PACIFIC POWER
A DIVISION OF PACIFICORP

825 NE Multnomah, Suite 2000
Portland, Oregon 97232

March 27, 2020

VIA ELECTRONIC FILING

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

Attn: Filing Center

RE: Advice 16-004—Compliance Filing—2019 Report on Pacific Power's Irrigation Load Control Pilot Program

PacifiCorp d/b/a Pacific Power submits the attached 2019 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

2019 Irrigation Load Control Pilot Program in Oregon

Issued March 27, 2020

PACIFIC POWER
A DIVISION OF PACIFICORP

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Overview

PacifiCorp has operated an irrigation load control program in Idaho since 2003 and in Utah since 2007. These voluntary direct load reduction programs allow PacifiCorp to better manage summer peak loads by providing incentives to customers that allow the Company to interrupt their irrigation service under certain conditions.

On May 3, 2016, the Public Utility Commission of Oregon (OPUC) approved PacifiCorp d/b/a Pacific Power's (Company's) 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.

This report summarizes 2019 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

Element	**Start Page**	**Section**
1. Review of annual enrollment		
a. Total program enrollment	15	Enrolled Customers
b. Sites added and removed	15	Enrolled Customers
c. Customer outreach	9	2019 Activities …Challenges From 2018
d. Crop(s)	16	Customer Crop/ Operations and Pumping Equipment
e. Weather data from local weather station(s)	16	Weather and Drought Impact
f. Available information on water restrictions	16	Impact of Irrigation Technology and Water Availability
2. Customer satisfaction a. Customer requests for retirement b. Site reassignment management	5	Participant Behavior *There were no customer requests for retirement or reassignments in 2019
3. Incentive payments	15 30	Customer Payment Structure Appendix B: Customer Payments
4. Review of annual program performance		

[1] Advice 19-008

a. Weekly available load reduction	18	Available Load Reduction
b. Load control events	22, 27	Load Control Events
c. Availability and load reduction comparison	8	Availability
5. Key observations	5	Key Findings

In 2019, the same small group of customers from 2018 continued to participate. Two new customers with 4 added sites and 7 additional pumps were enrolled during the 2019 season. The one customer with medium voltage equipment that was identified but not enabled during prior seasons began to participate in 2019 utilizing manual control in response to event notifications. Impacts were assessed using Advanced Metering Infrastructure (AMI) data from the Company. Four events were called in August of 2019; each with four hour duration for a total of sixteen event hours. Key findings from 2019 focus on participant behavior, event logistics and transitioning customers to the new provider.

Key Findings

Participant behavior

Grower interest and engagement was maintained amongst prior participants and two new customers were enrolled. The 2019 program year included four events. Two events were called back-to back in one week, which reinforces prior season observations around the propensity for growers to participate in events even if they are in close proximity to each other. Legacy and new customers participated in all events and fulfilled their commitment to curtail irrigation usage. Similar to the 2018 season, participants did not indicate concerns about water availability for the 2019 season.

Logistics

The 2019 events were all four hours and in close proximity to each other; Monday, Wednesday in one week and Tuesday, Wednesday in the next 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. Elapsed time between contract signing for the two new customers and the switch installations for the one new customer was comparatively fast.

Event notification was successful 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. AMI information for the medium voltage pumps took longer to retrieve from the Company system than originally anticipated and shortening the retrieval time for this data will be a focus for the upcoming season.

Delivery Costs

2019 was the second year of the new delivery contract with Connected Energy. Total costs in 2019 were lower than 2018 since there were no start-up costs. Costs per available kW declined compared to 2018 as additional customers enrolled and available load for control increased.

Assessing Costs and Benefits

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 16-004 was approved by the Oregon Public Utility Commission on May 3, 2016 and has operated for three growing seasons. Activities in the prior three seasons were outlined in the annual reports filed on March 31, 2017, March 30, 2018 and March 29, 2019. On July 22, 2019, the Company filed to extend and expand the program consistent with the recommendation provided in the year three report.

The Company filed the 2017 Integrated Resource Plan update on May 1, 2018 and included the potential impacts of the irrigation load control pilot program.[2] The 2019 IRP filed on October 18, 2019 included the potential impacts of the irrigation load control program as originally filed since approval of the extension and expansion was pending when the 2019 IRP was filed.[3]

The 2019 timeline of key program activities is outlined below.

2019 Timeline

Week of May 20	Pre-season communication to existing participants
June 5	Website updated to include 2019 season specific messages
Week of July 20	New switch installations complete
August 2	Event notification (Friday) to participating customers for August 5 event (Monday)
August 5	Four hour event conducted between 4pm-8pm, Pacific time
August 6	Event notification to participating customers for August 7 event
August 7	Four hour event conducted between 4pm-8pm, Pacific time

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

August 12	Event notification to participating customers for August 13 event
August 13	Four hour event conducted between 4pm-8pm, Pacific time
August 13	Event notification to participating customers for August 14 event
August 14	Four hour event conducted between 4pm-8pm, Pacific time
August 17	End of regular season (mandatory events)
September 30	End of season (including voluntary event window). Season end communication to participating customers
January 2020	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 4 (2019) availability represents a material increase compared to prior years and was a direct result of adding customers, sites and meters. A further increase, up to 5MW was included in the information provided in Advice 19-008.

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, which requested an extension of the pilot for an additional three years, through the 2023 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.

Table 1. Irrigation Load Control Pilot Program Parameters in place during 2019

Program Parameters	**Description**
Eligible Customers	Irrigation Customers on Schedules 41 or 48 in and around Klamath Falls.
Program Period	Week including June 1 through week including August 15.[4]
Program Hours	Weekdays, 12 p.m. to 8 p.m. Pacific Time.
Dispatch Limitations	52 hours per year, 20 events per year, up to 4 hours per event or twelve hours per week.
Incentive Rate	Estimated at $23-$27/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.

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

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.

Additional information about 2019 customers, dispatch events, incentive rates and payments, and event opt-outs is provided in Appendix 1.

2019 Performance

Availability

Program availability in 2019 increased as the direct result of adding customers and having the new provider focus on expansion rather than transition activities.

Four events were called in August 2019 and each event was four hours. The average kW available from all events was 554 kW, a material increase compared to 2018. There was 100% customer participation in all events. Load control equipment performed as expected. Accessing AMI data took longer than expected and represents an opportunity for improvement for the next season.

Table 2. Oregon Irrigation Load Control Pilot – 2016 - 2019 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	
kW (average all events)	281	432	258	554	

Notes for Table 2

- kW values are at customer site
- 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 2019 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 - 2019 Costs

	Year 1 (2016)	Year 2 (2017)	Year 3 (2018)	Year 4 (2019)	Year 5
Estimated Program Costs (Calendar Year)	$150,000	$225,000	$225,000	$225,000	$225,000
Actual Program Costs	$150,000	$125,000	$179,634	$157,082	

2019 Activities to Address Key Challenges From 2018

On July 22, 2019, the Company filed Advice 19-008 requesting authorization to extend and expand the program. The filing requested:

- 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 AMI data and manual control.

The expansion is intended to test whether localized deferral values can be achieved and the expanded hours and shorter notice option is a direct response to the need for increased resource flexibility identified by the company's Energy Supply Management (ESM) group. The filing was intended to implement recommendations identified in the 2018 report.

Consistent with the pilot intent to enroll different types of customers to achieve the targeted impacts (up to 3 MW), two new customers were added in 2019. Both customers differed from legacy participants in that they are not growers or the end users of water. Instead, these new participants move water on a bulk basis for the benefit of end users. One of the new customers was a large public entity with medium voltage pumps that had indicated interest in participating in prior years where the control equipment compatibility issues presented a unique challenge. This customer was able to participate utilizing the process described in Advice 19-008; utilizing AMI data and manual control. The company made the decision to enroll this customer in parallel with the pending regulatory process since a) the customer, a federal entity had finally received approval of the participation agreement from their contracting representative, b) the engagement process had been on-going for almost four years, c) sunk costs for enrollment were small in the remote chance requested changes were not approved, and d) the added load available for control was material.

Appendix 1
2019 Connected Energy Pacific Power
Irrigation Load Control Program Report

In support of Pacific Power's regulatory activities related to the Irrigation Load Control 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.

2019 Pacific Power Irrigation Load Control Program Report

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Date: March 20, 2020

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Overview of the 2019 Irrigation Load Control Program

This report provides an overview of the Irrigation Load Control (ILC) 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 ILC program in Oregon was initially granted by the Public Utility Commission of Oregon on May 4, 2016. The Irrigation Load Control 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. All customers that had participated in the program in 2016, 2017, and 2018 remained in the program during 2019. In addition, the program was expanded in 2019 increasing the average actual load reduction across the four events to 554 kW, a substantial increase over the 2018 average of 258kW.

Five customers with a total of 9 sites and 17 pumps participated in the program in 2019. Maximum load for available for curtailment was 945 kW and occurred on August 7, 2019 between the hours of 14:00 and 15:00. Participating sites were compensated for shutting off irrigation load for specific time periods determined by Pacific Power, and were provided day-ahead notice of load control events. 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.

Customer incentives in the ILC 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. The program hours are 12:00 PM to 8:00 PM Pacific Daylight Time (PDT), Monday through Friday, not including holidays.

Per Oregon Schedule 105, the load control season starts on the Monday of the week including June 1st and ends on the Friday of the week including August 15th. For the 2019 load control season, the first day of the program season was Tuesday, May 28th as Monday, May 27th was the Memorial Day holiday and, thus, not an eligible program day. The program season ended on Friday August 16th. Pacific Power may additionally call voluntary events from June 1st to September 30th each year. Voluntary events allow customers to earn payments for their real-time reductions during such events, but their participation or lack of participation does not impact their regular season capacity payments. No voluntary events were called by Pacific Power in 2019.

Pacific Power initiated four load control events during the 2019 load control season on the following dates and times:

- August 5, 2019 between hours of 4:00PM - 8:00PM
- August 7, 2019 between hours of 4:00PM - 8:00PM
- August 13, 2019 between hours of 4:00PM - 8:00PM
- August 14, 2019 between hours of 4:00PM - 8:00PM

Load reductions for the events are calculated using five-minute interval metering data from Connected Energy's direct load control devices. In 2019, the performance factor for all customers was 100%, which indicates that no customer opted out of any event in the program year.

Review of 2019 Customer Enrollment and Enablement

Customer Payment Structure

All participants are paid the same incentive rate based on measured available load for curtailment throughout the program season adjusted for any opt outs or non-performance in load control events. In 2019, all participants were paid at the $23/kW rate, the same rate that was paid in 2018. This payment structure is designed to provide fair and consistent treatment for all sites.

Enrolled Customers

For the 2019 load control season, Connected Energy enrolled two new customers with 7 new pumps loads. In addition, all previously installed customers remained in the program, resulting in a total of 17 pumps, across 5 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 the 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 Irrigation Load Control 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 and are "future proof" when the cellular providers begin to deactivate the 3G network toward the end of 2020.

Review of 2019 Program Participants and Performance

Customer Crop/Operations and Pumping Equipment

For the 2019 Irrigation Load Control season, customer crop types/operations included alfalfa, potatoes, and grass fields for cattle and livestock grazing as well as pumping into reservoirs. Pump sizes at these locations ranged for 40 HP to 750 HP.

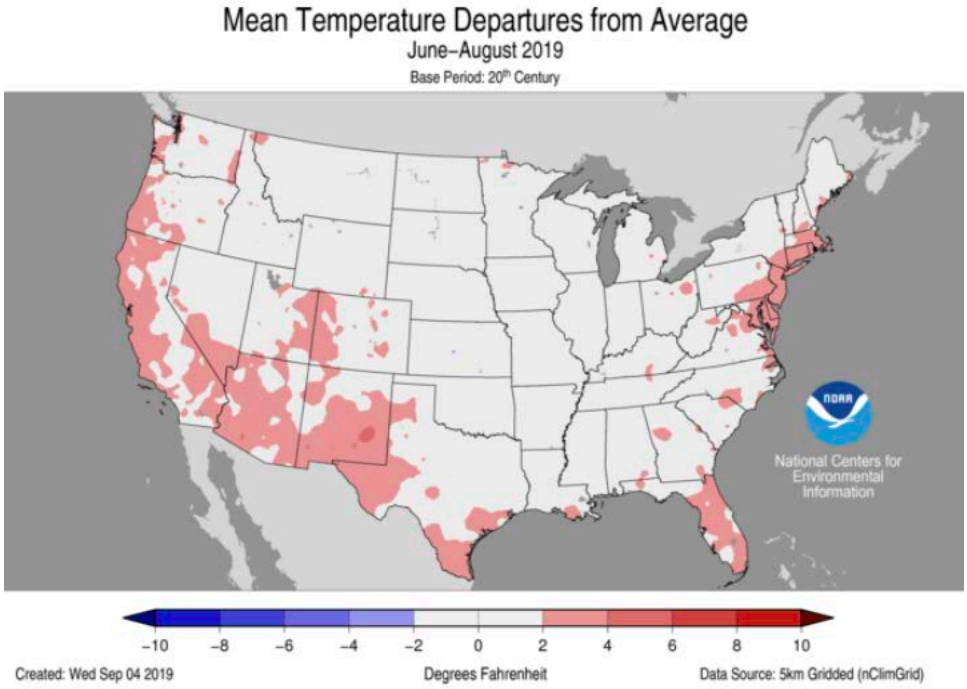
Impact of Irrigation Technology and Water Availability

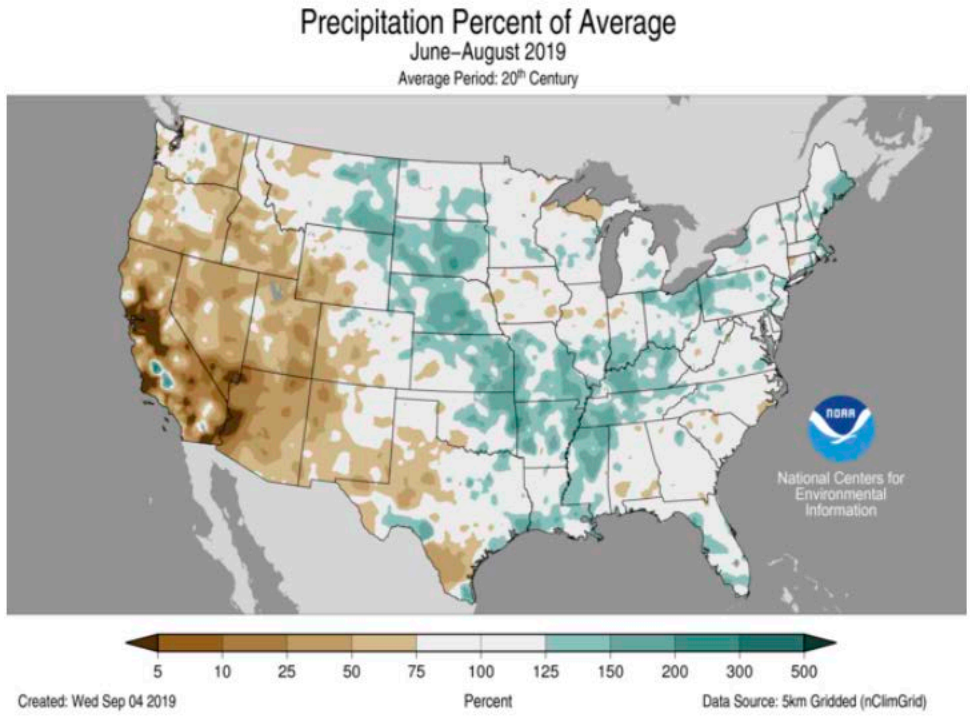
While pump size is a clear determinant of total availability in the Irrigation Load Control program, irrigation technology and water availability also impact irrigation pump run-time and thus can affect customer success in the Irrigation Load Control program. Pivot irrigation systems are operationally easier to manage for load control events than a wheel line or hand line irrigation system. During the 2019 season irrigators did not raise issues or questions about current or potential future water restrictions impacting their ability to participate in the program.

Weather & Drought Impact

Similar to 2017 and 2018, 2019 was warmer and dryer than normal[1], 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 ILC program region during the 2019 program season.





[1] 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/201908.

Available Load Reduction

The Oregon Irrigation Load Control program is evaluated based upon average available load reduction (kW) between the nearest Monday on or before June 1st and the nearest Friday on or after August 15th during program hours from 12:00 PM to 8:00 PM Pacific Daylight Time, non-holidays. In 2019, the program was active between Tuesday, May 28th and Friday, August 16th. All participants from 2018 remained in the program in 2019. In addition, 2 new customers with a total of 7 pumps enrolled in the program for 2019. The effective dates for these new enrollments were between July 20, 2019 and July 25, 2019. From the program start date on May 27, 2019 until the program year-end on August 16, 2019, the portfolio average available program load was 299 kW. The portfolio average available program load increased significantly from July 22, 2019 until August 16, 2019 to 693 Kw after the new 2019 enrollments were completed. The maximum available program load of 945 kW occurring on August 7, 2019.[2]

The table below shows the 5 highest hour ending amounts of available load during all hours (both inside and outside of program hours) during 2019. Note that three of the highest amounts of load were during program hours and two of the highest amounts were outside of program hours:

Date	Hour Ending	Within Program Hours	Peak Available Load
8/7/2019	15:00	Yes	945.0 kW
8/5/2019	15:00	Yes	913.5 kW
8/5/2019	16:00	Yes	913.0 kW
8/6/2019	12:00	No	912.0 kW
7/31/2019	09:00	No	910.9 kW

The charts below show maximum daily available program load during program hours only (Figure 1) and during all hours (Figure 2) for the Irrigation Load Control season (May 27, 2019 – August 16, 2019). Consistent with previous years, customers stopped their irrigation activities in line with the end of the growing season in early October with load dropping to ~0 kW at that point. 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.

[2] The maximum available program load occurred in the hour ending 15:00 (during program hours).

Figure 1

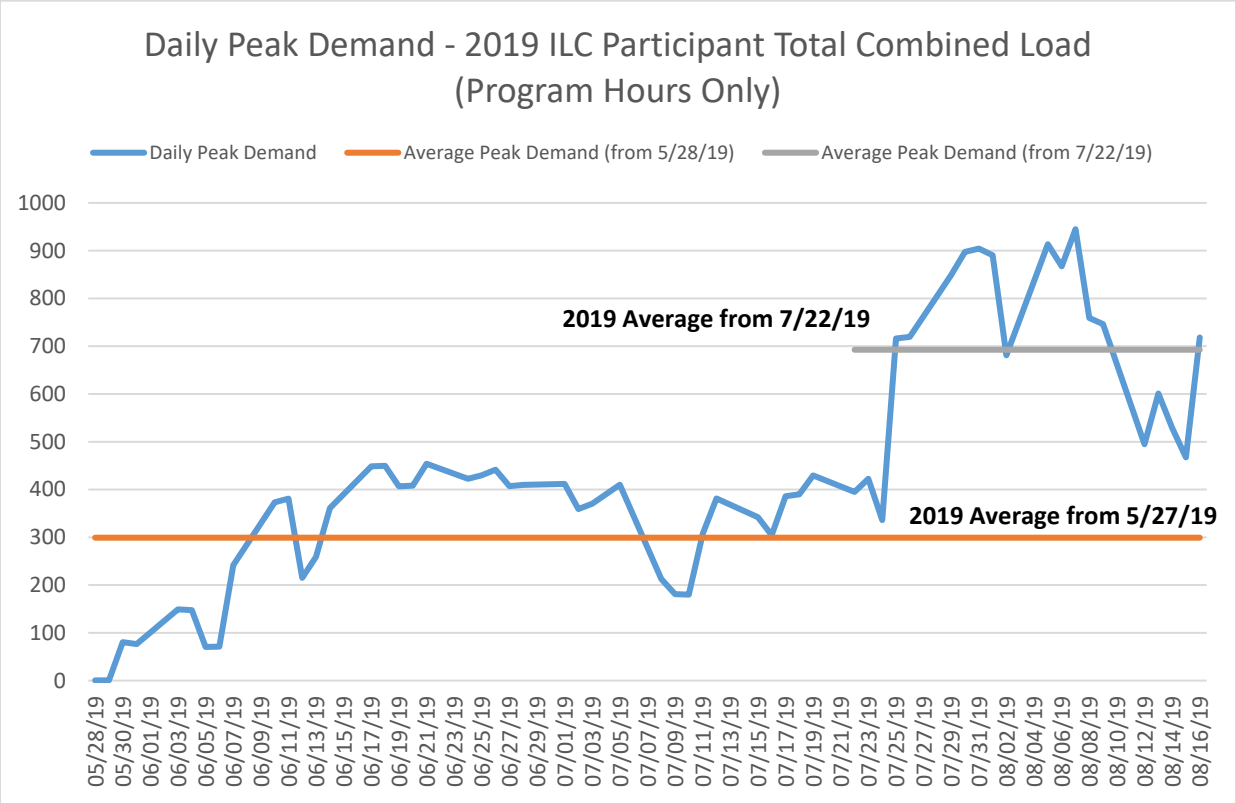
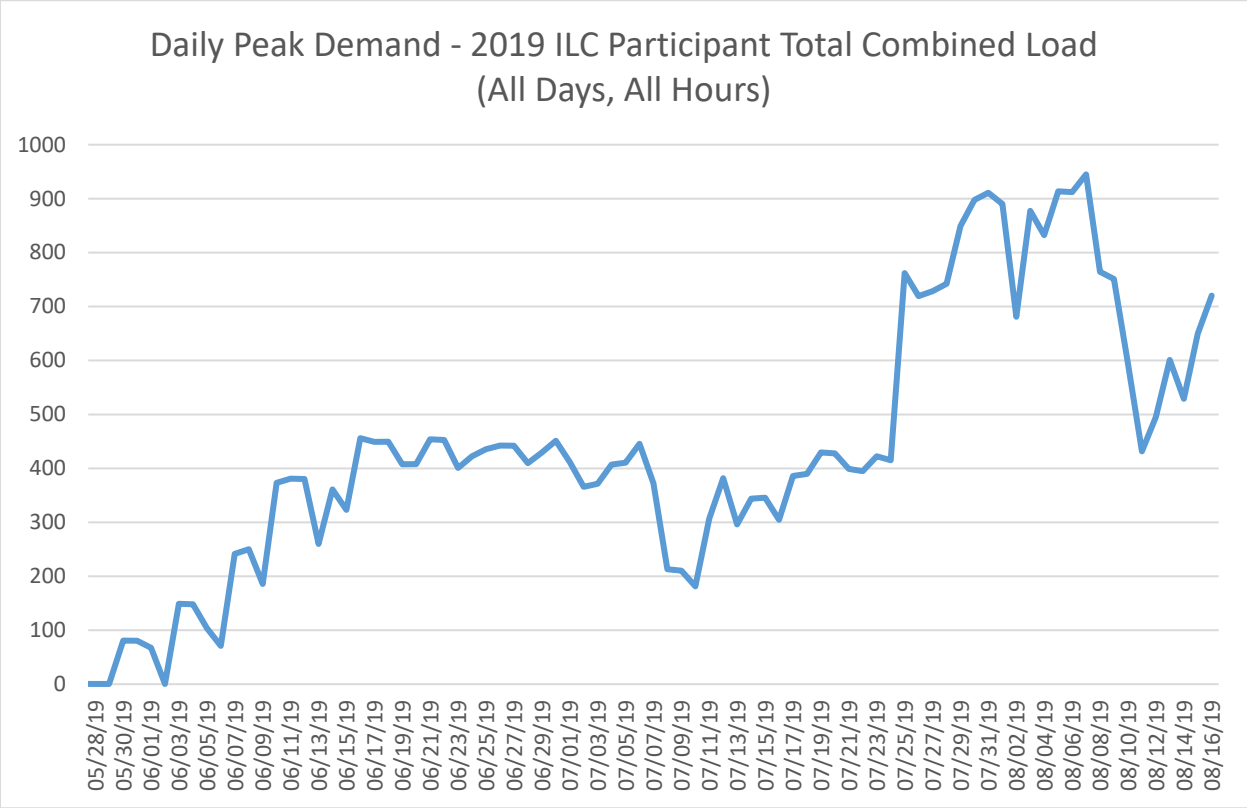


Figure 2

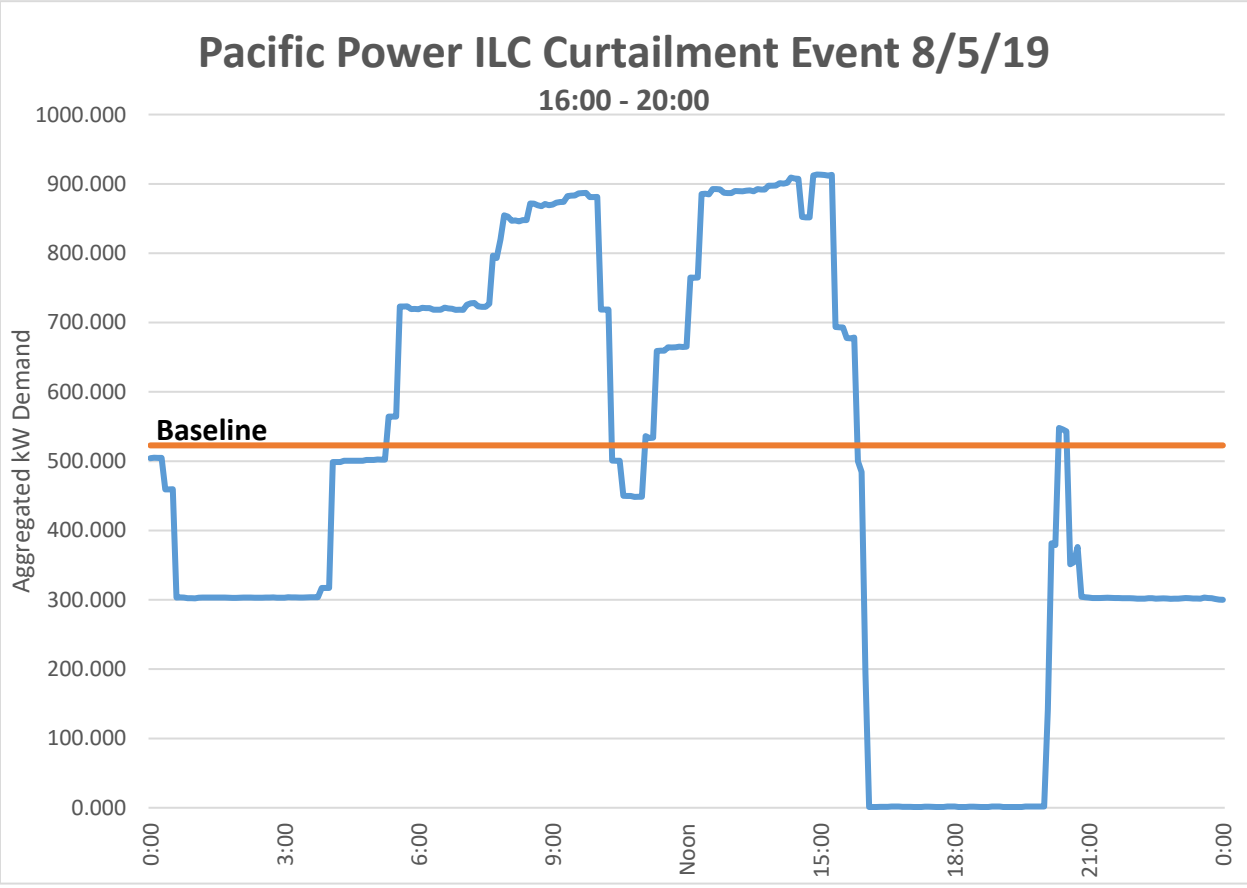


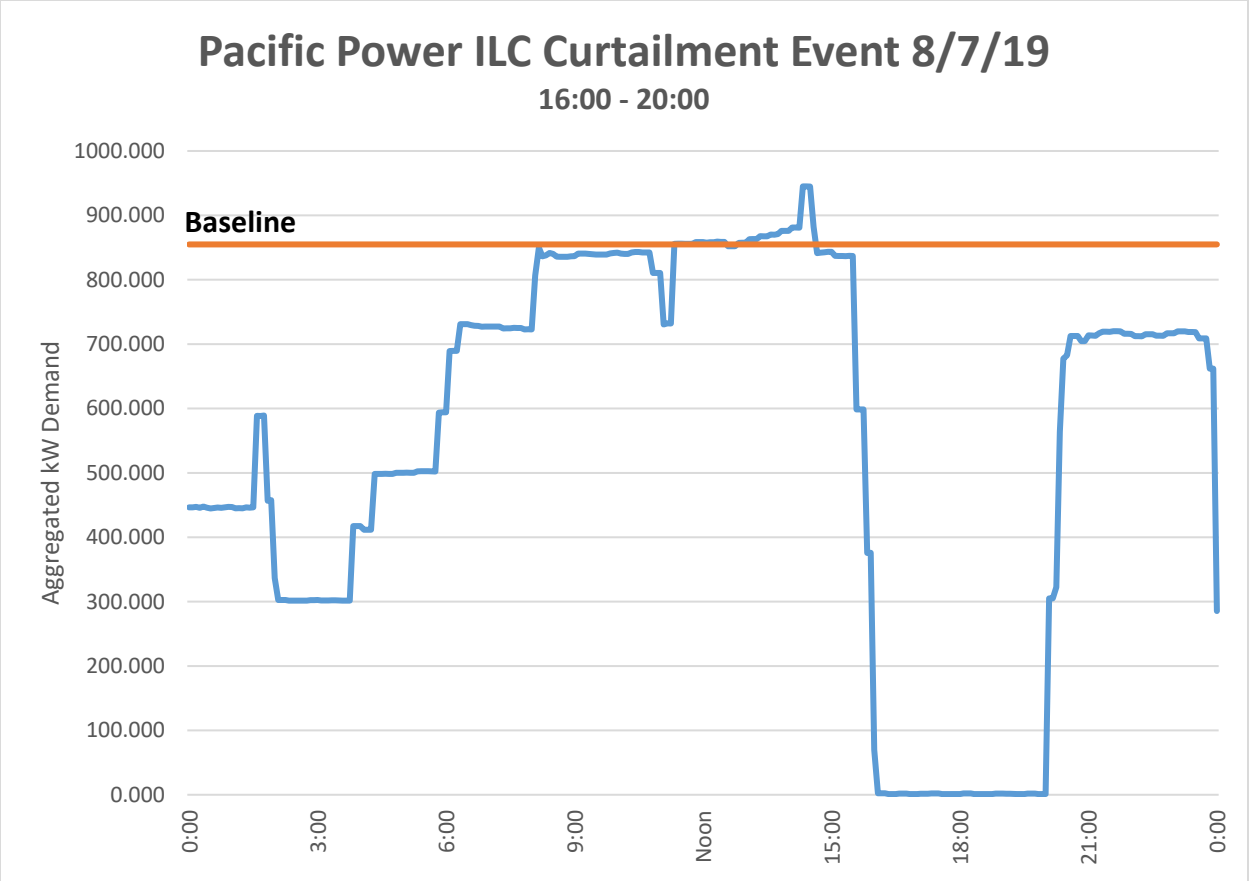
Load Control Events

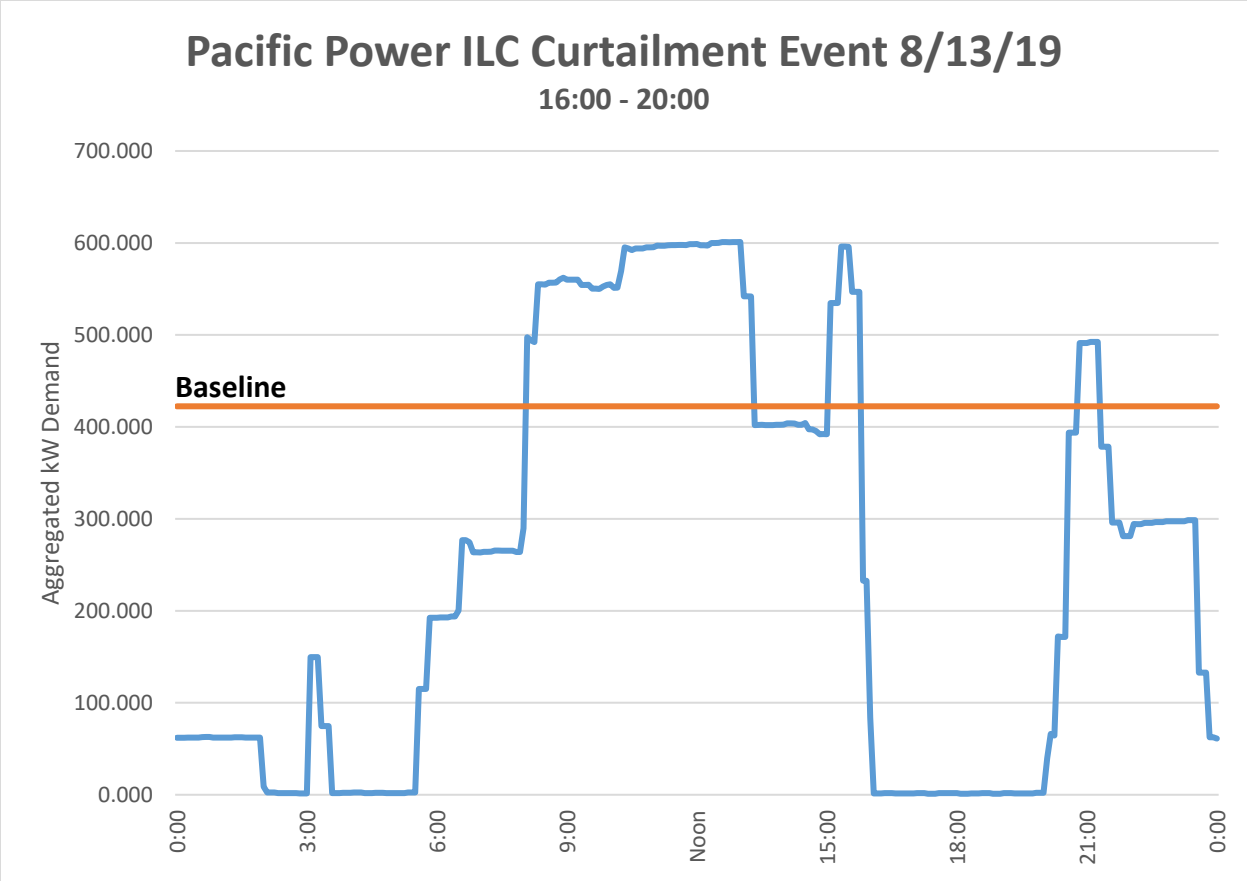
Pacific Power activated the Irrigation Load Control program for four mandatory irrigation load control events in 2019. Actual load reduction was measured as the difference between actual demand remaining on the system during the event and baseline demand. Baseline demand is the average demand during program hours (12 to 8pm PT) 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 5-minute interval energy usage measurements from Connected Energy's field installed equipment at customers' sites.

The 2019 portfolio delivered an average of 554 kW across the 4 mandatory load control events called during the 2019 program season. Load Reduction Performance Factor, the measure of actual load reduction compared to baseline demand, was 99.74% 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 2019 program season the customer performance factor was 100%, indicating that no customers opted out of any events.

Images below are visual representations of the 4 load control events showing the participating load's demand relative to baseline:




Pacific Power ILC Curtailment Event 8/7/19
16:00 - 20:00
Baseline
Aggregated kW Demand
1000.000
900.000
800.000
700.000
600.000
500.000
400.000
300.000
200.000
100.000
0.000
0:00
3:00
6:00
9:00
Noon
15:00
18:00
21:00
0:00


Pacific Power ILC Curtailment Event 8/13/19
16:00 - 20:00
Aggregated kW Demand
700.000
600.000
500.000
400.000
300.000
200.000
100.000
0.000
Baseline
0:00
3:00
6:00
9:00
Noon
15:00
18:00
21:00
0:00

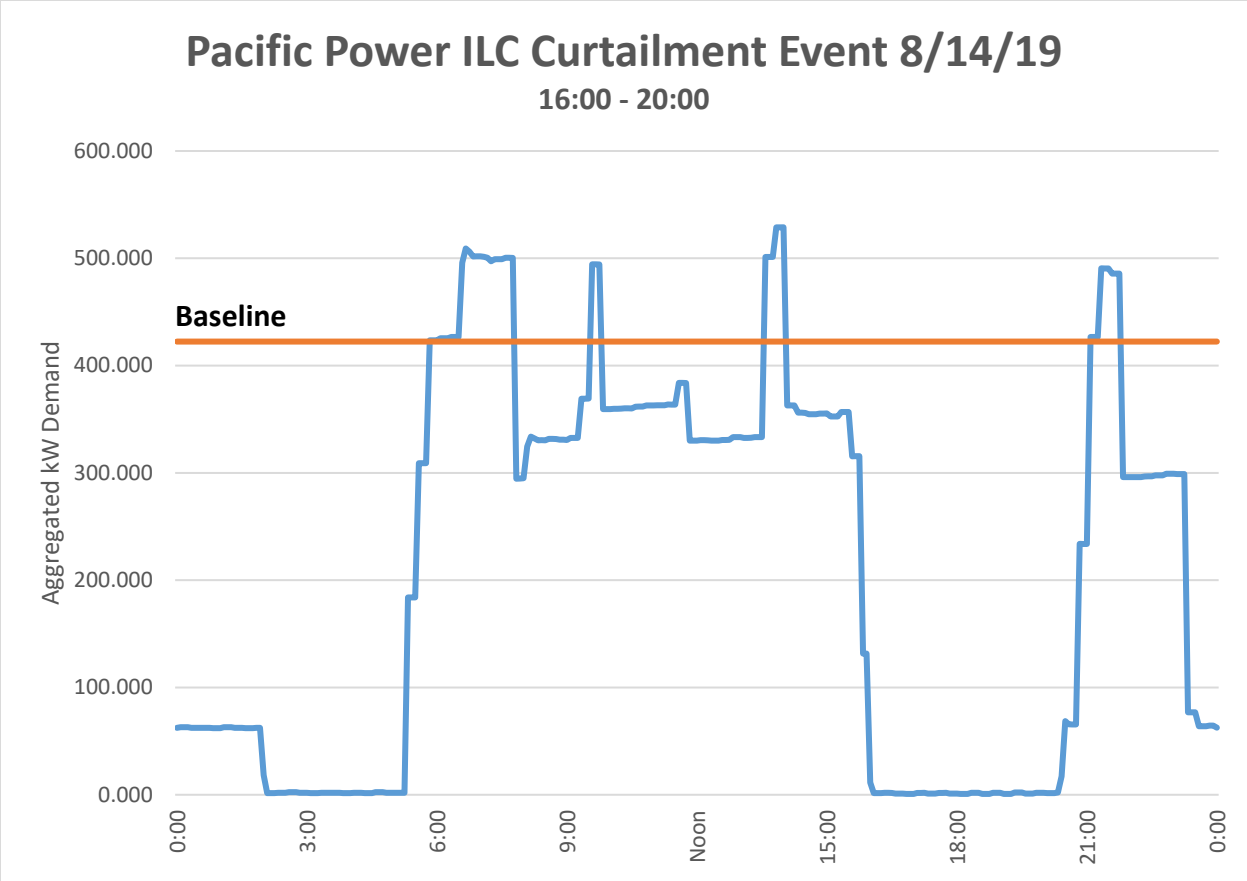

Pacific Power ILC Curtailment Event 8/14/19
16:00 - 20:00
Aggregated kW Demand
600.000
500.000
400.000
300.000
200.000
100.000
0.000
Baseline
0:00
3:00
6:00
9:00
Noon
15:00
18:00
21:00
0:00

Figure 2 below details the actual load reduction, baseline demand, and performance factor for each of the four called mandatory events.

Figure 2: Actual Load Reduction, Baseline Demand, and Performance Factor, by Event and Region

Date	Region	Actual Load Reduction (kW)*	Baseline Demand (kW)*	Load Reduction Performance Factor (%)*
8/5/2019	Oregon	521.35	522.75	99.73%
8/7/2019	Oregon	853.37	854.85	99.83%
8/13/2019	Oregon	420.83	422.38	99.63%
8/14/2019	Oregon	421.01	422.38	99.68%
Average of 4 Events	Oregon	554.14	555.59	99.74%

* 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. These measurements may or may not correspond to realized load reduction on Pacific Power's system.

Figure 3 below, provides details for each of the mandatory events in 2019. No events were called and then subsequently cancelled in 2019. Additionally, there were no voluntary events in 2019.

Figure 3: List of 2019 Event Activity

Event Type	Start Time (PDT)	End Time (PDT)	Notes / Comments
Mandatory	8/5/2019 16:00	8/5/2019 20:00	• Baseline demand was 522.75 kW • Total load reduction was 521.35 kW • Performance factor was 99.7%
Mandatory	8/7/2019 16:00	8/7/2019 20:00	• Baseline demand was 854.85 kW • Total load reduction was 853.37 kW • Performance factor was 99.8%
Mandatory	8/13/19 16:00	8/13/19 20:00	• Baseline demand was 422.38 kW • Total load reduction was 420.83 kW • Performance factor was 99.6%
Mandatory	8/14/19 16:00	8/14/19 20:00	• Baseline demand was 422.38 kW • Total load reduction was 421.01 kW • Performance factor was 99.7%

Key Lessons Learned from 2019

Connected Energy operated the program for the full irrigation season with all participants from 2018 remaining in the program for 2019. In addition, 2 new customers were added in 2019 with a total of 7 new participating pumps. Due to the complexity of field conditions (including high voltage equipment), Connected Energy was not able to install direct load control devices at 4 of the 7 pump sites. The 4 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 four events in 2019 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. Customers whose equipment is not-standard or complex posed an installation challenge and thus they have been unable to participate in the program. We created a supplemental process to allow these large desired loads to participate in the program. By using a manual notification process and by the customer agreeing to perform a manual curtailment, we were able to enroll these customers in the program.

APPENDIX A: Customer-Facing Irrigation Load Control Activity

The table below lists all activity involving program participants related to the Irrigation Load Control program that occurred in 2019, excluding Irrigation Load Control events.

See figures 2 and 3 above for dates and detail related to those events.

Figure 4: Participant-Facing Irrigation Load Control Activity in 2019

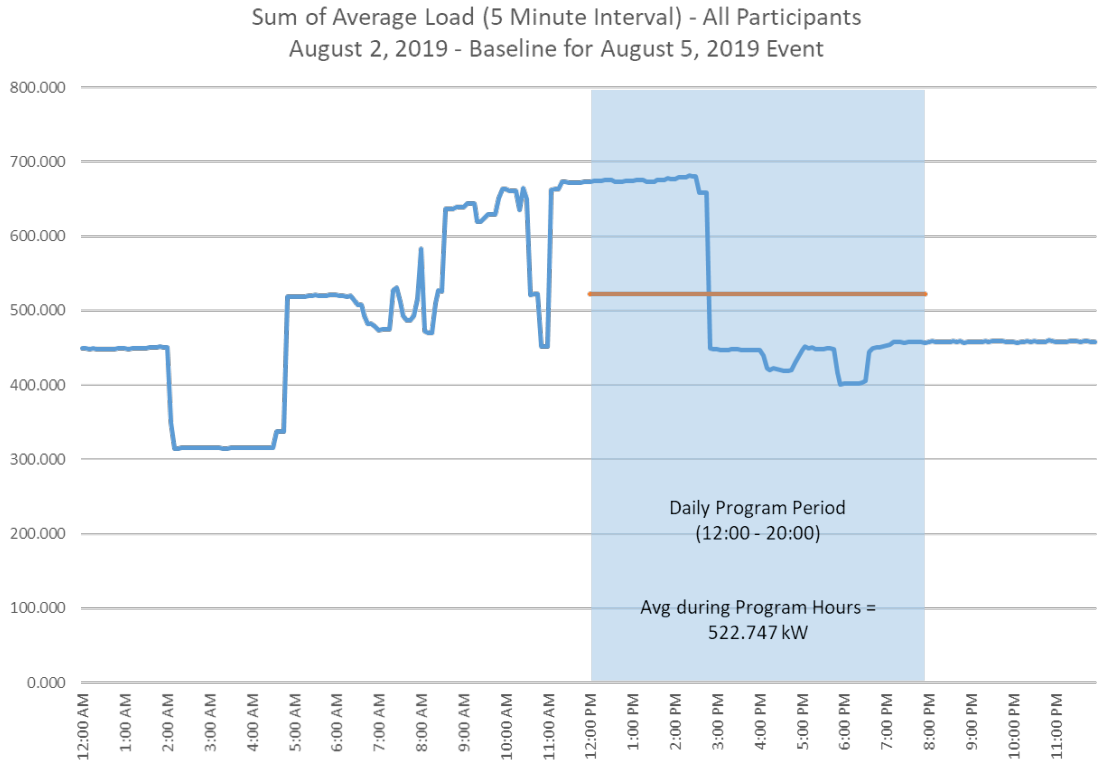
	Activity	Date	Description
1	**Welcome call placed to previous year participants**	Week of May 20, 2019	Connected Energy contacted all of the 2018 participants to notify them of the 2019 program year start. All participants were pleased that the program was continuing.
2	**New equipment installation**	Week of July 20, 2019	Connected Energy Field Service Engineer met with new program participants and our installation contractor to perform installation of field equipment to enable participation in ILC program.
3	**Courtesy calls to customers in advance of events**	Prior to each event	Connected Energy placed phone calls to each participant in advance of an event (in addition to electronic day ahead notifications) to ensure they were aware of scheduled events
4	**Incentive payments mailed to participants**	Complete in January 2020	Incentive checks mailed to enrolled customers for participation in the 2019 Load Control program.

APPENDIX B: Customer Payments

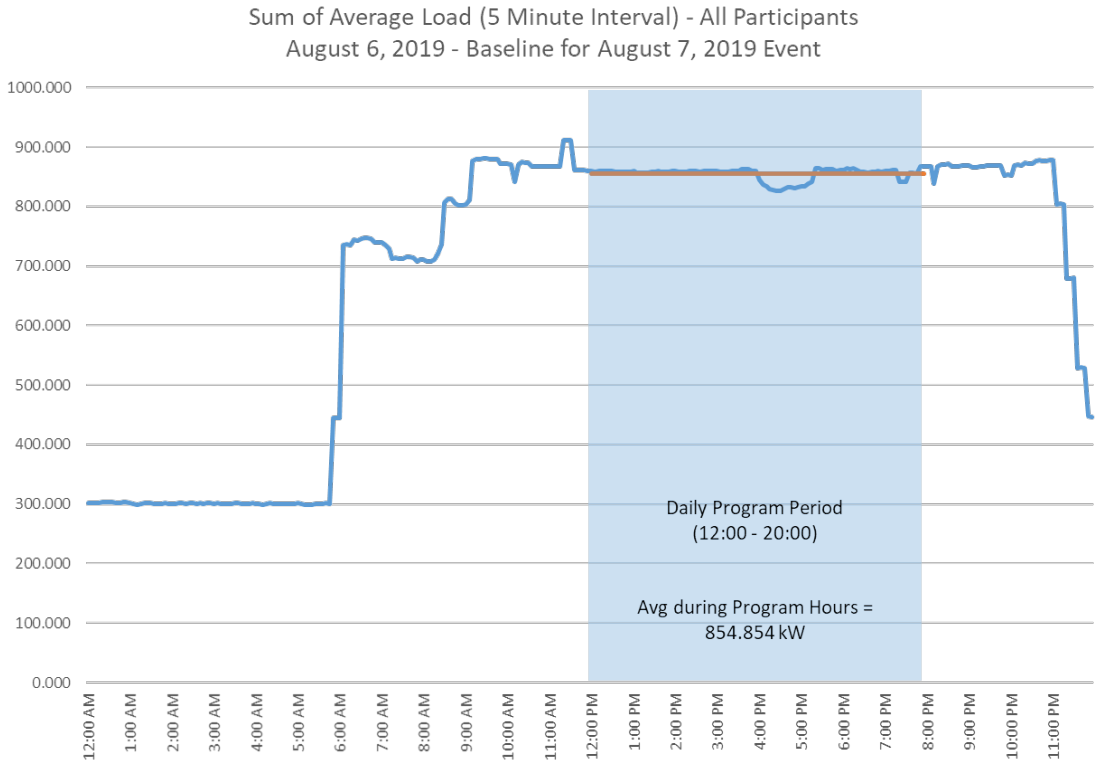
Five customers received incentive payments for their participation in the 2019 ILC program season. Incentives payments totaled $11,830.76 and were based on weekly available load that could participate in events multiplied by the participation factor. AMI five-minute interval data from the Pacific Power system 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 $23/kW rate.

APPENDIX C: Detailed Baseline Charts

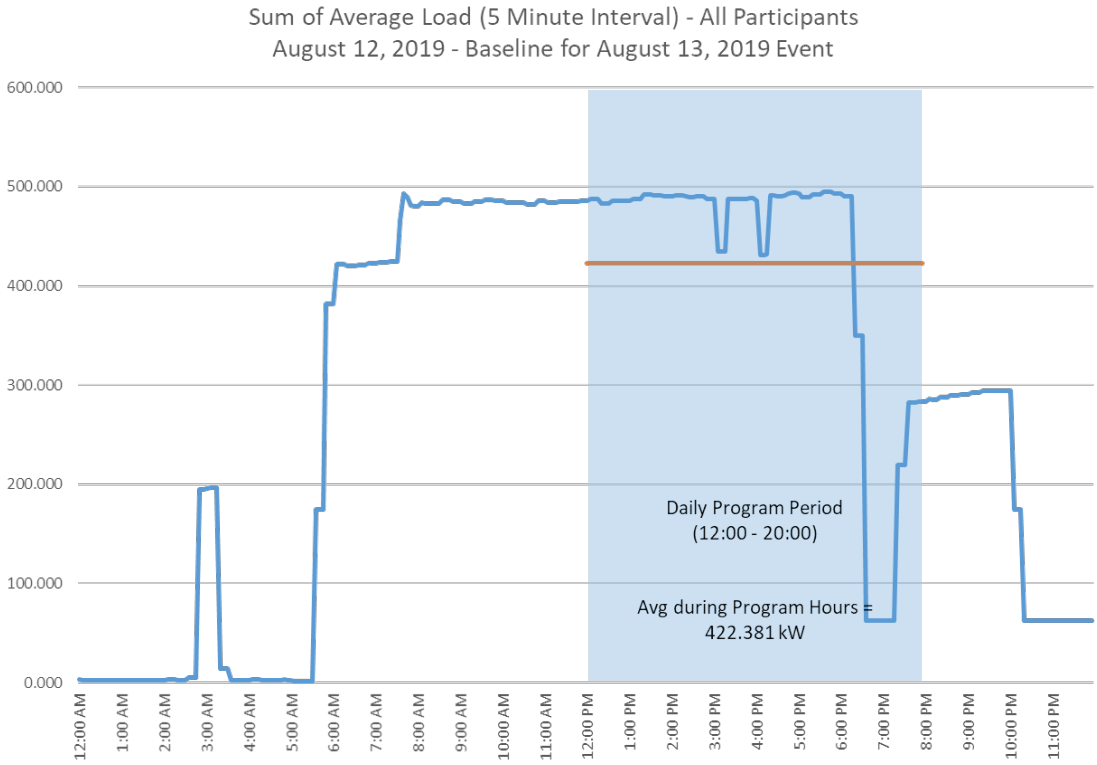
August 2, 2019 Baseline Chart for August 5, 2019 Event



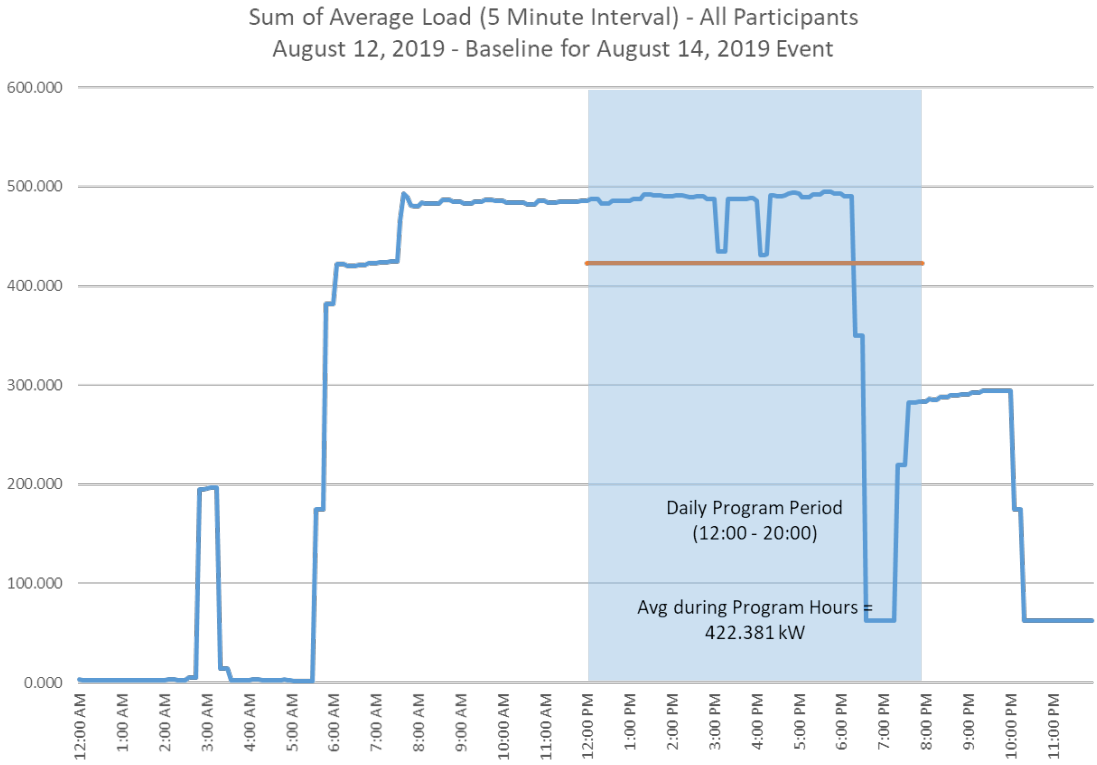
August 6, 2019 Baseline Chart for August 7, 2019 Event



August 12, 2019 Baseline Chart for August 13, 2019 Event



August 12, 2019 Baseline Chart for August 14, 2019 Event



Appendix 2

Oregon Pilot Program year four - benefits and costs discussion

The Oregon pilot program is intended to test designs, provide market feedback, and generate information about delivery logistics and costs. Pacific Power 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 2019 program developed in response to Recommendation No. 3 in the April 26, 2016 OPUC staff memo 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. 2019 program information is provided below each Protocol topic and labeled "Pilot" for the purposes of this discussion.

1. *Avoided Generation Capacity Costs*
   Pilot: For 2019, the Company's marginal capacity resource was Front Office Transactions (i.e. market purchases), which typically have a minimum increment of 25 MW. While this resource was too small to avoid a market transaction, the avoided energy costs below are calculated assuming that market transactions are avoided on a kW for kW basis.

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 and 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 three 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.

   Because day-ahead notice is required for curtailment, for valuation purposes the pilot program was assumed to allow day-ahead on-peak market purchases to be avoided. However, day-ahead on-peak purchases typically span a standard 16 hour block, rather than the four-hour curtailment associated with the pilot program. As a result, purchases may be necessary during the hours in which the irrigation loads are not being curtailed. The 2019 valuation is based on the highest cost day-ahead purchase transaction entered by the

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

Company, net of costs in non-curtailment hours based on Energy Imbalance Market (EIM)[7] prices.

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[8] and Oregon's Resource Value of Solar (UM-1910). Deferral values and their application in this analysis are from the 2019 IRP[9]. 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. While no future block loads were identified in 2019, for the purposes of this analysis, the distribution deferral value of $9.20/kw-year was utilized to estimate a potential distribution deferral benefit of $ 135.

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 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 2019 curtailment events is estimated at 10.13%. The value of avoided line losses is included in avoided energy costs.

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

The 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 four 2019 events was 0.554 MW at site. Applying the 10.13% estimated line loss, the load impacts at the generator are 0.610 MW.

2. *Expected call hours of the program (used to determine energy savings)*
   Pilot: Program was called for 16 hours in 2019. This is 30% of 52 maximum annual dispatch hours.

3. *Administrative Costs*
   Pilot: Administrative (non-incentive) costs paid in 2019 to Connected Energy include, program delivery and equipment installation costs for the fourth year of the pilot.

[7] For more information on EIM, see www.westerneim.com/pages/default.aspx
[8] 7th Power Plan applies transmission deferral value only.
[9] 2019 IRP – Table 6.8 – Oregon value

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. 2019 program expenses were paid through 2019 and are being recovered contemporaneously 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 CAISO markets.

7. *Bill reductions and increases*
   Pilot: 2019 participants' bills were not analyzed for changes since it was unlikely the sixteen 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: 2019 incentive payments were $11,831.

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 (weekends, before June 1st that a generation constraint could occur.

    - *Notification Time (B Factor)*
      Pilot: In 2019, program required 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 2019 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: Valuation for the avoided energy during the four events was performed internally by same team involved in other Oregon work; solar and avoided costs. Events require day ahead notification, so they are assumed to avoid day-ahead on-peak market energy purchases (16 hour blocks). The cost of replacing the portion of the 16 hour block not covered by the 4 hour curtailment event is estimated based on EIM price results. The small size of the current program makes it unlikely to actually avoid a day-ahead market transaction (typically 25MW increments). Estimated value based on day-ahead PacifiCorp transactions and EIM prices during the four events in 2019 was $1,320. Daily energy prices during event days for 2019 were lower than during event days for 2018.

- *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.