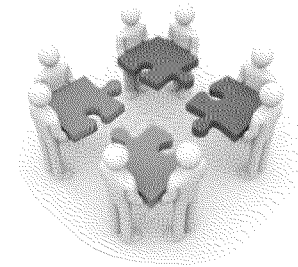




CPUC Energy Division/ PG&E Meeting Demand Response

March 6, 2014



PG&E Confidential



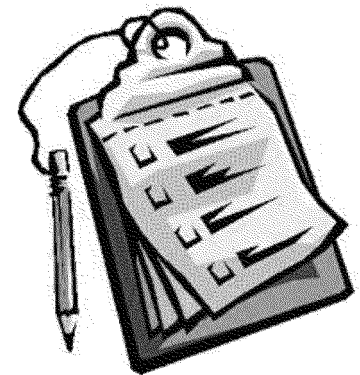
Meeting Agenda and Objective

Objective

The goal for this meeting is to provide an overview of Olivine's study of DR integration into the CAISO market with focus on PG&E's DR programs as well as a discussion of how the Implementation of Rule 24 will aid in the integration process.

Agenda

- ✓ Rule 24 Implementation
- ✓ Olivine Study of PG&E's DR Programs
- ✓ Q&A
- ✓ Next Steps





Preliminary - FOR DISCUSSION PURPOSES ONLY Rule 24 Implementation Overview

- Beginning this summer (2014), PG&E will be able to support limited 3rd party DR bidding into the wholesale market.
- PG&E expects to be able to accommodate mass market participation by 2017.
- In June, PG&E will file its cost recovery application to fund the critical elements needed to fully implement Rule 24.
- PG&E's IRM2 pilot may be a viable short term alternative for customers and aggregators to participate in the CAISO market.





Preliminary - FOR DISCUSSION PURPOSES ONLY

Rule 24 Implementation

2014	<ul style="list-style-type: none">• Up to 20 commercial service agreements or 30 commercial meters• 2 DRPs• Up to 50MW across a maximum of 6 total resources where PG&E is the LSE
2015	<ul style="list-style-type: none">• Up to 100 commercial service agreements or 150 commercial meters• 5 DRPs• Up to 50MW across a maximum of 6 total resources where PG&E is the LSE
2016	<ul style="list-style-type: none">• Up to 500 commercial service agreements or 750 commercial meters• Unlimited number of DRPs and Resources
2017	<ul style="list-style-type: none">• Rule 24 available to open market• Transition to automated process is completed

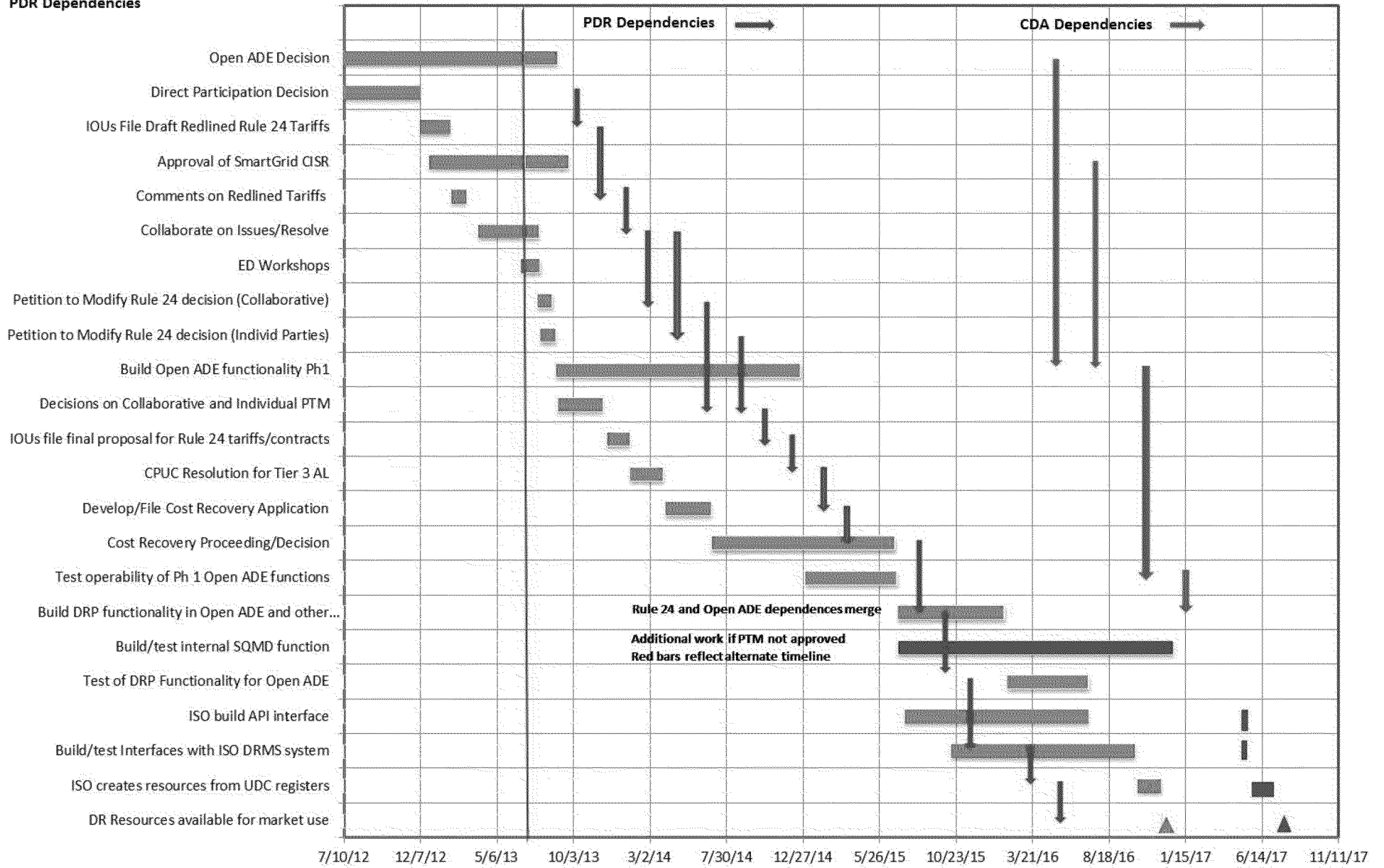
PG&E's ability to manually implement Rule 24 is volume constrained. As such, the availability is limited until various systems are built and tested. The estimated numbers above are highly dependent on the following assumptions.

- ✓ Approval of Rule 24 Cost Recovery Application by mid-2015
- ✓ Availability of CAISO's application program interface (API), Rule 24 functionality in CDA and PG&E's forecast engine (2016)
- ✓ Availability of additional data storage, automatic PDP disenrollment, My Energy (2017)



Gantt Chart

PDR Dependencies





Preliminary - FOR DISCUSSION PURPOSES ONLY

Rule 24 Implementation – IRM2

- Participation in PG&E’s IRM2 pilot may be preferable to “Direct Participation” for many customers and aggregators until the wholesale market is more developed.
- DRP and IOU roles and processes are very similar to those found in Rule 24. However, IRM2 provides the following benefits as compared to the current Direct Participation structure.
 - ✓ Participants needn’t obtain or develop their own tools to calculate SQMD, register, bid and settle with the CAISO.
 - ✓ Participants are compensated for DR capacity, which provides the vast majority financial incentive for DR load drop.





Preliminary - FOR DISCUSSION PURPOSES ONLY Rule 24 Implementation Summary

- PG&E can begin processing Rule 24 applicants this summer and over the next 3 years will expand its ability to accommodate larger volumes of customers.
- To accommodate a large volume of customers (> 100), certain IT systems must be in place to automate the process. These systems and their costs will be identified in our June cost recovery filing.
- PG&E is on schedule with the October 2013 “Gantt Chart” it provided to the Commission. Better estimates of certain components in the timeline will soon be available.
- As a alternative, DRPs may gain market experience with little cost and at full compensation levels by participating in this pilot until the market is more fully developed.





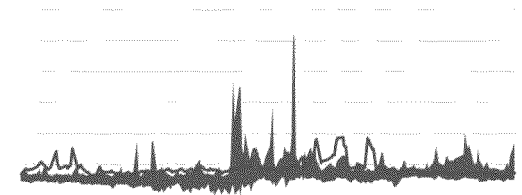
Olivine Study - Executive Summary

PG&E recognizes that the integration of DR with the CAISO wholesale markets is an important policy objective for California.

As we continue to discuss and implement strategies for broader-scale integration (in the DR OIR and the 2017+ DR Applications), PG&E is already working to advance this policy objective through practical, near-term actions.

- IRM Pilot (Phase 2) and proposal to continue/expand the IRM Pilot during 2015-2016 “bridge” period
- Olivine assessment of program “fit” with CAISO markets and contractual option to pursue implementation of select opportunities in the 2014-2016 timeframe

PG&E and Olivine are currently working closely to finalize an integration plan for 2014-2016; we would like to share some useful context from the Olivine report today and return in 3-4 weeks to discuss an integration plan for 2014-2016.

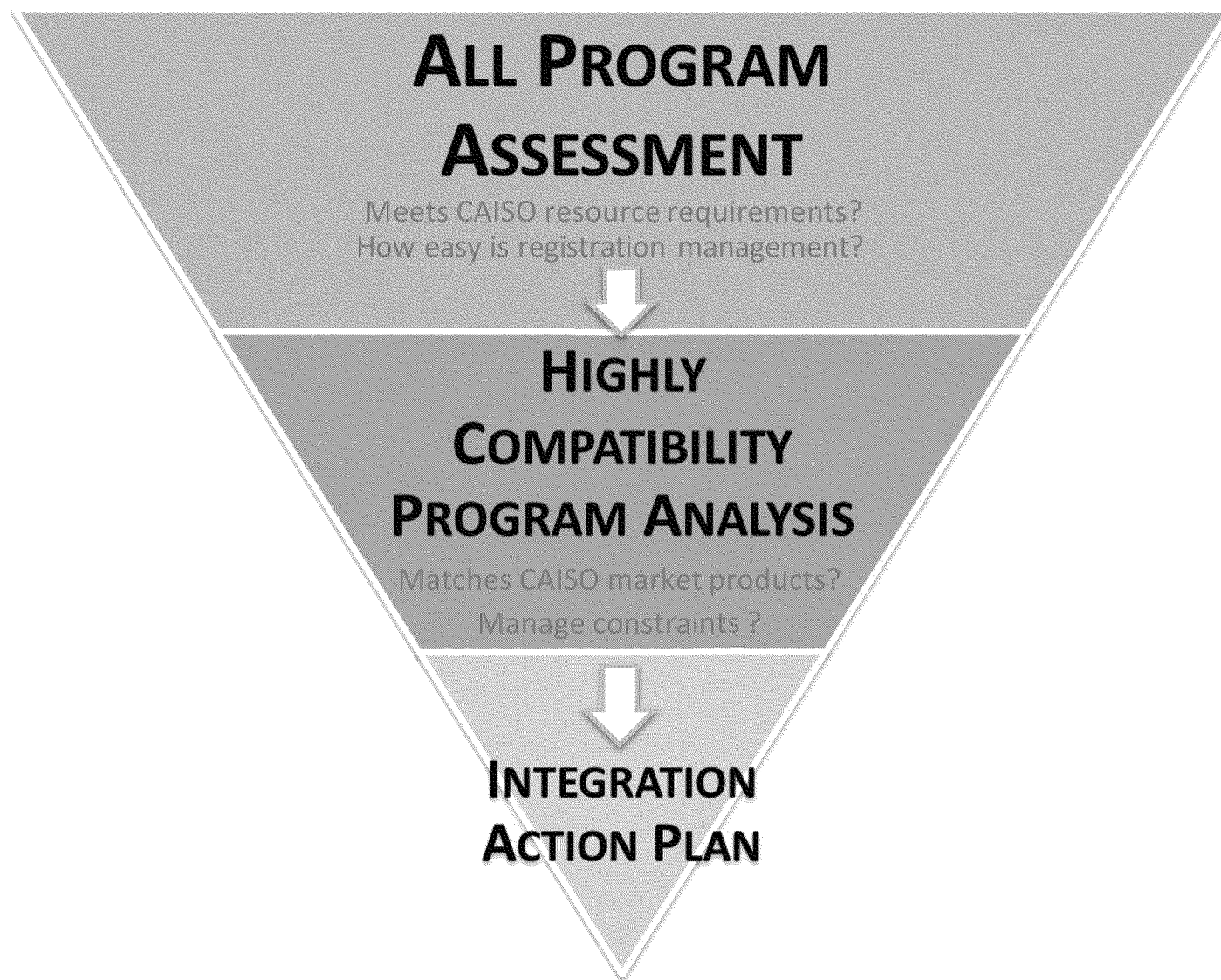




Report Structure

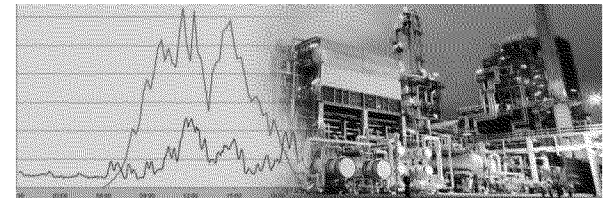
- **Situational Analysis/Background**
 - Context, Education and all Program-Reference
- **Program Analysis**
 - Assessment of Program Portfolio
 - Evaluation of Highly Compatible Programs
- **Roadmap**
 - Recommendations for Integration
 - Roadmap for Implementation Plan





Findings - Common Items

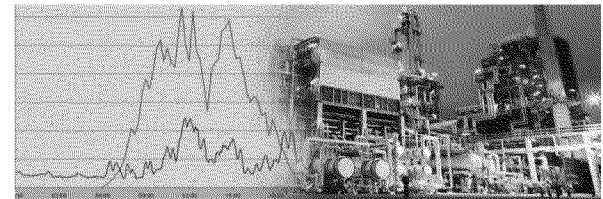
- PDR and RDRR require participants to be separated by sublap.
- PDR and RDRR require participants to be separated by LSE / ESP / CCA.
Issue: None of PG&E's current programs adequately separate participants.
- PG&E must enter into an agreement with an ESP / CCA before we can bid the ESP's / CCA's customers.
Outstanding Question: Can PG&E issue an event to an LSE's / CCA's customers for a market award that does not involve its customers?
- A PDR is subject to marginal dispatch.
Issue: None of PG&E's current programs adequately adjust the amount of delivered MW.
- Obtaining meter data to meet CAISO's submittal timelines.



BIP – CAISO's Real Time Energy under RDRR

- Comparatively stable and small participant base.
- Market orders are for a 5 minute duration.
- Advisory notice 40 minutes before the first binding 5 minute interval.
- Binding notice issued 2.5 minutes before the first 5 minute interval.
- All subsequent orders are 2.5 minutes before the 5 minute interval.
- Requires integration with CAISO's Automated Dispatch System.

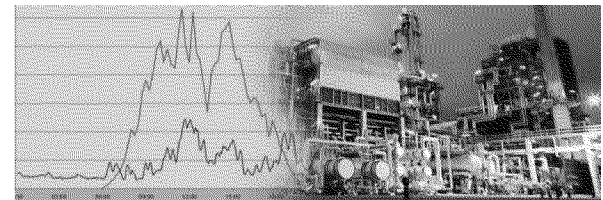
See Table 5 Potential BIP Resources by Sub-LAP on page 21 of the confidential study filed pursuant to Public Utility Section 583.



CBP Day-Ahead - CAISO's Day-Ahead Energy under PDR

- Moderate sized number of participants.
- CBP does not scale well to account for marginal dispatch.
- CBP's performance measurement over multiple sublaps conflicts with the CAISO's sublap by sublap performance measurement.
- CBP nominations are due 5 days before the start of the month. CAISO's processes require approximately 2 weeks.
- If one CBP based resource receives a market award, then all CBP portfolios with like attributes must be dispatched (i.e. same CBP product and same sublap).
- Primary event trigger is detached from the CAISO's market processes.

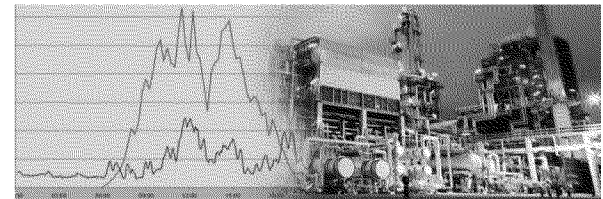
See Table 6 CBP Day-Ahead 1-4 Hour Resources by Sub-LAP on page 23 of the confidential study filed pursuant to Public Utility Section 583.



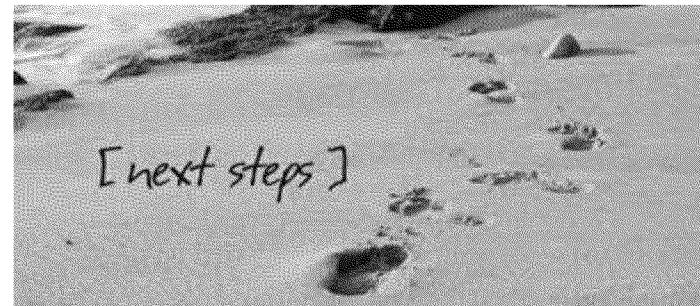
AMP Day-Of -- CAISO's Day-Ahead Energy under PDR

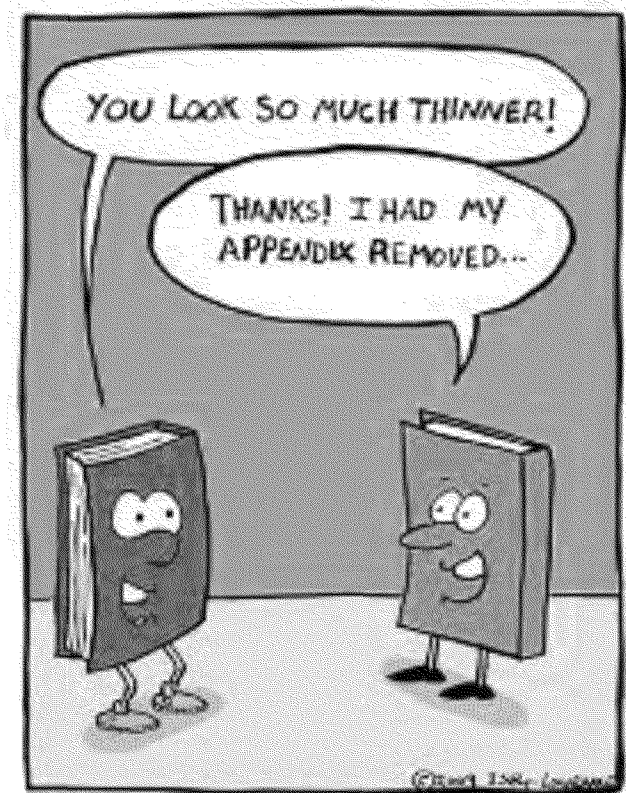
- Large number of participants. Very difficult to manage without API.
- AMP does not scale well to account for marginal dispatch.
- AMP's performance measurement over multiple sublaps conflicts with the CAISO's sublap by sublap performance measurement.
- AMP nominations are due 5 days before the start of the month. CAISO's processes require approximately 2 weeks.
- If a AMP based resource receives a market award, then all the entire AMP portfolio for that sublap must be dispatched.
- Current event triggers are detached from the CAISO's market processes.

See Table 7 Potential AMP Resources by LCA using September Nominations as Proxy on page 24 of the confidential study filed pursuant to Public Utility Section 583.



- Identifying next topics and dates for ongoing CPUC ED - PG&E DR discussion





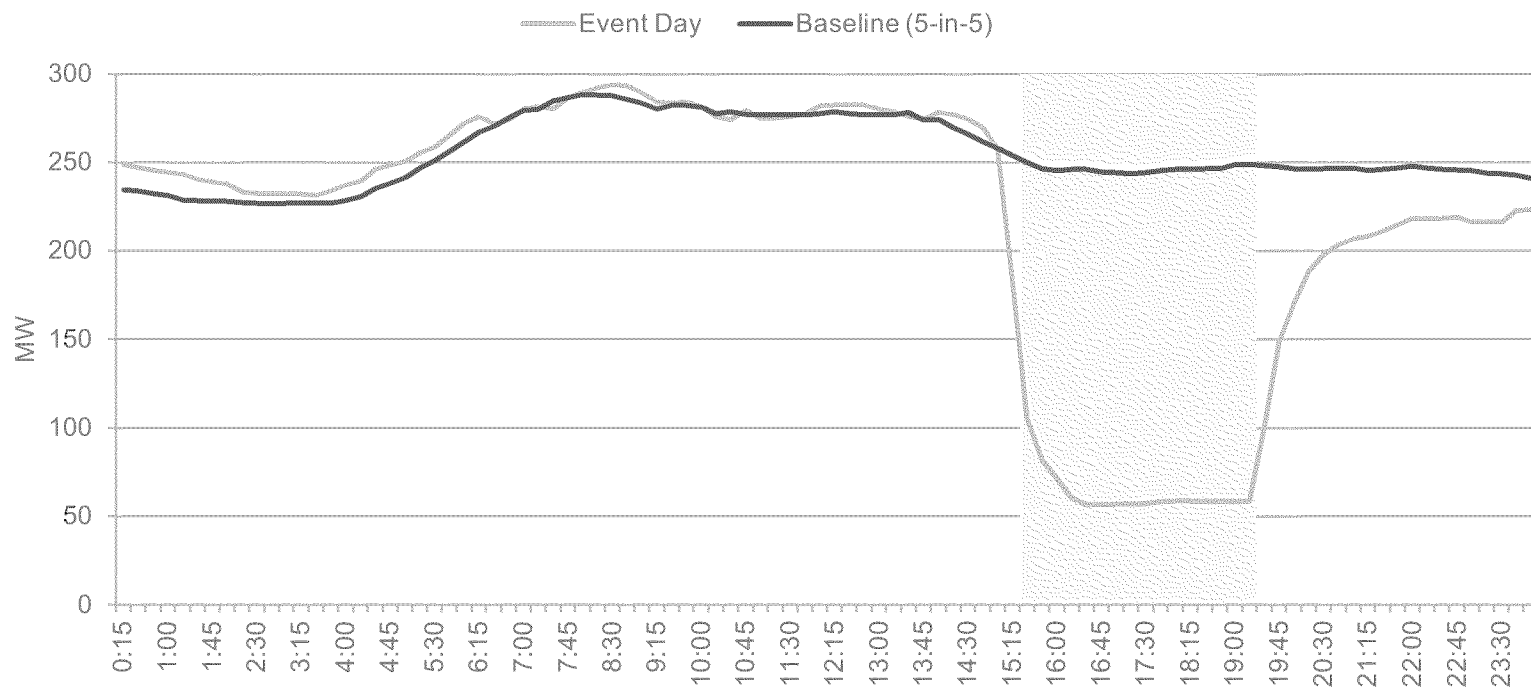


Comparison of Rule 24 and IRM2 Pilot

	Rule 24 - Direct Participation	Current Intermittent Resource Management Pilot 2 (IRM2)
Enablement	<ul style="list-style-type: none"> • DRPs required to obtain their own non-IOU Scheduling Coordinator (SC) • DRPs needs to obtain or create tools to calculate SQMD, register, bid, and settle with ISO 	<ul style="list-style-type: none"> • PG&E provides DR resource owners (Aggregators, CCA/ESP, Customers) the registration, bid and settlement platforms and SC to interact into the CAISO market.
Roles and Operations	<ul style="list-style-type: none"> • DRPs determine how many MWs (who) to bid in, when to bid in, and at what price. • PG&E's role is to verify registrations and disseminate data. 	<ul style="list-style-type: none"> • DRPs determine how many MWs (who) to bid in, when to bid in , and at what price within a given range. • PG&E's role is to verify registrations, disseminate data and compensate (capacity) DR resource owner for load drop
Must Offer Obligations (MOO)	<ul style="list-style-type: none"> • None. <ul style="list-style-type: none"> ✓ DRPs can bid energy reductions into the CAISO at anytime when price above NBT. ✓ No assurance that the DR resource will bid-in when it's needed most. Not a great incentive to drop load. 	<ul style="list-style-type: none"> • Yes, given pre-specified parameters <ul style="list-style-type: none"> ✓ DRP has a monthly bid requirement of 72 hours per month. ✓ A bid price ceiling and floor (NBT) ✓ Economically encouraged to bid in to keep capacity payments
DRP Incentives (Example)	<ul style="list-style-type: none"> • DRPs will receive the LMP from the CAISO for energy reduction. <ul style="list-style-type: none"> ✓ 1 MW (load reduction) x \$100 MWH (CAISO LMP) = \$100 for load drop ✓ No capacity payments since there are no MOO requirements ✓ Total incentive = \$100 	<ul style="list-style-type: none"> • DRPs will receive the LMP from the CAISO for energy reduction. <ul style="list-style-type: none"> ✓ 1 MW (load reduction) x \$100 MWH (CAISO LMP) = \$100 for load drop ✓ PG&E to provide DRP with \$10,000 per MW-Month capacity payment for meeting MOO. Capacity payment = \$10,000 ✓ Total incentive: \$100 energy payment + \$10,000 capacity payment = <u>\$10,100</u>



2/6/14 BIP Event



- PG&E's load reduction vs. forecast:

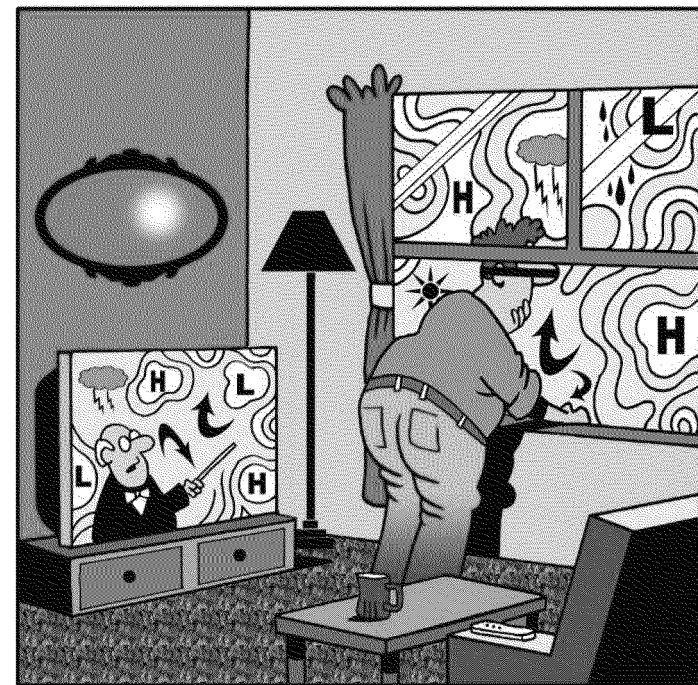
	Hour 1	Hour 2	Hour 3	Hour 4
Reduction + Est. Reduction	167	188	187	189
Forecast*	174	170	166	164

*from weekly BIP forecasts sent to PG&E Electric Transmission Grid Ops on January 30

- SCE dropped 575MW/hour during this event (more LCI customers)
- Accurate forecast (updated data will follow)
- High Customer performance



PG&E's DR Forecast vs. Actual

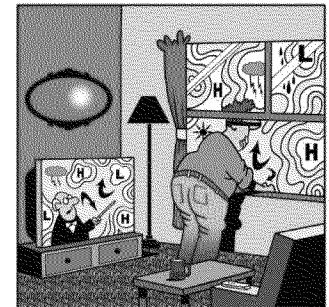




2012 Daily Forecasted vs. Actual DR

Programs	No. of DR Events	Daily Forecast	Ex-Post
		(Averaged MW over All Events)	
AMP-DA	3	44	50
AMP-DO	3	138	129
BIP	1	219	221
CBP-DA	5	26	20
CBP-DO	6	28	23
DBP	3	38	38
PDP	7	28	25
SmartAC	1	110	78
SmartRate	6	19	19

- 611 MW load reduction
- Overall performance and forecasting was good
- The data incorporates re-tests for low or non-performers (thus, lowering the final number since it's averaged, and making the forecasting % a wider range)
- Due to local calls, the MW may appear smaller than the MW attributed to the entire program





2013 Daily Forecasted vs. Actual DR

Programs	No. of DR Events	Daily Forecast	Post-Event
		(Averaged MW over All Events)	
AMP-DA	7	56	34
AMP-DO	6	117	108
BIP	2	122	119
CBP-DA	5	7	4
CBP-DO	5	10	11
DBP	6	21	19
PDP	8	41	38
SmartAC	4	6	5
SmartRate	8	41	36

- ~ 634 MW load reduction (preliminary numbers until April 1 Load Impact filing)
- Overall performance and forecasting was good
 - (22.9% forecasting accuracy) error rate
- The data incorporates re-tests for low or non-performers (thus, lowering the final number since it's averaged, and making the forecasting % a wider range)
- Due to local calls, the MW may appear smaller than the MW attributed to the entire program

