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SDG&E's Microgrid Activities

DOE Electricity Advisory Committee

October 20, 2011

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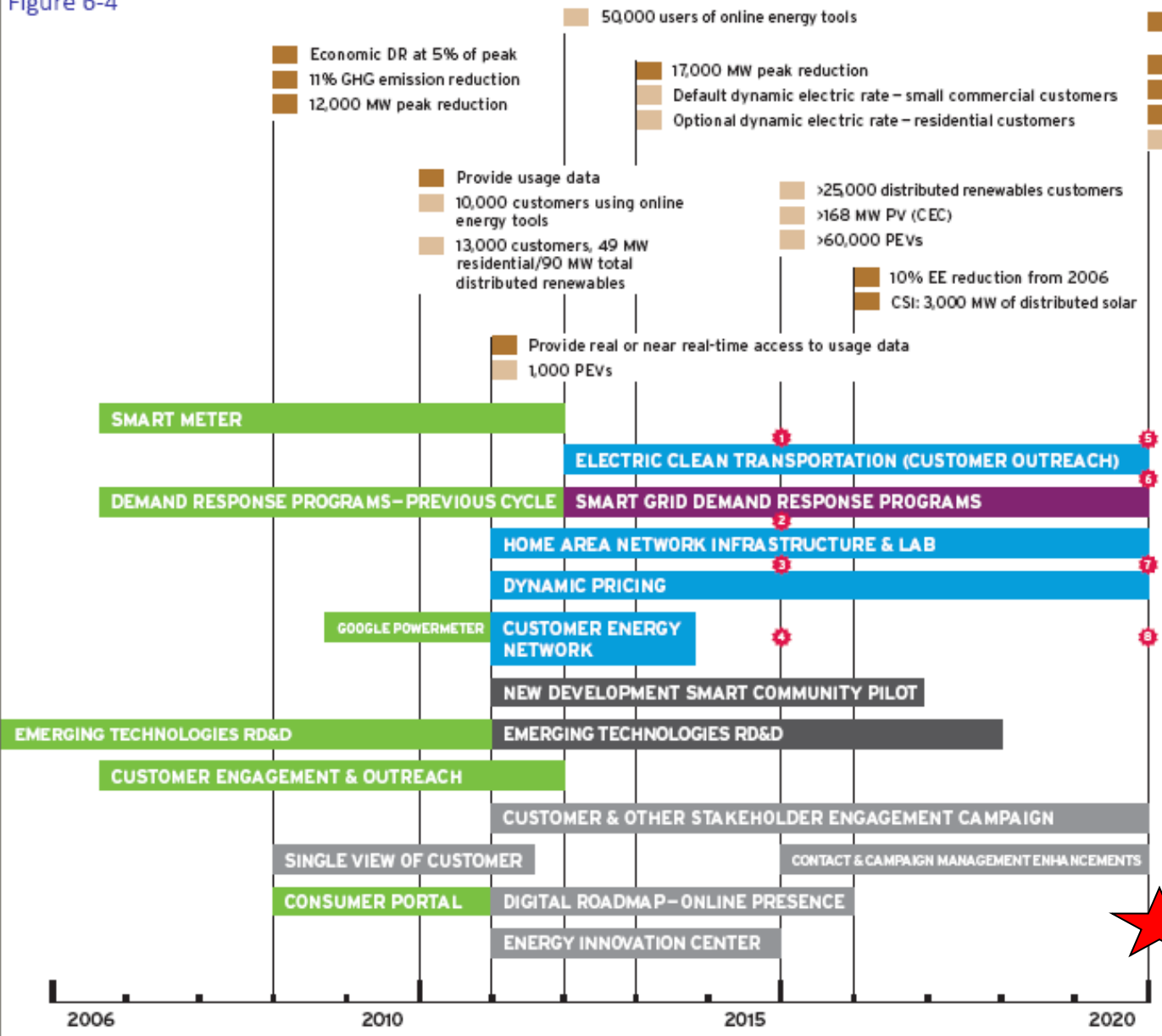
1 2 3 4 5 6 7 8 9 2011 Smart Grid Roadmap

CUSTOMER EMPOWERMENT

Key

- Policy Goal
- Forecast
- SDG&E Smart GridVision
- In Flight Project
- New Project - Policy
- New Project - Value
- New Project - Pilot
- Enterprise Project

Figure 6-4



SDG&E Smart Grid Vision: by 2015

1. Customer education and outreach programs are proactively engaging customers through multiple channels
2. SDG&E and third parties are providing HANs and other customer premise network capabilities, providing customers real time feedback on power consumption and energy pricing
3. Standardized/reliable customer specific interval usage information and time differentiated price signals are available, enabling customers to make informed and cost-based energy use decisions
4. Customers can choose among multiple energy information services and providers

SDG&E Smart Grid Vision: by 2020

5. Customers are provided near-real time signals via price and event triggers enabling a balance of supply and demand
6. Widely adopted standards create a ubiquitous market of plug-and-play network devices in businesses and homes, including multi-unit dwellings
7. SDG&E is providing options and tariffs for customers to sell generation using distributed energy resources, electric vehicle to grid, or energy storage discharge
8. Microgrid and other technologies give customers more reliability options

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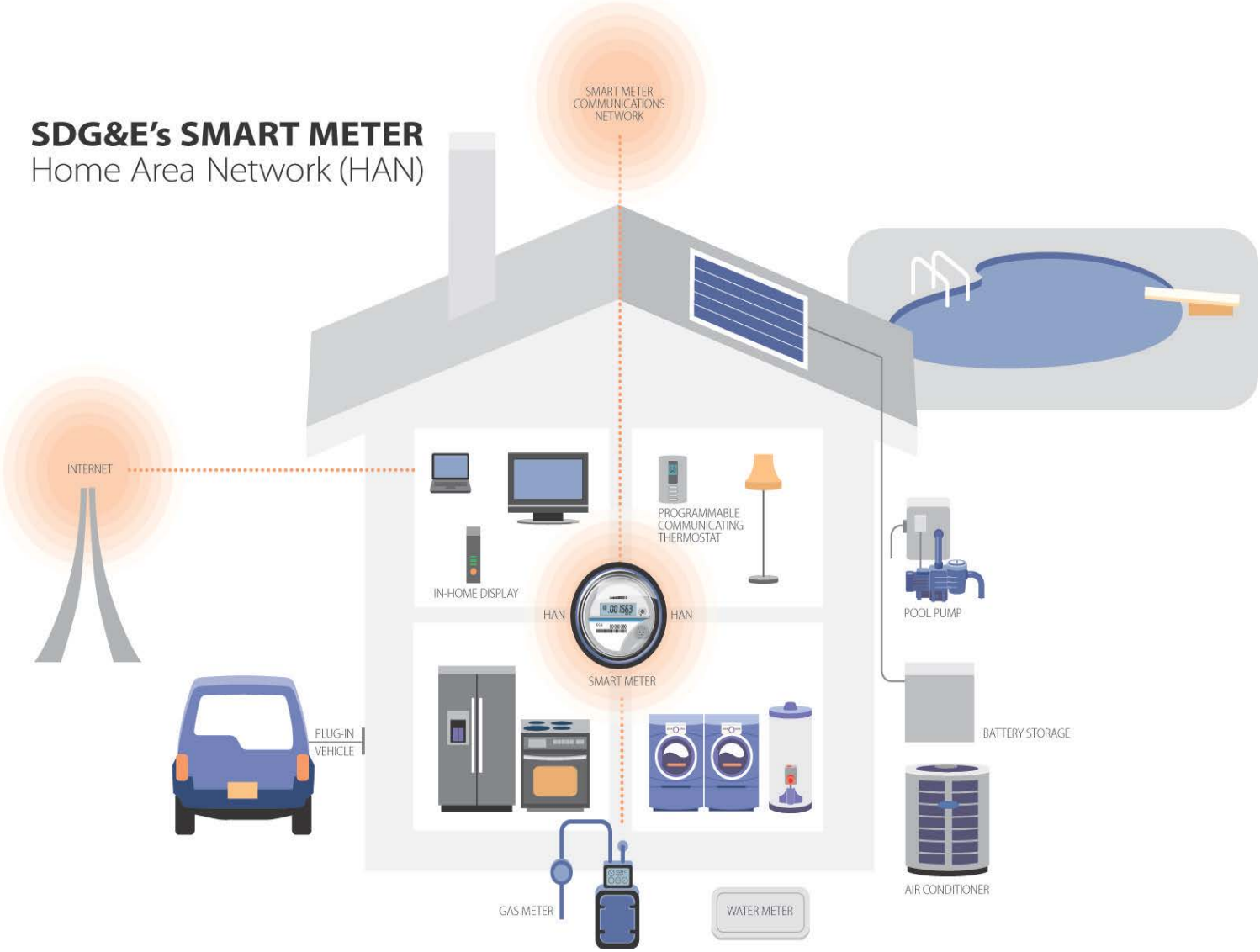
Future Microgrid?



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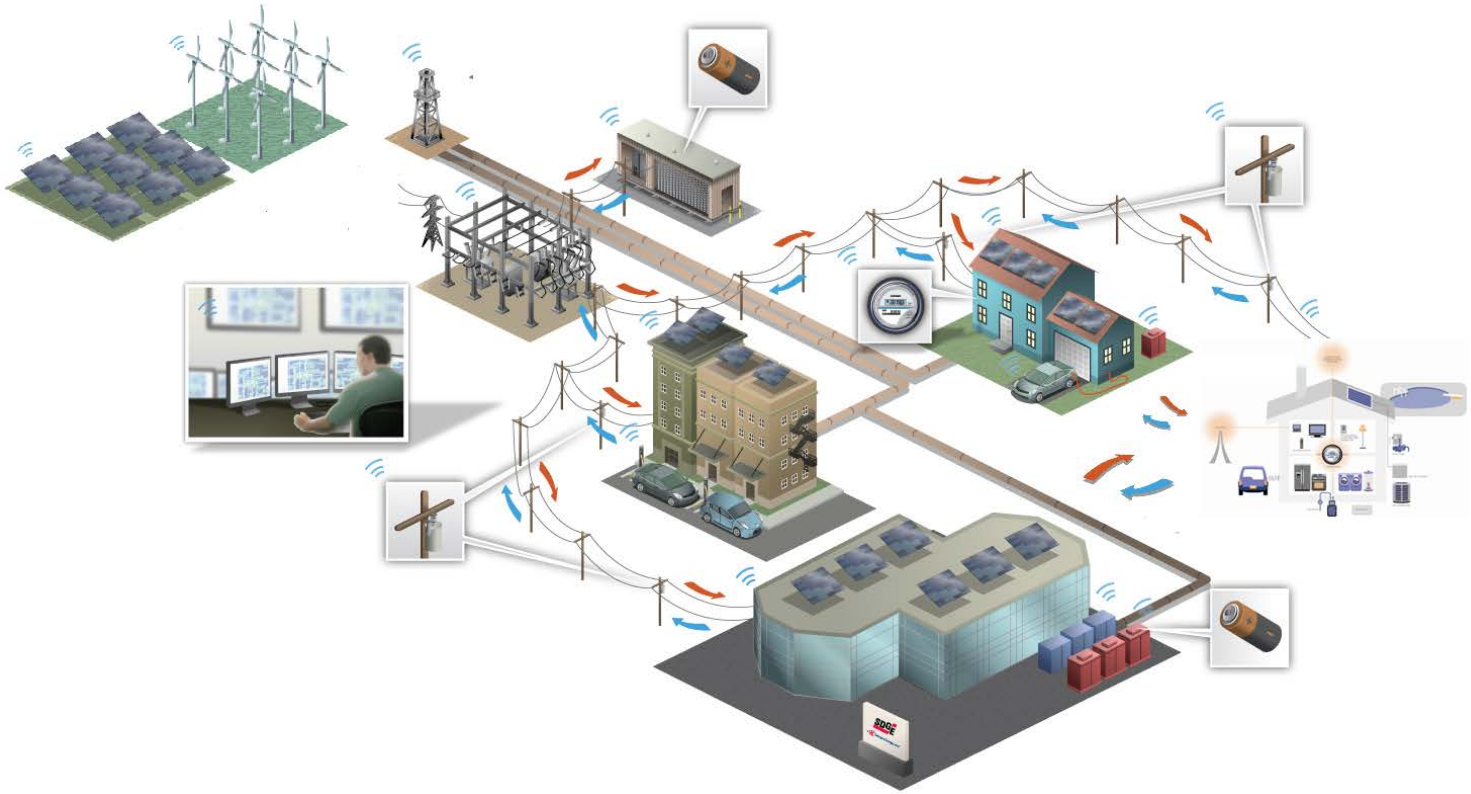
Project Summary

Utilize advanced technologies to integrate and manage distributed resources within the Smart Grid

Budget:	$7.5M DOE and $2.8M CEC plus matching funds from SDG&E and partners
Benefits:	▪ Integrate and leverage various generation and storage configurations ▪ Reduce the peak load of feeders and enhance system reliability ▪ Enable customers to become more active participants in managing their energy use



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Microgrid Design

Requirements

- Define microgrid boundary
  - Industrial customer, campus, substation, circuit
- Match load and generation
  - Voltage, frequency and power factor within tolerances
- Define reliability requirements
  - SAIDI, SAIFI, MAIFI and power quality
- Determine seamless transition
  - How long to restore power in island
- Define loads
  - Critical, demand response, peak load
- Determine island duration
  - Typical outage or extreme event
- Define generation needs
  - Renewables, energy storage, fossil generation

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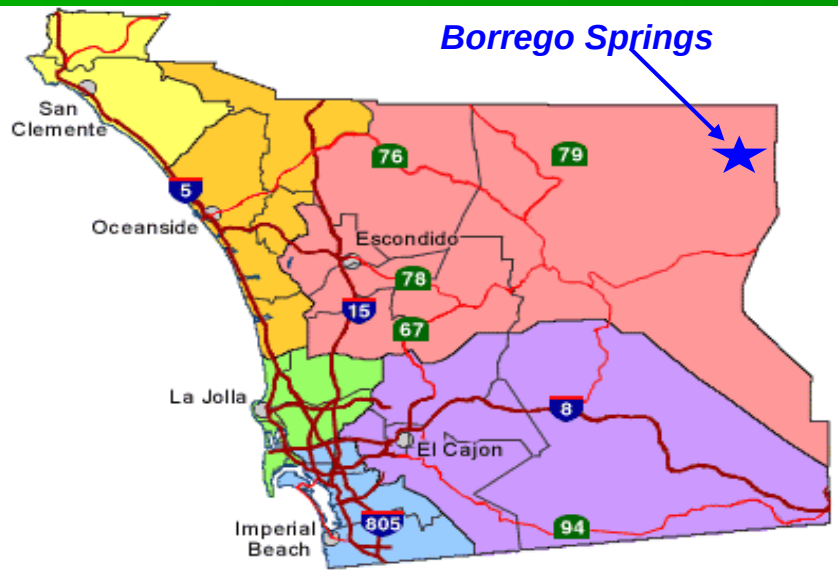
Site Selection – Borrego Springs, CA

Key Strengths:

- Progressive-minded community
- High concentration of customer-owned solar generation
- Potential for reliability enhancements
- Opportunity to balance supply and demand to be more self-sufficient
- Extendable to service territory



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Borrego Springs

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Rooftop PV Systems

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Ground Mounted PV Solar Array

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Project Components

Distributed Energy Resource (DER) and VAr Management

- Two 1.8 MW Tier 1 Caterpillar 3516DITA diesel generators owned by SDG&E
  - 200 hours per generator per year
  - Upgrading to meet Tier 4 emissions and to be remotely operable
  - ✓ Delivered generators to Borrego Springs, October 2011
- SCADA Capacitors
  - Standards evaluating pilot installations

Advanced Energy Storage

- Commercial/Substation-Sized (~ 1500 kWh)
  - Execute agreement, October 2011
  - Install batteries, Q2 2012
- Community or Neighborhood-Sized (3 @ ~ 50 kWh)
  - ✓ Executed agreement, August 2011
  - Install batteries, Q1 2012
- Home (5 @ 5-10 kWh) – finalize agreement with preferred vendor, October 2011

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Project Components

Feeder Automation

- To utilize FLISR with new OMS/DMS system

Customer Energy Management/Price-Driven Load Management (PDLM):

- 125 customers to participate in testing how pricing signals can/may alter customer usage
- Executed agreement with the University of San Diego, August 2011
- Executed agreement with Pacific Northwest National Laboratory (PNNL), September 2011
- Finalize agreement for PDLM solution with preferred vendor, October 2011

Microgrid Controller

- To be located at Borrego Springs Microgrid Yard, self-contained
- Finalize requirements with Oracle
- Complete design, Q4 2011

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Managing a Microgrid

Distribution Management System

Information
Electricity Pricing
DER status
Demand Response Programs
Network status
Community Objectives
Load and Resource Profiles

Microgrid Controller (DERMS?)

Monitor/request DR & provide price signals

SCADA System

PDLM

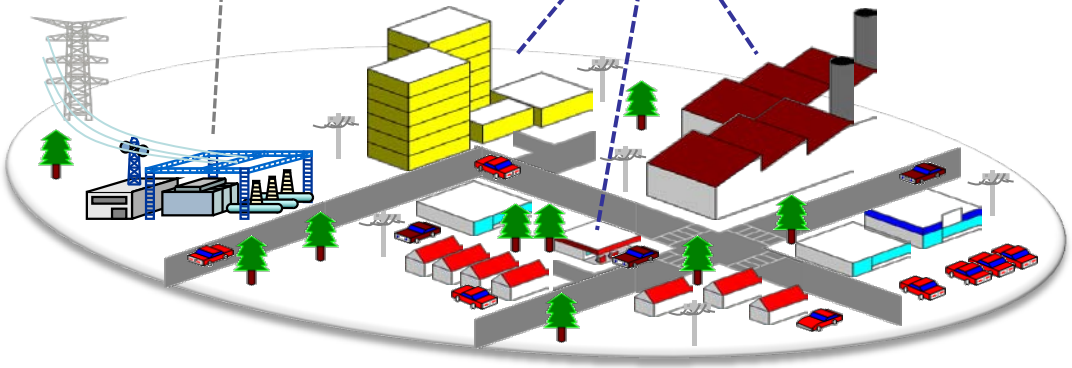
Estimate, optimize, request & monitor DR and Price Driven Load Management

Monitor & control DER

HAN NOC

Distributed Energy Resources
Utility-scale Energy Storage
Rooftop PV Solar
Micro-turbines
Building Energy Storage
Community Energy Storage
Distributed Generation
Home Energy Manager
PEVs
Ground PV Solar Array

Grid Resources
Capacitor Banks
Voltage Regulators
Automated Switches
Power Electronics
Communications



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Update on 2011 Milestones

- ✓ Obtained Stationary Source Permit from San Diego County APCD, Q1
- ✓ Constructed noise abatement wall, Q2
- ✓ Executed agreement for the development of the Microgrid Controller, Q2
- ✓ Complete site development of generator portion of microgrid yard, 9/11
- ✓ Install generators, 10/11
- Initial testing of generators, 10/11
- Complete design of the Microgrid Controller, Q4
- Recruit customers to participate in Home Area Network demonstration, Q2 2012
- Install batteries, Q2 2012

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Schedule

	2010		2011				2012				2013
Description	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Engineering and Design											
Installation and Testing											
Demonstration											
Reporting											

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Questions?

Thank You

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