

A blue-tinted graphic with rounded corners. It features a background of a power plant with tall chimneys and power lines. Overlaid on this are various data visualization elements: a map of California with labels for "Stockton" and "Fresno", several circular gauges or meters, and labels for "Generator 1" and "Generator 2".

Electric Utility Industry Transformation

John Di Stasio

Former CEO, SMUD

Advisory Board Member, Space-Time Insight

6th SMART GRIDS & CLEANPOWER

Cambridge, UK

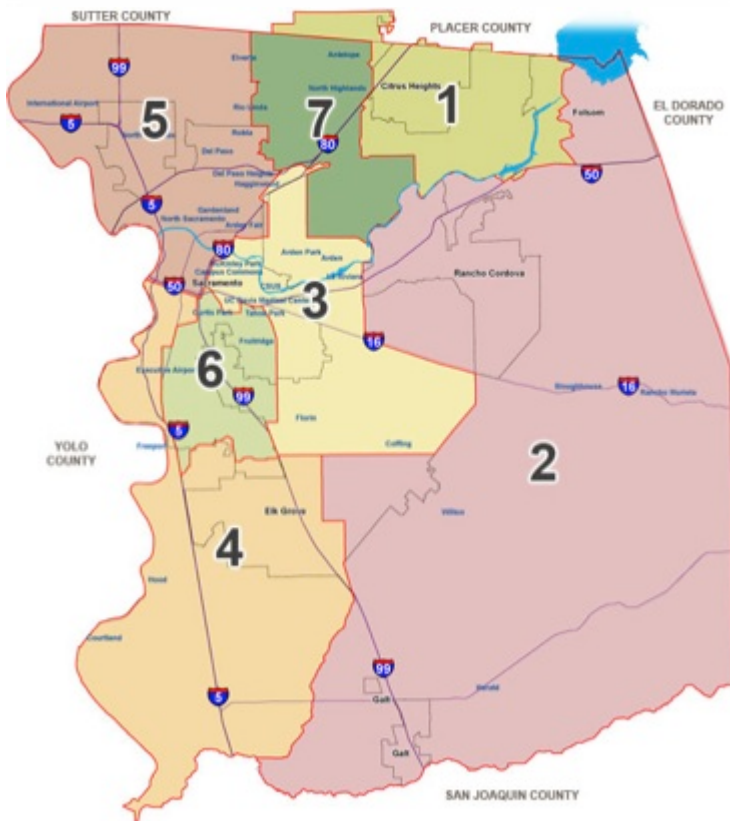
June 4, 2014

www.hvm-uk.com

About Sacramento Municipal Utility District



- **Municipal Electric Utility**
 - **Governed by a Board of Directors**
- **610,000 Customers**
 - **540,000 Residential**
 - **70,000 Commercial**
- **Summer-Peaking Load (Air Conditioning)**
 - **Residential Peak: 4-7pm June-September**
 - **Peak load ~3300 MW, of which 400MW = 40 hours**
- **Energy Mix:**
 - **25% Renewables**
 - 15% biomass and waste
 - 2% small hydro
 - 1% solar
 - 7% wind
 - **20% Large Hydro**
 - **53% Natural Gas**
 - **2% Wholesale Market**



About Space-Time Insight

Overview

- ❑ Situational intelligence solutions for asset-intensive industries
- ❑ Shipping product since 2008
- ❑ HQ in Silicon Valley; offices in India and UK

By the Numbers

- ❑ Mission-critical implementations worldwide
- ❑ 5 of the 20 largest US utilities are customers
- ❑ Over 75 billion records processed per month
- ❑ Analyzing up to 5 million assets per deployment

Recognized as Industry Leader



Presentation Overview

Investigating change in the electric utility industry...

- ❑ External drivers for industry change
- ❑ A case study: SMUD's retail strategy
- ❑ Responding to change – smart grid

External Drivers Overview

“Energy deregulation will create the largest transfer of wealth in US history.”

Warren Buffet

Evolution of the utility industry is being catalyzed by new...

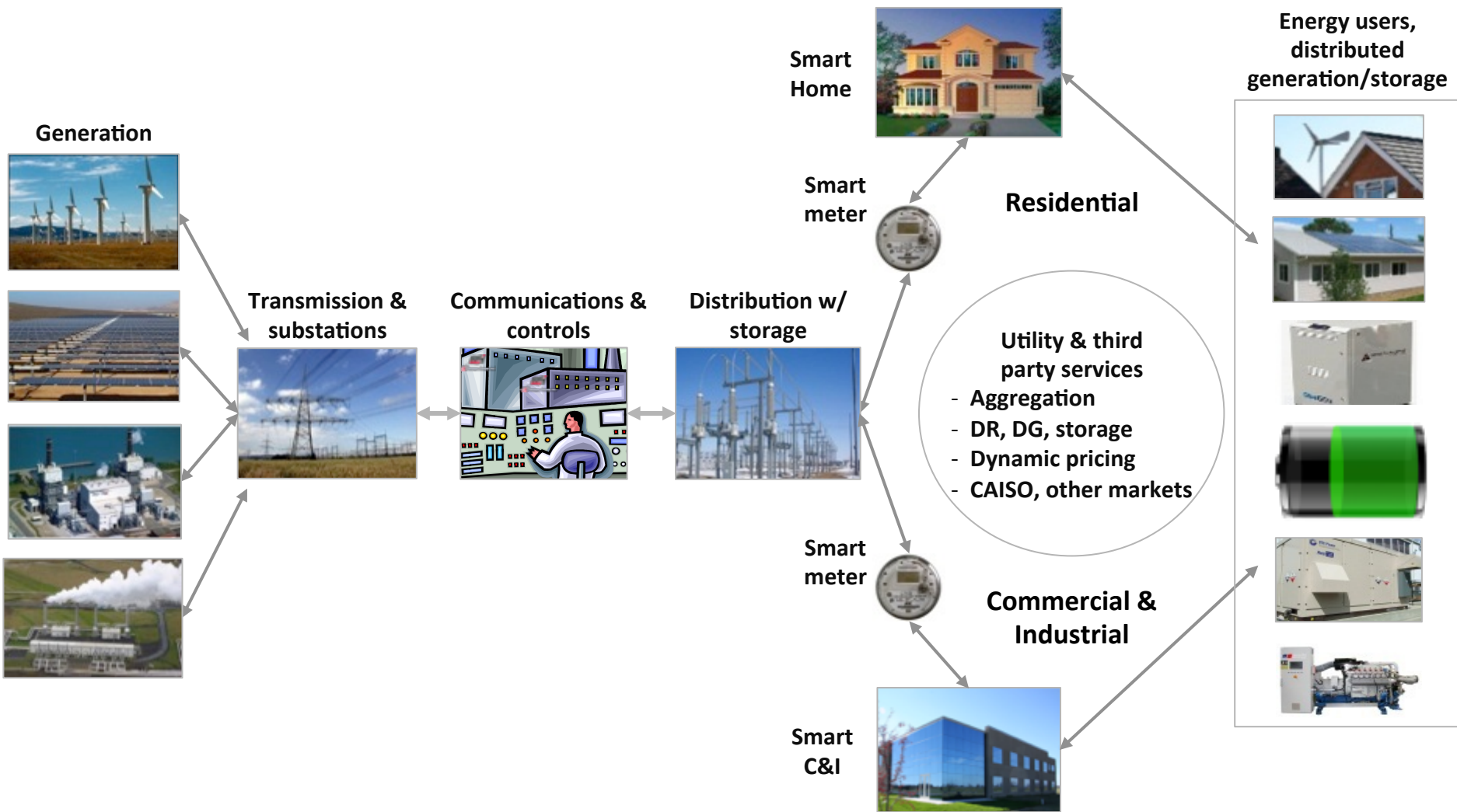
- ❑ Customer expectations
- ❑ Regulation and legislation
- ❑ Markets
- ❑ Business models
- ❑ Non-utility entrants
- ❑ Services
- ❑ Technologies
- ❑ Generation sources
- ❑ Energy innovation investments

California and Western External Drivers

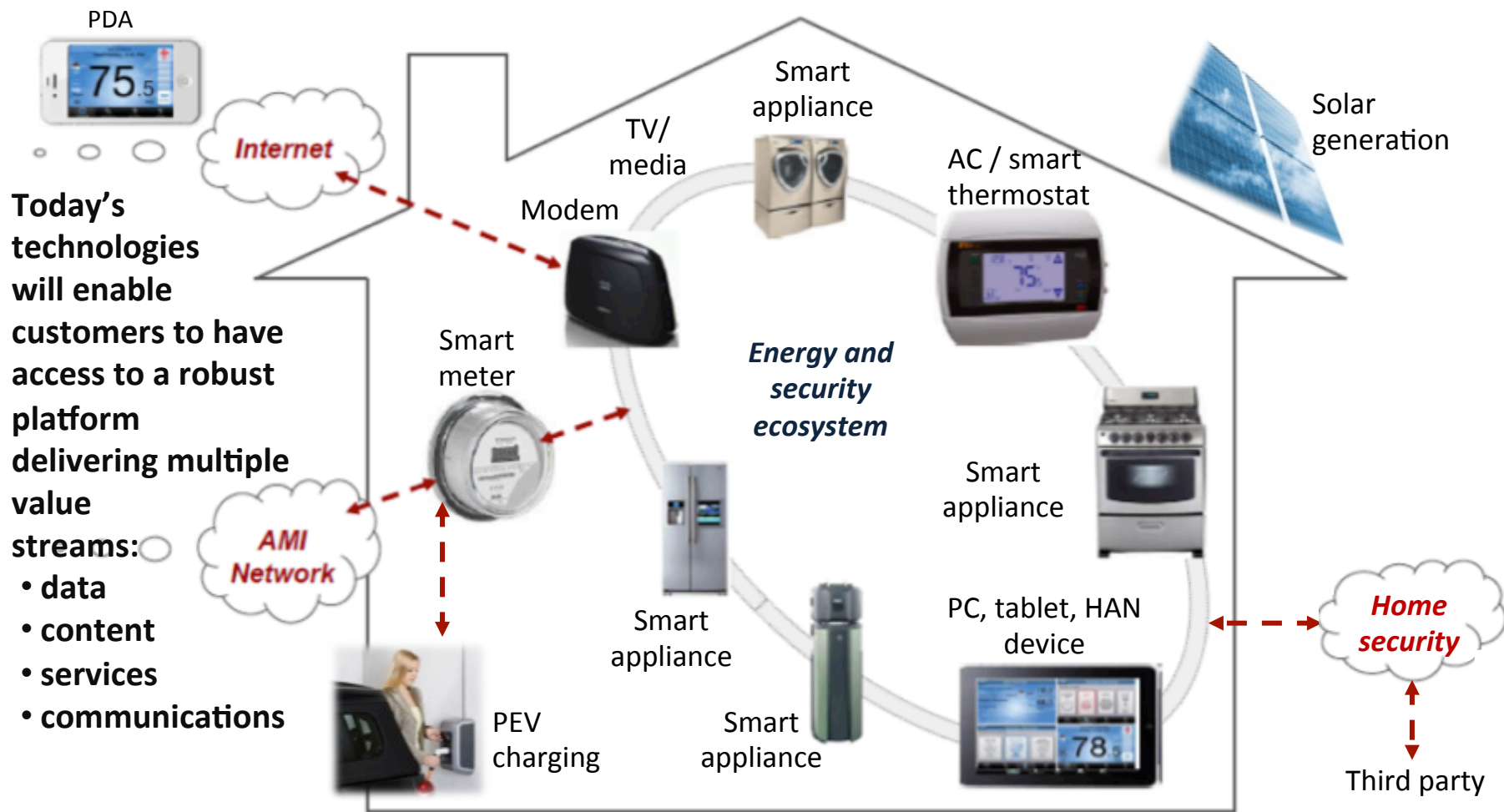
- ❑ **Climate Change**
 - **EPA and AB32**
- ❑ **Organized Markets**
 - **Energy Imbalance and Capacity**
- ❑ **Reliability**
 - **Physical and Cyber Security**
- ❑ **Financial Reform**
 - **Dodd Frank**
- ❑ **Renewable Integration and Regulation**
 - **The Duck Curve**

New Customer Expectations: Utility Industry Evolution

The utility world of the future will be driven by a robust bi-directional flow of energy and information.



New Customer Expectations: New Residential Experience

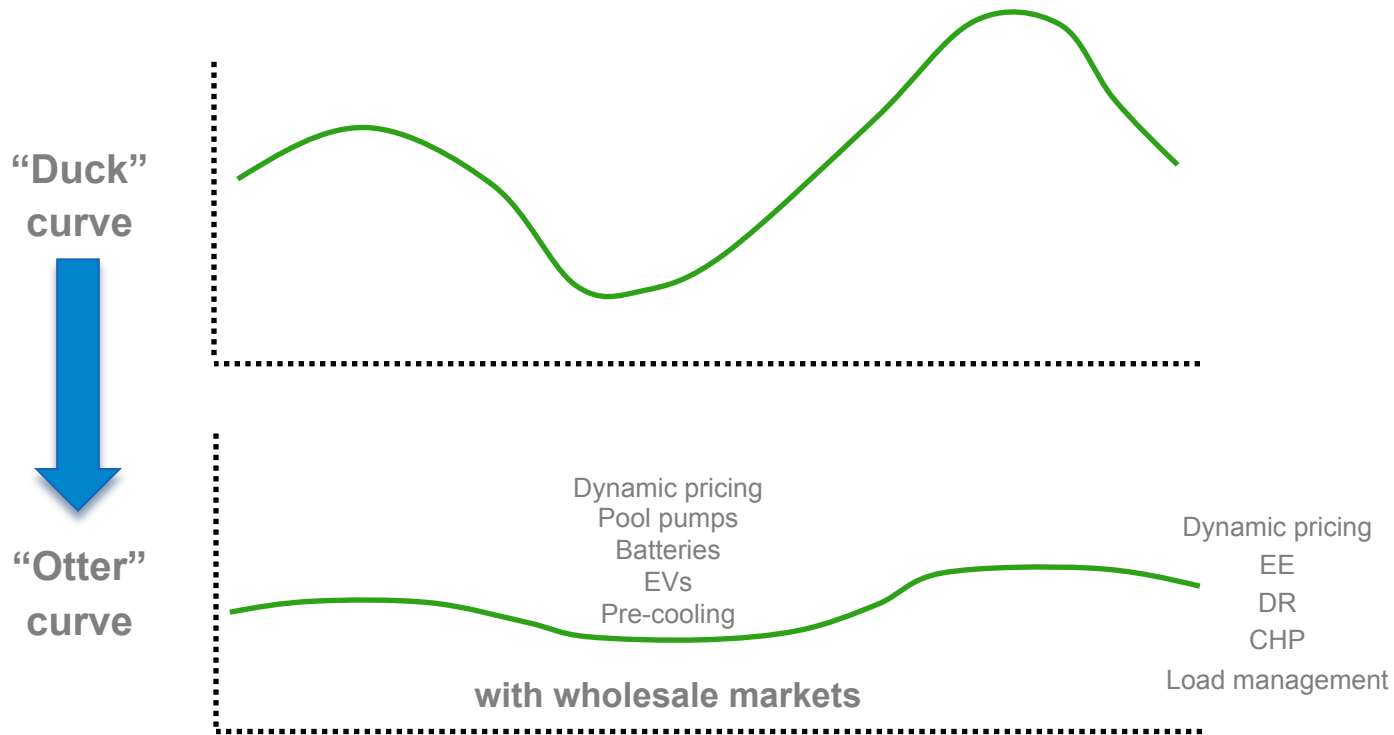


SMUD's Retail Strategy



Load Curves: Duck to Otter

Pricing and technologies will profoundly change our load curve, and our customers play a direct role.

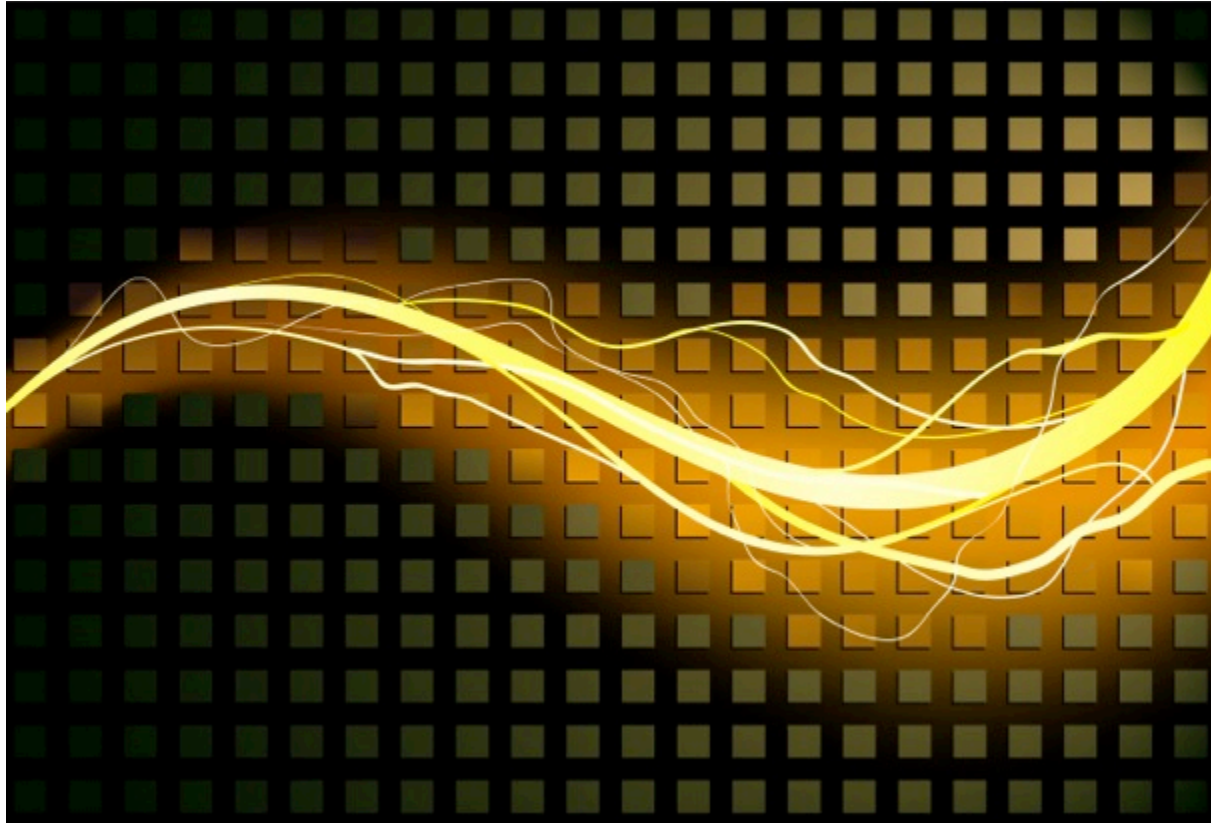


Arizona State University's Utility of the Future

- **Purpose**
 - Provide critical assistance to utilities looking to develop strategies for the transition to decentralized energy provisioning, clean energy, and energy efficiency
- **Justification**
 - High proportion of renewables being delivered to the grid
 - Customers investing in energy technologies
 - Ongoing shift toward ISOs and electricity markets
 - Regulatory models and markets shifting revenues from utilities to other participants in the energy system
- **Key Players and Sponsors**
 - APS, Tucson Electric, Duke, PGE, DTE, AEP, EPRI, CEE, Southern
 - Embracing change, and determining how to benefit from, rather than fall victim to:

“... creative destruction in the utility industry caused by the proliferation of distributed generation and energy efficiency.”


SMUD Responding to Change – Smart Grid



Smart Grid Investment Grant (SGIG)

October 2009 DOE Announcement

- SGIG grants to 100 entities
- \$203 million to California
- \$127.5 award to SMUD for a \$308 million project
- SMUD received 63% of the SGIG funds that went to California



U.S. DEPARTMENT OF ENERGY

News Media Contact(s):
(202) 586-4940

For Immediate Release
October 27, 2009

President Obama Announces \$3.4 Billion Investment to Spur Transition to Smart Energy Grid
Applicants say investments will create tens of thousands of jobs, save energy and empower consumers to cut their electric bills

ARCADIA, FLORIDA – Speaking at Florida Power and Light's (FPL) DeSoto Next Generation Solar Energy Center, President Barack Obama today announced the largest single energy grid modernization investment in U.S. history, funding a broad range of technologies that will spur the nation's transition to a smarter, stronger, more efficient and reliable electric system. The end result will promote energy-saving choices for consumers, increase efficiency, and foster the growth of renewable energy sources like wind and solar.

The \$3.4 billion in grant awards are part of the American Reinvestment and Recovery Act, and will be matched by industry funding for a total public-private investment worth over \$8 billion. Applicants state that the projects will create tens of thousands of jobs, and consumers in 49 states will benefit from these investments in a stronger, more reliable grid. Full listings of the grant awards by category and state are available [HERE](http://www.energy.gov/recovery/smartgrid_maps/SGIGSelections_Category.pdf) (http://www.energy.gov/recovery/smartgrid_maps/SGIGSelections_Category.pdf) and [HERE](http://www.energy.gov/recovery/smartgrid_maps/SGIGSelections_State.pdf) (http://www.energy.gov/recovery/smartgrid_maps/SGIGSelections_State.pdf). A map of the awards is available [HERE](http://www.energy.gov/recovery/smartgrid_maps/SmartGridGrantLocations.pdf) (http://www.energy.gov/recovery/smartgrid_maps/SmartGridGrantLocations.pdf).

An analysis by the Electric Power Research Institute estimates that the implementation of smart grid technologies could reduce electricity use by more than 4 percent by 2030. That would mean a savings of \$20.4 billion for businesses and consumers around the country, and \$1.6 billion for Florida alone – or \$56 in utility savings for every man, woman and child in Florida.

One-hundred private companies, utilities, manufacturers, cities and other partners received the Smart Grid Investment Grant awards today, including FPL, which will use its \$200 million in funding to install over 2.5 million smart meters and other technologies that will cut energy costs for its customers. In the coming days, Cabinet Members and Administration officials will fan out to awardee sites across the country to discuss how this investment will create jobs, improve the reliability and efficiency of the electrical grid, and help bring clean energy sources from high-production states to those with less renewable generating capacity. The awards announced today represent the largest group of Recovery Act awards ever made in a single day and the largest batch of Recovery Act clean energy grant awards to-date.

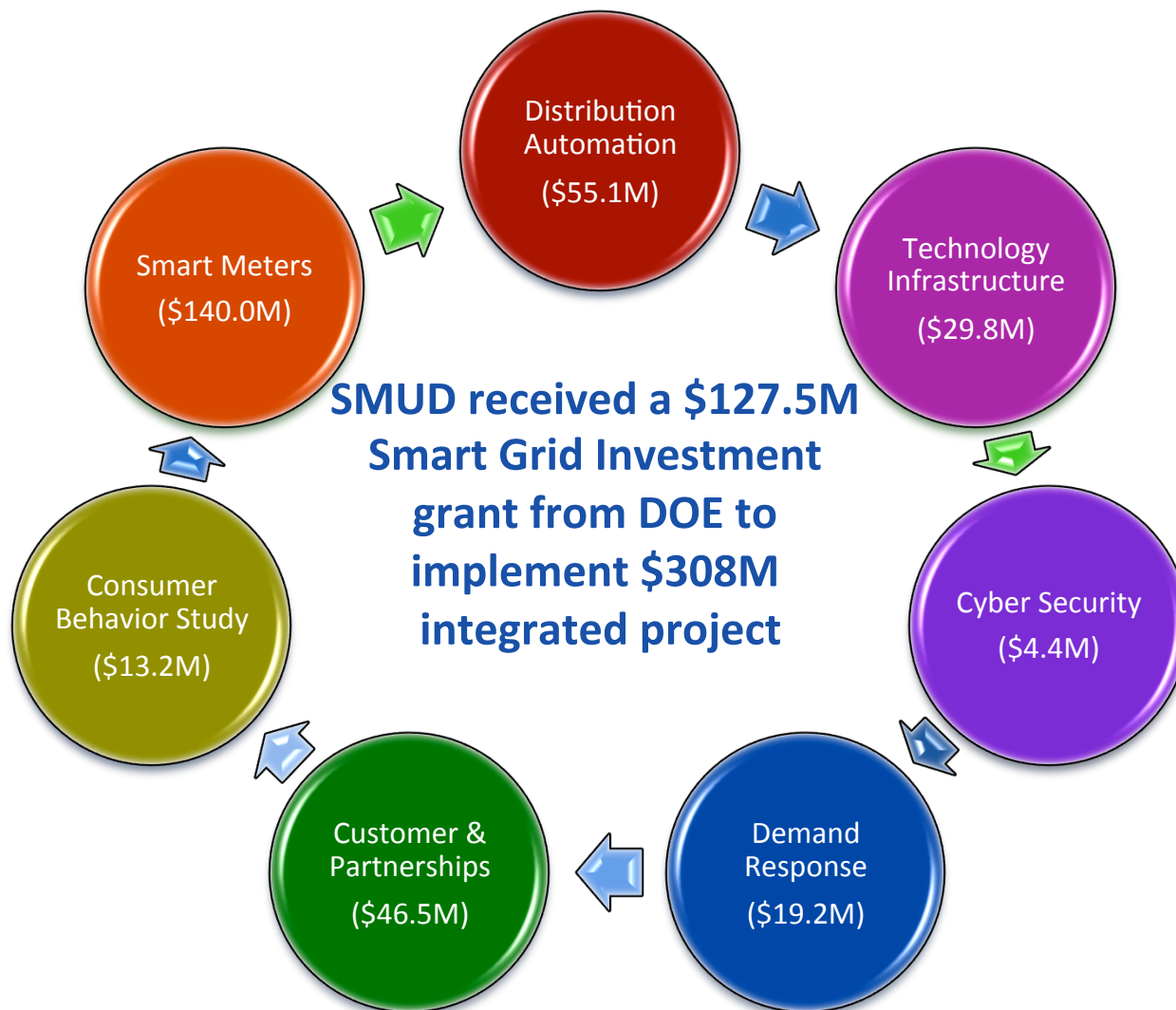
Today's announcement includes:

- **Empowering Consumers to Save Energy and Cut Utility Bills – \$1 billion.** These investments will create the infrastructure and expand access to smart meters and customer systems so that consumers will be able to access dynamic pricing information and have the ability to save money by programming smart appliances and equipment to run when rates are lowest. This will help reduce energy bills for everyone by helping drive down "peak demand" and limiting the need for "stand-by" power plants – the most expensive power generation there is.

SmartSacramento Vision



SmartSacramento[®] ARRA Grant

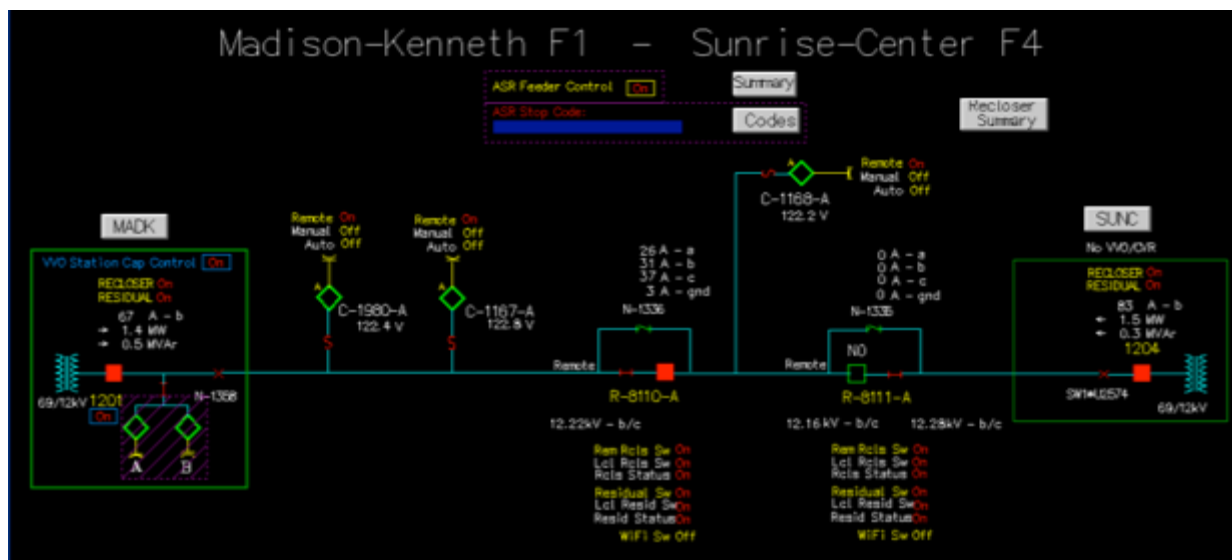


1. Installed over 615,000 smart meters; using many of the features
2. Implemented smart pricing options and tested TOU, CPP and combination TOU/ CPP on opt-in and default customers
3. Installed DRMS and developed several DR programs including residential PCT and commercial AutoDR initiatives
4. Implemented multiple distribution projects that improve system performance
5. Rolled out customer-related programs and services that improved customer satisfaction and helped customers better manage their energy usage
6. Installed an enterprise service bus to manage the multiple software programs linked to smart grid. Implemented customer relationship management software
7. Implemented state-of-the-art cyber security protocols and technologies
8. Implemented multiple smart grid R&D initiatives

Distribution Automation



Automated Sectionalizing and Restoring



Electronic Switching Map



INTERGRAPH®
SIEMENS

Outage Communication Management



Enhanced Outage Management

QA - SECONDARY FORM - Last update at 1/6/2014 1:19:04 PM

Legend

- Awaiting results
- Non-AMI
- Ping Successful
- Ping Failed

+ Zoom In - Zoom Out

Zoom Window Pan Mode

Fit Map Select Device

Device | Meter | Event | List

Device

Specific Device

Current Outages

Use Date Range

From:

To:

Load: 33.39 Amps

Include AMI Counts

Include all Meters

Get Meter Voltage

Get Disconnect Status

Add Comments To Event

Ping For Selected Row

Zoom to Selected Row

Status: Finished Pinging Meters Rows: 8 Run Time: 60

Clear Form Send to Excel

Event	Name	Transformer	PingResults	VoltageResults	ConnectStatusResults
D13121700001	customer 1	TX-01075812	Success (.480)	(Volts = 246/0/0) (Amps = 4.15/0/4.15)	Connected (Closed)
D13121700001	customer 2	TX-01075764	Success (1.07)	(Volts = 244/0/0) (Amps = 1.04/0/1.04)	Connected (Closed)
D13121700001	customer 3	TX-01075732	Success (.892)	(Volts = 245/0/0) (Amps = 2.07/0/2.07)	Connected (Closed)
D13121700001	customer 4	TX-01075733	Success (1.03)	(Volts = 246/0/0) (Amps = 1.32/0/1.32)	Connected (Closed)
D13121700001	customer 5	TX-01076023	Success (6.68)	(Volts = 246/0/0) (Amps = 8.67/0/8.67)	Connected (Closed)
D13121700001	customer 6	TX-01075731	Success (1.35)	(Volts = 243/0/0) (Amps = 11.1/0/11.1)	Connected (Closed)
D13121700001	customer 7	TX-01075992	Success (5.98)	(Volts = 246/0/0) (Amps = 3.14/0/3.14)	Connected (Closed)
D13121700001	customer 8	TX-01075734	Success (.478)	C.(Volts = 285.28/285.66/285.92) (Amps = 1.9/1.9/0)	Commercial Non-Switchable



Embracing the “Big Data” Revolution



SPACE-TIME
INSIGHT



Landis
|Gyr+

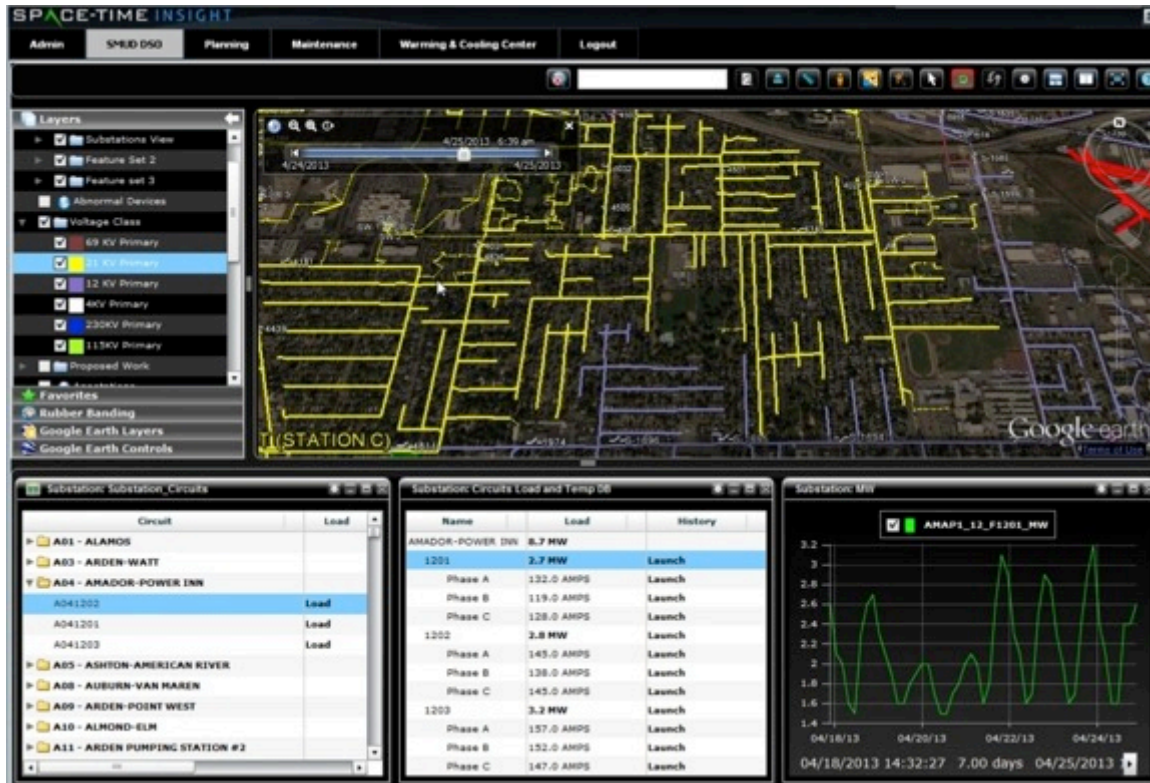


INTERGRAPH®

software AG

Situational Awareness and Visual Intelligence

(SAVI)



SPACE-TIME
INSIGHT

INTERGRAPH®

SAP®

ORACLE®

OSIsoft®

software AG

SPACE-TIME INSIGHT

Admin | SMUD DSO | Planning | Maintenance | Warming & Cooling Center | Logout

4/25/2013 6:39 am

Layers

- Search
- DNM
- Substations View
- Feature Set 2
- Feature set 3
- Abnormal Devices
- Voltage Class
- Proposed Work
 - Proposed Features
 - Proposed Orders
 - Annotations
 - Historical Substation Load
- Emergency
- Weather
- Outage
- Critical Services

Favorites

- Rubber Banding
- Google Earth Layers
- Google Earth Controls

Proposed Orders: Orders_Dashboard

Order Number	Order Type	Order Short Desc	Earliest Start Date
30088739	DSB2	CR D-183-4 = 3110 KMP (EXPEDITED)	2013-03-12 00:00:00.0
30095269	DSB2	CR B-48-1-5 = 44,762 K (EXPEDITED)	2012-12-28 00:00:00.0
30089341	DSB2	POLE RPL 240/191 UD024356	2013-03-20 00:00:00.0
30087314	DSB2	POLE RPL 296/152 UD083587	2013-03-20 00:00:00.0
30088286	DSB1	OFFSITE WORK-VINEYARD POINT VIL PH1B	2013-02-13 00:00:00.0
30050709	DSB1	AUBURN BLVD. WIDENING, SYLVAN CORNERS	
30098471	DSB1	SD14 - 16TH AND O STREET	2012-11-15 00:00:00.0
30087051	DSB2	CR A-100 = 2515 KM	2012-06-19 00:00:00.0

SPACE-TIME INSIGHT

nitroom Maintenance SMUD DSO Warming & Cooling Center Logout

Layers

- Area Maps
- Asset Health
 - Current AHI
- Corrective Maintenance
- DNM
- FULL NW
 - Capital Project Features
 - Proposed Features
 - Substation Circuit
 - Trading
- Heat Map
- Multiple Notifications
- Outages
- Preventive Maintenance
- Proposed Work
- Favorites
- Rubber Banding
- Google Earth Layers
- Google Earth Controls

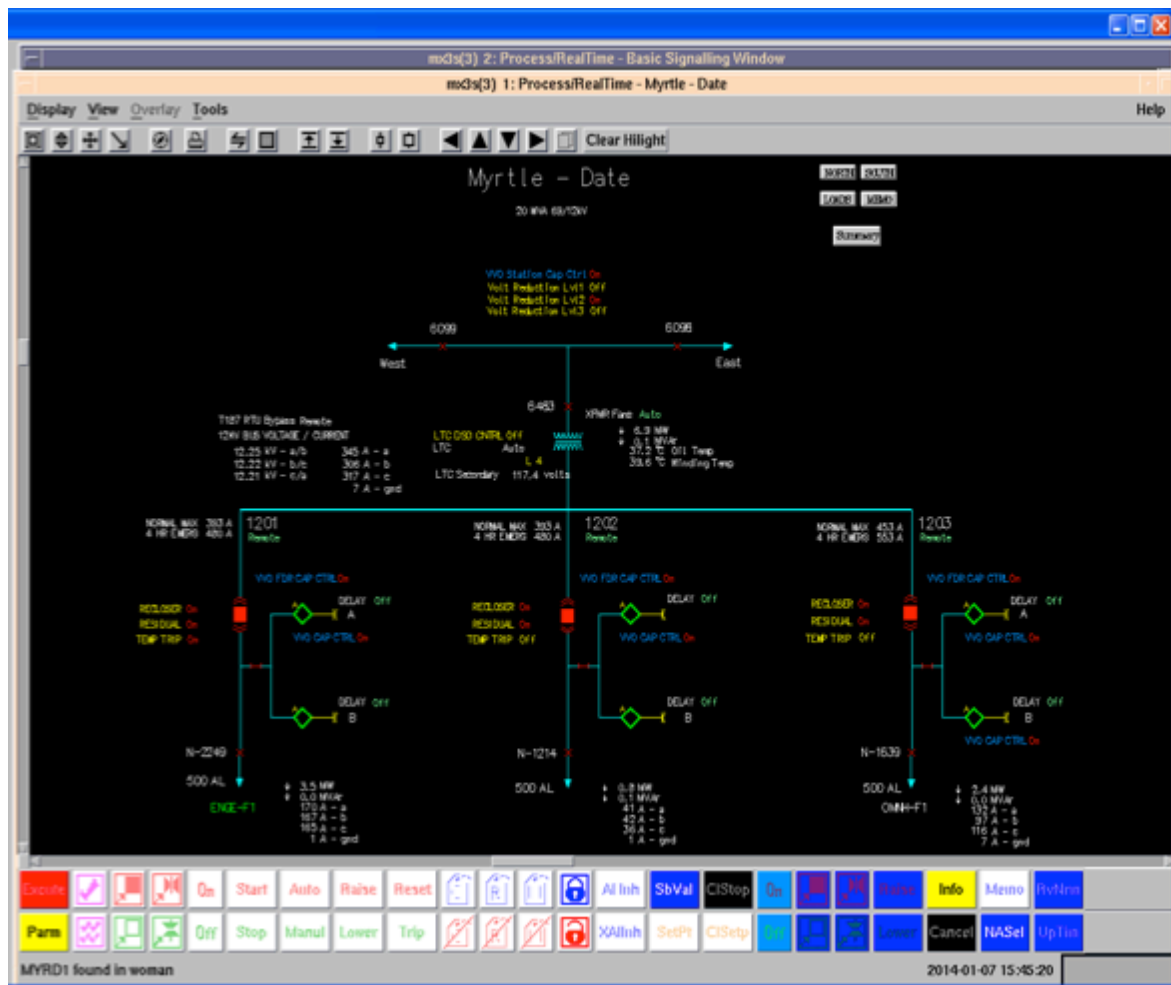
AHI Legend

- Very Good
- Good
- Fair
- Monitor
- Poor

Current AHI: AHI Dashboard

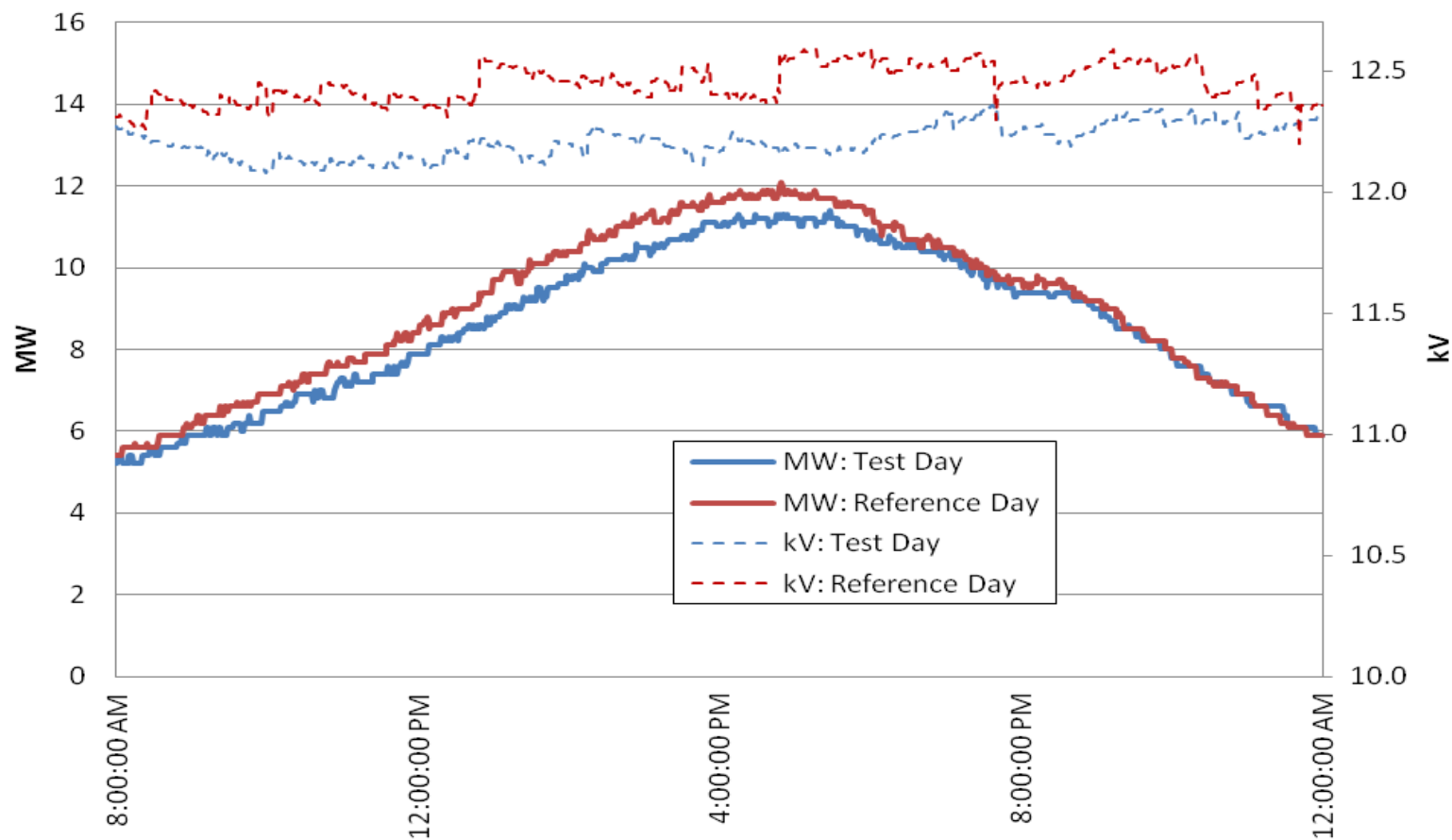
Bank #	Size (MVA)	Primary Voltage	Secondary Voltage	AHI Rating	Serial Number	Equipment Location	Final Score After
BULK							71.37916666666666
DISTRIBUTION							66.1632653061225
14TH AVE - 52ND							59.3
24TH - GARDENDALE							64.2
1	20	69	12	Fair	F-2775-2	24th ST-GARDENDALE & U	64.2
34 ST - E ST							63.3
43RD - SOUTH LA							62.5

Conservation Voltage Reduction and Volt/Var Optimization

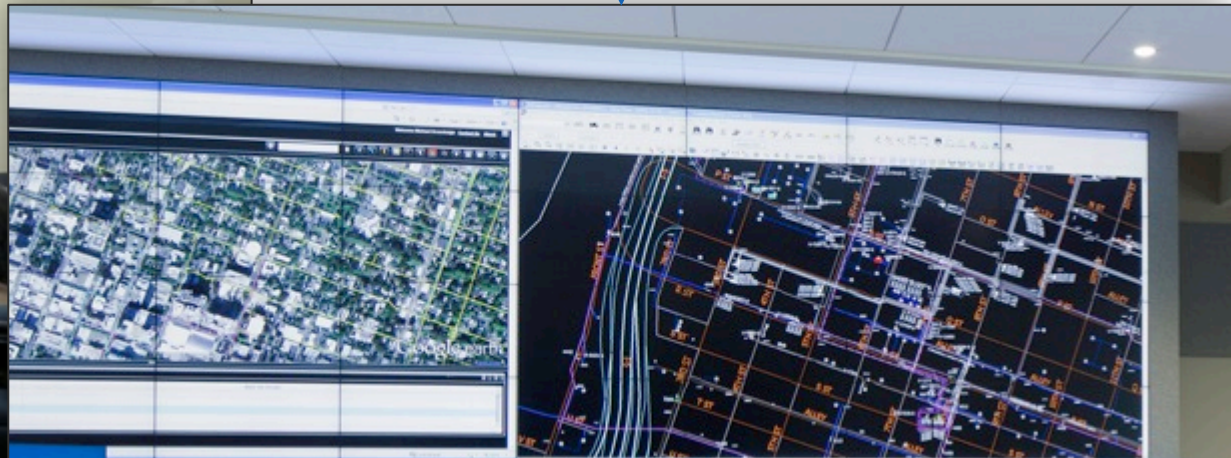
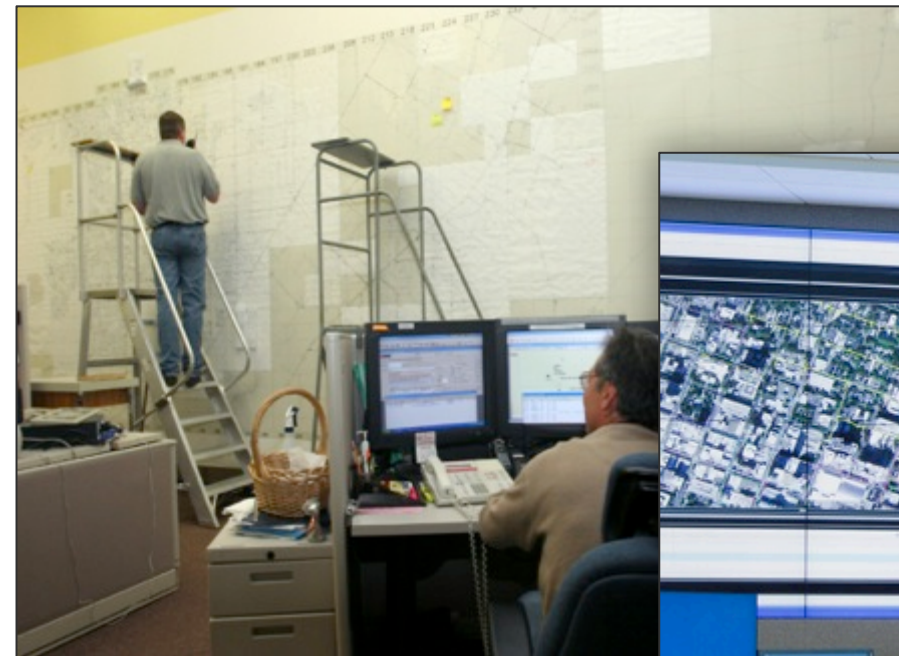


2011 Pilot Deployment – CVR Results

Myrtle-Date 2% CVR Analysis



Results



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 [linkedin.com/company/space-time-insight](https://www.linkedin.com/company/space-time-insight)

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