

PG&E Automated Demand Response (ADR) Incentives

for Ag Irrigation Pumps



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1. Overview of PG&E Incentives for Agricultural Irrigation Pumps

Introduction

Growers in California can potentially offset the cost to install remote monitoring and controls on irrigation pumps by applying for Pacific Gas and Electric Company's (PG&E) Automated Demand Response (ADR) incentives. Additionally, growers can offset the cost to install soil/plant moisture monitoring solution in the fields irrigated by pumps that participate in the ADR Program.

PG&E ADR program offers **\$200 per kW** of calculated load reduction, in return for commitment to participate in demand response (DR) events.

DR events are called by utilities to meet grid management needs. In a DR event, PG&E calls on participating growers to temporarily turn off irrigation pumps. PG&E pays a grower additional incentives each time the grower participates in a DR event.

Participating in a DR program means you are helping to keep our state's energy supply clean, reliable and affordable, while retaining pump control.

Note: 1 hp = 0.75 kW or 1 kW = 1.34 hp

Eligibility

Eligibility criteria are:

- At least one irrigation pump equipped with PG&E meter (no minimum pump horsepower requirement) and
- At least one year of billing history.

A time-of-use (TOU) meter is acceptable for billing history, but a PG&E meter that records electric use every 15 minutes must be installed prior to project completion.

Costs **eligible** for ADR incentives include:

- Remote pump control (start, stop, auto-restart),
- Remote pump flow and pump pressure monitoring
- Remote soil/plant moisture monitoring,
- Telecommunication fees for three years,
- Labor for installation and commissioning, and
- Project management costs.

Costs **NOT eligible** for ADR incentives include:

- Pump vibration monitoring,
- Pump bearing temperature monitoring,
- Chemical and fertilizer system monitoring/control,

- Power quality monitoring,
- Reservoir level monitoring,
- Safety/security system, and
- Weather monitoring.

**Benefits
Growers Can
Receive**

By participating in ADR program, growers can receive:

- **One-time incentives** to install remote monitoring and ADR-enabled controls on pumps,
- **Ongoing payments** for actively participating in an eligible DR program,
- **Ability to remotely monitor pump on/off status, pump flow, and pump pressure** year-round,
- **Ability to remotely turn off pumps** year-round,
- **Ability to remotely monitor soil/plant moisture** in the fields irrigated by participating pumps,
- **Advanced notification** about upcoming DR events via text, email, or phone call,
- **Convenience of automated participation** in DR events,
- **Ability to override pump shutdown** during a DR event (growers retain pump control), and
- **Technical and administrative support** including incentive estimation, application processing, support enrolling in a DR program, and ongoing connectivity support.

**One-time
Incentives and
Ongoing
Payments**

\$200 per kW of calculated DR load reduction covering up to 75% of project cost is offered in **one-time incentives**. Note that 60% of the incentive will be issued after successful load shed verification test and the remaining 40% of the incentive will be issued 12 months later.

The **ongoing payment** amount depends on the selected DR program.

As an example for illustration purposes, for a portfolio of 10 pumps with combined power draw of 1,000 kW (equivalent to 1,340 hp) and 300 kW of calculated DR load reduction, a grower might receive:

- \$60,000 in one-time ADR incentives and
- \$16,000 to \$33,000 per year in bill credits participating directly with PG&E in Peak Day Pricing DR program, OR \$10,000 per year in cash participating through an aggregator in Capacity Bidding DR program.

**Commitments
Growers Make**

When a grower receives ADR incentives, the grower has to:

- Participate in a qualifying DR program for at least 3 years directly with PG&E or through an aggregator. Qualifying DR programs include: Peak Day Pricing, Capacity Bidding Program, Demand Response Auction Mechanism, Supply Side Pilot, and Excess Supply Pilot.

- Adjust irrigation operations when pumps are automatically and safely shut down during a DR event for an average of 15 events a year between May 1st and October 31st, 2 p.m. to 7 p.m., lasting 1 to 4 hours, with day-ahead notification (conditions vary by DR program).
-

Getting Started

To get started:

- Call 1-855-866-2205 for assistance.
 - To get no obligation estimate of potential ADR incentive amount, log on to your PG&E account (www.pge.com) and authorize access to energy usage data for “Energy Solutions” using [Share My Data](#) feature.
 - To place your project in the queue to be processed, complete ADR Program Application Form and email it to pge-adr@energy-solution.com .
-

ADR Project Milestones

The table below summarizes key project milestones.

1. Application	2. Installation	3. Payment
<ul style="list-style-type: none"> • Project screening • Application Processing (once ADR Program Application Form is submitted) • Project approval 	<ul style="list-style-type: none"> • Equipment installation (incl. configuring connection to DR server) • Load shed verification test (site visit) 	<ul style="list-style-type: none"> • 1st incentive payment (60% of the incentive) • After 12 months, 2nd incentive payment (40% of the incentive)

2. Demand Response (DR) Programs Eligible for PG&E ADR Funding

Eligible DR Programs

The following DR programs are eligible for ADR funding:

- Peak Day Pricing Plan,
- Capacity Bidding Program.

More advanced qualifying DR Programs include:

- Demand Response Auction Mechanism,
 - Supply side Pilot, and
 - Excess Supply Pilot.
-

Strategies for reducing electric load

Growers could use the following strategies to shed load during DR events:

- Adjust irrigation schedule and irrigate outside of DR events (most common strategy).
 - Use well pumps outside of DR events to move water into reservoirs, then rely on booster pumps with smaller power draw to irrigate fields as needed.
 - With the use of Variable Frequency Drives (VFDs) on pumps, lower pump power draw during DR events and irrigate smaller blocks at a time.
-

Peak Day Pricing Plan

Growers can participate in Peak Day Pricing (PDP) program, by enrolling a pump in a qualified rate schedule that offers PDP option. Qualified ag rates schedules with PDP option include Ag-4A, Ag-4C and Ag-5C.

Earned PDP credits appear on a monthly bill and lower either monthly demand charges or demand & energy charges depending on the rate schedule. See Appendix B: Peak Day Pricing (PDP) Plan, Monthly Bill Example for more details.

DR Events

- 9 to 15 events per year
- Between May 1st and October 31st
- 2 p.m. to 6 p.m., Monday through Friday (non-holiday)
- Day-ahead notice

Incentives

- Bill credits from May 1st to October 31st (rate schedules AG-4A, Ag-4C, or AG-5C)
- PDP Plan offers bill protection (participation for the first 12 months is risk-free; customers who would have done better on their applicable Time-of-Use rate than on PDP Plan will receive a credit for the difference)

Penalty for non-Participation

On DR event days, energy charge of \$1 per kWh will apply, 2 p.m. to 6 p.m.

https://www.pge.com/en_US/business/rate-plans/rate-plans/peak-day-pricing/peak-day-pricing.page

Capacity Bidding Program

Growers can participate in Capacity Bidding Program (CBP) directly with PG&E or through an aggregator that offers this program.

DR Events (for the “prescribed” option)

- Max 30 hours per month, max 5 events per month
- Between May 1st and October 31st
- 11 a.m. to 7 p.m., Monday through Friday (non-holiday)
- Day-ahead notice

Incentives/Penalty (when participating through an aggregator)

- Aggregator helps the grower to nominate a load shed bid for each month
- Incentive/penalty depends on the agreement between the grower and aggregator
- Incentives are paid in cash

https://www.pge.com/en_US/business/save-energy-money/energy-management-programs/third-party-programs/capacity-bidding.page

More advanced DR Programs

Demand Response Auction Mechanism (DRAM)

- Aggregator bids the customer into the CA Independent System Operator (CAISO) energy market.
- EnerNOC is a registered DRAM provider and serves ag industry.

Supply Side Pilot (SSP)

- Aggregator bids the customer or customer bids directly into energy wholesale market.
- Olivine is a pilot administrator and CAISO scheduling coordinator (<http://olivineinc.com/services/our-work/ssp/>).

Excess Supply Pilot (XSP)

- Customer needs to increase energy use when asked.
 - Olivine is a pilot administrator (<http://olivineinc.com/services/our-work/xsp/>).
-

3. Available Vendors

**Vendors
Offering ADR
Related
Services**

The table below lists vendors offering ADR related services in agricultural sector (listed in alphabetical order).

Role	Vendors
Providers of ADR-Enabled Pump Control Solution	<p>Bermad https://www.bermad.com/</p> <p>Johnson Controls www.johnsoncontrols.com</p> <p>Observant www.observant.net</p> <p>Polaris Energy Services* www.polarisenergyservices.com</p> <p>WiseConn http://wiseconn.com</p>
Distributors and Installers	<p>Agri-Valley Irrigation, Inc. www.agrivalley.com</p> <p>Bedard Controls www.bedardcontrols.com</p> <p>Bennett & Bennett Irrigation www.bennettirrigation.com</p> <p>Polaris Energy Services* www.polarisenergyservices.com</p> <p>Streamline Irrigation www.streamlineirrigation.net</p> <p>Western Ag and Turf www.westernagandturf.com</p>
DR Program Aggregators	<p>NRG Energy www.nrg.com</p> <p>IPKeys Power Partners www.ipkeyspowerpartners.com</p> <p>Polaris Energy Services* www.polarisenergyservices.com</p>

* Polaris Energy Services is a technology provider, an installer and an aggregator.

Appendix A: DR Events Called for CBP & PDP in 2014 – 2016

Year 2016: Capacity Bidding Program (CBP), Day-Ahead Option

Date	Event Number	Type	Start	Stop	Duration (hours)	Zone
6/20/2016	1	Day Ahead	3:00 PM	7:00 PM	4	All
6/21/2016	2	Day Ahead	3:00 PM	7:00 PM	4	All
6/22/2016	3	Day Ahead	5:00 PM	7:00 PM	2	All
6/27/2016	4	Day Ahead	3:00 PM	7:00 PM	4	All
6/28/2016	5	Day Ahead	3:00 PM	7:00 PM	4	All
6/30/2016	6	Day Ahead	4:00 PM	7:00 PM	3	All
7/14/2016	7	Day Ahead	5:00 PM	7:00 PM	2	All
7/25/2016	8	Day Ahead	3:00 PM	7:00 PM	4	All
7/26/2016	9	Day Ahead	3:00 PM	7:00 PM	4	All
7/27/2016	10	Day Ahead	3:00 PM	7:00 PM	4	All
7/28/2016	11	Day Ahead	3:00 PM	7:00 PM	4	All
7/29/2016	12	Day Ahead	3:00 PM	7:00 PM	4	All
8/15/2016	13	Day Ahead	3:00 PM	7:00 PM	4	All
8/16/2016	14	Day Ahead	3:00 PM	7:00 PM	4	All
8/17/2016	15	Day Ahead	3:00 PM	7:00 PM	4	All
9/26/2016	16	Day Ahead	3:00 PM	7:00 PM	4	All
9/27/2016	17	Day Ahead	3:00 PM	7:00 PM	4	All

Year 2016: Peak Day Pricing (PDP), Day-Ahead Option

Date	Event Number	Type	Start	Stop	Duration (hours)	Zone
6/1/2016	1	Day Ahead	2:00 PM	6:00 PM	4	All
6/3/2016	2	Day Ahead	2:00 PM	6:00 PM	4	All
6/27/2016	3	Day Ahead	2:00 PM	6:00 PM	4	All
6/28/2016	4	Day Ahead	2:00 PM	6:00 PM	4	All
6/30/2016	5	Day Ahead	2:00 PM	6:00 PM	4	All
7/14/2016	6	Day Ahead	2:00 PM	6:00 PM	4	All
7/15/2016	7	Day Ahead	2:00 PM	6:00 PM	4	All
7/26/2016	8	Day Ahead	2:00 PM	6:00 PM	4	All
7/27/2016	9	Day Ahead	2:00 PM	6:00 PM	4	All
7/28/2016	10	Day Ahead	2:00 PM	6:00 PM	4	All
8/17/2016	11	Day Ahead	2:00 PM	6:00 PM	4	All
9/26/2016	12	Day Ahead	2:00 PM	6:00 PM	4	All

Year 2015: Capacity Bidding Program (CBP), Day-Ahead Option

Date	Event Number	Type	Start	Stop	Duration (hours)	Zone
6/12/2015	1	Day Ahead	3:00 PM	7:00 PM	4	All
6/25/2015	2	Day Ahead	3:00 PM	7:00 PM	4	All
6/26/2015	3	Day Ahead	3:00 PM	7:00 PM	4	All
6/30/2015	4	Day Ahead	3:00 PM	7:00 PM	4	All
7/1/2015	5	Day Ahead	3:00 PM	7:00 PM	4	All
7/16/2015	6	Day Ahead	4:00 PM	7:00 PM	3	Central Coast, Fresno, Los Padres, North Coast, Bay Area
7/28/2015	7	Day Ahead	3:00 PM	7:00 PM	4	All
7/29/2015	8	Day Ahead	3:00 PM	7:00 PM	4	All
7/30/2015	9	Day Ahead	3:00 PM	7:00 PM	4	All
8/17/2015	10	Day Ahead	3:00 PM	7:00 PM	4	All
8/18/2015	11	Day Ahead	3:00 PM	7:00 PM	4	All
8/26/2015	12	Day Ahead	3:00 PM	7:00 PM	4	Fresno, Los Padres, North Valley, Sacramento Valley, Sierra, San Joaquin, Stockton
8/27/2015	13	Day Ahead	3:00 PM	7:00 PM	4	All
9/9/2015	14	Day Ahead	3:00 PM	7:00 PM	4	All
9/10/2015	15	Day Ahead	3:00 PM	7:00 PM	4	All
9/11/2015	16	Day Ahead	3:00 PM	7:00 PM	4	All

Year 2015: Peak Day Pricing (PDP), Day-Ahead Option

Date	Event Number	Type	Start	Stop	Duration (hours)	Zone
6/12/2015	1	Day Ahead	2:00 PM	6:00 PM	4	All
6/25/2015	2	Day Ahead	2:00 PM	6:00 PM	4	All
6/26/2015	3	Day Ahead	2:00 PM	6:00 PM	4	All
6/30/2015	4	Day Ahead	2:00 PM	6:00 PM	4	All
7/1/2015	5	Day Ahead	2:00 PM	6:00 PM	4	All
7/28/2015	6	Day Ahead	2:00 PM	6:00 PM	4	All
7/29/2015	7	Day Ahead	2:00 PM	6:00 PM	4	All
7/30/2015	8	Day Ahead	2:00 PM	6:00 PM	4	All
8/17/2015	9	Day Ahead	2:00 PM	6:00 PM	4	All
8/18/2015	10	Day Ahead	2:00 PM	6:00 PM	4	All
8/27/2015	11	Day Ahead	2:00 PM	6:00 PM	4	All
8/28/2015	12	Day Ahead	2:00 PM	6:00 PM	4	All
9/9/2015	13	Day Ahead	2:00 PM	6:00 PM	4	All
9/10/2015	14	Day Ahead	2:00 PM	6:00 PM	4	All
9/11/2015	15	Day Ahead	2:00 PM	6:00 PM	4	All

Year 2014: Capacity Bidding Program (CBP), Day-Ahead Option

Date	Event Number	Type	Start	Stop	Duration (hours)	Zone
5/14/2014	1	Day Ahead	4:00 PM	7:00 PM	3	Bay Area, Central Coast
5/15/2014	2	Day Ahead	3:00 PM	7:00 PM	4	All
7/7/2014	3	Day Ahead	4:00 PM	7:00 PM	3	All
7/14/2014	4	Day Ahead	3:00 PM	7:00 PM	4	Fresno, Los Padres, Stockton
7/25/2014	5	Day Ahead	3:00 PM	7:00 PM	4	Stockton, Fresno, Bay Area
7/28/2014	6	Day Ahead	3:00 PM	7:00 PM	4	All
7/29/2014	7	Day Ahead	4:00 PM	7:00 PM	3	All
8/1/2014	8	Day Ahead	3:00 PM	7:00 PM	4	Bay Area, Fresno, Geysers, Los Padres, North Coast, North Valley, Sacramento Valley, Sierra
9/15/2014	9	Day Ahead	3:00 PM	7:00 PM	4	All
10/2/2014	10	Day Ahead	3:00 PM	7:00 PM	4	Central Coast
10/3/2014	11	Day Ahead	3:00 PM	7:00 PM	4	Central Coast


Year 2014: Peak Day Pricing (PDP), Day-Ahead Option

Date	Event Number	Type	Start	Stop	Duration (hours)	Zone
6/9/2014	1	Day Ahead	2:00 PM	6:00 PM	4	All
6/30/2014	2	Day Ahead	2:00 PM	6:00 PM	4	All
7/1/2014	3	Day Ahead	2:00 PM	6:00 PM	4	All
7/7/2014	4	Day Ahead	2:00 PM	6:00 PM	4	All
7/14/2014	5	Day Ahead	2:00 PM	6:00 PM	4	All
7/25/2014	6	Day Ahead	2:00 PM	6:00 PM	4	All
7/28/2014	7	Day Ahead	2:00 PM	6:00 PM	4	All
7/29/2014	8	Day Ahead	2:00 PM	6:00 PM	4	All
7/31/2014	9	Day Ahead	2:00 PM	6:00 PM	4	All
9/12/2014	10	Day Ahead	2:00 PM	6:00 PM	4	All

Appendix B: Peak Day Pricing (PDP) Plan, Monthly Bill Example

PDP Plan and Bill Example

The bill below is for a service account on a non-ag rate schedule. Even so, the example illustrates how bill credits would appear on a bill for service accounts on a rate schedule with PDP option.



ENERGY STATEMENT
www.pge.com/MyEnergy

Account No: 0000000000-0
Statement Date: 09/11/2014
Due Date: **09/30/2014**

Details of Electric Charges

08/09/2014 - 09/09/2014 (32 billing days)

Service For: 0000 0000000 00000
Service Agreement ID: 0000000000
Rate Schedule: A105X Medium General Demand-Metered Service - TOU
Enrolled Programs: Peak Day Pricing Plan

08/09/2014 - 09/09/2014

Customer Charge	32 days	@ \$4.59959	\$147.19
<u>Demand Charge</u>	186.240000 kWh	@ \$13.34000	2,484.44
<u>Energy Charges</u>			
Peak	9,371.040000 kWh	@ \$0.15910	1,490.93
Part Peak	13,429.600000 kWh	@ \$0.15237	2,046.27
Off Peak	25,082.240000 kWh	@ \$0.13191	3,308.60
<u>PDP Program Details</u>			
Maximum Demand Credits	186.240000 kW	@ -\$2.42000	-450.70
Peak Usage Credits	9,371.040000 kWh	@ -\$0.00721	-67.57
Part Peak Usage Credits	13,429.600000 kWh	@ -\$0.00721	-96.83
Off Peak Usage Credits	25,082.240000 kWh	@ -\$0.00721	-180.84
Event Day Charges	236.320000 kWh	@ \$0.90000	212.69
Energy Commission Tax			13.89
Total Electric Charges			\$8,908.07
Usage For This Period's Event Days (2PM to 6PM)			
09/09/2014	236.320000 kWh		

Service Information

Meter # 0000000000
Total Usage 47,862.880000 kWh
Serial P
Rotating Outage Block 50

Additional Messages

Time-Of-Use Customers: In 2014, Daylight Saving Time ends on November 3. To adjust for this, from October 27 – November 2, 2014 your time-of-use periods will begin and end one hour later.

This customer saved \$583 this month with PDP: \$796 in credits against \$213 in penalty charges

PG&E Automated Demand Response Program
Implemented by Energy Solutions and ASWB Engineering
1-855-866-2205 www.pge-adr.com
Last Updated November 2018

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Appendix C: PG&E ADR Project Example

Grower Profile The table below summarizes key facts about one of the growers who received incentives from PG&E ADR program.

Location	near Chico
Crops	almonds, walnuts
Water source	mostly groundwater, some surface water
Irrigation system	microirrigation, sprinklers
Irrigation scheduling	using remote soil moisture monitoring
DR experience	participated in DR manually prior to applying for ADR incentives

Project Summary

The ADR project had:

- 24 irrigation pumps, 30 hp to 200 hp,
- 544 kW approved load shed potential (or ~730 hp; combined from 24 irrigation pumps) and
- **\$92,000** total incentives to install pump controls covering 61% of project costs.

Details about participation in Demand Response (DR) program:

- Enrolled in Capacity Bidding Program (CBP) through NRG,
 - Participated in 16 DR events lasting 4 hours each in 2015 DR season and in 19 DR events lasting 1-4 hours in 2016 DR season,
 - Delivered 100% of committed load shed in 2015 and 2016 DR season, and
 - Receiving an estimated **\$18,500 per year** in ongoing CBP DR revenue.
-

Key Challenges

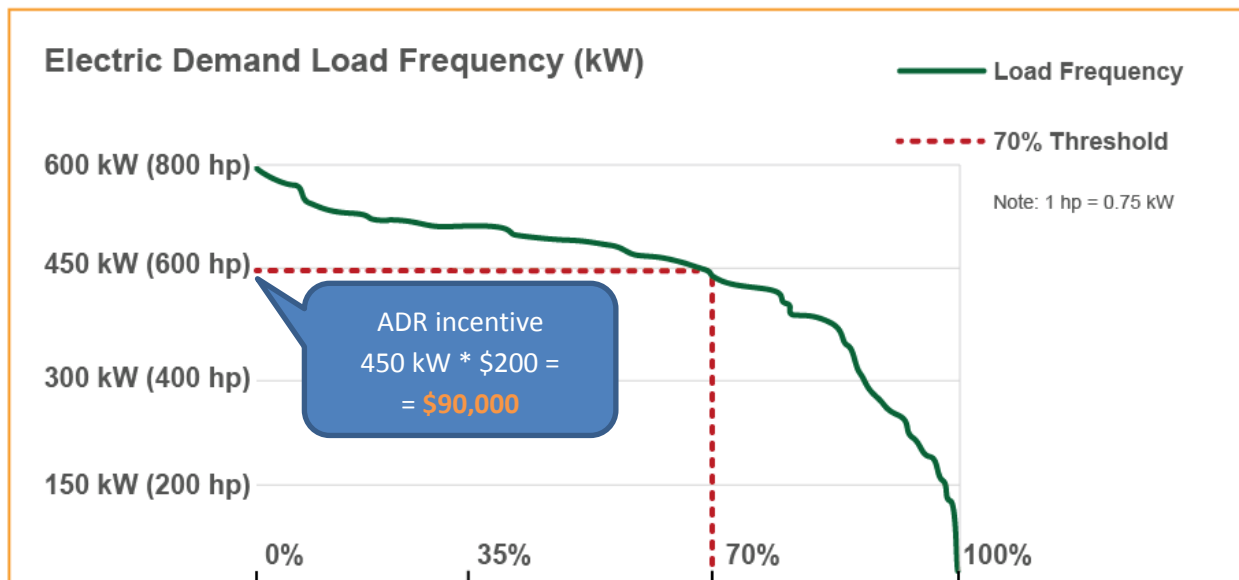
Key challenges for this ADR project included:

- Selecting the combination of pumps to maximize the potential load reduction during a DR event,
 - Selecting and integrating technology to not only automate pumps, but also to provide farm telemetry to use as a platform to collect data on other equipment, facilities, weather, and soil moisture.
-

Appendix D: Methodology to Calculate PG&E ADR Incentive

Methodology The following table summarizes the methodology to calculate ADR incentive.

Step	Description
1	Calculate 10-day baseline load values for each day in the given DR season(s), based on average of actual electric load for the 10 preceding non-holiday, non-DR event weekdays in the DR program time window.
2	Order the 10-day load values from the greatest to smallest for May-October period. For each 10-day load value, calculate corresponding percent of likely DR events (based on the probability of DR events within each month). For example, July and August are weighted more heavily, with 63% of likely events, than May and June with 11% of likely events.
3	Create Load Frequency chart (below).
4	ADR incentives are calculated based on the 10-day load value that is exceeded 70% of likely DR events. Incentive Amount = kW load value at 70% x \$200 <i>Note: kW value at 70% is also referred to as calculated DR load reduction in this document.</i>



Appendix E: Assumptions to Estimate Ongoing DR Revenue

Key Assumptions

Example

As an example for illustration purposes, for a portfolio of 10 pumps with combined power draw of 1,000 kW (equivalent to 1,340 hp) and 300 kW of calculated DR load reduction, a grower might receive \$16,000 to \$33,000 per year in bill credits participating directly with PG&E in Peak Day Pricing DR program, or \$10,000 per year in cash participating through an aggregator in Capacity Bidding DR program.

Key Assumptions (in the above example)

- The estimate of DR load reduction is based on actual pump use between May 1st and October 31st, in the DR program time window.
- The lower limit for Peak Day Pricing (PDP) estimate assumes all pumps are switched from Ag-4C to Ag-4C rate with PDP option.
- The upper limit for PDP estimate assumes: i) all pumps are switched from Ag-5C to Ag-5C rate with PDP option, ii) all pumps have 0 kW capacity reservation level.
- Both lower and upper limit for PDP estimate assume pumps are not used during DR events when super-peak charge applies.
- The Capacity Bidding Program estimate assumes equal split of DR revenue between an aggregator and a grower.

Actual amounts will vary depending on specifics of participating pumps and aggregator contract.

Appendix F: Other Options for Receiving Demand Response (DR) Ongoing Revenue

Other Options for DR Revenue

It should be noted that growers could receive Demand Response (DR) ongoing revenue not only by participating automatically, but also by participating manually or semi-automatically in a DR program. The graphic below summarizes three different options for participating in one or more DR programs.

It should also be noted that ADR incentives are available only for the automated participation. The ADR program requires participation in at least one qualifying DR programs. Other DR programs exist besides the DR programs eligible for ADR funding.

