PG&E's Demand Response Technology Initiatives

Roadmap and Opportunities

April 11, 2014

PG&E®

Agenda

- Demonstrate ED and PG&E priorities alignment
- Discuss customer-centric end-use automation and PG&E's DR roadmap
- Discuss 3rd Party DR

2

PG&E is:

1. Expanding residential/SMB participation in Demand Response(DR)
2. Expanding the portfolio of DRresources to provide wholesale market capacity
3. Allowing 3 parties to becomemore involved in addressing residential
4. Utilizing AMI technology in the DRspace

3
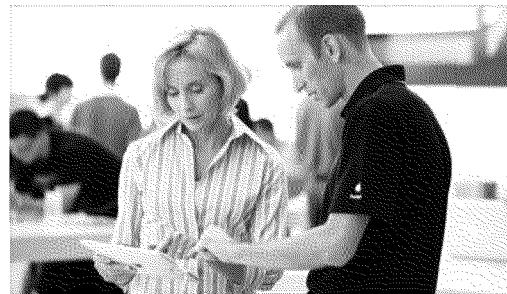
Customer-centric end-use automation

Open communication standards

openADR ALLIANCE

ZigBee® Alliance

- Enable cost-effective integration with broader range of customer devices

- Customers can choose devices that they find valuable and appealing

New channels to reach customers

- Retailers and service providers engaging customers where they live and shop

- Customer acquisition and fulfillment costs shared with other markets

Enables us to reach a broader audience of custom

4
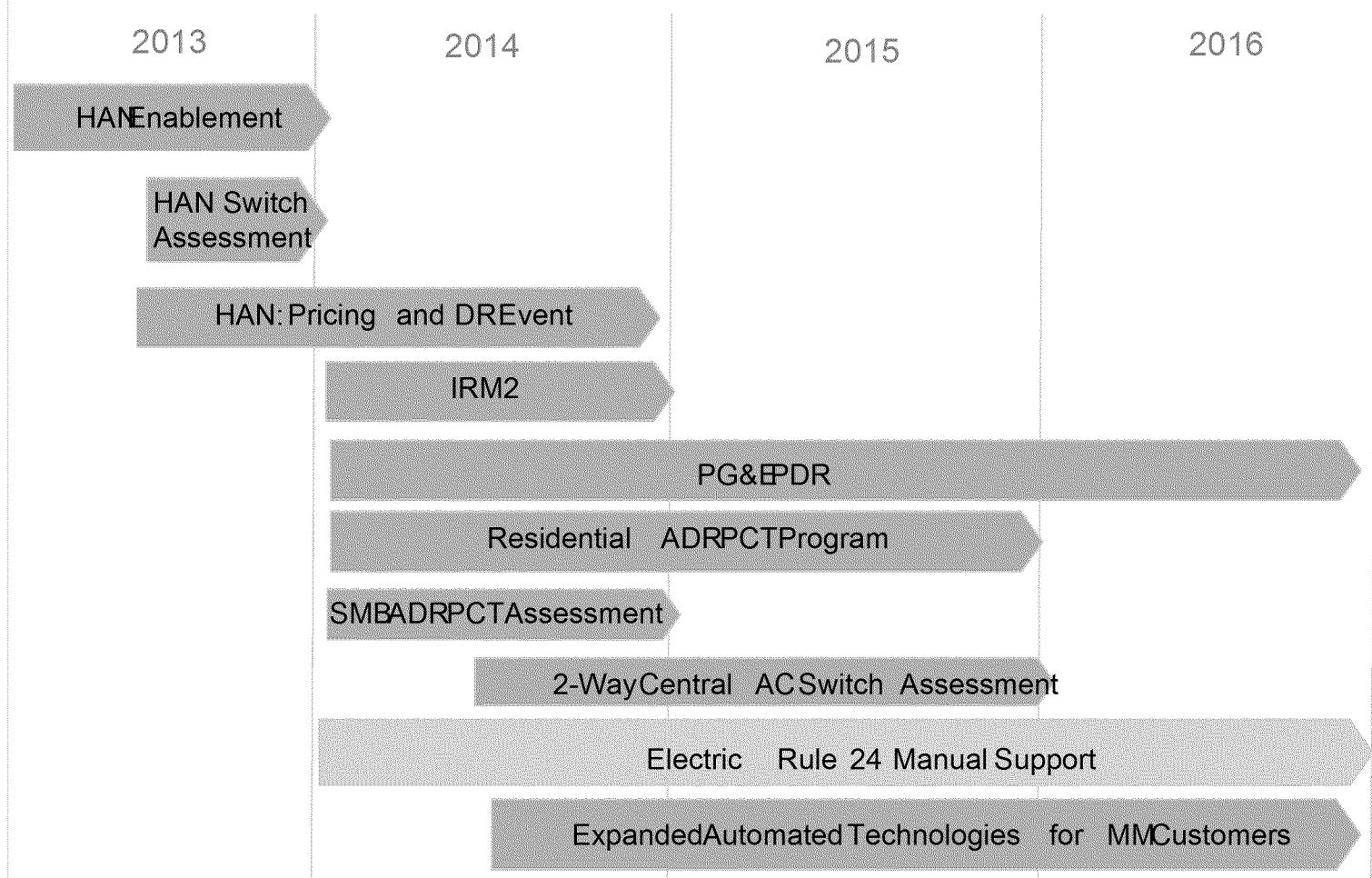
PG&E's current DR options

	Information Enablement	Automated Response	Automated DLC
Description	Offer customers information about upcoming DR events, their energy usage and the price of energy in order to support their behavioral efforts during DR events.	Offer customers information about upcoming DR events, their energy usage and the price of energy as delivered to a load controller installed in customer premises that automatically responds to the information. Customers have the ability to alter how the load controller responds to the information.	Offer customers DR program participation through the installation of a load controller in the customer premise that automatically responds to a DLC signal. Customers do not have the ability to alter how the load controller responds to the DLC signal.
Current Activities	• Phone, Fax, Email, Text • HAN - Pricing Information & Event Signal • HAN Real Time Energy Usage • Customer Data Access Enablement	• HAN SMB - Price Information • ADR for Residential and SMB - Event Signal • ADR for C&I - Event Signal	• AC Cycling – DLC Signal • One and Two-way communications (e.g., AMI/HAN) • Direct installation by controlling entity

5

Initiatives for 2014 -16

| 2013 | 2014 | 2015 | 2016 |

HAN Enablement

HAN Switch Assessment

HAN: Pricing and DR Event

IRM2

PG&E PDR

Residential ADR PCT Program

SMB ADR PCT Assessment

2-Way Central AC Switch Assessment

Electric Rule 24 Manual Support

Expanded Automated Technologies for MM Customers

⬤ Expand residential/SMB participation in DR   ⬤ 3rd parties involvement

⬤ Expand portfolio of DR resources to provide more wholesale capacity

6

Leveraging the AMI Network

What's available now?

- Real time energy usage
- Ability to join HAN devices to a SmartMeter™ via MyEnergy

What's being delivered in 2014?

- DR event notifications
- Customer pricing information

What are we looking at in 2015 and beyond?

- DLC over HAN
- Next generation Smart AC
- Third Party opportunities

Third-party DR

PG&E is committed to supporting the third-party DR aggregation market:

- Intermittent Renewables Management 2 (IRM2) pilot is currently underway in the PG&E service territory to provide nonutility entities training and experience with registering with the CAISO,
- Voluntarily led the PFM to modify current AMP contracts in support of third-parties
- Meter data for direct CAISO bidding will be available via Rule 24 implementation
- Proposing to support residential aggregation (as part of Supply-Side Pilot) in 2015-16

8

Third-party DR

How are we doing it?

- PG&E is building an open-standard platform to enable behind-the-meter DR solutions
  - PG&E is implementing AMI/HAN and AutoDR using leading industry standards (SEP 1.x, OpenADR 2.0)
  - Customers adopting these standards-based solutions should be able to leverage them with any utility or third-party DR programs
  - PG&E is working with a third-party certification facility (NTS) to enable any manufacturer to validate HAN device interoperability with PG&E's network

- Third-party DR aggregators do not currently have the ability to leverage PG&E's AMI network to notify/dispatch customer loads
  - Investigating if/how third-parties can use AMI network for DR event notifications or direct load control.

DR Team Contacts:

Fabienne Arnoud FXAI@pge.com

WendyBrummer wlbg@pge.com

Albert Chiu AKC6@pge.com

Kimberly Conley K2CO@pge.com

Steve Haertle SRH1@pge.com

Andrew Hoffman a2hc@pge.com

Stephen Kung SJK0@pge.com

Alina Koch Lawrence A2KF@pge.com