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Agenda


- **65 minutes: Nexant presentation**
 - Metering Pilot **Background**
 - Metering Pilot **Summary**
 - Metering Pilot **Customer Experience**
 - Metering Pilot **Results**
 - Verification Administrator's **Recommendations**
- **30 minutes: Comments and Q&A**

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Metering Pilot Background




- **CPUC Decision 16-09-056 directed the prohibition** of the use of certain fossil-fueled power generation resources to produce load reductions for IOU DR programs or DRAM products (**Prohibition**):
 - Distributed generation technologies (topping-cycle CHP or non-CHP) fueled by diesel, natural gas, gasoline, propane, or liquefied petroleum gas¹ (**Prohibited Resources (PRs)**)
- **Prohibition is effective January 1, 2019**
- **Prohibition applies** to all participants of:
 - Agricultural Pumping-Interruptible (**AP-I**) Program
 - Base Interruptible Program (**BIP**)
 - Capacity Bidding Program (**CBP**)
 - IOU **DR pilots**
 - **DRAM products**

¹: Exempted are pressure reduction turbines, waste heat-to-power bottoming cycle CHP, storage, and storage coupled with renewable generation that meets standards adopted for the SGIP. ³

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Metering Pilot Background




- **D.16-09-056 also directed the IOUs to develop an audit verification plan (Verification Plan)** to evaluate whether affected DR program participants are complying with the Prohibition
 - Approved with modifications by CPUC Resolution E-4906
- **Verification Plan proscribes annual audit activities**, carried out on a random sample basis, varying according to PR disposition at the DR participants' premise, attested to by the customer:²
 - **Scenario 1:** No PR onsite
 - **Scenario 2:** PR(s) onsite, won't use to reduce load during DR events
 - **Scenario 3:** PR(s) onsite with ____ kW nameplate capacity, needed to use for safety, health, or operational reasons during DR events

²: Residential participants of DR programs affected by the Prohibition are not required to sign attestations.⁴

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Metering Pilot Background



- **Verification Plan relies on querying currently existing information** sources for the annual audit
 - In the case of Scenario 2 customers, the existing information source leveraged for audit are operating manifests required to be kept for most PRs


- **E-4906 also directed the IOUs to conduct a Metering Pilot** to test installation of data collection devices that record when PRs are used
 - Electronic data collection may be a more reliable information source for audit than operating manifests

- **Nexant is retained by SCE on behalf of the IOUs:**
 - Carry out the Verification Plan in 2019 and 2020
 - Conduct the 2019 Metering Pilot

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Metering Pilot Summary



The 2019 Metering Pilot was carried out according to the following specifications as directed by E-4906:

- Install data collection equipment on the PRs of 10% of Scenario 2 DR participants
- Half of the installations data loggers and half interval meters
- Participants belonging to three specific use-case scenarios must be included in the pilot:
 - Use Case 1: No discretionary load for shed during DR events
 - Use Case 2: PR is used for baseload generation
 - Use Case 3: PR is not connected to the IOU's distribution system
- Collect data through September 27, 2019
- Exclude IOU DR pilot participants


The Metering Pilot was implemented with the following additional design requirements:

- All onsite PRs to be monitored, using consistent data collection device types
- Evenly distribute installations by IOU service territory
- Exclude DRAM and LCR participants

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Metering Pilot Summary



The universe of attesting DR program participants, current April 2019 is comprised of 3,023 service accounts

- Excludes residential, DR pilot, LCR contract, and DRAM participants:

IOU	Scenario 1 Service Accounts	Scenario 2 Service Accounts	Scenario 3 Service Accounts	Total Service Accounts
SCE	1,498	145	30	1,673
PG&E	988	162	6	1,156
SDG&E	155	38	1	194
Total	2,641	345	37	3,023


IOU	Scenario 2 Customers	Scenario 2 Service Accounts
SCE	82	145
PG&E	38	162
SDG&E	4	38
Total	124	345
10% Sample Size Target		35

- 345 total eligible participants: 10% sample = 35 Metering Pilot participants

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Metering Pilot Summary



- Nexant's partner Mad Dash, Inc. contacted customers representing 61 service accounts** for participation the pilot
- Contact initiated with an introduction letter** explaining the pilot's mandate and providing an IOU or aggregator point of contact if the customer has questions or wants to verify authenticity
- Customer contacts representing 38 service accounts resulted in successful installations**, the remaining contacts with 23 service accounts did not.
- 68% of installations were complete by May 1**, 95% of installations complete by May 15, last install was May 23. The first event for the affected programs called after April 1 was June 10.


Device Type	Number of Devices Installed	Number of Sites Installed	% of Sites Installed by Device Type
Data logger	26	19	50%
Interval meter	32	19	50%
Total	58	38	

PR Fuel	Count
Diesel	42
Fuel cell	12
Natural gas/LP	1
Unknown	1
Total	56

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Metering Pilot Summary



Summaries of customer characteristics of the 38 installations:

IOU	Number of Devices Installed	Number of Sites Installed	% of Sites Installed by IOU	% of All Scenario 2 Sites by IOU
SCE	24	19	50%	42%
PG&E	18	12	32%	47%
SDG&E	16	7	18%	11%
Total	58	38		

DR Program	Number of Devices Installed	Number of Sites Installed	% of Sites Installed by Program	% of All Scenario 2 Sites by Program
AP-I	7	7	18%	3%
BIP	16	12	32%	36%
CBP	35	19	50%	61%
Total	58	38		


Installation counts by Use Case won't sum to 58 devices or 38 service accounts

Use Case	Number of Devices Installed	Number of Sites Installed
Use Case 1: No discretionary ("other") on-site load available to reduce during DR events	24	12
Use Case 2: PR is used for baseload generation	10	9
Use Case 3: PR is not connected to utility distribution system	31	24

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Metering Pilot Summary



More summaries of customer characteristics of the 38 installations:


Industry Group	Number of Devices Installed	Number of Sites Installed	% of Sites Installed by Industry Group	% of All Scenario 2 Sites by Industry Group
Agriculture, Mining, and Construction	2	2	5%	6%
Manufacturing	8	7	18%	17%
Wholesale, Transport, and Other Utilities	9	8	21%	12%
Retail Stores	31	16	42%	32%
Offices, Hotels, Finance, Services	7	4	11%	31%
Schools	0	0	0%	1%
Institutional/Government	0	0	0%	1%
Other or Unknown	1	1	3%	1%
Total	58	38		

Number of Devices Installed by PR Nameplate Capacity	Device Type		Number of Devices Installed
	Data Logger	Interval Meter	
< 100 kW	1	4	5
100 kW < X < 500 kW	29	18	47
500 kW < X < 1 MW	2	3	5
1 MW < X < 2MW	0	1	1
2 MW < X < 3 MW	0	0	0
> 3 MW	0	0	0
Total	32	26	58

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Metering Pilot Summary



Data Loggers: Simple devices that record data over time through detection devices attached to it. The detection devices used in the Metering Pilot are current transformers (CT) which detect the flow of electric current.

- Battery operated
- Installed inside or near the electrical cabinet of the ATS (if PR is a BUG) or disconnect (if PR is a fuel cell)
- Connected to a single CT (either split-core or coil)
- Memory to store at least a year of data
- No communications


Interval Meters: More sophisticated than data loggers, they specifically calculate and record power measurements over time as calculated through detection of both voltage (using electric leads) and current (using CTs)

- Installed inside or near the electrical cabinet of the ATS (if PR is a BUG) or disconnect (if PR is a fuel cell)
- Connected to 3 CTs on all three phases (either split-core or coil) and electric leads to a voltage reference (also powering the device)
- Memory to store at least a year of data
- No communications

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Metering Pilot Summary




- While the 50-50 split by data collection device type was ultimately met, **we had to work around site conditions at five installation sites that precluded safe and timely installation of interval meters:**
- **Customer would not permit access to ATS without shutting down power to the site:**
 - In some cases, customer site safety rules do not even permit opening the ATS cabinet without a shutdown
 - In other cases, even if access to the ATS was granted, working with live voltage to connect the interval meter leads was not permitted by the customer without a shutdown
 - Three sites presented this situation to MDI electricians. In all three cases they were able to install data loggers, which do not require a voltage reference
- **ATS is unsafe for obtaining voltage reference:**
 - In the case of two sites, the ATS configuration or condition was such that even with a shutdown, there was not a way to safely establish a voltage reference. In these two cases the MDI electrician successfully installed a data logger

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Metering Pilot Summary




- **We could not complete any installation (either data logger or interval meter) on three PRs – all fuel cells:**
 - These three fuel cell disconnect cabinets were sealed by the utility and could only be unsealed by utility staff.
- **Other data collection barriers encountered:**
 - One data logger found to be missing upon the return visit for retrieval

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Metering Pilot Summary



Equipment, installation, and retrieval costs for the Metering Pilot totaled \$109,280...

	Data Loggers	Interval Meters
Total Equipment Costs	\$9,200	\$25,060
Total Installation Costs	\$24,250	\$28,750
Total Retrieval Costs	\$8,740	\$13,280
Total Sites	19	19
Total PRs	25	28
Total Devices	26	32
Subtotal	\$42,190	\$67,090
Grand Total	\$109,280	

... representing \$2,221 per average data logger site and \$3,531 per average interval meter site

	Data Loggers	Interval Meters
Cost per Site	\$2,221	\$3,531
Cost per PR	\$1,688	\$2,396
Cost per Device	\$1,623	\$2,097

These costs don't include developing the participation recruitment list, customer contact and scheduling, procuring equipment, training and dispatch of field staff, disposition reporting, and data analysis and reporting

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Metering Pilot Customer Experience

- **Installation and removal time** is a primary customer-facing difference between data logger and interval meter installations on PRs:

Activity	Data Logger (minutes per site)	Interval Meter (minutes per site)
Installation	106	176
Removal	32	51

- **Nexant surveyed Metering Pilot participants** immediately following the data collection device installations
- **Mode and scope:** Telephone and email, 5 questions
- **Response rate:** 64%

Equipment Type	Responses	Response Rate
Data Loggers	11	79%
Interval Meters	2	38%
Loggers and Meters	1	100%
Total	14	64%

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Metering Pilot Customer Experience 2


Key findings from the customer survey:

- **All but one respondent (13 of 14) reported no issues with scheduling** data collection equipment installation
 - One respondent reported that the originally scheduled appointment had to be cancelled and that the rescheduled visit surprised them
- All 14 respondents stated that there were **no problems while MDI's electrician or technician was on site** doing the installation.
- When asked if they had any suggestions for improvement to the installation process, **three suggestions were made** by three separate respondents:
 - Increase the lead time between initial notification and installation
 - Provide notice at the time of scheduling of access and shutdown requirements
 - Concern that the electrician did not have proper PPE to work inside live gear (concerns were allayed by installing a data logger instead of interval meter)

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Metering Pilot Results




- **Our analysis was structured to answer the following questions:**
 - **How do DR participants currently use their PRs?**
 - Do they vary in consumption pattern depending on whether the PR is used for baseload, if the customer has no discretionary load shed, or if the PR is not connected to the grid?
 - **Are the PRs used during outages of IOU-supplied electric service?**
 - **Are the PRs used during DR events?**
 - **If PR(s) is/are used during a DR event, is the participant also delivering load impacts to the IOU?**
 - If so, is there evidence that the PR use was for the purpose of producing the load impacts?

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Metering Pilot Results




Data Received for Metering Pilot Customers

Loggers & Meters	Whole-Building AMI	Participant Data
<ul style="list-style-type: none"> ▪ Loggers <ul style="list-style-type: none"> — Measure whether PR is operating, no kW in 5-min intervals — 26 loggers installed, 23 yielded usable data — 2 had unusable data, 1 missing ▪ Meters <ul style="list-style-type: none"> — Measure kW produced by PR in 5-min intervals — 32 meters installed, 31 yielded usable data — 1 incorrectly calibrated 	<ul style="list-style-type: none"> ▪ 3 years of hourly interval data for all metering pilot participants <ul style="list-style-type: none"> — Jan 2017-Sept 2019 ▪ Some truncated data due to account openings and closings ▪ Outage data also provided by premise during this period 	<ul style="list-style-type: none"> ▪ Customer Characteristics ▪ DR participation data ▪ Event Dispatch information ▪ Weather & System Load

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Metering Pilot Results



Analysis Steps:


1. Clean Logger, Meter, Whole-premise, and customer characteristics Data
2. Estimate load impacts for participants on event days
Identify event-like days (proxy days) to assess baseline operations
3. Identify baseline PR operating patterns on proxy days
4. Identify PR operating patterns on event days
5. Assess the degree to which participants use their PRs to provide load impacts

Date	DR Events Dispatched			Number of Metering Pilot Participants Participating in DR Event		
	SCE	PG&E	SDG&E	SCE	PG&E	SDG&E
6/10/2019			CBP	0	0	2
6/11/2019	CBP		CBP	2	0	2
6/12/2019	CBP		CBP	2	0	0
7/23/2019	CBP		CBP	0	0	2
7/24/2019	CBP		CBP	0	6	2
7/25/2019	CBP	CBP	CBP	0	0	2
8/5/2019	CBP		CBP	2	0	0
8/6/2019	CBP			2	5	0
8/14/2019	CBP	CBP	CBP	2	5	2
8/15/2019	CBP	CBP	CBP	2	5	0
8/26/2019	CBP			2	0	0
8/27/2019	CBP	CBP	CBP	14	0	2
8/28/2019	CBP			2	5	2
9/3/2019	CBP			2	0	0
9/4/2019	AP4, BP, CBP		BIP, CBP	2	0	0
9/5/2019	CBP	CBP	CBP	2	0	0
9/6/2019	CBP		CBP	0	5	0
9/8/2019	AP-1, BIP			0	8	2
9/9/2019	CBP			0	5	2

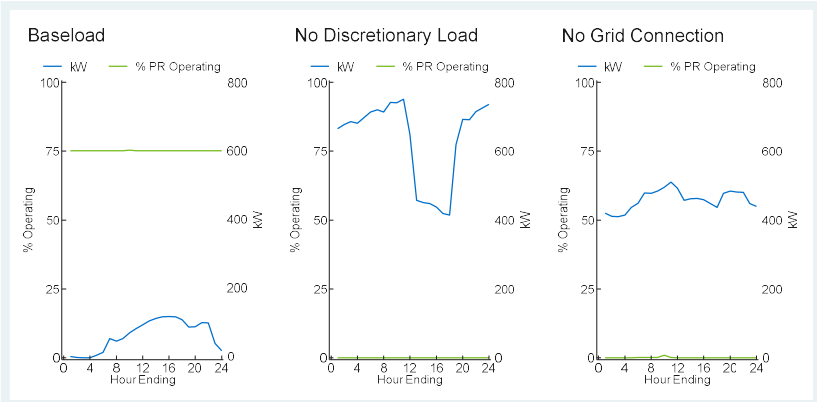
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Metering Pilot Results




Proxy days are summer weekday, non-holiday days in 2019 with similar weather conditions as the event days



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Metering Pilot Results



Are Customers Using Their PRs during Outages? Events?

Outages

- The Metering Pilot concluded prior to onset of 2019 PSPS outages
- Very few outage hours generally for metering pilot participants (59 out of ~140,000 customer-hours)
- 4 hours of the 59 had PR operations
- 2/4 hours are associated with baseload operation customers

IOU	# of Customer Outage Hours	# of Customer Outage Hours where PR Ran
SCE	57	2
PG&E	0	0
SDG&E	2	2


Events

- 37 customers were dispatched at least once for an event across 19 unique event days
 - Multiple events could be called at multiple IOUs per day
- 155 customer event hours
- 27 event hours associated with PR use
 - 3 hours where PR appears to be used for DR
 - Remaining 24 appear to be base load PR generation

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Metering Pilot Results



The evaluation team was successful in determining that data loggers and meters could be used to identify PR use during DR events


Specific considerations for the technology used going forward:

Consideration	Data Logger	Interval Meter
Strengths	<ul style="list-style-type: none"> Can nearly always be successfully installed. In the case of fuel cell disconnects, a coordinated visit between field technician and IOU technician may be required if the fuel cell disconnect is under IOU seal. Installations are easy on the customer – fast and simple. Data loggers are inexpensive. 	<ul style="list-style-type: none"> Can definitively inform an evaluator whether a PR is used differently on DR event days versus non-event days.
Weaknesses	<ul style="list-style-type: none"> Unless a PR is nearly never used to serve load, data loggers cannot definitively inform an evaluator whether a PR is used differently on DR event days versus non-event days. Ease of installation also means that it is more likely that data loggers "disappear" while in the field. 	<ul style="list-style-type: none"> Installations are hard on the customer – obtaining a voltage reference may require shutting down electric service for safe installation (or to simply comply with customer access policy). Interval meters are more expensive than data loggers.

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Verification Administrator's Recommendations




- **Nexant does not recommend that all Scenario 2 DR participants be required to install monitoring equipment at their own expense and to be maintained at their own expense going forward.**
 - Requiring customers to install and maintain PR monitoring equipment would likely be a barrier to program participation.
 - Many customers will likely not develop the know-how that is required to successfully maintain data collection equipment in proper working order over time.
- **Nexant does not recommend that all Scenario 2 DR participants be required to permit their IOU, DRP, or the VA to install monitoring equipment as a condition of participation.**
 - The level of effort for the IOUs, DRPs, or VA to maintain a permanent census fleet of monitoring equipment as customers join/leave programs would be significant.
- **Nexant recommends that an amended Verification Plan require a random sample of Scenario 2 DR participants to be selected for monitoring each year.**
 - This random audit approach mimics the same encouragement mechanism used by the rest of the Plan's audit mechanisms to develop and encourage compliance.
 - It is important to conduct a true random sample each year – even if a customer is randomly selected for audit one year, they are also eligible for random selection for audit in any subsequent year they are participating in a DR program.

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Verification Administrator's Recommendations




- **Nexant recommends that the default monitoring equipment be interval meters, and to use data loggers in cases where the installation of interval meters is not possible.**
 - We recommend that shutdowns for installation/retrieval or coordination with the IOU be enforced to facilitate interval metering installation if necessary.
- **Nexant recommends that interval data recorded internally by the PRs be used in lieu of installing external data collection devices.**
 - The most problematic installations encountered during the Metering Pilot were fuel cells – fuel cells were also the PR type that were found to consistently be equipped with on-board metering.
- **We recommend all PRs at sampled customer premises be monitored.**
 - Not being able to monitor just one of multiple PRs makes it impossible to rule out use of PRs for DR load reductions.
- **Nexant recommends that the attestation forms be amended to provide a field for the customer to provide a point of contact that is knowledgeable of their PRs' operations and that can be directly contacted in the case of audit.**

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Pros and Cons of Census Monitoring



[Requiring IOU/DRP/VA to install PR monitoring equipment as a condition of DR participation](#)

Pros

- **Records of all participants' PR usage would exist at all times**
 - Would accrue the benefit of further encouraging all DR participants to comply with the Prohibition
 - All violations would be identified each year, not only those selected in a sample


Cons

- **Cannot realize VA cost savings through sampling:**
 - To realize the all "Pros" outlined above, all devices would need to be probed each year to get the data, not just a sample
 - Increased VA costs (relative to sampling approach) to download data each year from all customers and to conduct analysis on all customers
- **To achieve a true census, equipment would need to continually (quarterly, monthly?) be placed in field and removed from field**
 - Significant project management costs associated with managing enrollment and unenrollment and placing equipment in field/removing equipment.
 - In the case of IOUs/DRPs installing the equipment, significant inter-party coordination in the VA getting the data from all the parties (IOUs/DRPs)

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Pros and Cons of Sample Monitoring



[Randomly sampling a selection of DR participants for PR monitoring each year](#)

Pros

- **Predictable VA costs that can be budgeted in advance for a given sample size**
- **Significantly lower costs due to:**
 - Lower project management and coordination costs
 - Significantly fewer installations
 - Many fewer excursions into field due to customers joining/leaving programs throughout the year
- **A monitoring sample can still provide a robust estimate of the compliance rate**

Cons

- **Records of all participants' PR usage would exist only for a sample of customers**
 - Would accrue the benefit of further encouraging the **sampled** DR participants to comply with the Prohibition
 - The possibility of being sampled the next year introduces a "hassle factor" that encourages customers to implement compliant practices all the time rather than adjusting operations to respond to presence of monitoring each year
- **Only violations of sampled customers would be identified each year**

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