

# SDG&E Overview



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**San Diego Renewable Energy Society**

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# Introduction / Disclaimer

- Professional background / history with SDG&E
  - 14 years with SDG&E / Jobs in technical project management, Federal Accounts, regulatory related work (Smart Meter case), procurement (power purchase agreement negotiations), and Smart Grid
  - Overlapping with my utility experience, I served in the US Navy: 10 yrs on active duty / 11 yrs as a reservist
- Disclaimer: The views expressed here are my own, and DO NOT necessarily represent those of SDG&E or Sempra Energy.
  - I am here to explain some “utility basics” and engage in a conversation.
  - I will attempt to explain some background information about utilities and how they do business based on my own experience.



# SDG&E Background -- History



- **Incorporated April 18, 1881 as the 'San Diego Gas Company'**
  - 'San Diego Gas and Electric Light Company' in April 1887
  - 'San Diego Consolidated Gas & Electric Company' in April 1905
  - 'San Diego Gas & Electric Company' in August, 1940
- Theme: SDG&E has grown with and served San Diego for more than 130 years



# SDG&E Background -- TODAY

- **1.4** million electric meters (~900k gas meters) serve over **3** million people and approximately 100,000 businesses.
- **4,500+** employees support a service area covering **4,100** square miles in two California counties and **25** cities.
- Transmission (69-500kV)
  - ~**1,800** mi overhead, ~**105** mi underground
  - Over **14,000** structures
  - **22** substations
  - **201** tie lines
- Distribution (12kV & 4kV)
  - ~**10,100** mi underground (60%)
  - ~**6,700** mi overhead (40%)
  - ~**280** substations
  - ~**1,000** circuits
  - ~**220k** wood poles



# SDG&E and Sempra Energy

- SDG&E is part of Sempra Energy, a Fortune 500 energy services company, based in San Diego, California.

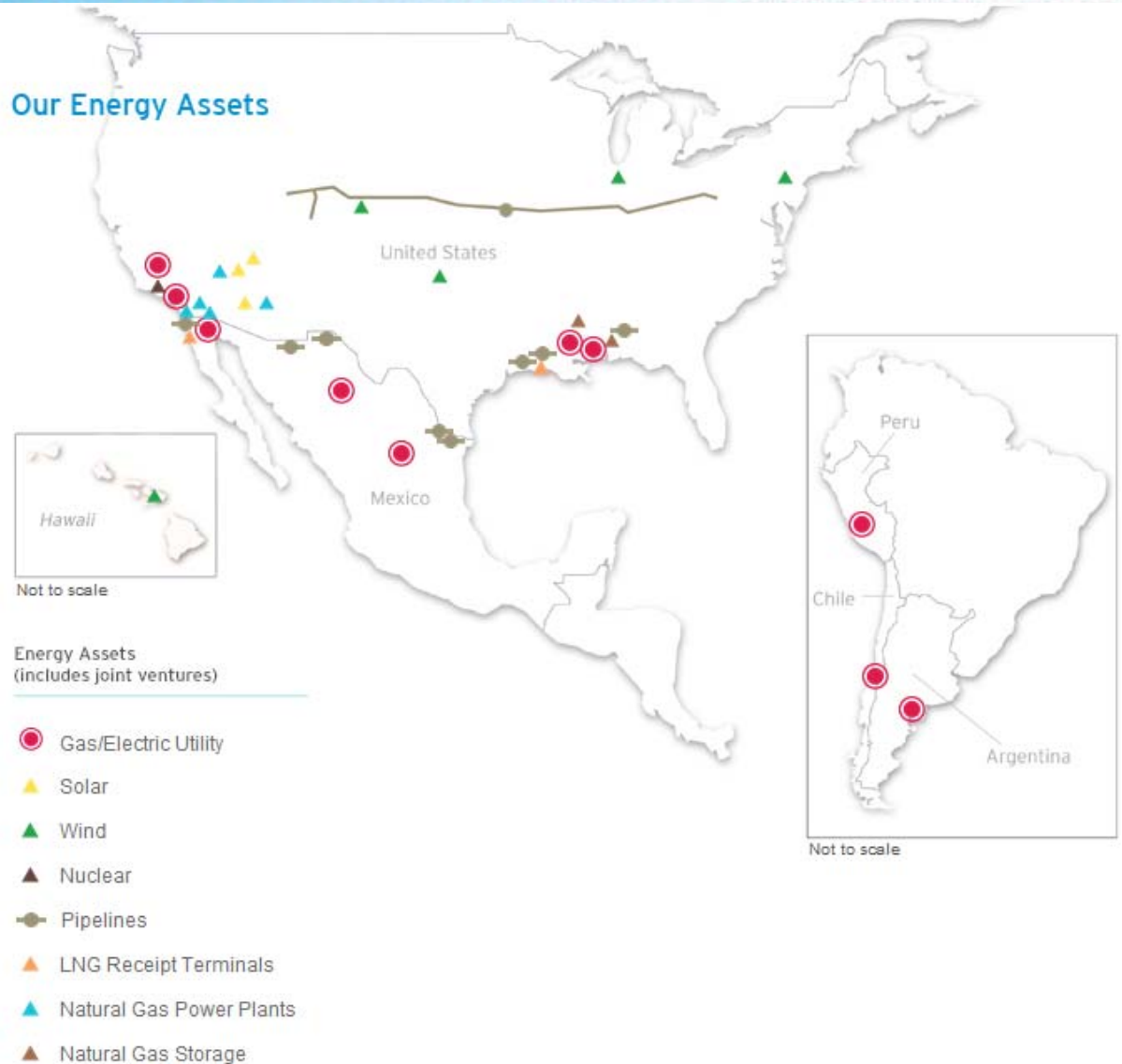
- **Sempra Energy:**

California utilities: **San Diego Gas & Electric Co.** / **Southern California Gas Co.** - serve more than 20 million consumers.

Sempra's other businesses: **Sempra U.S. Gas & Power** and **Sempra International** – develop and operate critical energy infrastructure and provide gas and electricity services in North America and South America.

Formed in 1998 by the merger of Enova (parent of SDG&E) and Pacific Enterprises (parent of SCG)

## Our Energy Assets



# *SDG&E – Industry Recognition / Awards*




- “Most intelligent utility in the United States” by *Intelligent Utility Magazine* and IDC Energy Insights for 3 consecutive years (2009, 2010 & 2011)
- Greentech Media’s 2012 “Top Ten Utility” award for excellence in Smart Grid development (2011, 2012)
- *POWER Magazine*’s Smart Grid Award for 2012
- U.S. Environmental Protection Agency’s Climate Leadership Award for 2012
- Six consecutive years as recipient of PA Consulting’s ReliabilityOne™ award – recognizing SDG&E as the most reliable among western U.S. electric utilities
- VP of Customer Services (Ms. Caroline Winn) awarded “Customer Service Leader of the Year” (Large utility category) by *Intelligent Utility Magazine* for 2012

# Utility as the Default Provider

- It is clear within California Law (the public utilities code) that the utility is the default provider of electricity and natural gas within their franchised service territory.
  - Service provided at just and reasonable rates (as determined by the CPUC)

This means that if another load serving entity (like an energy service provider) cannot provide service to the customer, the utility must step in.

It also means that the utility must plan ahead to build out the network / grid and procure the commodity necessary to serve customers.



**CALIFORNIA LAW**

**CALIFORNIA PUBLIC UTILITIES CODE**

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# Very basic utility rate making

- Every 3-5 years, the IOUs go before the CPUC to present their 'General Rate Case' application (GRC Phase I)
  - Details how much money, in total, it will take to run the business (the 'revenue requirement')
  - Presented in the form of sworn testimony before an ALJ
  - Other parties also present testimony
  - Then there is a series of data requests / and submittal of reply testimony and then 'briefs' are filed by parties
  - Eventually, the ALJ or Assigned Commissioner will issue a Proposed or Draft Decision, which will then go before the Commission for a vote
    - Other commissioners can issue alternate decisions
- Following GRC phase I / determination of the total funding necessary to run the utility, it must be divided up among the customer base
  - Rate-making – how much of the burden should each customer class bear
    - Residential / small commercial / medium & large commercial / agricultural / street lighting, etc...

Transmission / bulk power system: FERC  
Distribution: CPUC

BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA

<p>Application of San Diego Gas &amp; Electric Company (U 902-M) for Authority, Among Other Things, to Increase Rates and Charges for Electric and Gas Service Effective on January 1, 2012</p>	<p>Application No. 10-12-__</p>
---	---------------------------------

GENERAL RATE CASE APPLICATION OF SAN DIEGO  
GAS & ELECTRIC COMPANY (U 902-M)

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December 15, 2010

SDGE Doc#249194



# “Decoupling” – promoting EE

- In the early 1980’s in California, the CPUC determined that to incent the IOUs to truly pursue energy efficiency, that they needed to be ‘decoupled’.
  - That is, the utilities’ revenue would be disconnected or decoupled from the total sales volume (kWh / therms)
  - Utilities are NOT dependent on how much energy the utility sells in order to make a profit
    - A prediction of total sales is used as part of the rate making process
    - To the degree that the prediction is off, a balancing account mechanism is used to ‘true up’ the total dollars collected on an annual basis
  - Earnings / an ‘authorized rate of return’ is earned on invested capital
    - Referred to as the utilities’ **rate base**
  
- There is wide agreement that decoupling has been a success in terms of EE with energy consumption per customer almost flat since implementation



# Drivers of the Smart Grid

## Strategic Components

**Customer** – Enable energy markets and encourage customer’s participation in energy management through smart energy devices, new products and services, increased Energy Efficiency (EE)/Demand Response (DR), adoption of PEVs and renewable resources



In-home/in-premise displays, control of individual appliances, Energy management systems/controllers

**Environment** – Incorporate and enable all generation and storage options to support customer choice, improve grid stability, improve power supply options, reduce GHG



Plug-In Electric Vehicle (PEV) Integration, Renewable Resource Integration

**Grid** – Enhance the grid to reduce customer disruptions, resist attack, improve workforce and asset optimization, and improve efficiency



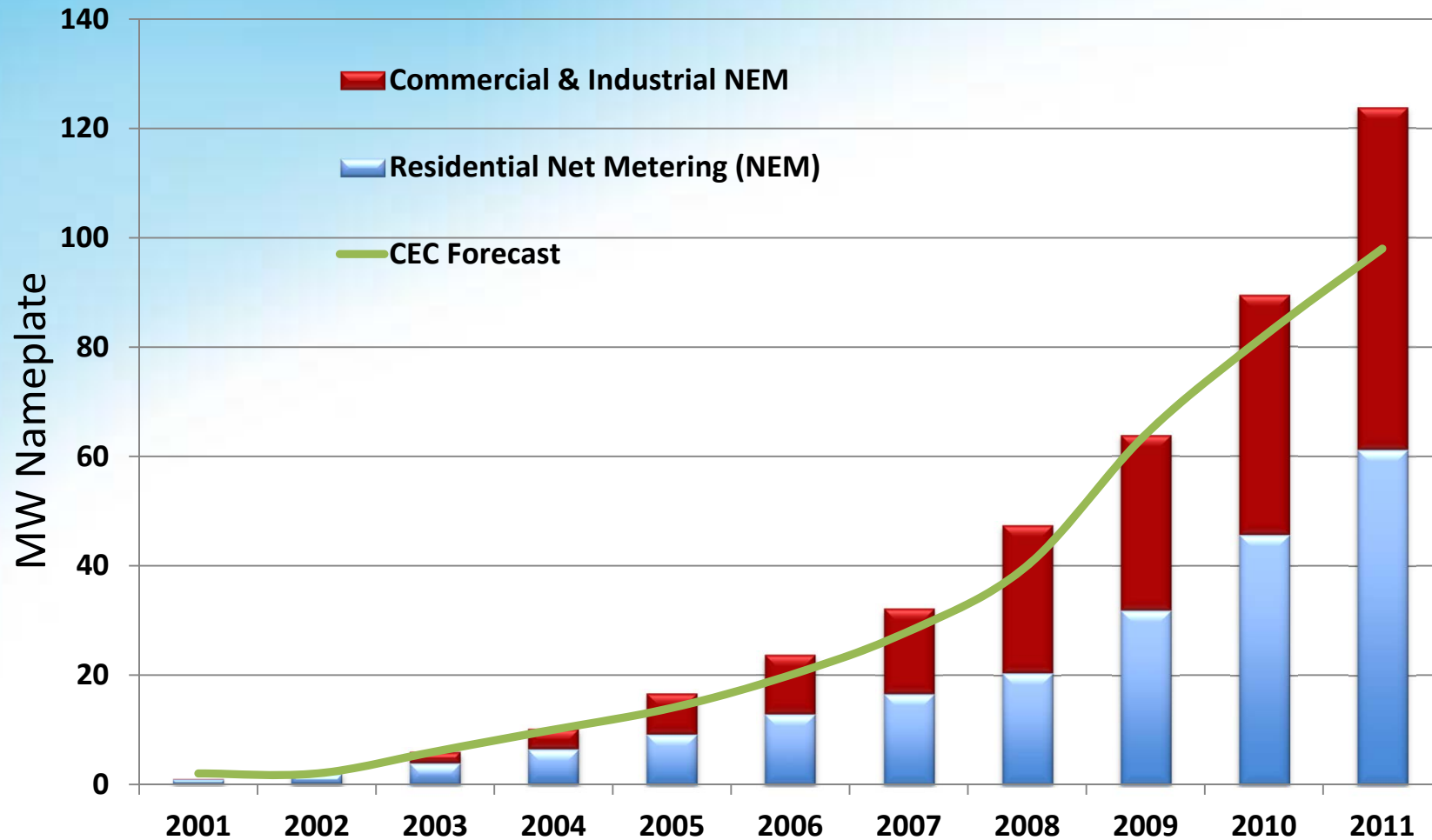
Large Scale Energy Storage, Phasor Measurement Units, Self- Healing Grid, Network Communications

# *Factors Driving Urgent Need for Energy System Changes*

- Customer Empowerment
  - Choice, Control, Convenience
  - Smart Appliances, Smart Charging, Smart Rates
- Centralized renewables
  - Intermittent availability issues
  - Increased volume threatens grid stability
- Distributed renewables (rooftop solar)
  - No control, can't see it, no communication
  - Power quality issues will increase
- Electric vehicles
  - Current electric grid cannot manage potential volume
  - Overall consumption may rise significantly

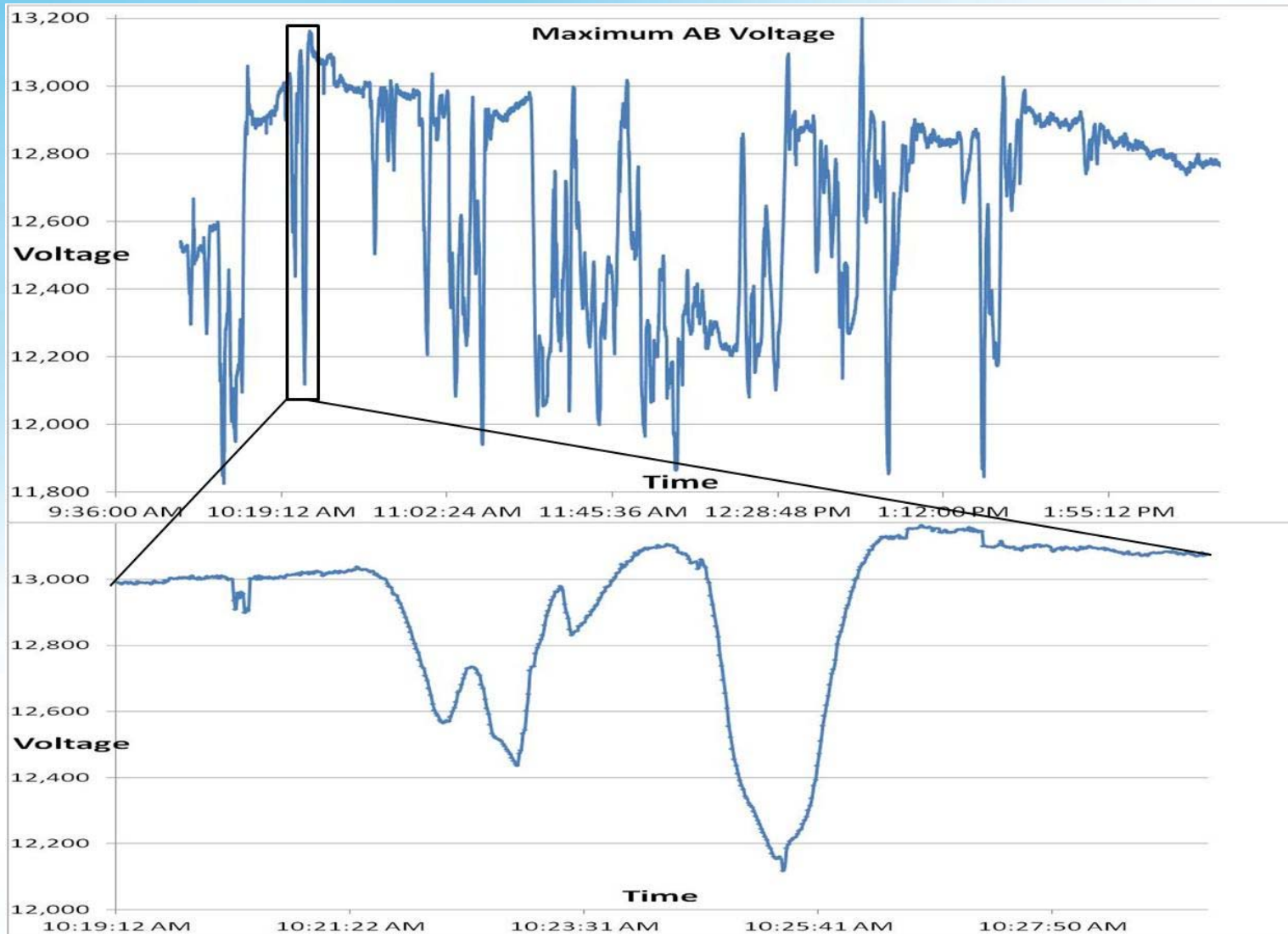
**Job of managing grid getting more complex;  
need to leverage technology**

# Commercial & Residential Generation



# INTEGRATION OF DER

## PV Intermittency

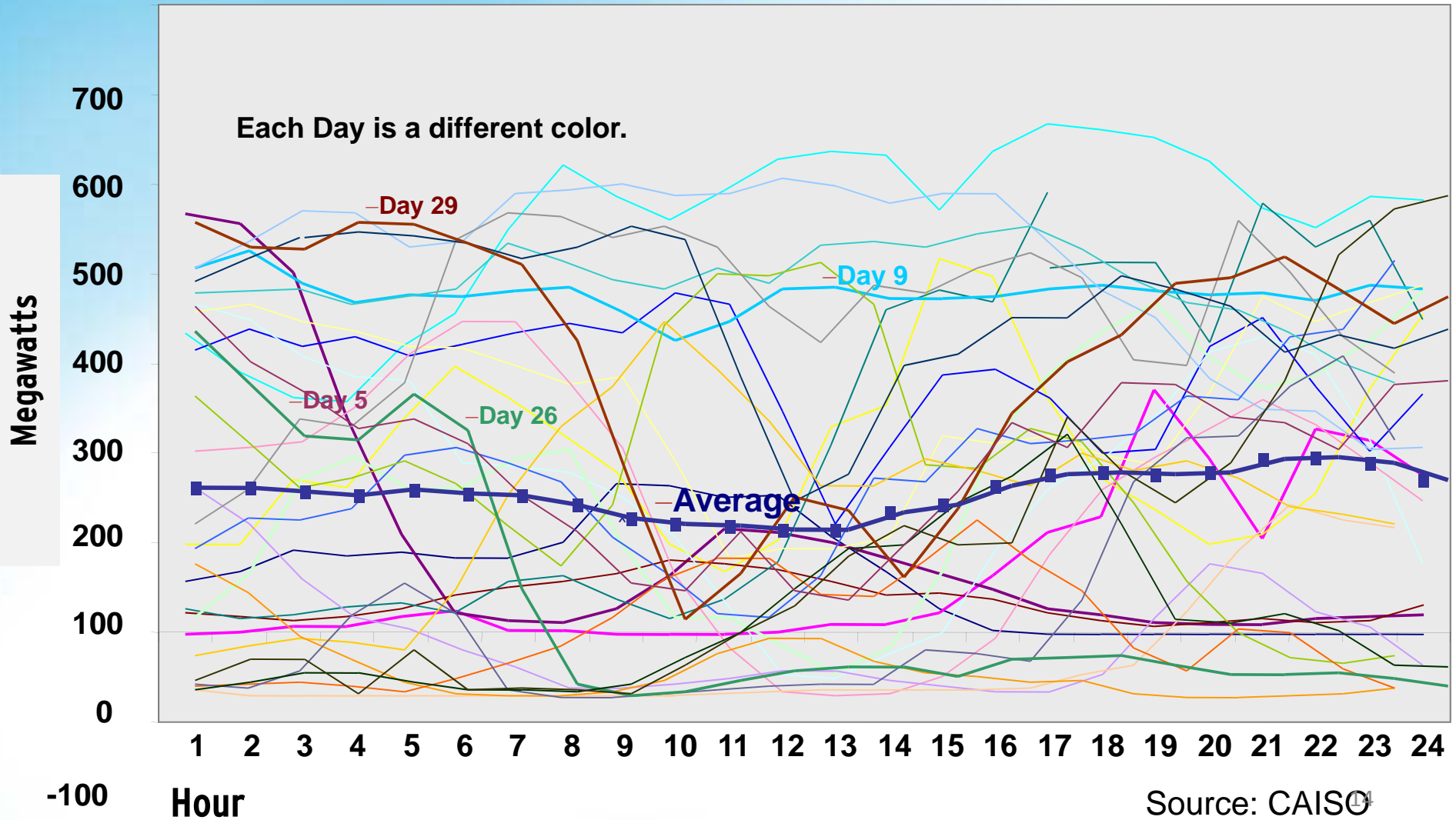


- Outside ANSI ranges
- Not CVR Compliance
- O&M Issues

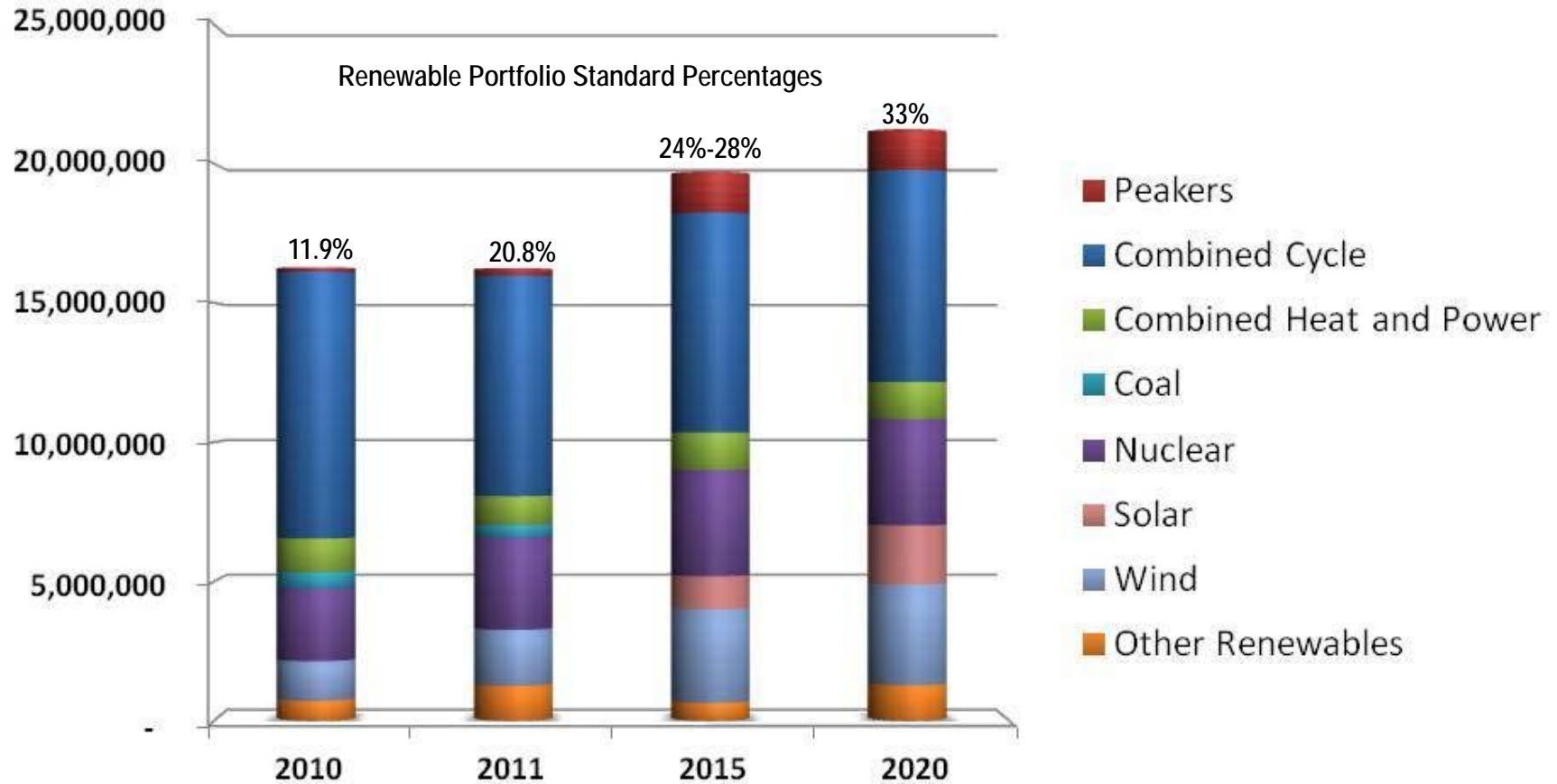
# Tehachapi Wind Generation in: April – 2005



Could you predict the energy production for this wind park either day-ahead or 5 hours in advance?



# Changing San Diego Energy Mix



Energy mix for 2015 and 2020 are subject to substantial uncertainty  
Values are for illustration purposes and do not represent forecasts

# Smart Grid Deployment Plan (SGDP)



SB 17 required a “Smart Grid Deployment Plan” to be filed by 7/1/2011

## Vision

- Smart Market, Customer & Utility. Meet environmental policies.

## Baseline

- Inventory of SG investments and assessment of privacy & security.

## Strategy

- Provide benefits to consumers and compliance with SB17.

## Security

- Describe Grid and Cyber Security strategy.

## Roadmap

- Timing of deployment of SG technologies.

## Cost

- Cost estimates for SG investments for next 5 years.

## Benefits

- Analysis: policy driven, environmental goals, economic, etc.

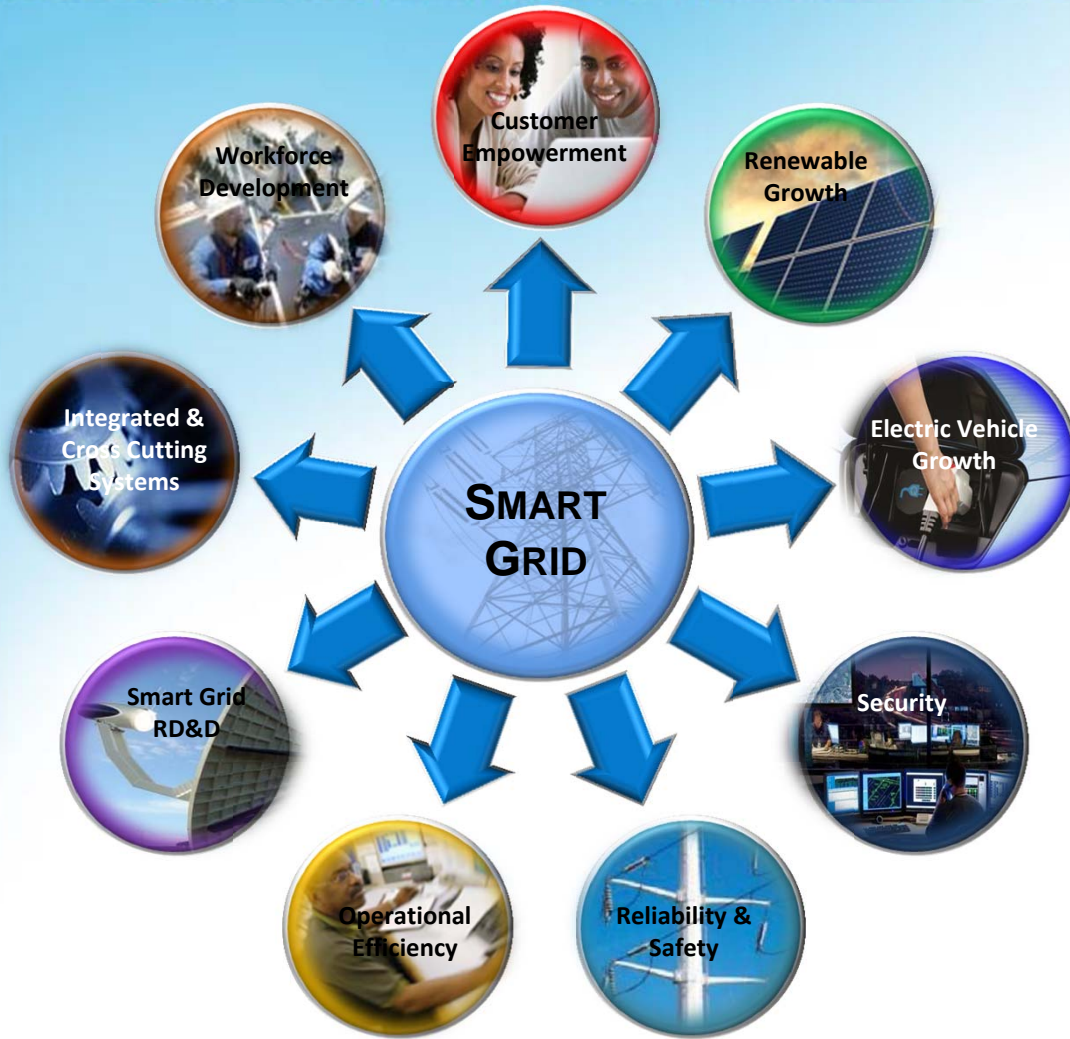
## Metrics

- Measure performance.

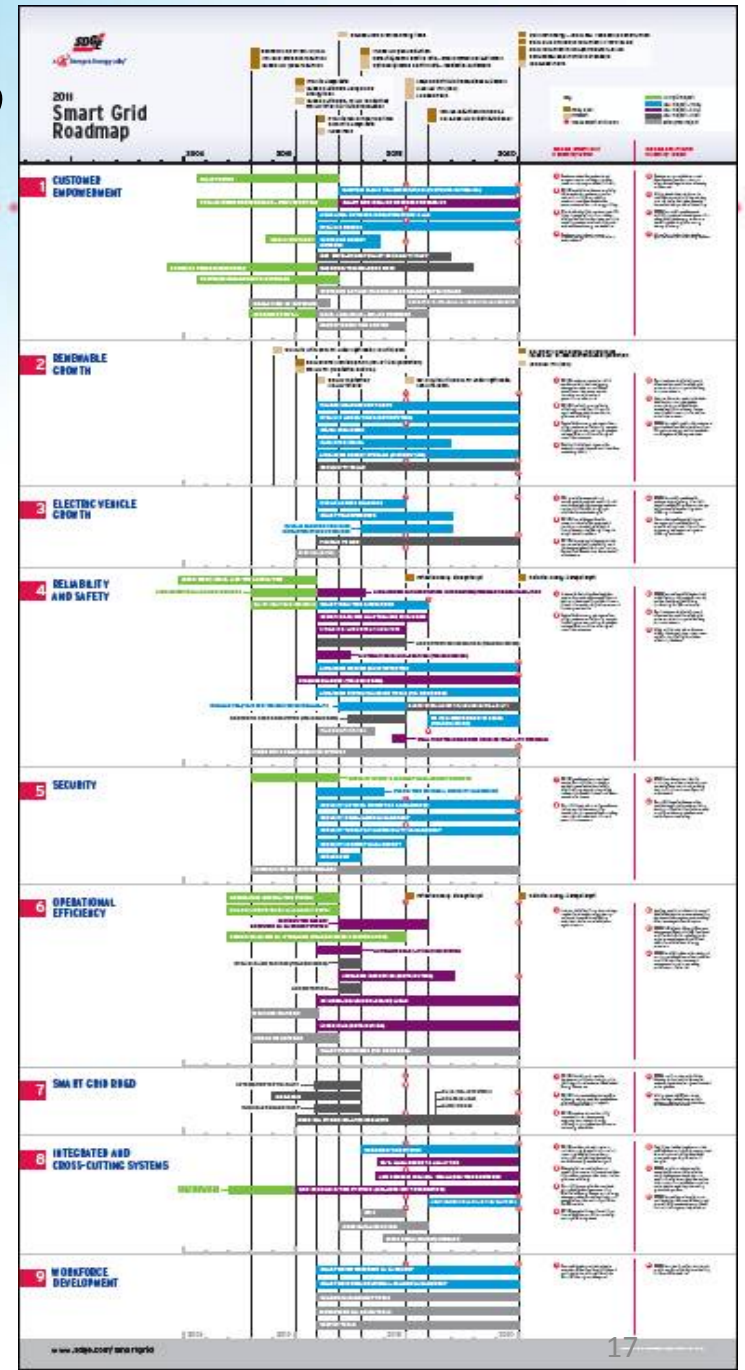
Source: CPUC



# SDG&E's Smart Grid Roadmap



Deployment Roadmap | San Diego Gas & Electric



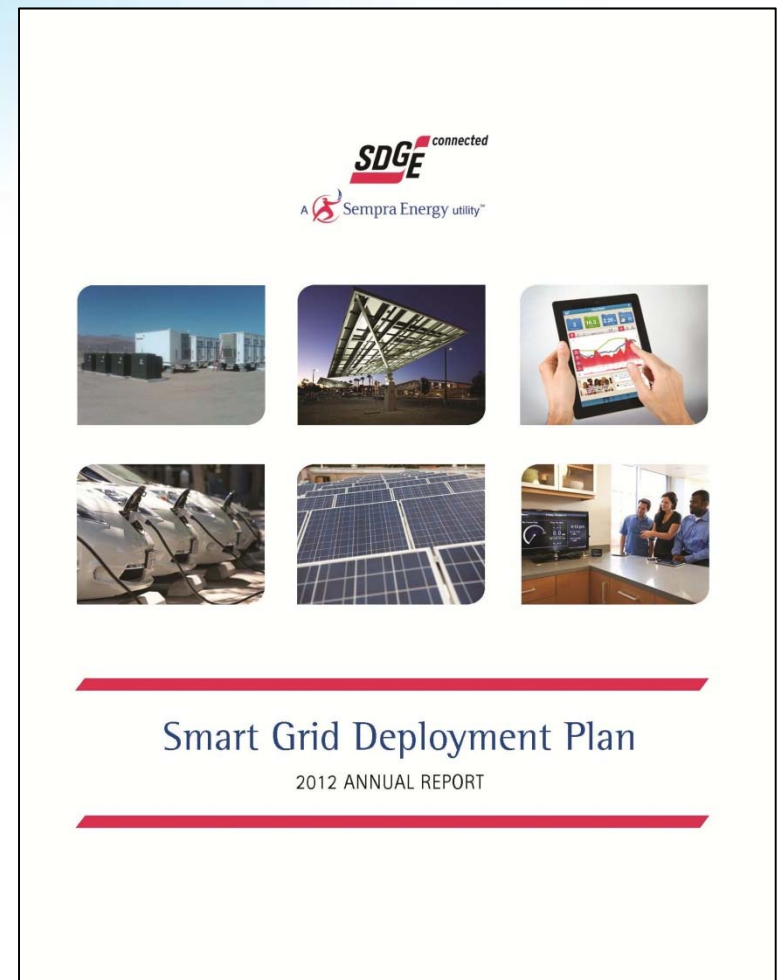
# Highlights of SDG&E's Annual Report

Filed 10/1/2012



Reporting period: 7/1/2011 – 6/30/2012\*\*\*

- Costs: ~\$156M / Benefits: ~\$40M
- Overall - 63 projects / including 9 enterprise projects
  - Evolution of the 82 projects / 18 enterprise from SGDP
- Completion (or near completion) of numerous / MAJOR smart grid related projects
  - Smart meter deployment / OMS/DMS/GIS
- Numerous smart grid related / based offerings completed and rolled out to customers
  - "Reduce Your Use" / Green Button / Biggest Energy Saver/San Diego Energy Challenge
  - 7 RYU events; ~ 60K customers enrolled in notifications
- 4,426 new DER systems interconnected / for a total of ~18,000 system wide representing >140MW of capacity
- Electric Vehicles
  - ~1,600 vehicles in the service territory / Car2Go service
  - For separately metered, TOU is working: Only 7% of the consumption on-peak (noon to 8pm) & 82% during super off-peak (midnight to 5am)
- CBM systems & processes resulted in THREE avoided catastrophic equipment failures at three substations



\*\*\* - this is the reporting period for the metrics included in the report. In the "Highlights" section of the report, information through 18 September, 2012 is sometimes used.

# SDG&E Annual Report –Project List



## Customer Empowerment Projects

- 1 - Smart Meters
- 2 - Green Button Download My Data
- 3 - Connected...to the Sun
- 4 - Green Button Connect My Data
- 5 - Smart Grid Demand Response
- 6 - EV Education and Outreach
- 7 - HAN Projects
- 8 - Smart Pricing Program
- 9 - PEV Rate Experiment
- 10 - Vehicle to Home (V2H) Pilot
- 11 - Digital Roadmap
- 12 - Enterprise Notification System
- 13 - Stakeholder Engagement

## Distribution Automation & Reliability Projects

- 14 – Advanced Energy Storage, Dist.
- 15 – Dynamic Line Ratings, Dist.
- 16 – Dynamic Voltage Control
- 17 - Borrego Springs Microgrid
- 18 – PMU - Distribution
- 19 – Smart Community Programs
- 20 – SCADA Capacitors
- 21 – SCADA Expansion, Dist.
- 22 – Wireless Faulted Circuit Indicators

23 – EV Demand Response, G2V

24 – Solar Energy Project

25 – Smart Substations

## Transmission Automation & Reliability Projects

- 26 – Automated Fault Location
- 27 – Composite Core Conductor
- 28 – Dynamic Line Ratings, Transmission
- 29 – PMU, Transmission
- 30 – SCADA Expansion, Transmission

## Asset Management, Safety & Operational Efficiency Projects

- 31 – Geospatial Information System (GIS)
- 32 – OMS/DMS
- 33 - Advanced Ground Fault Detection
- 34 - Advanced Weather Station Integration & Forecasting
- 35 – Arc Detection, Distribution
- 36 – Arc Detection, Transmission
- 37 – CBM – Substation Transformers
- 38 – PEV Infrastructure Upgrades
- 39 – Smart Isolation and Reclosing
- 40 – Smart Transformers
- 41 – Solar to EV Project
- 42 – Advanced Distribution Management System

43 – Microgrid Community Hardening

44 – Vehicle to Grid (V2G) Pilot

45 – Flexible Demand Initiative (FDI)

46 – Micropile Foundations

47 – CBM – Gas Breakers

48 – Dynamic Reactive Support

49 – Smart Grid Enabled EE

50 – PEV Batteries in Stationary Applications

51 – Early Fire Detection System

52 – Mobile Off-Grid Com. Systems

53 – Mobile Command Centers

## Security Projects

- 54 – Cybersecurity Projects
- 55 – Customer Privacy Program
- 56 – Substation Security Hardening

## Integrated & Cross-cutting Systems Projects

- 57 – Integrated Test Facility
- 58 – Low Power Wide Area CN
- 59 – SDG&E Grid Comm. Systems
- 60 – Smart Grid RD&D
- 61 – Smart Grid 2.0 Eng. & Architecture
- 62 – Workforce Development
- 63 – Data Management & Analytics

# Green Button - Empowering Customers

- In September 2011, the White House challenged utilities throughout the United States to develop a tool to provide energy consumers timely access to their own energy data with the click of a single button online
- In December 2011, SDG&E launched the **Green Button**, a new tool that provides customers with easy access to their energy usage data in a simple, common format.
- SDG&E customers are now among the first in the nation to be able to download their energy usage data in a standard format and share it with third-parties for energy evaluation and analysis.
- Download up to 13 months of data!
- There are numerous Green Button apps to explore and share your energy use data! [OpenEI](#)



**Green Button  
Download  
My Data**®

My Account Pay My Bill Financial Assistance My Energy Manage My Accounts My Profile Contact Us  
My Account > My Energy > Energy Charts

## Energy Charts

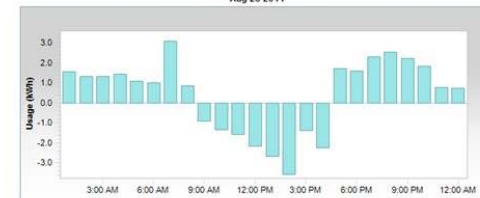
For Account 3000000000 (Net Meter)



### Electric

- Your total usage for the Day was 9,535 kWh, and your maximum usage was 3,100 kWh.
- These charts are informational. Your data is validated before you are billed.
- Want to learn more? Take our tutorial [About Your Charts](#).
- Tell us what you think. [Send an email](#) with comments, questions or feedback.

Aug 28 2011



- Display
- 15 minute intervals
  - Day
  - Week
  - Month
  - Year
  - Show Temperature

Select Date(s)  
<< Aug 28 >>

[Switch to Bill Period](#)  
[Details](#)

Compare

- None  Prior Day  Same Day, Prior Week  Same Date, Prior Month

Account: 102E

**Date Range**

Note: You can download a maximum of 13 months of data from the current date.

Start date: Oct 29 2010

End date: Nov 29 2011

**File Type**

- CSV - for your analysis
- XML - for sharing with 3rd party providers

OK Cancel

Usage For

- Month
- Year
- Show Temperature
- Show Estimated Usage

20

# Biggest Energy Saver Customer Engagement

SDG&E piloted a Biggest Energy Saver contest that challenged residential electricity consumers to reduce their electric energy consumption and demonstrate the benefits of using smart meter energy consumption information.

## SDG&E's Biggest Energy Savers:

➤ **E.Faunce, Lakeside, CA - Savings 46.5% -1,356 kWh**

"I'll admit, we got *really* into the contest. All of the my friends knew about it and they wrote notes on my Facebook wall encouraging us to keep it up."

➤ **L. Hale - La Mesa, CA - Savings 42.8% -1,488 kWh**

"I had no idea how much energy the 'can lights' in the kitchen used – and, I probably never would have thought to investigate that – but, the daily reminders motivated me to. Now, unless I need all of those lights, I use as few as possible."

➤ **J. Gonzalez - Alpine, CA - Savings 34.2% - 1,506 kWh**

"Every time I can see that there are other people on the leaderboard saving more energy than I am, I'm motivated to save even more."



**On average BES+HAN households saved 12% more energy than HAN-only households.**

# San Diego Energy Challenge



About Jobs Privacy & Terms Sign In

## Win prizes by saving energy.

Play on behalf of your favorite San Diego middle school to save energy and win prizes

Choose A School

Save Energy

Win Prizes

[Sign up with facebook](#)

We're friendly and won't spam your friends

## Play with Friends, Family, or the world to save the most energy.

Leaderboards	Everyone
	13,010
	10,494
	9,548

**Complete with Friends**  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore.

[Download iPhone App](#)

Open in the App Store

**We're Everywhere You Are**  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore.

Your children, family, or even your roommates

**Establish Your Household**  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore.

- SimpleEnergy Team
- SimpleEnergy Team
- oCern

**Join or Create a Team**  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore.

**Earn Points & Badges**  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore.

**Blah, Blah, blah**  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore.

**Work for a Utility?**  
Learn how Simple Energy uses game mechanics to engage customers!

Start Winning Prizes Today!

[Sign up with facebook](#) [Sign In](#)

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SAN DIEGO Energy Challenge
Dashboard Leaderboards Badges Reports

**Win Big on Peak Days: June 8-10!**  
Save extra during peak days to win big!

[Learn More About Peak Days](#)

My Profile  
Badges  
Reports  
Household  
Yoav  
Yoav  
Yoav  
ADD TO YOUR HOUSEHOLD  
The Awesomes  
Yoav  
Yoav  
Yoav  
WRITE FRIENDS TO YOUR TEAM

**YOUR SAVINGS** -5.5% SINCE YESTERDAY

**FRIENDS AVG** 3.44% SINCE YESTERDAY

Leaderboards	Everyone
1	13,010
2	10,494
3	9,548

Invite more of your friends to play!

**It's a Peak-Time Day**

**Win Bigger by Saving More Energy Today.**

Reach your goal by saving up to 30% or more today. Below is a chart of the bigger prizes you can win today!

**Targeted Tip for Peak Days**

**Get out and have a BBQ!**

1,234 people did this Tip including 3 friends Mike, Justin, and Yoav

**Daily Tips**

**TIP: Power strip it!**  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris

[I did that!](#) [VIEW MORE TIPS](#)

**Recent Activity**

- December 22 at 11:39 AM
- December 22 at 11:39 AM
- December 22 at 11:39 AM
- December 22 at 11:39 AM

[VIEW MORE ACTIVITY](#)

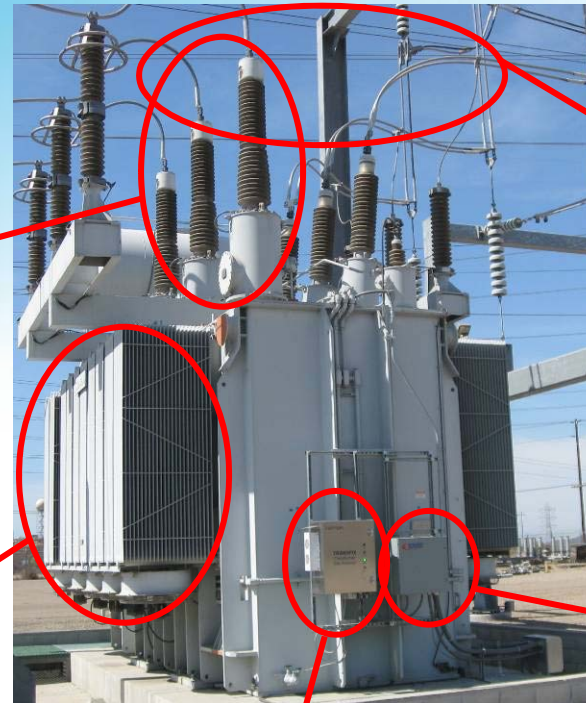
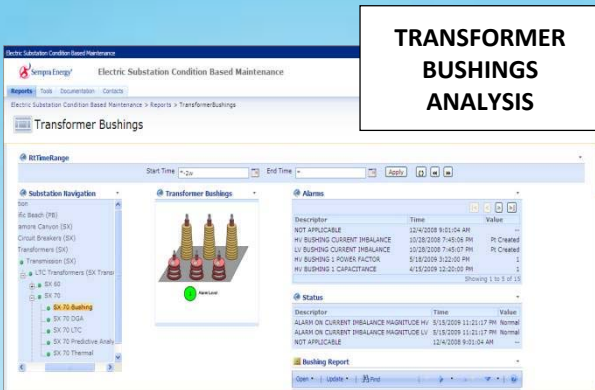
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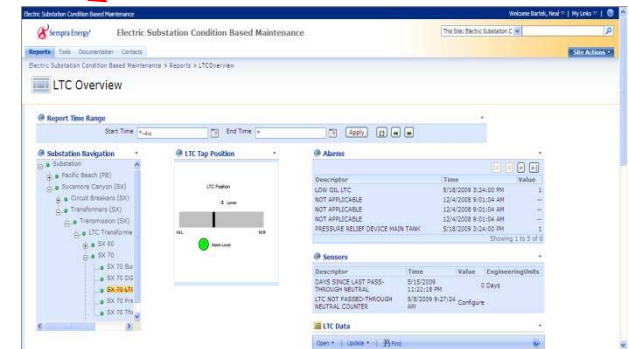


# Operational Efficiency: Condition Based Maintenance

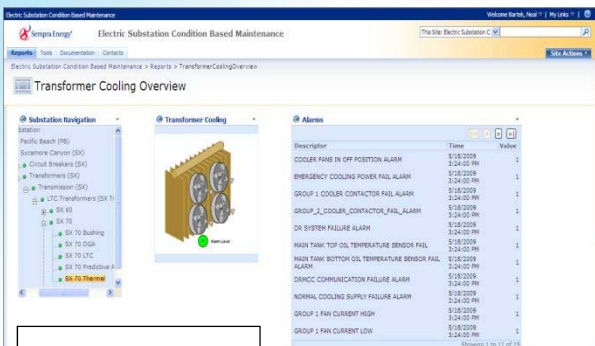
**TRANSFORMER BUSHINGS ANALYSIS**



LTC energy is measured at the control cabinet on the other side of the bank



**TRANSFORMER COOLING ANALYSIS**

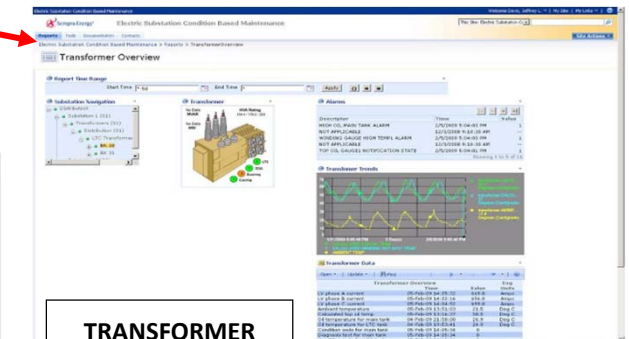


**TRANSFORMER COOLING ANALYSIS**



**DISSOLVED GAS ANALYSIS**

**TRANSFORMER ANALYSIS**



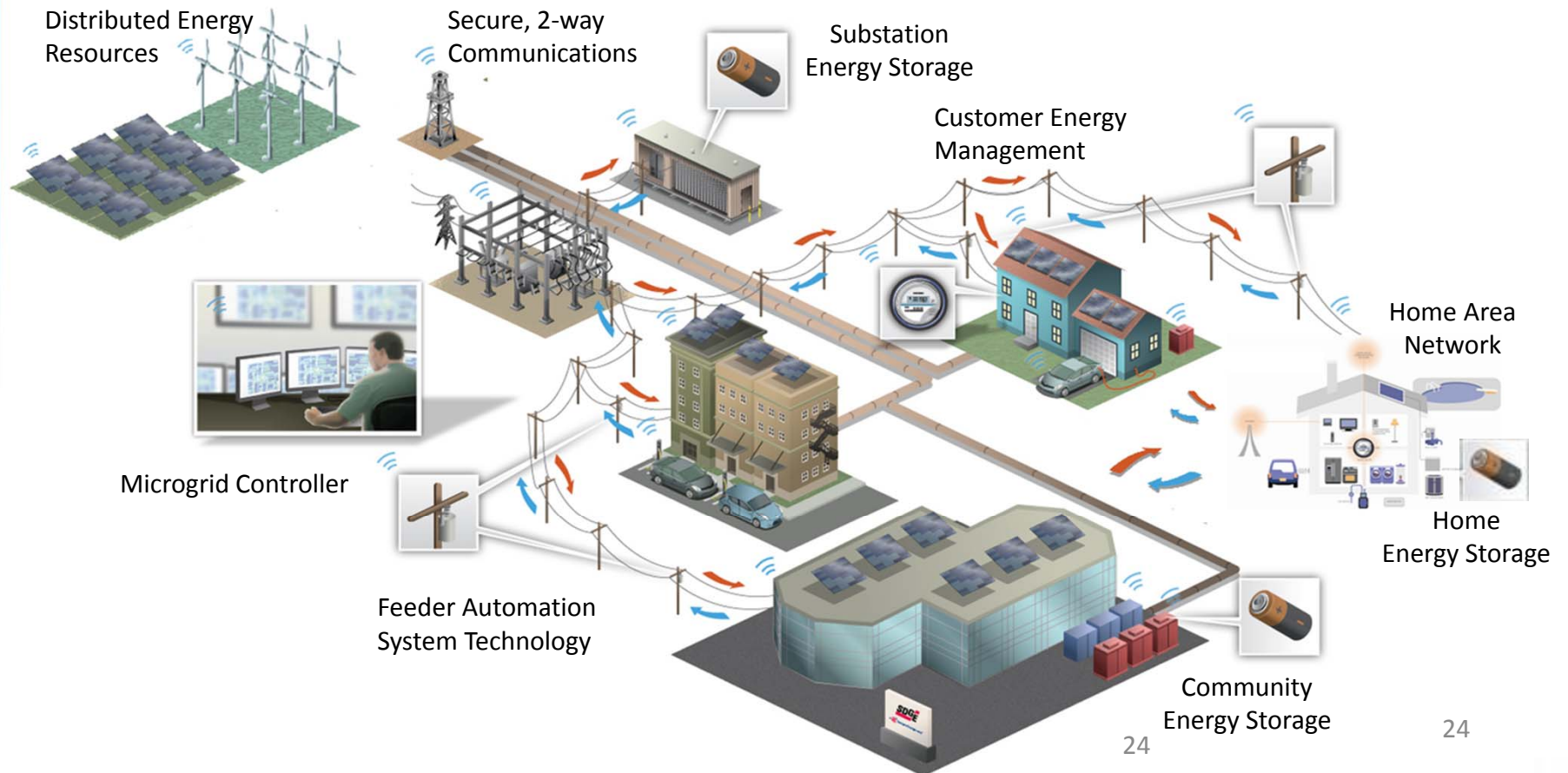
# Research, Development & Demonstration: SDG&E Borrego Springs Microgrid Project

## Description

In cooperation with the US Department of Energy and the California Energy Commission, SDG&E along with public and private sector partners are developing a “microgrid” project – a small version of its smart electric grid.

## Benefits:

- Integrate and leverage various generation and storage configurations and other smart grid technologies
- Reduce the peak load of feeders and enhance system reliability
- Enable customers to become more active participants in managing their energy use





*Questions?*

**Thank You**

Patrick Charles

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[www.sdge.com/smartgrid/](http://www.sdge.com/smartgrid/)

