minute Peak Load Data - Baseline
Average Peak Load During Program Hours
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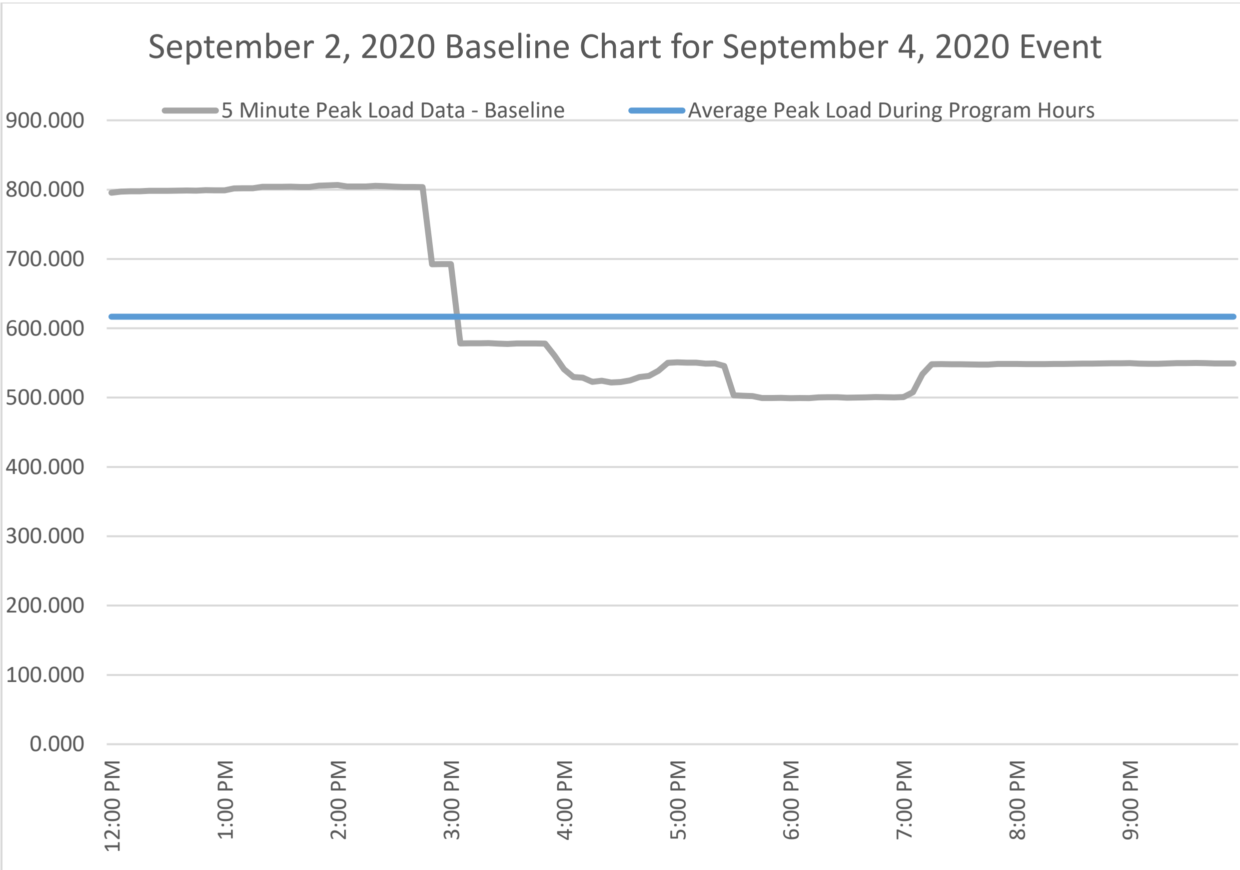

September 2, 2020 Baseline Chart for September 4, 2020 Event
5 Minute Peak Load Data - Baseline
Average Peak Load During Program Hours
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Appendix 2: Oregon Pilot Program Year Five - Benefits and Costs Discussion

The Oregon Pilot Program is intended to test designs, provide market feedback, and generate information about delivery logistics and costs. PacifiCorp will monitor the costs and benefits to understand the feasibility of expanding the load control program beyond the pilot stage in Oregon.

This Appendix provides discussion of the costs and benefits of the 2020 program developed in response to Recommendation No. 3 in the April 26, 2016 Commission Staff Report in Advice No. 16-04 to utilize the California Public Utilities Commission Distributed Energy Resource Avoided Cost Framework ("Framework") as a guide when conducting the post-season assessment.

Appendix A of the Framework, 2015 Demand Response Cost Effectiveness Protocols (Protocols) is dated November 2015.[5] It is important to note that these protocols are not directly applicable to pilots: "These protocols are not designed to measure 'pilot' programs, which are done for experimental or research purposes, technical assistance, educational or marketing and outreach activities which promote DR or other energy-saving activities in general..."[6] Although these Protocols are not directly applicable to pilots, they are being used here as an initial guide to help discuss the Pilot Program as it moves forward.

To utilize the Protocols as a guide, information from pages 11 and 12 of Appendix A is provided below, italicized; Protocol references to California utilities have been removed. The 2020 program information is provided below each Protocol topic and labeled "Pilot" for the purposes of this discussion. A summary of the avoided cost results is provided below. Details on the assumptions behind these results are provided in the section that follows.

Summary of Avoided Cost Results

	Short-Term Avoided Costs (Market)		Long-Term Avoided Costs (High)		Long-Term Avoided Costs (Expected)	
Value (2020$)	**$**	**$/kW-yr**	**$**	**$/kW-yr**	**$**	**$/kW-yr**
Energy	$4,387	$9.73	$4,387	$9.73	$4,387	$9.73
Losses	$504	$1.12	$504	$1.12	$504	$1.12
Day-ahead Energy+Losses	$10,721	$23.78	n/a	n/a	$2,529	$5.61
Hour-ahead Energy+Losses	$800	$1.77	n/a	n/a	$189	$0.42
Generation Capacity	n/a	n/a	$25,146	$55.78	$17,497	$38.81
Transmission Capacity	n/a	n/a	$1,093	$2.42	$286	$0.63
Distribution Capacity	n/a	n/a	$3,187	$7.07	$679	$1.51
Total	$16,413	$36.40	$34,317	$76.12	$26,071	$57.83

[5] *2015 Demand Response Cost Effectiveness Protocols,* California Public Utilities Commission. 2015.
[6] *Id*, page 7.

1. *Avoided Generation Capacity Costs*

   Pilot: In the near term, the Company's recent IRP's have assumed marginal capacity requirements would be met with Front Office Transactions (i.e. market purchases), which typically have a minimum increment of 25 MW. While this resource was too small to avoid an entire market transaction, the avoided energy costs below are calculated assuming that market transactions are avoided on a kW for kW basis. Because the Company has the option to call events, it can avoid day-ahead market purchases, which often trade at a premium to real-time energy costs, especially when they cover a long block of hours. Based on the day-ahead product cost on the actual event days, this premium is estimated at $23.78/kW for the 2020 season. Note that some of the benefits within this value are actually attributable to the hour-ahead notice provision, as all of the events were initiated on an hour-ahead basis. If events had required day-ahead notice, different or fewer days might have been identified for events. With hour-ahead notice, the Company is better able to target events to conditions, and that targeting is reflected in this result.

   The hour-ahead notification option selected by all customers creates additional value, as the Company can avoid day-ahead market purchases, with demand response option intended as a backstop, and does not have to actually initiate an event unless conditions warrant it. This value is estimated at $1.77/kW for the 2020 season, based on potential avoided market transactions during weeks when no events were called, but could have been if conditions had warranted it. This value does not include the additional benefits of hour-ahead notice embedded within the actual event days.

   Over the longer term, the Company will need to acquire additional physical resources, at a higher cost than market transactions and uses the expected net cost of a simple cycle combustion turbine (SCCT) as a proxy. The timing of this resource need is uncertain, so the analysis considers high, medium and low cases, with the SCCT need starting in year 1 for the high case and in year 10 for the low case, and a twenty-year nominal levelized value is reported for each case. The medium case reflects the next SCCT starting in year 7, which corresponds to the 2026 resource in the 2019 IRP preferred portfolio. While the timing for an SCCT is uncertain, the expected value reflects the average of the medium and high cases, or a SCCT in roughly year 4. This assumption reflects the fact that the first resource additions were made prior to 2026 in the 2019 IRP, and that the 2021 IRP has adopted a lower market capacity limit in light of the evidence that regional resource sufficiency is declining. The generation capacity contribution of the program was estimated as 60% after grossing up for losses, which is somewhat lower than the 86% contribution for a four-hour battery that is available every day during the summer. The capacity contribution value is based on the kW of non-event load during Program hours, which was 451 kW during 2020. In the expected case, a blend of near-term market and long-term SCCT net costs produces a generation capacity value of $44.84/kW. In the high case, SCCT net costs starting in year 1 result in a generation capacity value of $55.78/kW. Because a SCCT would provide much the same optionality ascribed to the avoided market capacity costs, the day-ahead and hour-ahead benefits are not included for those years in which capacity costs are based on an SCCT.

2. *Avoided Energy Costs*
   Pilot: A review of the loads preceding and following each event indicate a mixture of load shedding (loads not fully restored after events) or load shifting (loads returning following the event) or a hybrid (some but not all load returning after events) This review provides additional information to that gathered in the last five seasons and continues to suggest a mixture of shedding and shifting but provides no definitive conclusion about load shifting or shedding as the primary impact. For the purposes of this report, energy value is reported based on the amounts shed, relative to the prior day baseline, without any adjustments related to shifting. For the 2020 valuation, the value of avoided energy is based on the avoided energy during event hours, with day-ahead and hour-ahead option value being reflected in the market capacity estimate.

   Avoided energy during event hours is based on EIM fifteen-minute market prices for PacifiCorp West, PacifiCorp East, and Malin, blended using the same ratios applied to qualifying facilities and adopted in the Resource Value of Solar proceeding. The value of energy during 2020 curtailment events averaged approximately $318/MWh.

   Because energy volumes reflect metered loads, it is appropriate to account for the value of avoided line losses that would otherwise have been incurred to serve those loads. Avoided line losses are based on the 12 month by 24 hour estimates of marginal losses at secondary voltage, as applied in the July 2019 compliance filing for the Resource Value of Solar. Avoided losses represent a roughly 11.4% increase in energy savings, and resulted in effective energy savings of approximately $355/MWh when grossed up for losses.

3. *Avoided Transmission and Distribution Costs*
   Pilot: Assigning transmission and/or distribution deferral value(s) to load management is consistent with the 2019 IRP, the Northwest Power Planning and Conservation Council's 7th Power Plan[7] and Oregon's Resource Value of Solar (UM-1910). Deferral values and their application in this analysis are derived from analysis presented in Table 6.8 and in Appendix Q in the 2019 IRP. Available information indicates enabled load control equipment is connected to four separate distribution substations. In 2019, none of these substations were identified as needing import capacity upgrades and no transmission deferral value was assigned. In 2019, one device controlling approximately 15 kW (site) of irrigation load was connected to a distribution substation identified for an upgrade if block load additions materialize in the future.

   For 2020, the transmission and distribution (T&D) deferral portion of the analysis was updated to more generically estimate value based on a full-size program, rather than the specific attributes of the existing load control locations. High, Average, and Low transmission and distribution deferral values were identified. Many locations have more than adequate T&D capacity, so the Low value is zero. In 2020$ and before capacity contribution is accounted for, Average values are $4.34/kw-yr. for transmission capacity and $9.61/kw-yr for distribution capacity, while High values roughly twice as the average at $8.31/kw-yr for

[7] 7th Power Plan applies transmission deferral value only.

transmission capacity and $22.55/kw-yr. for distribution capacity. While it is possible a single location could have T&D values that were both high, it is not expected to be common. Much more common would be locations where T&D values were both zero.

Because the program has restrictions on the number of events, the number of days per week, and the total number of hours per year, the ability to respond to both system requirements (for generation capacity) and local requirements (for transmission and distribution capacity) may be limited. In particular, the net load peak that drives generation capacity requirements tends to occur later in the day as the sun is setting, whereas transmission and distribution peaks tend to occur in mid-to-late afternoon. The four-hour daily event duration does not allow events to cover both of these periods. These limitations are reflected in the capacity contribution, which is estimated at 29% for transmission and 31% for distribution after grossing up for losses. These values are based on the kW of non-event load during Program hours, which was 451 kW during 2020.

The transmission capacity deferral credit for "High" cost locations is estimated at $2.42/kw-yr., while the comparable value for the distribution capacity deferral credit is estimated at $7.07/kw-yr. The expected values for the program as a whole are based on averaging the medium and low deferral credit values, and result in a transmission capacity deferral value of $0.63/kw-yr. and a distribution capacity deferral value of $1.51/kw-yr.

4. *Avoided Environmental Costs for Greenhouse Gases (GHG)*
   Pilot: There are no published costs for GHG that are applicable to this analysis. There are no Oregon explicit avoided environmental cost associated with GHG reductions.

5. *Line Losses*
   Pilot: For valuation purposes, the hourly line loss factor methodology developed for docket UM 1910 was used. Under that methodology, avoided line losses are highest during peak load periods, and as a result, the avoided line losses during the 2020 curtailment events is estimated at 11.4%. The value of avoided line losses is included in avoided energy and capacity costs.

6. *Weighted Average Cost of Capital (WACC)*
   Pilot: Not applicable for contemporaneous recovery of these pilot costs.

The Load Serving Entity (LSE) will specify the following quantitative information relevant to the evaluation of each program, following the procedures outlined in these protocols:

1. *Load Impacts, in MW*
   Pilot: The average MW reduction across the six 2020 events was 0.574 MW at site. Applying the 11.4% estimated line loss, the load impacts at the generator are 0.639 MW.

2. *Expected call hours of the program (used to determine energy savings)*
   Pilot: Program was called for 24 hours in 2020. This is 46% of 52 maximum annual dispatch hours.

3. *Administrative Costs*
   Pilot: Administrative (non-incentive) costs paid in 2020 to Connected Energy include, program delivery costs for the fifth year of the pilot.

4. *Participant Costs (for only those programs which are not using a percentage of incentives as a proxy measurement)*
   Pilot: Participants do not incur capital costs to participate.

5. *Capital Costs and Amortization Period, both to the LSE and to the Participant (should be specified for each investment)*
   Pilot: There are no unamortized capital costs to recover over an amortization period. The 2020 program expenses were paid through 2020 and are being recovered through Schedule 95.

6. *Revenues from participation in CAISO Markets (such as ancillary services or proxy demand resource)*
   - *CAISO Markets Entered*
   - *Average megawatts (MWs) and hours bid into those*
   - *Average market price received*
     Pilot: This resource was not large enough to change any portion of the Company's participation in the California Independent System Operator (CAISO) markets.

7. *Bill reductions and increases*
   Pilot: The bills for the 2020 participants were not analyzed for changes since it was unlikely the 24 event hours combined with a mixture of load shedding and load shifting around those events would have had an impact on total bills for the season.

8. *Incentives paid*
   Pilot: The 2020 incentive payments were $13,454.

9. *Increased supply costs*
   Pilot: The resource is too small to change supply costs.

10. *Revenue gain/loss from changes in sales (usually assumed to be the same as bill reductions and increases)*
    Pilot: See No. 7 above.

11. *Adjustment Factors (if not required to use default values)*.

    - *Data need to calculate Availability (A Factor)*
      Pilot: The portion of the capacity value that can be captured by the program based on availability (daily, monthly), frequency and duration of calls permitted. While this program is likely to be coincident with generation capacity constraints in the summer, it is not necessarily available during all hours (or days before June 1st or after September 1st) that a generation constraint could occur.

- *Notification Time (B Factor)*
  Pilot: In 2020, program required no less than one hour- and no more than one day-ahead notification.

- *Trigger (C Factor)*
  Pilot: Events can be called at the discretion of utility (within the specified months, weeks, days, hours). Other than that, there are no restrictions. The 2020 events were triggered by a forecast for higher than typical power prices for the super peak period. In addition, hot weather was forecast for the period.

- *Distribution (D Factor)*
  Pilot: The D Factor can be summarized as "right time", "right place", "right certainty" and "right reliability." The pilot was not designed to avoid specific local investments.

- *Energy Price (E Factor)*
  Pilot: See 2 for discussion of components utilized in 2020 avoided energy analysis.

- *Flexibility (F Factor)*
  Pilot: The pilot is too small for the Company to assess possible F Factor value.

- *Geographical/local avoided generation capacity (G Factor)*
  Pilot: Not applicable.

The LSE may also add the following optional inputs:

1. *Social non-energy benefits, such as environmental benefits (in addition to the avoided GHG cost included in the avoided cost calculator), job creation benefits, and health benefits.*
   Pilot: Not applicable.

2. *Utility non-energy benefits, such as fewer customer calls and improved customer relations.*
   Pilot: Not applicable.

3. *Participant non-energy benefits, such as improved ability to manage energy use and "feeling green."*
   Pilot: Not applicable

4. *Market benefits, such as market power mitigation and market transformation benefits*
   Pilot: Not applicable.

Overall comparison of benefits and costs for the 2020 season.

	Benefits	Costs	b/c ratios
Avoided generation capacity	$17,497		
Avoided energy + market	$7,609		
Avoided transmission	$286		
Avoided distribution	$679		
Total	$26,071		
Incentives		$13,454	
Delivery		$162,250	
Total		$175,704	
Incentives			1.94
Delivery			0.16
Total			0.15