

March 30, 2022

***VIA ELECTRONIC FILING***

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

**RE: Advice 16-04—Compliance Filing—2021 Report on Pacific Power’s Irrigation Load Control Pilot Program**

PacifiCorp d/b/a Pacific Power (PacifiCorp or the Company) submits the attached 2021 Irrigation Load Control (ILC) 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 (Commission) on May 4, 2016.

Additionally, in early 2020, the Commission approved PacifiCorp’s request to extend and expand the ILC program conditional on a recommendation after the 2021 season that provides clear direction to either ramp down or move the pilot toward a full-scale program. PacifiCorp contracted with the Applied Energy Group to provide research and reporting services culminating in a recommendation. The Company therefore submits the attached memorandum entitled, “Recommendations for PacifiCorp’s OR ILC Pilot,” dated February 15, 2022.

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

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

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

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

Sincerely,



Shelley McCoy  
Director, Regulation

Enclosure



# 2021 Irrigation Load Control Pilot Program in Oregon



Issued March 30, 2022



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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.<sup>1</sup> 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 option were approved by the Commission.

This report summarizes 2021 Pilot Program activity and presents the key findings from the sixth season. 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:

<b>Element</b>	<b>Start Page</b>	<b>Section</b>
1. Review of annual enrollment		
a. Total program enrollment	14	Enrolled Customers
b. Sites added and removed	14	Enrolled Customers
c. Customer outreach	9	2021 Activities to Address Key Challenges
d. Crop(s)	15	Customer Crop/ Operations and Pumping Equipment
e. Weather data from local weather station(s)	15, 16	Weather and Drought Impact
f. Available information on water restrictions	15	Impact of Irrigation Technology and Water Availability
2. Customer satisfaction		Participant Behavior
a. Customer requests for retirement	4	*There were no customer requests for retirement or reassignments in 2021
b. Site reassignment management		
3. Incentive payments	14	Customer Payment Structure

<sup>1</sup> Advice 19-008

	26	Appendix B: Customer Payments
4. Review of annual program performance		
a. Weekly available load reduction	17-18	Available Load Reduction
b. Load control events	19 -22	Load Control Events
c. Availability and load reduction comparison	7	Availability
5. Key observations	4-5	Key Findings

In 2021, the same small group of customers (five) from 2020 continued to participate. Six events were called through June, July and August 2021, each with a four-hour duration for a total of 24 event hours. Key findings from 2021 focus on participant behavior, especially the interest and ability to participate with a) hour ahead notice, and b) reduced water availability.

## Key Findings

### Participant behavior

Grower interest and engagement was maintained amongst prior participants, even with reduced water availability and the lingering impacts from COVID-19 pandemic. As was the case in the prior season, potential new customers engaged in preliminary discussions with the Company and the delivery team but paused further analysis while they managed the logistics of their on-going business during the pandemic and water shortages. The 2021 program year included six events (the same as 2020), all called with one-hour ahead notification. Events were called on consecutive days in two different weeks. Three events were called in one week. The 2021 event schedule reinforces prior season observations around the propensity for growers to participate in events even if they are near each other.

### Logistics

The 2021 events were all four hours and near each other; Sunday and Monday in June, Friday in July, Thursday, Friday and Saturday in August. 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. It also reinforces the value of the changes requested and approved in Advice 19-008, specifically adding the ability call events on weekends.

Event notification worked as designed and customers participated when called (i.e., did not opt out of events after they were called). Water availability and resultant operational challenges did cause one customer to opt out two pumps for the entire season. This occurred at the beginning of the season. 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 Advanced Metering Infrastructure (AMI) information for the medium voltage pumps was improved. Converting the 15-minute AMI data to five-minute intervals continues to require an extra step.

### Delivery Costs

2021 was the fourth year of the Connected Energy delivery contract. Incentive costs decreased compared to 2020 which reflects the lower available kW during the season.

### 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 16-04, 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 (IRP) Update on May 1, 2018, and included the potential impacts of the Pilot Program.<sup>2</sup> The 2019 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.<sup>3</sup> 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 February 2021. The 2021 IRP was filed on September 1, 2021, and irrigation impacts are included the preferred portfolio.<sup>4</sup>

The 2021 timeline of key program activities is outlined below.

### 2021 Timeline

Week of May 24	Pre-season communication to existing participants
Week of May 24	Website updated to include 2021 season specific messages
June 27	Hour-ahead notification to participating customers for June 27 event
June 27	Four-hour event conducted between 4pm-8pm, Pacific time
June 28	Hour-ahead notification to participating customers for June 28 event
June 28	Four-hour event conducted between 4pm-8pm, Pacific time
July 30	Hour-ahead notification to participating customers for July 30 event

<sup>2</sup> 2017 Integrated Resource Plan Update, Table 4.4, page 34

<sup>3</sup> 2019 Integrated Resource Plan, Table 5.12, page 115

<sup>4</sup> 2021 Integrated Resource Plan, New Demand Response, Table 9.18, Volume 1, p. 309

July 30	Four-hour event conducted between 4pm-8pm, Pacific time
August 12	Hour ahead notification to participating customers for August 12 event
August 12	Four-hour event conducted between 4pm-8pm, Pacific time
August 13	Hour-ahead event notification to participating customers for August 13 event
August 13	Four-hour event conducted between 4pm-8pm, Pacific time
August 14	Hour-ahead event notification to participating customers for August 14 event
August 14	Four-hour event conducted between 4pm-8pm, Pacific time
September 4	End of season
December 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 6 (2021) 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 2021 season by COVID-19, drought conditions in the Klamath Basin 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 approved in Advice 19-008 were applicable to the 2021 season.

**Table 1. Irrigation Load Control Pilot Program Parameters in place during 2021**

<b>Program Parameters</b>	<b>Description</b>
Eligible Customers	Irrigation Customers on Schedules 41 or 48 in and around targeted areas posted on the Company web site.
Program Period	Week including June 1 through week including September 1.
Program Hours	All days 12:00 p.m. to 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	Day ahead at \$18/kW per year. Hour ahead at \$30/kW per year.
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).

Additional information about 2021 customers, dispatch events, incentive rates and payments, and event opt-outs is provided in Appendix One.

## **2021 Performance**

### Availability

Program availability in 2021 decreased and was directly related to water availability. All customers participated with one hour notice. Potential customer additions while promising early in the season were directly impacted by their increased focus on operational challenges from the water availability and the continued COVID-19 pandemic impacts.

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 360 kW, a decrease compared to 2020. Except for the one customer who opted out two pumps for the entire season for operational reasons related to water availability, 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 – 2016–2021 Performance**

	Year 1 (2016)	Year 2 (2017)	Year 3 (2018)	Year 4 (2019)	Year 5 (2020)	Year 6 (2021)
Estimated kW	0 - 2,000	3,000	3,000	3,000	3,000	5,000
Proxy/Available kW	565	546	563	945	969	730
kW (average all events)	281	432	258	554	574	360

Notes for Table 2

1. kW values are at customer site
2. 2021 estimated kW is from Advice 19-008.
3. For 2021 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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 2021 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 – 2016–2021 Costs**

	Year 1 (2016)	Year 2 (2017)	Year 3 (2018)	Year 4 (2019)	Year 5 (2020)	Year 6 (2021)
Estimated Program Costs (Calendar Year)	\$150,000	\$225,000	\$225,000	\$225,000	\$225,000	\$325,000
Actual Program Costs (including corrections for prior years)	\$150,000	\$125,000	<del>\$179,634</del> \$180,819	<del>\$157,082</del> \$181,631	\$175,704	\$174,804

Notes for Table 3

- 2021 estimated program costs are from Advice 19-008
- 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 2022.
- 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.

## 2021 Activities to Address Key Challenges

Oregon irrigation resources were included in the Demand Responses Request for Proposals (RFP) released in February 2021. Information from this RFP informed the post 2021 season recommendation to either expand or cancel the Pilot Program. The recommendation prepared by AEG is provided in addition to this report.

During the 2021 season, weekend days were available for events through changes approved in Advice 19-008. Events on a Sunday in June and a Saturday in August were called in 2021 using these new days. Hour-ahead notification was utilized for all six events.

The geographic area was expanded beyond areas in and around Klamath Falls, Oregon as part of Advice 19-008. Outreach to a large customer in Medford with multiple pumps and a different type of irrigation system (drip) was promising in 2020 and at the beginning of 2021, but the customer ultimately needed to prioritize operational concerns related to water, crop quality and COVID-19 impacts on available labor and suspended engagement again during the 2021 season.

# Appendix 1

## 2021 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.



## 2021 Pacific Power Irrigation Load Control Program Report

Connected Energy  
651 Holiday Drive  
Foster Plaza 5, Suite 400  
Pittsburgh, PA 15220  
[www.connectedenergy.com](http://www.connectedenergy.com)

Pacific Power  
825 NE Multnomah  
Portland, OR 97232  
[www.pacificorp.com](http://www.pacificorp.com)

**Date: February 8, 2002**

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## Overview of the 2021 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 for the 2021 irrigation season. This report is intended to document program results, accomplishments, and challenges, including lessons learned that will be leveraged to enhance the program going forward.

Regulatory approval for the ILC program in Oregon was initially granted by the Oregon Public Utility Commission 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. 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 2020 have remained in the program during 2021.

In 2021, the program delivered an average load reduction across the six called events of 360 kW, a reduction of 37 percent from the 2020 average of 574 kW. This reduction was primarily due to significant water restrictions that created two noted operating scenarios. First, some program participants had reduced pumping loads due to the simple lack of available water. Second, one participant opted to continue operating pumps through all curtailments due to the need to keep water flowing to prevent fields from flooding. These two scenarios resulted in a lower overall program load as well as the inability to curtail all the controlled during the called events.

Due to the combined challenges of continued COVID restrictions along with limited access to water and thereby limited pumping capability, we were unable to expand the program in 2021. As a result, the same five customers from 2020 with a total of 9 sites and 17 pumps remained in the program in 2021. Maximum load available for curtailment was 730 kW and occurred on August 18, 2021 between 1:00PM and 2:00PM. 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 2021, 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, with only one participant opting out 2 pumps for all events as noted above.

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. For 2021, the program hours were maintained as 12:00 PM to 10:00 PM Pacific Daylight Time (PDT) for all days (weekends and holidays included) from May 31, 2021, through and including September 5, 2021.

Pacific Power initiated six load control events during the 2021 load control season on the following dates and times:

- June 27, 2021, between hours of 4:00PM - 8:00PM – Sunday
- June 28, 2021, between hours of 4:00PM - 8:00PM – Monday
- July 30, 2021, between hours of 4:00PM - 8:00PM – Friday
- August 12, 2021, between hours of 4:00PM - 8:00PM - Thursday
- August 13, 2021, between hours of 4:00PM - 8:00PM – Friday
- August 14, 2021, between hours of 4:00PM - 8:00PM – Sat

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 billing data for the one large customer with medium voltage (2300V) pumps.

# Review of 2021 Customer Enrollment and Enablement

## Customer Payment Structure

In 2021, the program continued to offer an hour ahead notice option that provided a higher incentive (\$30/kW per year) than the day ahead notice option incentive (\$18/kW per year). All program participants 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. The six events called by Pacific Power in 2021 were all initiated with an hour ahead notice.

## Enrolled Customers

In 2021, Connected Energy did not enroll any new customers as a direct result of COVID related restrictions as well as significant water restrictions. Connected Energy conducted marketing activities early in the program year and quickly learned that due to the significant water restrictions in and around the Klamath Basin, potential participants voiced that they would likely not participate this year due to the reduced amount of time their pumps would be operating. They did, however, voice a desire in the program in the future as water restrictions are lifted.

Despite COVID related and water related restrictions, all previously installed customers remained active in the program, resulting in a total of 17 pumps, across 5 different customers.

In support of marketing activities and program expansion in 2022, we worked with the Energy Trust of Oregon (ETO) to identify irrigation customers who have participated in ETO incentive programs for irrigation upgrades and enhancements. Through contact data provided by ETO we have initiated calls to more than fifteen potential program participants. Interest in the program has been very favorable with several customers voicing interest in the program in 2022.

## 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, we 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 2021 Program Participants and Performance**

### **Customer Crop/Operations and Pumping Equipment**

For the 2021 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 from 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 2021 season, Participants had significant concerns related to major water restrictions throughout the Klamath Basin. These water restrictions resulted in several participants experiencing reduced pumping loads due to the lack of water to pump. In one other case, the participant found it operationally necessary to opt two pumps out of all events as there was a need to continuously move water to prevent fields from flooding.

### **Weather & Drought Impact**

Similar to the previous three years, 2021 was warmer and dryer than normal in the Irrigation Load Control geographical area, leading to greater irrigation needs. As noted above, however, water restrictions resulted in lower pumps loads versus historical averages.

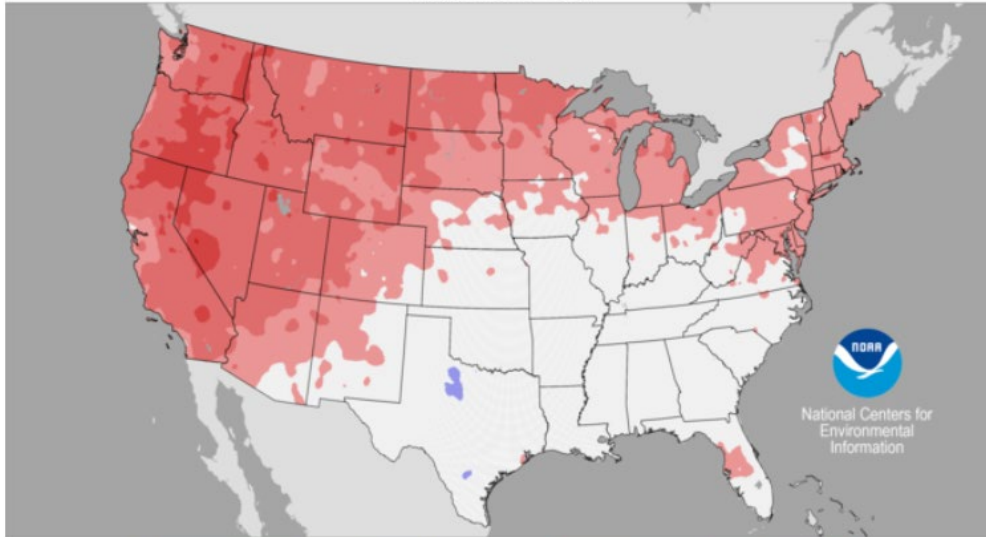
The two images below highlight the above average temperatures and below average precipitation across much of the western part of the country including the ILC program region during the 2021 program season.



## Mean Temperature Departures from Average

June–August 2021

Average Period: 20<sup>th</sup> Century



Created: Tue Sep 07 2021

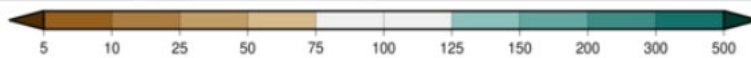
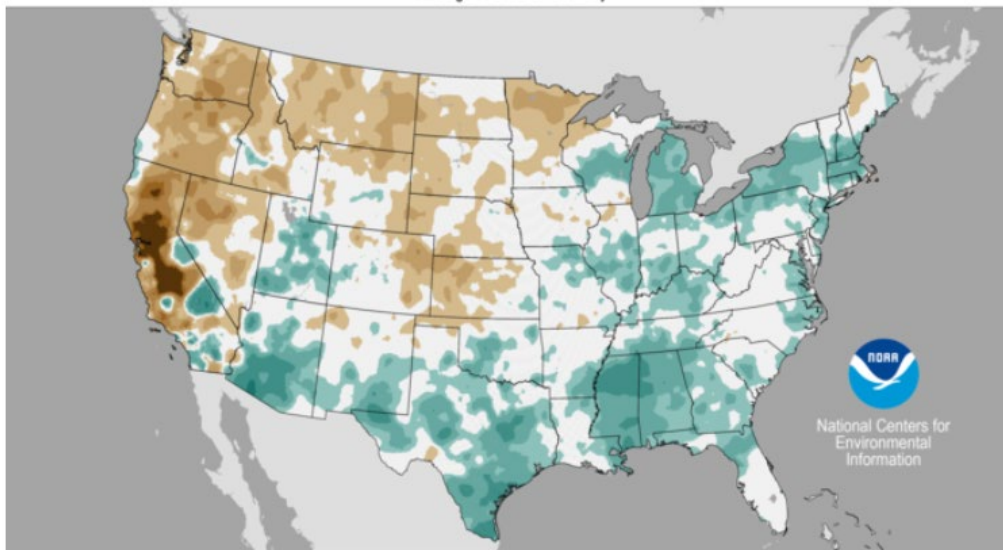
Degrees Fahrenheit

Data Source: nClimGrid

## Precipitation Percent of Average

June–August 2021

Average Period: 20<sup>th</sup> Century



Created: Tue Sep 07 2021

Percent

Data Source: nClimGrid

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 Irrigation Load Control program is evaluated based upon average available load reduction (kW) during the 2021 program year, which ran from May 31, 2021 through September 5, 2021.

The two charts below are provided for comparative purposes between the 2020 and 2021 program years.

For the 2020 program year the portfolio average available load reduction was 574kW (see Figure 1 below). The chart below shows daily available demand during active program hours (12:00 PM – 10:00 PM, all days) and active program months in 2020.

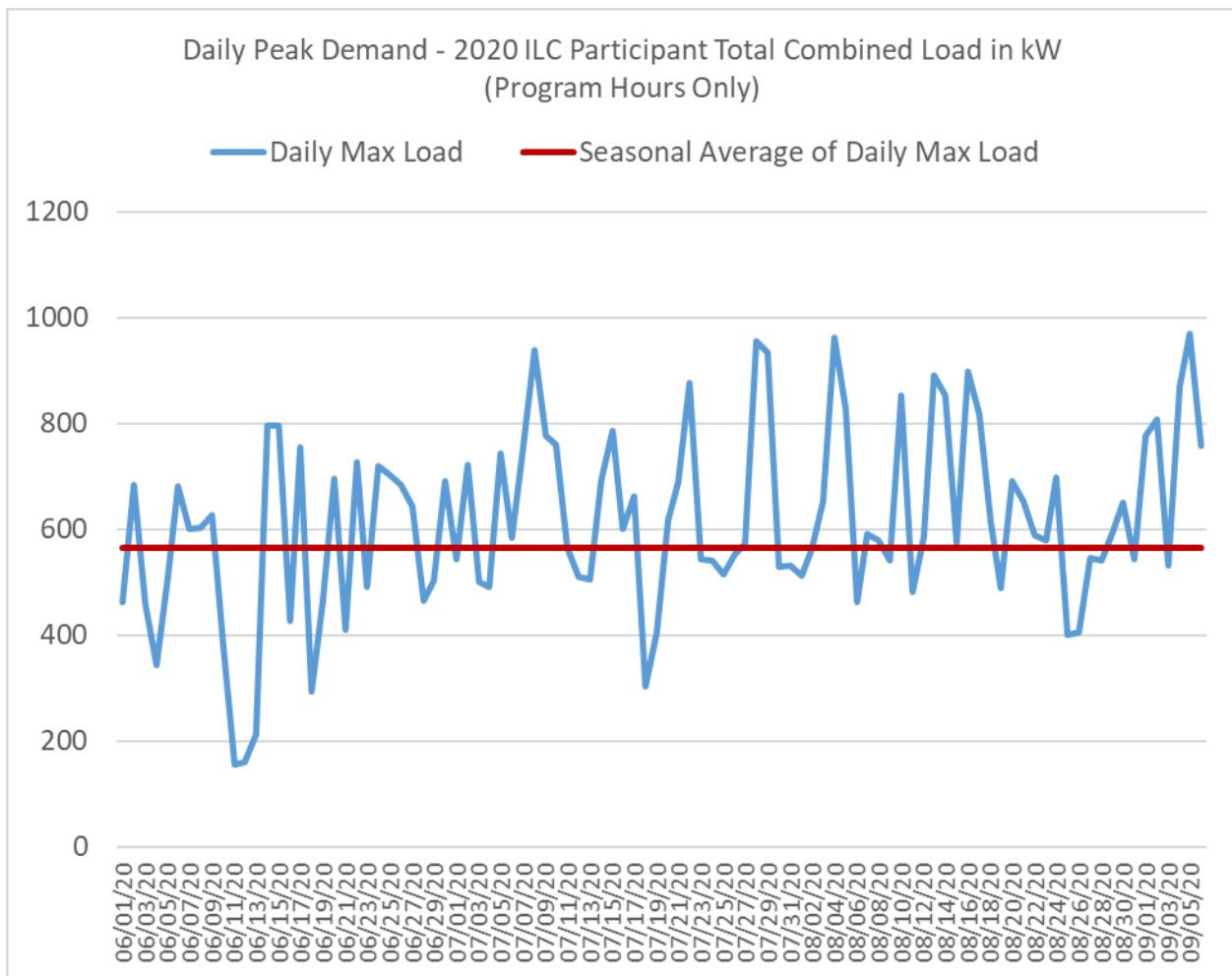


Figure 1 – 2020 ILC Participant Total Combined Load in kW for Program Hours Only

For the 2021 program year, the portfolio average available load reduction was 473kW (see Figure 2 below), nearly 20 percent lower than 2020. As noted earlier in this report, this is due primarily to reduced pumping because of reduced water availability from the upper Klamath Lake.

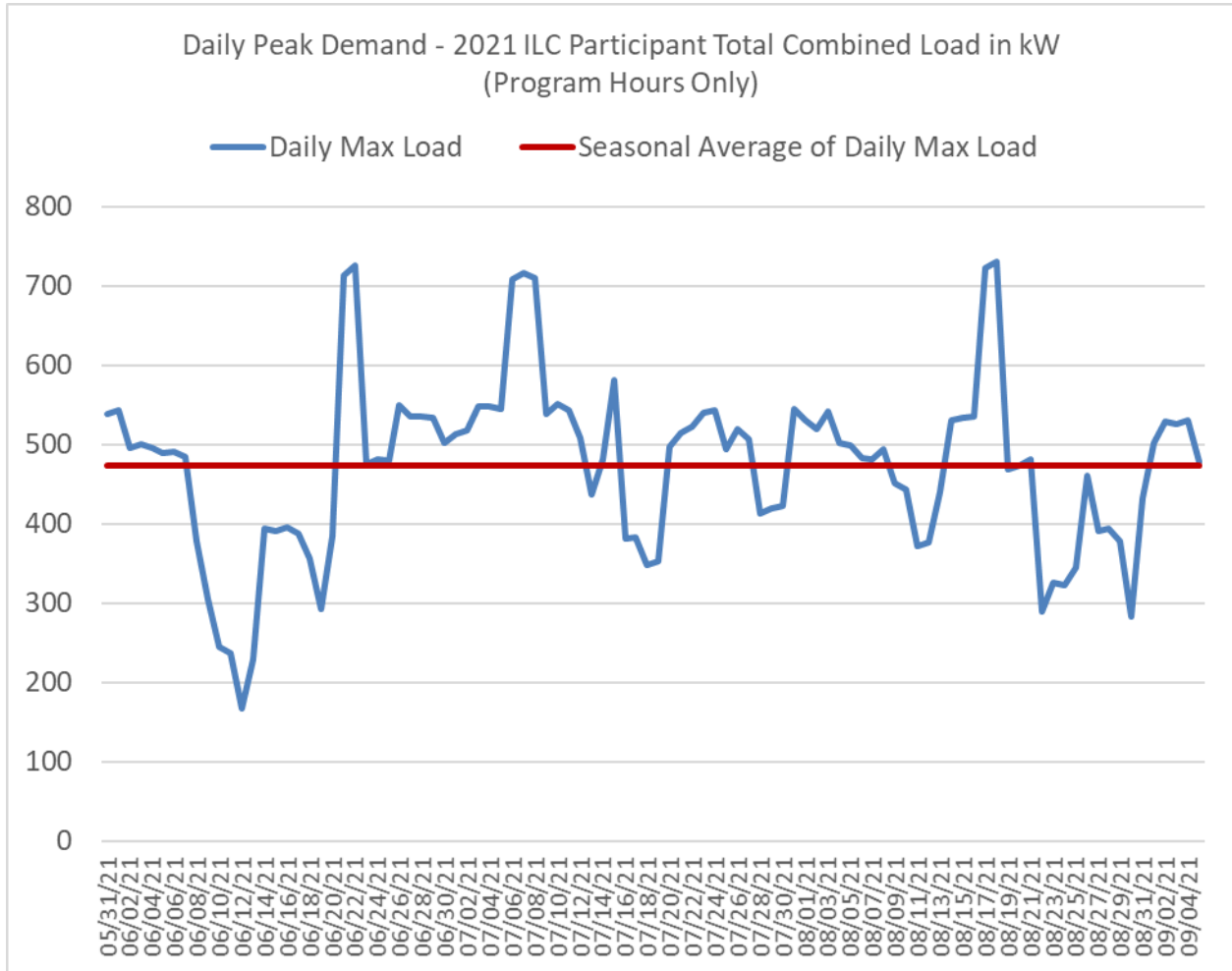


Figure 2 – 2021 ILC Participant Total Combined Load in kW for Program Hours Only

## Load Control Events

Pacific Power activated the Irrigation Load Control program for six irrigation load control events in 2021. 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 (12pm to 10pm) on the most recent non-event, program day. Detailed Baseline Charts are provided in Appendix C for each event. 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 and 5-minute Pacific Power data for the one customer with medium voltage equipment.

The 2021 portfolio delivered an average of 360 kW across the 6 called load control events. Load Reduction Performance Factor (LRPF), the measure of actual load reduction compared to baseline demand, was 84.7 percent for the portfolio. The LRPF was lower in 2021 since one participant opted two pumps out of all events due to the need to continuously move ground water to prevent fields from flooding.

Figures 3 through 8 below are graphs showing the Event Peak Load data for each of the 6 event days. The red line on each graph shows the 5-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. The difference between the lines shows the amount of curtailed load achieved by the event.

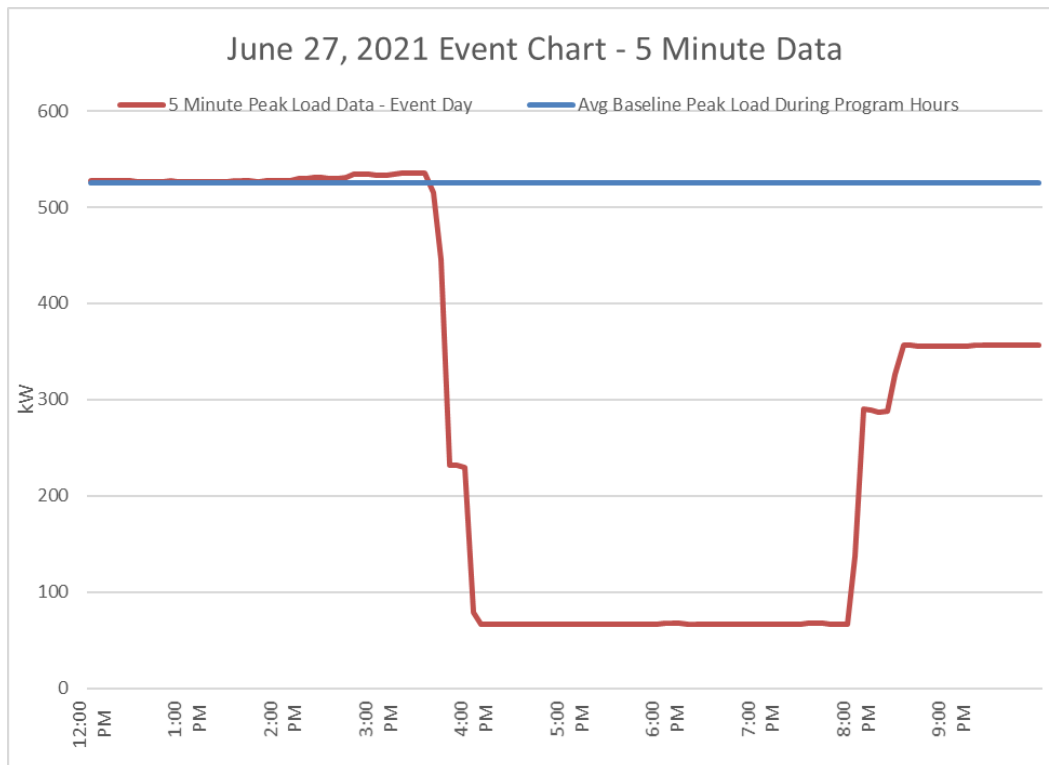


Figure 3 – June 27, 2021 Event Chart

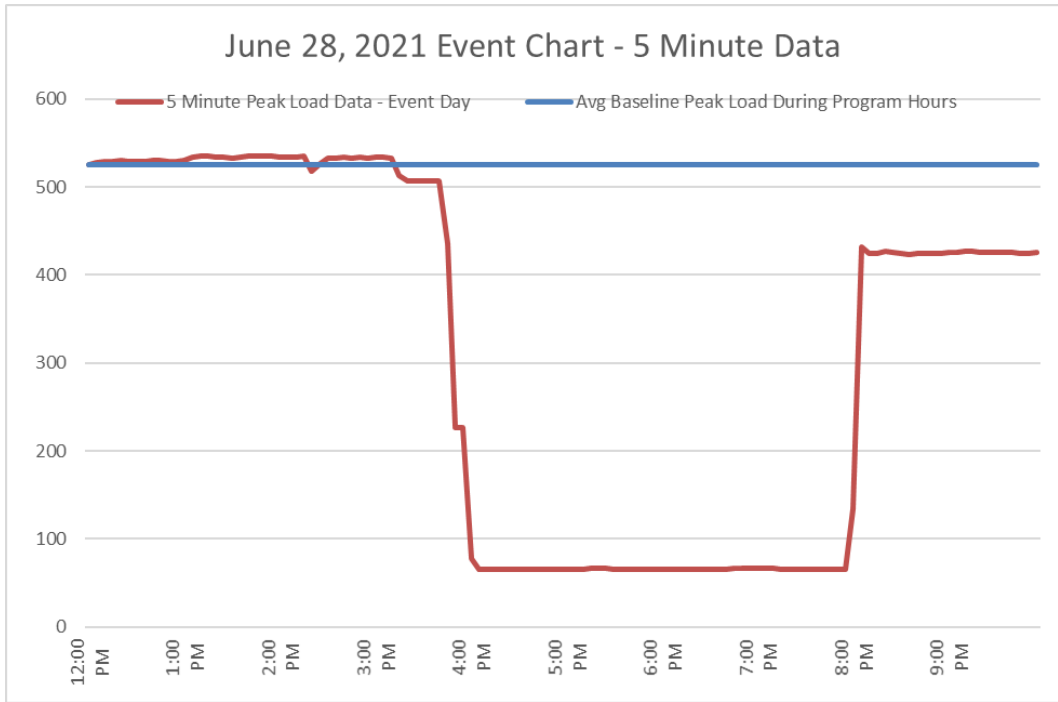


Figure 4 – June 28, 2021 Event Chart

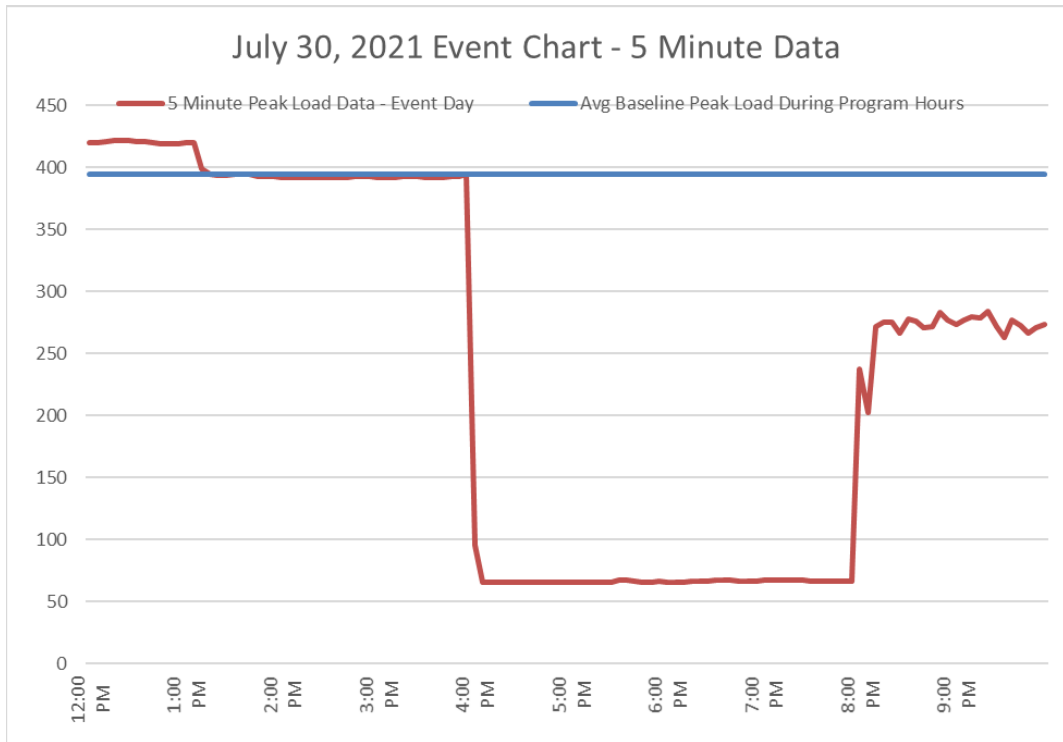


Figure 5 – July 30, 2021 Event Chart

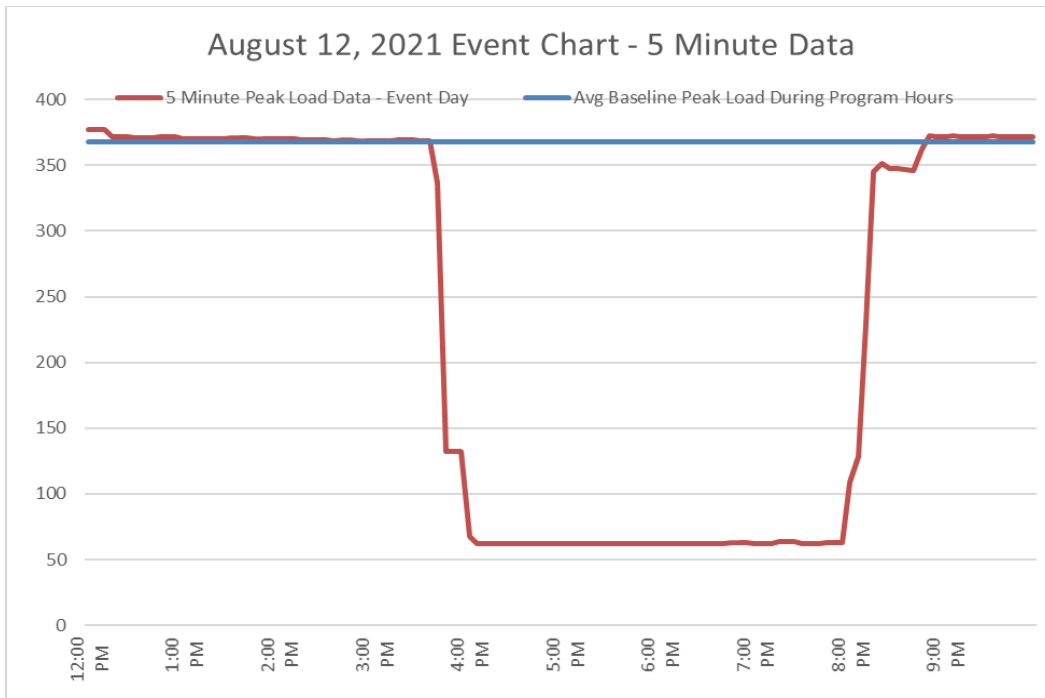


Figure 6 – August 12, 2021 Event Chart

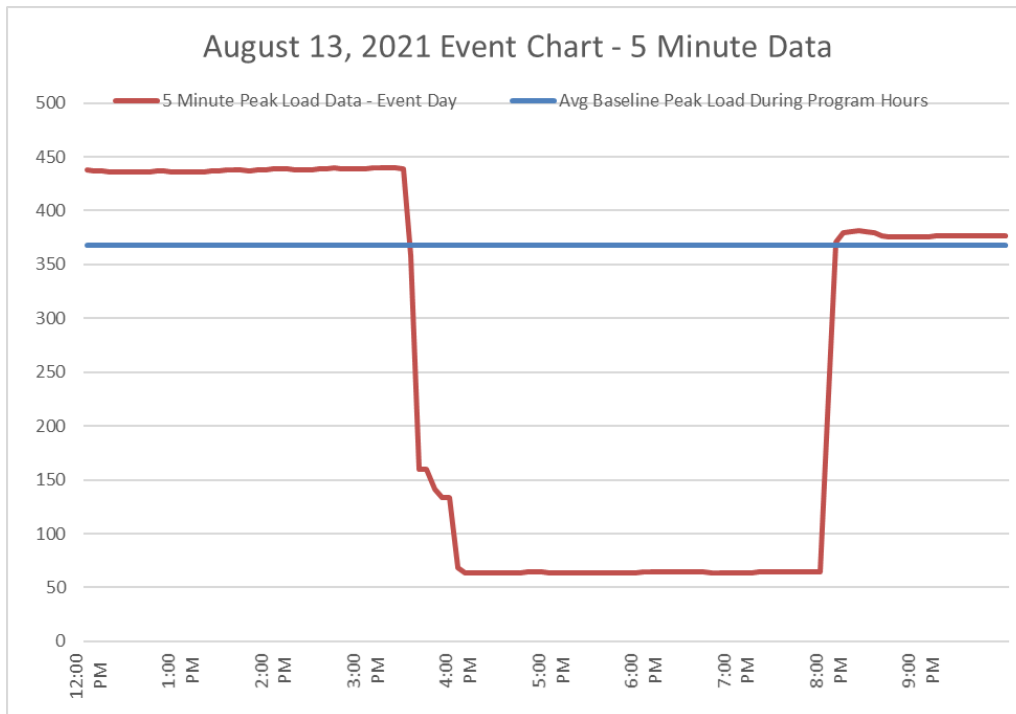


Figure 7 – August 13, 2021 Event Chart

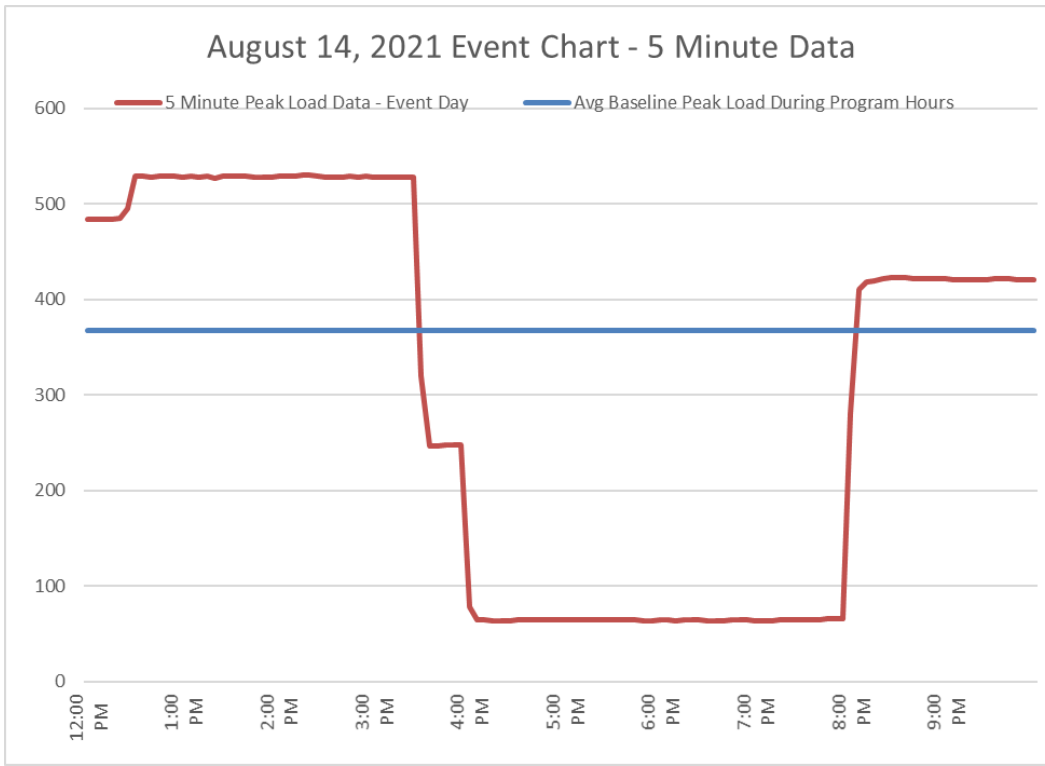


Figure 8 – August 14, 2021 Event Chart

## Load Control Results

Table 1 below shows the summary detail for each of the six called events. Included is the actual load reduction (defined as Baseline Demand minus the amount of load remaining on the system), 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 (%)*
<b>27-Jun-21</b>	Oregon	457.86	524.88	87.23%
<b>28-Jun-21</b>	Oregon	459.27	524.88	87.50%
<b>30-Jul-21</b>	Oregon	327.99	394.79	83.08%
<b>12-Aug-21</b>	Oregon	305.53	367.84	83.06%
<b>13-Aug-21</b>	Oregon	303.81	367.84	82.59%
<b>14-Aug-21</b>	Oregon	303.17	367.84	82.42%
<b>Avg of 6 Events</b>	Oregon	359.61	424.68	84.68%

\* 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 5-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.

One note regarding Load Reduction Performance Factor being significantly lower than in previous years. As stated in the report, one participant opted two pumps out of all events due to the need to continue pumping water to prevent fields from flooding. This resulted in approximately 65kW not being curtailed. This amount of load represents nearly all the difference between the Actual Load Reduction and the Baseline Demand.



## **Key Lessons Learned from 2021**

- As noted earlier in this report, the overall program results were impacted by the severe water restrictions imposed on both existing and potential program participants.
- Of the six called events in 2021, all events were initiated with a one-hour notice which has continued to be received positively by participants.
- Other than a single participant who opted out 2 pumps for operational reasons for all events, there was 100 percent participation from all remaining participants.
- Marketing the program to potential participants during 2021 has given a head start to increased enrollments in 2022.

## **Appendix A: Customer-Facing Irrigation Load Control Activity**

Listed below are the major activities involving program participants that occurred in 2021.

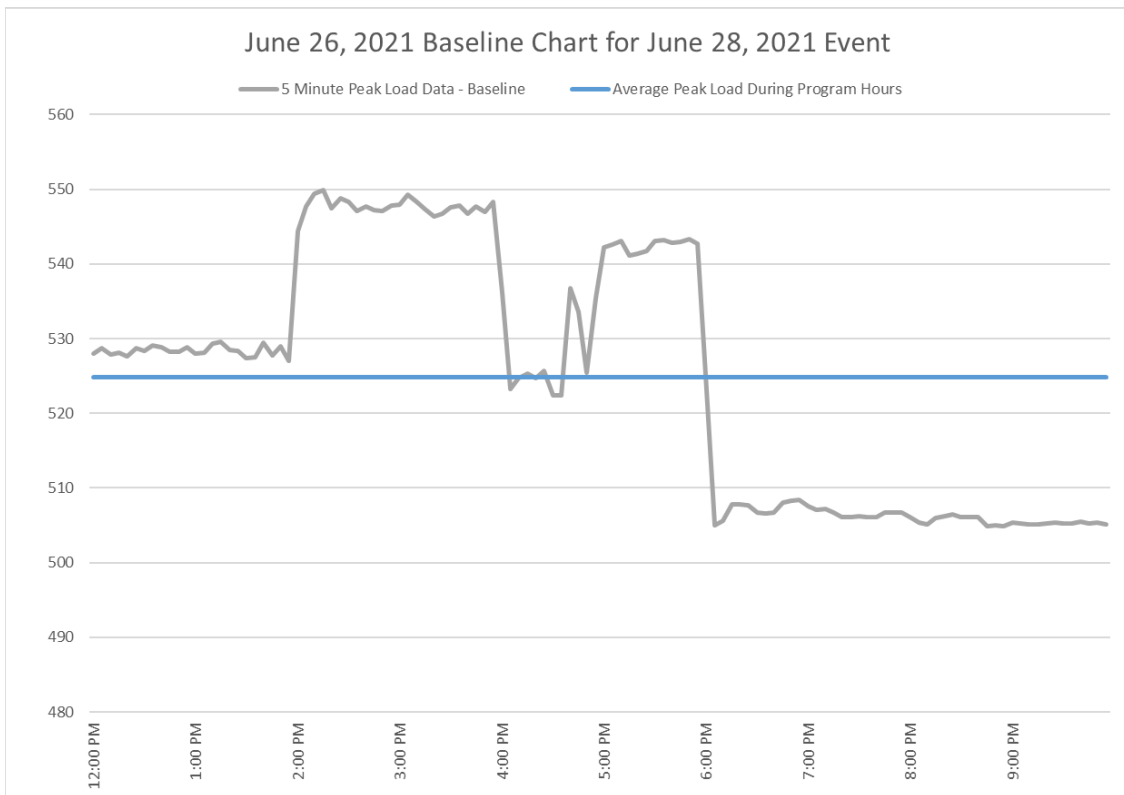
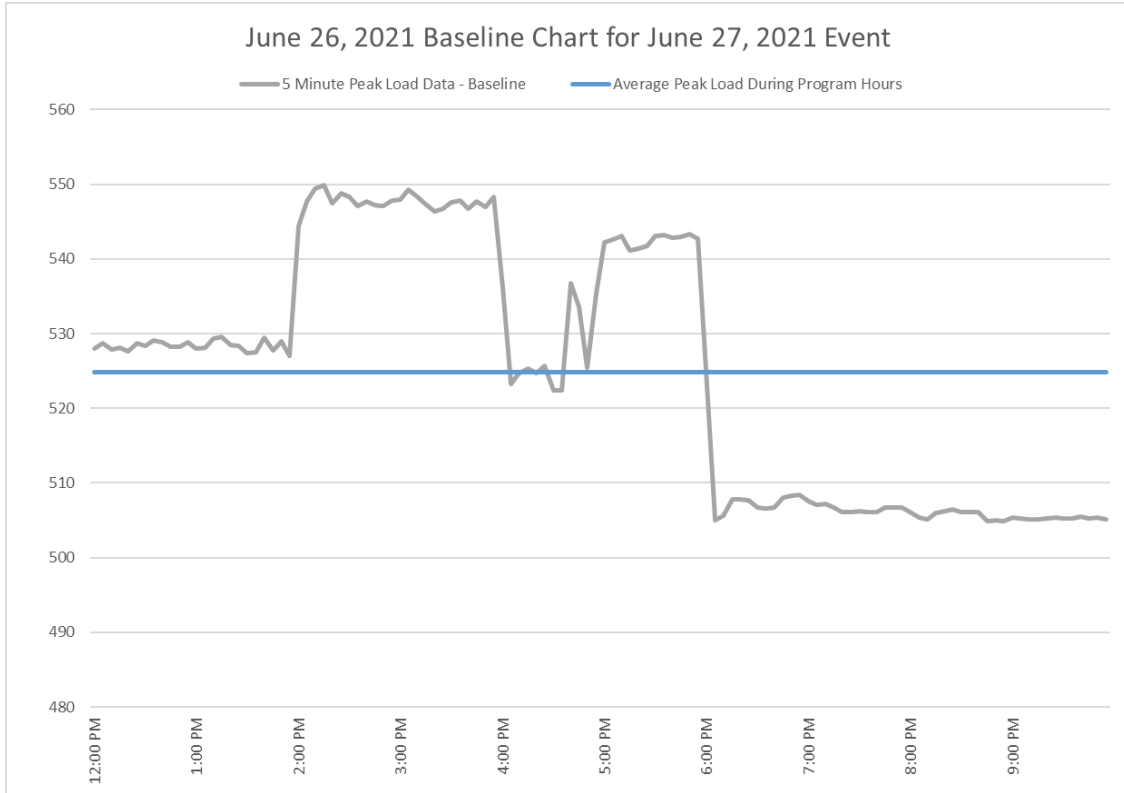
See Table 1 above for dates and detail related to the called Irrigation Load Control events.

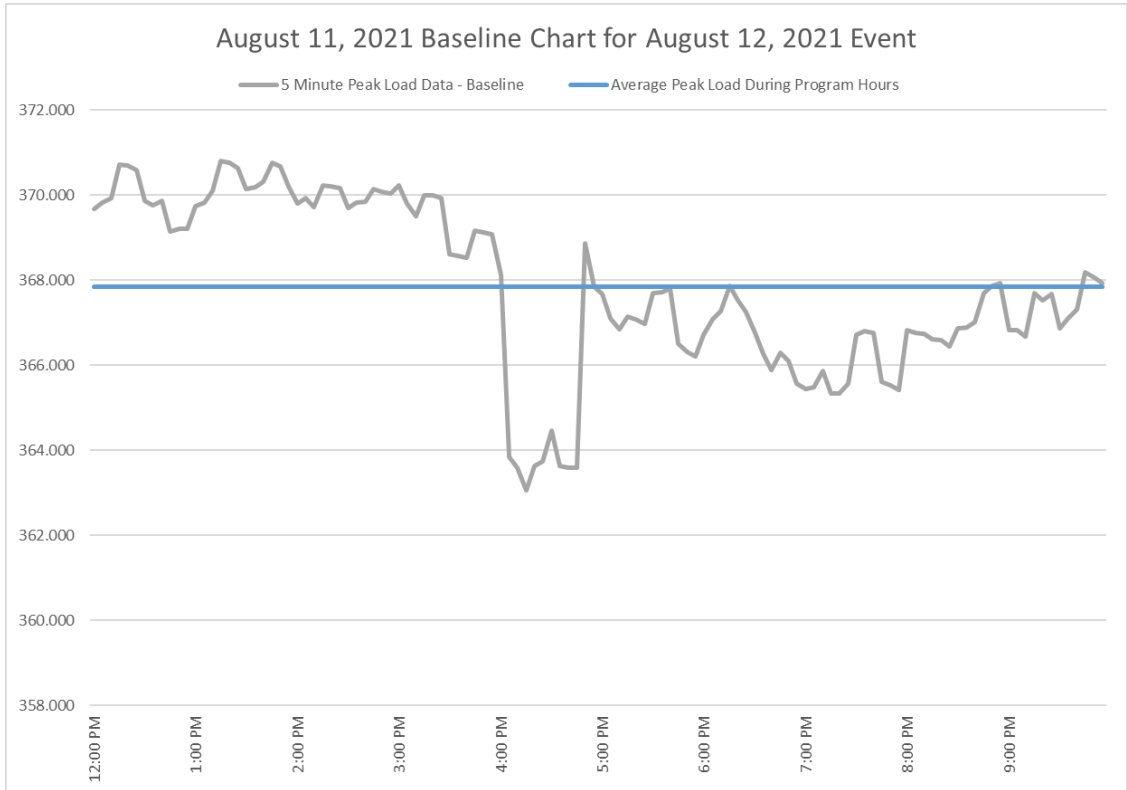
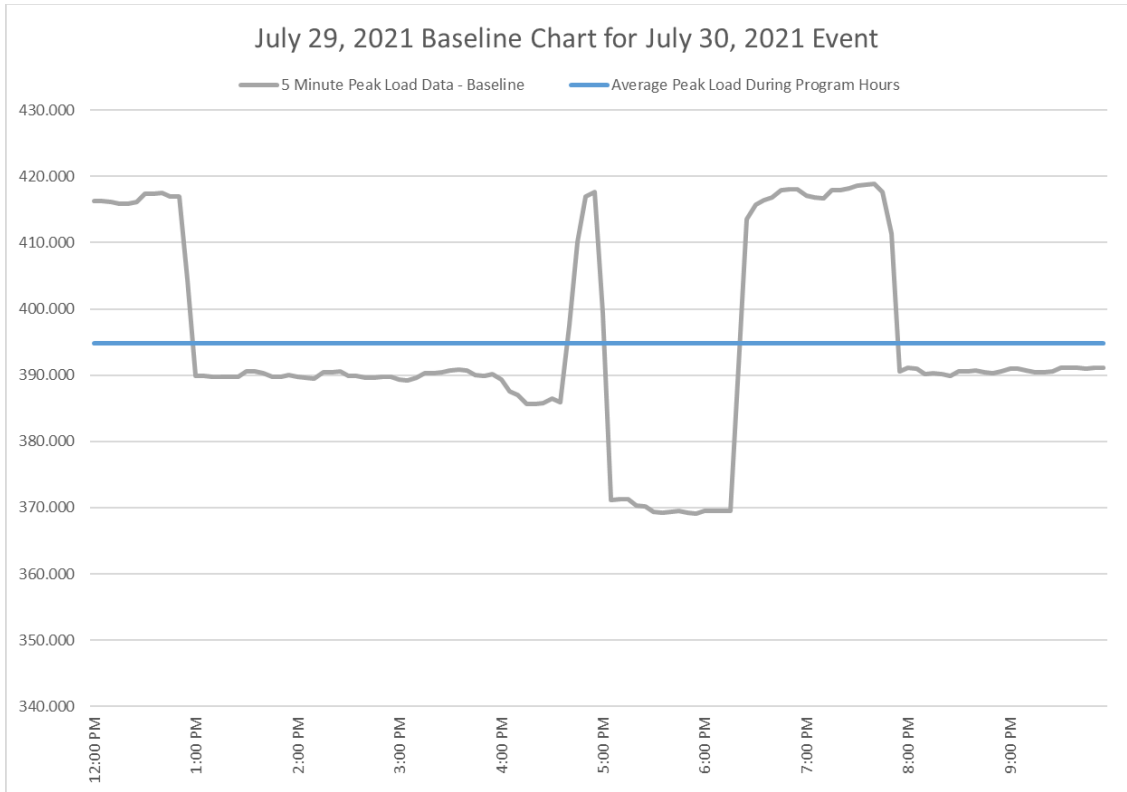
<b>Activity</b>	<b>Date</b>	<b>Description</b>
<b>1 Welcome calls placed to previous year participants</b>	During month of May 2021	Connected Energy contacted all the 2020 participants to notify them of the 2021 program year start as well as the continuation of the program enhancements (addition of hour ahead notification and expanded program hours). All participants were pleased that the program was continuing.
<b>3 Courtesy calls to customers in advance of events</b>	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.
<b>4 Incentive payments to participants</b>	Complete	Incentives have been calculated based on program rules and participation. Similar to previous years, earned incentive payments will be sent by check.

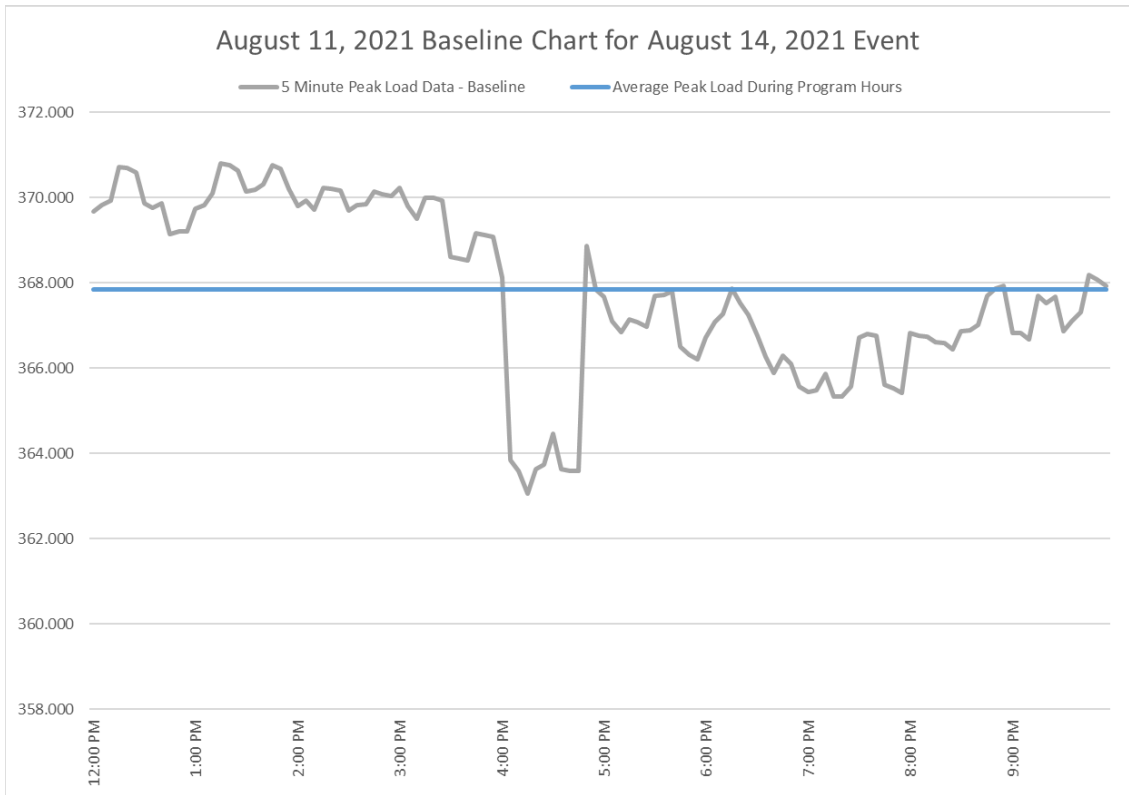
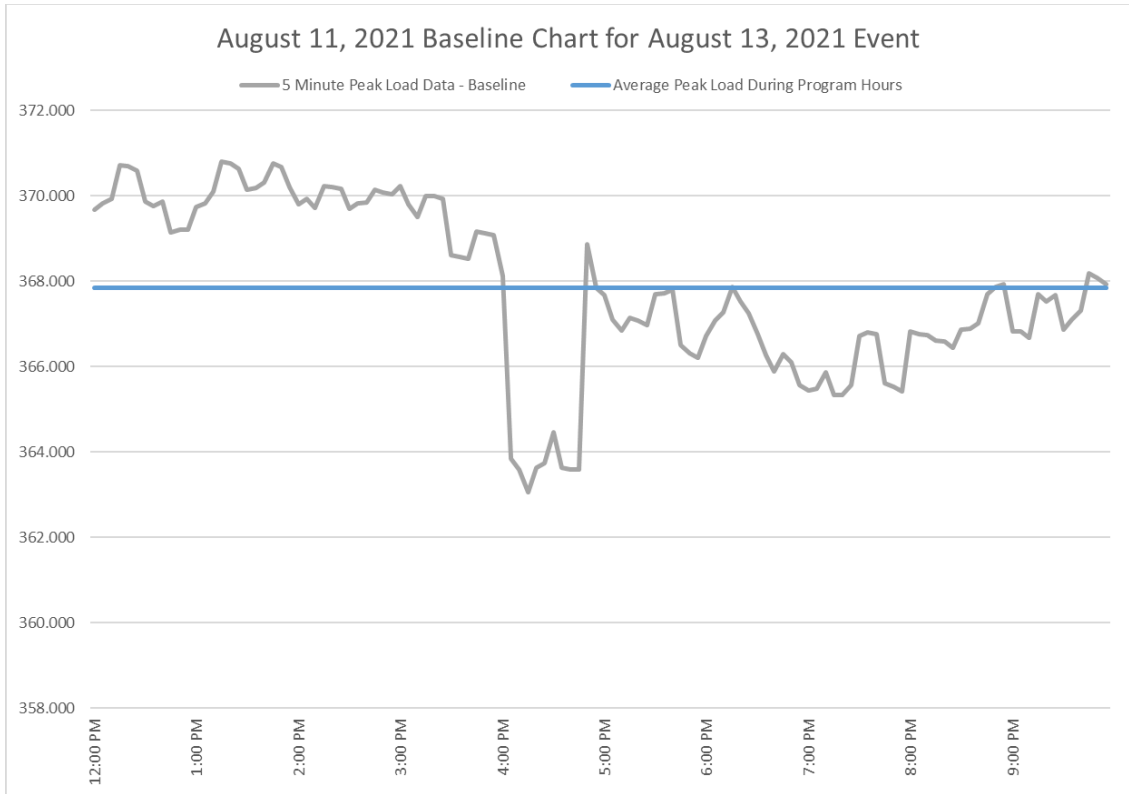
## **Appendix B: Customer Payments**

Five customers received incentive payments for their participation in the 2021 ILC program season. Incentive payments totaled \$9,803.54 and were based on available load that could participate in events multiplied by the participation factor less any load remaining on the load control device during a curtailment. For the one installation where direct load control devices were not able to be installed, 2021 customer billing data was used for all calculations. The participation factor was 100 percent for 15 of the customer locations and 0 percent for the remaining 2 customer locations. All customer incentives were calculated utilizing a \$30/kW rate since all customers selected the hour ahead Dispatch Notification option.

### Appendix C: Detailed Baseline Charts







## Appendix 2: Oregon Pilot Program Year Six - 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 2021 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.<sup>5</sup> 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...”<sup>6</sup> 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 2021 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

Value (2021\$)	Short-Term Avoided Costs (Market)		Long-Term Avoided Costs (High)		Long-Term Avoided Costs (Expected)	
	\$	\$/kW-yr	\$	\$/kW-yr	\$	\$/kW-yr
Energy	\$655	\$1.61	\$655	\$1.61	\$655	\$1.61
Losses	\$52	\$0.13	\$52	\$0.13	\$52	\$0.13
Day-ahead Energy+Losses	\$5,633	\$13.86	n/a	n/a	\$1,329	\$3.27
Hour-ahead Energy+Losses	\$1,843	\$4.54	n/a	n/a	\$435	\$1.07
Generation Capacity	n/a	n/a	\$25,280	\$62.22	\$18,644	\$45.89
Transmission Capacity	n/a	n/a	\$959	\$2.36	\$251	\$0.62
Distribution Capacity	n/a	n/a	\$2,879	\$7.09	\$614	\$1.51
<b>Total</b>	<b>\$8,183</b>	<b>\$20.14</b>	<b>\$29,825</b>	<b>\$73.41</b>	<b>\$21,979</b>	<b>\$54.10</b>

<sup>5</sup> 2015 Demand Response Cost Effectiveness Protocols, California Public Utilities Commission. 2015.

<sup>6</sup> *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 \$13.86/kW for the 2021 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 \$4.54/kW for the 2021 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 20-year nominal levelized value is reported for each case. The medium case reflects the next SCCT starting in year 6, 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 84 percent after grossing up for losses, which is slightly lower than the 86 percent 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 473 kW during 2021. In the expected case, a blend of near-term market and long-term SCCT net costs produces a generation capacity value of \$50.23/kW. In the high case, SCCT net costs starting in year 1 result in a generation capacity value of \$62.22/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 2021 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 Energy Imbalance Market 15-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 2021 curtailment events averaged approximately \$76/megawatt-hour (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 secondary voltage service level for energy, for irrigation customers on Oregon Schedule 41, as applied in the 2018 Line Loss Study for the Oregon General Rate Case (GRC). Avoided losses represent a roughly 7.97 percent increase in energy savings, and resulted in effective energy savings of approximately \$82/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 7<sup>th</sup> Power Plan<sup>7</sup> 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 2021, 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 2021\$ and before capacity contribution

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<sup>7</sup> 7<sup>th</sup> Power Plan applies transmission deferral value only.

is accounted for, Average values are \$4.44/kw-yr. for transmission capacity and \$9.83/kw-yr for distribution capacity, while High values roughly twice as the average at \$8.49/kw-yr for transmission capacity and \$23.05/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 28 percent for transmission and 31 percent for distribution after grossing up for losses. These values are based on the kW of non-event load during Program hours, which was 406 kW during 2020.

The transmission capacity deferral credit for “High” cost locations is estimated at \$2.36/kw-yr., while the comparable value for the distribution capacity deferral credit is estimated at \$7.09/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 \$0.62/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 in this historical period.

5. *Line Losses*

Pilot: For valuation purposes, the hourly line loss factor methodology developed for the Oregon GRC was used, based on a 2018 study. 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 2021 events was 0.360 MW at site. Applying the estimated line loss, the load impacts at the generator are 0.389 MW.

2. *Expected call hours of the program (used to determine energy savings)*  
Pilot: Program was called for 24 hours in 2021. This is 46 percent of 52 maximum annual dispatch hours.
3. *Administrative Costs*  
Pilot: Administrative (non-incentive) costs paid in 2021 to Connected Energy include, program delivery costs for the sixth 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. Participant costs representing the transactions costs and the value of service lost were estimated to be 75 percent of incentives or \$7,353. This assumes that the maximum possible value of the transaction costs and value of service lost can be approximated as a proportion of the value of all incentives otherwise a customer would not elect to participate in the program.
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 2021 program expenses were paid through 2021 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 2021 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 2021 incentive payments were \$9,804.
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 1 or after September 1) that a generation constraint could occur.
- *Notification Time (B Factor)*  
Pilot: In 2021, 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 2021 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 2021 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 2021 season.**

	Benefits	Costs	b/c ratios
Avoided generation capacity	\$18,644		
Avoided energy + market	\$2,471		
Avoided transmission	\$251		
Avoided distribution	\$614		
Total	\$21,979		
Incentives		\$9,804	
Delivery		\$165,000	
Total		\$174,804	
Incentives			2.24
Delivery			0.13
Total <sup>1</sup>			0.13

Notes for Table:

- Using the same b/c ratio framework, this program “breaks even” and has a 1.00 b/c ratio once it reaches a minimum of 5.9 aMW in size.



## MEMORANDUM

To: Don Jones and Peter Schaffer (PacifiCorp)  
From: Maggie Buffum, Kelly Marrin, and Barb Ryan (AEG)  
Date: 2/15/2022  
Re: Recommendations for PacifiCorp's OR ILC Pilot

### The Purpose of This Memo

Pacific Power has offered irrigation customers in the Klamath basin an irrigation load control (ILC) program since 2016. In 2019, Pacific Power filed to extend and expand the program. In early 2020, the Public Utility Commission of Oregon (OPUC) approved Pacific Power's request and conditioned their approval on a recommendation after the 2021 season that provides clear direction to either ramp down or move the pilot toward a full-scale program.

Pacific Power contracted with the Applied Energy Group (AEG) to provide research and reporting services culminating in a recommendation to either transition the ILC pilot to a full-scale program or ramp down. This memo summarizes findings from that research and provides AEG's recommendations for expanding the pilot.

### Summary of Findings and Recommendation

This section first summarizes AEG's research activities, including our associated findings and recommendations. Then, we give our overall recommendation regarding the ILC Pilot.

#### Research Activities and Findings

**AEG based its recommendation on two key activities**, described below, along with a summary of key findings and recommendations for consideration. The sections that follow provide additional details on AEG's research.

We completed a [documentation review](#), which covered overviews of the current pilot, load-reduction estimation methods, pilot participants and performance over time, and plans for the pilot's expansion.

- AEG found that the methods used to calculate savings align with industry standards and match the descriptions of methods provided in the implementer's annual reports.
- PacifiCorp plans for the program to continue offering multiple event notification options (e.g., day-ahead and hour-ahead notifications) to increase the program's value to PacifiCorp and the ILC program participants. Part of the program expansion will include a review of the baseline approaches given the different options available to customers.
- PacifiCorp received multiple responses to its recent request for DR implementation proposals from bidders looking to implement an ILC program in Oregon. Levelized costs per-kW were consistently lower than other commercial and industrial (C&I) demand reduction strategies.
- PacifiCorp's 2021 IRP model selected an ILC program in Oregon as a demand-response resource through 2031.

We also conducted a series of [in-depth interviews](#) with the current program implementer and all five current pilot participants to gain insight into program delivery and operations, challenges or successes with the pilot, satisfaction with incentives and pilot design, and recommendations for improvements.



- Participants most often cited saving money as the main program benefit. One water agency participant described its interest in helping develop and promote programs that lower energy costs, which it sees as an additional benefit to ILC pilot participation.
- Overall, the current participants were satisfied with the pilot. Four out of five participants found the incentives satisfactory and felt they made the program worth the time and effort. When prompted for recommendations, some participants suggested increasing the incentives (including those satisfied with the pilot), which is a typical finding in satisfaction research. All five participants would prefer to receive the incentive before the end of the calendar year.
- Although they rarely opted out of an event, many participants said the ability to opt out was important in their decision to enroll.
- Participants felt that farmers with pivot systems would have the easiest time participating, and one participant said that pastureland worked very well with the program. However, none of the participants felt that the type of irrigation technology or crops supported by the pumps in the pilot affected their participation.
- The implementer felt that the COVID-19 pandemic impacted the pilot's ability to attract new participants. While the pandemic did not appear to impact any participant's ability to respond to events, potential customers needed to focus instead on other aspects of their operations as a result of it.
- While only one participant, a water agency, mentioned the effect of water shortages on their participation in the pilot, the implementer saw lower available capacity for curtailment overall compared to previous years and believed that water shortages discouraged some potential participants from committing to the pilot.

### Final Recommendation

Based on these findings, **AEG recommends that PacifiCorp transition the the ILC pilot to a full -scale program. Below we present our** conclusions and recommendations for the expansion based on the research activities.

- The current pilot, which includes a small number of customers all located in the Klamath Basin, has generated consistent capacity savings over the years, though water availability influences the available capacity. Expanding customers, geography and pump types **can mitigate the volatility of savings for reasons outside of customers' control**, such as during dry seasons, because growers or water agencies may need to respond differently to these environmental (or other) factors.
- The current participants themselves value the program and provided insightful feedback. Their high satisfaction with the pilot under its existing pricing structure and the limited technological barriers to participation they cited provide evidence that scaling the pilot to a broader customer base outside of the Klamath Basin could be successful. **AEG recommends that the implementer and PacifiCorp consider quicker incentive payments to customers and review incentive levels for each dispatch option as part of the participation and cost effectiveness analysis provided in annual reporting.**
- The responses from actual bidders for program implementation show that the market supports the pilot's continuation and expansion, as does the pilot's selection in the 2021 IRP through 2031.
- **As the program expands, the implementer and PacifiCorp program staff, should review the baseline methods periodically to ensure they reflect the multiple dispatch methods.**

The sections that follow provide additional details on AEG's research.

### Documentation Review

The AEG team reviewed the existing ILC pilot reports and documentation in detail to build a comprehensive picture of the pilot over time. We also validated the appropriateness of the methods used to estimate load reductions and cost-effectiveness and noted any recommendations in these areas for future program years.



We received the following data and documentation from PacifiCorp.

- 2021 performance reports with context around results from the implementer's perspective.
- Five-minute load data for each pump during the 2021 event season, demand reduction calculations, and incentive calculations.
- PacifiCorp's descriptions of the ILC pilot program and its plans for expanding the program through 2023.
- PacifiCorp staff recommendations for expanding the program, including program background information, discussion of early results and challenges, plans for transitioning the pilot to a full program, and key pilot data from the 2016-2018 program years, that was delivered to the OPUC.
- Results from PacifiCorp's recent demand response RFP and current integrated resource plan modeling to see the potential demand reductions and costs-per-kW bid from the market of implementers.

### Pilot Overview

The Oregon Irrigation Load Control Pilot offers voluntary direct load-control to irrigation customers within the Oregon portion of the Klamath Basin. The pilot's goal is to reduce the load from irrigation pumps during peak summer days. Similar programs currently exist in PacifiCorp's Utah and Idaho territories, and they launched the pilot to test the program design in Oregon.

The 2021 event season ran from the first week of June through the first week of September. The pilot restricts events to less than 52 hours per year in total, with up to 20 events per year, each lasting no more than four hours. Customers choose between day-ahead notice incentives (\$18/kW per year) and hour-ahead notice incentives (\$30/kW per year); in the 2021 event season, all customers selected the hour-ahead option. Customers can opt out of events without penalties beyond the foregone incentives.

Load-control devices with integrated metering chips are installed on the pumps and provide five-minute interval data during the entire program event season. This data is used to calculate actual load reductions (i.e., a running pump produces positive load and curtailment shows zero load).

### Load-Reduction Estimation Methods

The program implementer estimated load reductions by assuming that during curtailment events, each pump could have consumed an amount equal to their observed load during the most recent eligible non-event day, on average. Then, to calculate the total curtailed load for each pump across all events, this potential curtailed load was reduced by the pump's actual load across curtailment events.

This approach is generally reasonable, but AEG provides the following comments for consideration:

- **The baseline approach is appropriate for both day-ahead and hour-ahead notification options, but there are opportunities to modify estimation methods depending on which option each customer selects.** The current method uses the most-recent eligible non-event day to create the baseline for each pump. This method is necessary when customers receive notifications a full day ahead of the event, but different notification options allow for other baseline periods, such as the hour ahead of an event for the hour ahead dispatch notification, which would more fully reflect the impacts from shorter notice events.

### Pilot Participation and Performance Over Time

In the first year of the pilot (2016), the implementer recruited three customers with ten pumps. These customers all continue to participate in the pilot. In 2019, the current implementer recruited two additional customers for a total participant pool of five customers and 17 pumps used for crop growth (alfalfa, potatoes), pasturelands for livestock grazing, and reservoirs.

The design of the pilot has primarily remained consistent over the years with tweaks to incentive pricing and timing and duration of events called as needed.





- 2016: (Partial season.) One event.
- 2017: (Full season.) All customers participated in the four events; each event lasted longer than the one 2016 event, and all were dispatched with only a day of separation between events. The logistics of dispatching events using the load-control technology were successful throughout the season. The implementer signaled its intention to exit the delivery contract after the 2017 season completed.
- 2018: The current implementer (Connected Energy) took over the pilot after being selected through a request for proposals (RFP). The pilot retained all previous participants through new agreements and new load-control switch technology. All customers participated fully in three of four events. (One of the four events revealed issues with one of the load-control switches.)
- 2019: The implementer recruited two additional participants with seven pumps. Like prior event seasons, the four events occurred close together (all four took place within two weeks) without losing participation. Although 2019 was warmer and dryer than normal (a continuing trend since the 2017 event season), according to the implementer, the irrigators did not raise concerns about water shortages concerning their ability to participate in the pilot.
- 2020: The COVID-19 pandemic did not appear to have a meaningful impact on participation in the events, though the implementer found it difficult to enroll new customers whose focus shifted to managing their current operations. All six events were called with one-hour ahead notification, which increased incentive costs compared to the day-ahead notifications of previous years.
- 2021: Six events were dispatched during the season, including one on Saturday and one on Sunday. However, droughts and low water availability reduced pump loads leading to notably smaller impacts. One customer opted two pumps out of all events to prevent flooding, contributing to the lower available and achieved reductions. All other pumps participated in the six events.

*Table 1 Pilot Participation and Performance Over Time*

Metric	2016	2017	2018	2019	2020	2021
<b>Implementer</b>	EnerNOC		Connected Energy			
<b>Participating Customers (Pumps)</b>	3 (10)	3 (10)	3 (10)	5 (17)	5 (17)	5 (17)
<b>Target kW Reduction</b>	0-2,000	3,000	3,000	3,000	5,000	5,000
<b>Number of Events</b>	1	4	4	4	6	6
<b>Average Available kW</b>	565	546	563	945	969	473
<b>Average kW Reduction</b>	281	432	258	554	574	360
<b>Actual Costs</b>	\$150,000	\$125,000	\$180,819	\$181,631	\$175,704	\$174,804
<b>Cost per kW (\$/kW)</b>	\$265.49	\$229.94	\$321.17	\$192.20	\$181.33	\$369.56

### Planned Program Expansion

According to a memo submitted to the OR PUC by PacifiCorp staff on February 14, 2020, PacifiCorp plans to extend the Irrigation Load Control Pilot through 2023 and expand the pilot in terms of the number and location of participating pumps. The current pilot focuses on a small number of customers in the Klamath Basin. Expanded recruitment would target 70 larger pumps in the Klamath Basin, Central Oregon, and south of Medford.

The pilot expansion would retain several changes already integrated into the current pilot, such as extending the event season to September 1 (from August 15) and the last eligible hour to 10 pm (from 8 pm). The implementer has also added an hour-ahead notification option with higher incentives. As discussed in the [participant interview](#) findings, these changes were well-received by current participants, and in 2021, all five participants opted for hour-ahead notifications.



For pumps with unique configurations that could not participate with the current load-control switch, the implementer would consider allowing customers to manually control pumps for events and instead use Advanced Metering Infrastructure (AMI) data to calculate achieved load reductions and incentive payments.

AEG reviewed responses to PacifiCorp's recent request for DR implementation proposals, including an irrigation load control program in Oregon. The levelized costs per-kW associated with these bids were lower than other types of C&I programs and are materially less than the pilot costs on a per-kW basis. Furthermore, based on the assumptions provided by bidders, the 2021 IRP selected the ILC program as a viable demand response resource through 2031.

### In-Depth Interviews

For this task, AEG conducted six in-depth interviews. We interviewed the implementation program manager and all five current program participants. The interviews focused on gathering information that could help inform future ILC program years.

- The **implementer interview** focused on perceived satisfaction of OR ILC participants, requests or feedback from participants, perceived level of interest among other irrigators, effects of COVID on recruitment or operations, and learnings from other programs or pilots.
- The **participant interviews** focused on general program satisfaction, satisfaction with incentives, preferred notification type, length and frequency of events, types of irrigation that are good candidates for controls (i.e., pivot, drip, wheel line, hand line), participation as it relates to pump sizes and crop types, interest in other types of controls including manual control, and COVID effects on operations and participation.

Below we include a detailed summary of the interviews.

#### Program Background

Connected Energy implements the program. It is a turnkey program where Connected Energy is responsible for all customer recruitment, onboarding, hardware installation, event notification and implementation, reporting, and calculation and processing of incentives.

There are currently five participants in the program: three growers and two water agencies. The growers have pivots and wheel line irrigation systems with irrigation seasons from April/May to September/October. Three of the participants became aware of the program through Pacific Power's outreach, one proactively searched for energy-saving options, and another hired a contractor to help them find energy-saving opportunities.

#### Program Participation

Connected Energy has been running the program since 2018. They recruit customers from a list provided by Pacific Power. Connected Energy conducts one-on-one outreach with prospective participants and feels that customers with a large load that runs often and can be curtailed for up to 4 hours are good candidates. Conversely, customers who use pumps to reduce flooding, customers with small pumps, or customers with pumps that do not run very often are poor candidates.

All five participants find it easy to participate in events. Four of the five said the program has caused them to shift energy usage, and one participant said participation has decreased their water usage. The dominant reason for participating is the incentive. Only one participant, a water agency, cited an additional benefit for participating. He is interested in helping to develop and promote programs that lower energy costs and sees that as an additional benefit to program participation. Although Connected Energy feels that the access to technology that allows them to remotely control and monitor their irrigation devices is an additional benefit, none of the participants cited that feature as a benefit.

According to the implementer, COVID restrictions have made participating in the program less of a priority or focus for prospective participants. There are also water restrictions where potential participants don't have access to water, so there is nothing to control.



However, none of the program participants felt that COVID impacted their ability to participate, and only one participant, a water agency, said water shortages affected their participation. Most participants think that farmers with pivot systems will have the easiest time participating, and one participant feels that pastureland works better than other crops for the program.

### **Program Satisfaction**

For the first time since 2018, three events in a row were called in 2021. According to Connected Energy, there were no customer complaints. They reach out to customers personally by phone to notify customers of events. Overall satisfaction with the program is high, with the exception of one participant who requested additional information on the calculations. The participants were all very satisfied with the number and frequency of events and the event notification. All the participants would prefer to receive the incentive check before the year-end rather than early in the new year.

Additional suggestions for improving the program include the following:

- Encourage more customers to participate
- Provide more transparency into how long the program will continue
- Pay the incentive as a credit on the utility bill
- Improve the platform for remote access into pump operations

Connected Energy has a lot of experience with load control programs. As a rule, they use lessons learned from other areas to inform how they implement the Pacific Power program. They are constantly learning and using their experience to improve all their programs.