

# The Business Case for Demand Response

Energy Efficiency Utility Summit

Doubletree Hotel – Portland

11 May 2011



Philip D. Lusk

Power Resources Manager

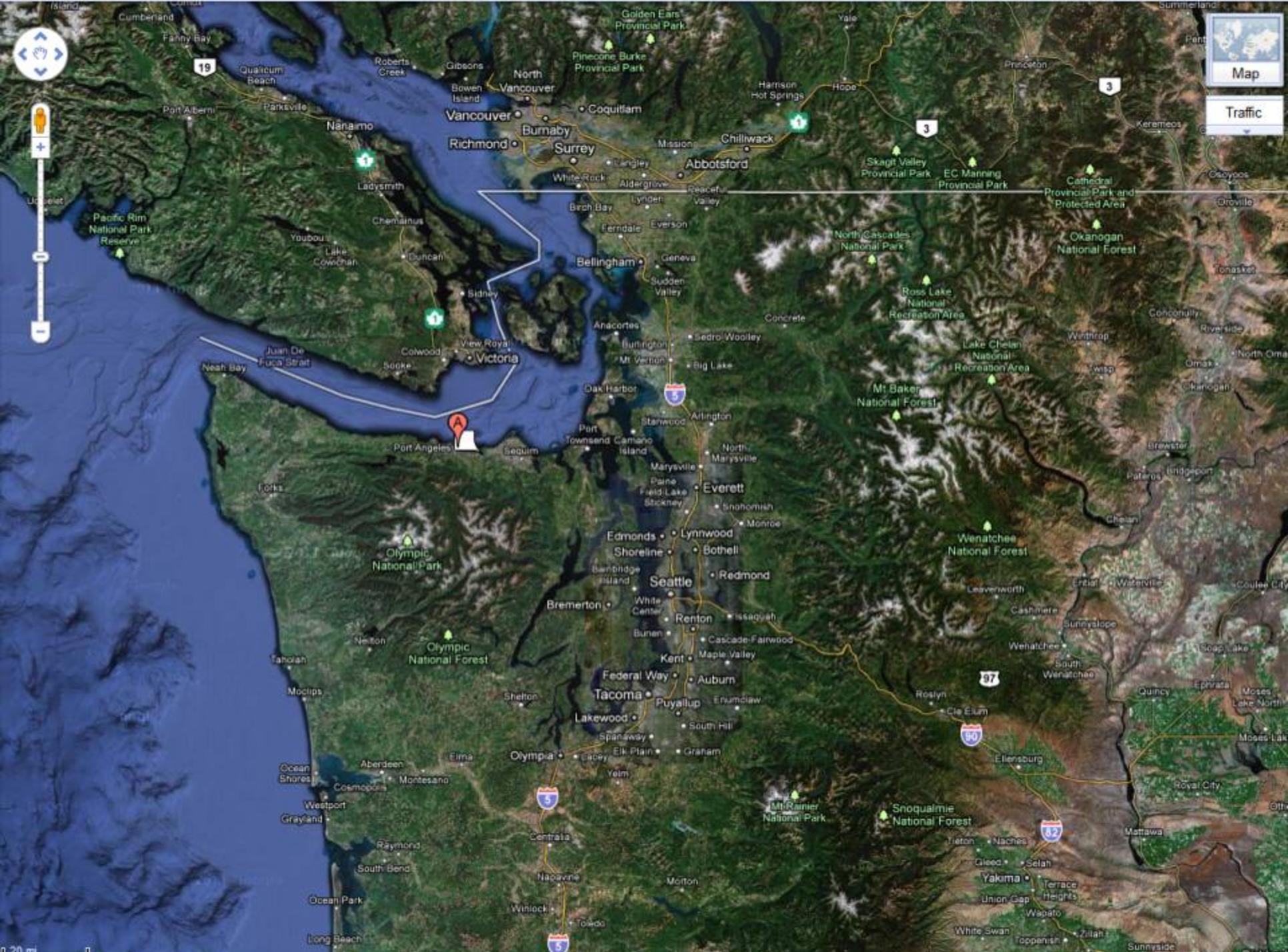
360.417.4703

plusk@cityofpa.us

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# Today's Topics

- Background
  - Automated Metering Infrastructure Efforts
  - Rate Design Efforts
  - Demand Response Efforts
  - Outstanding Issues
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Map  
Traffic

19

3

3

5

87

90

82

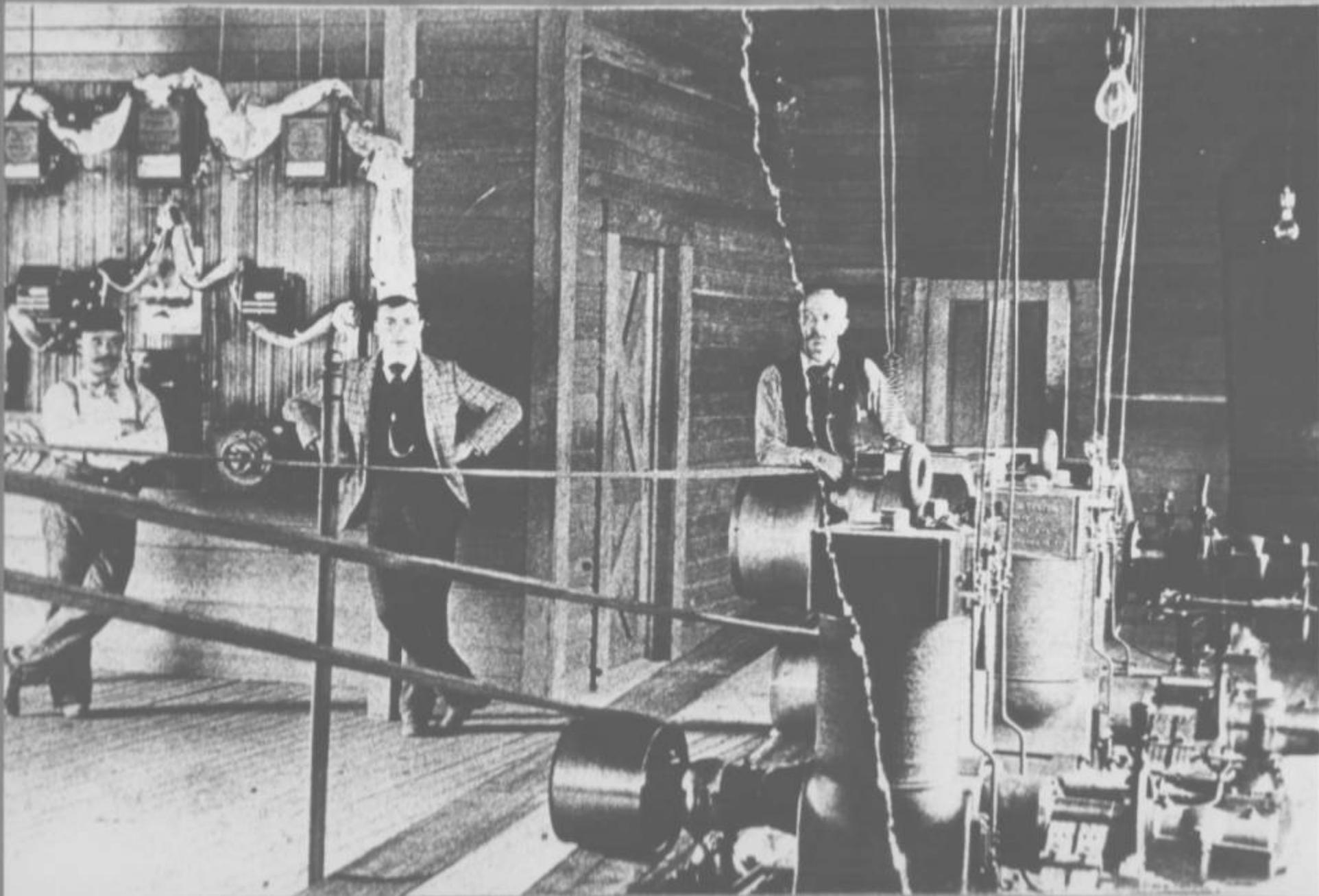
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Port Angeles

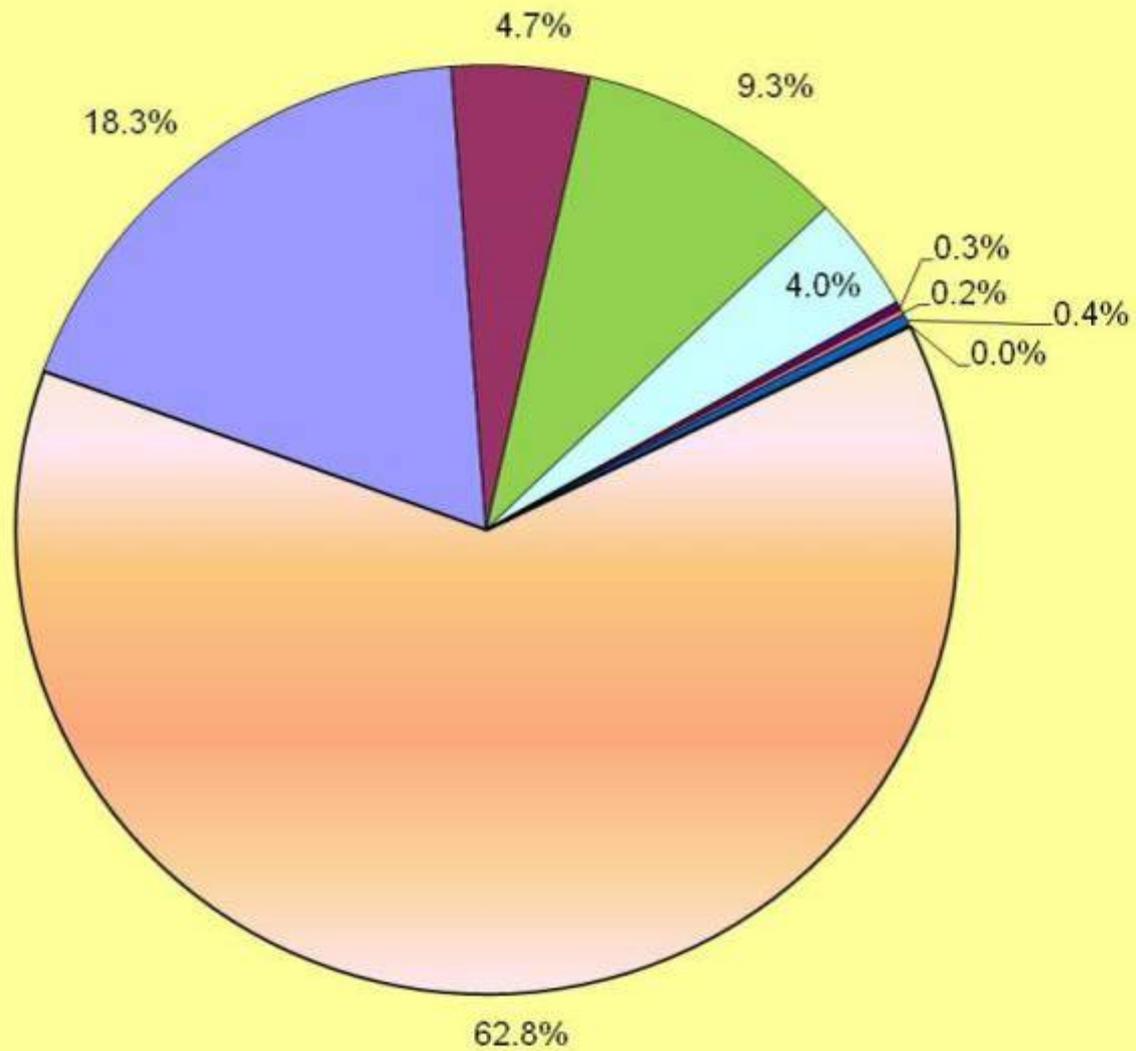


WASHINGTON.



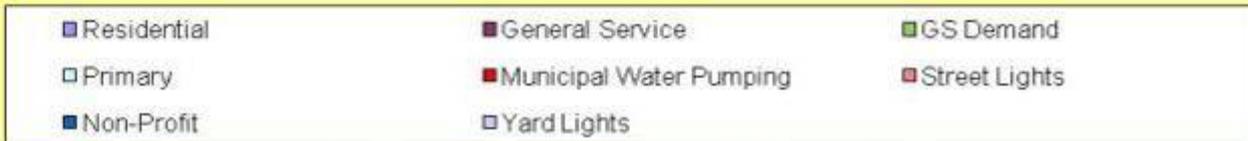
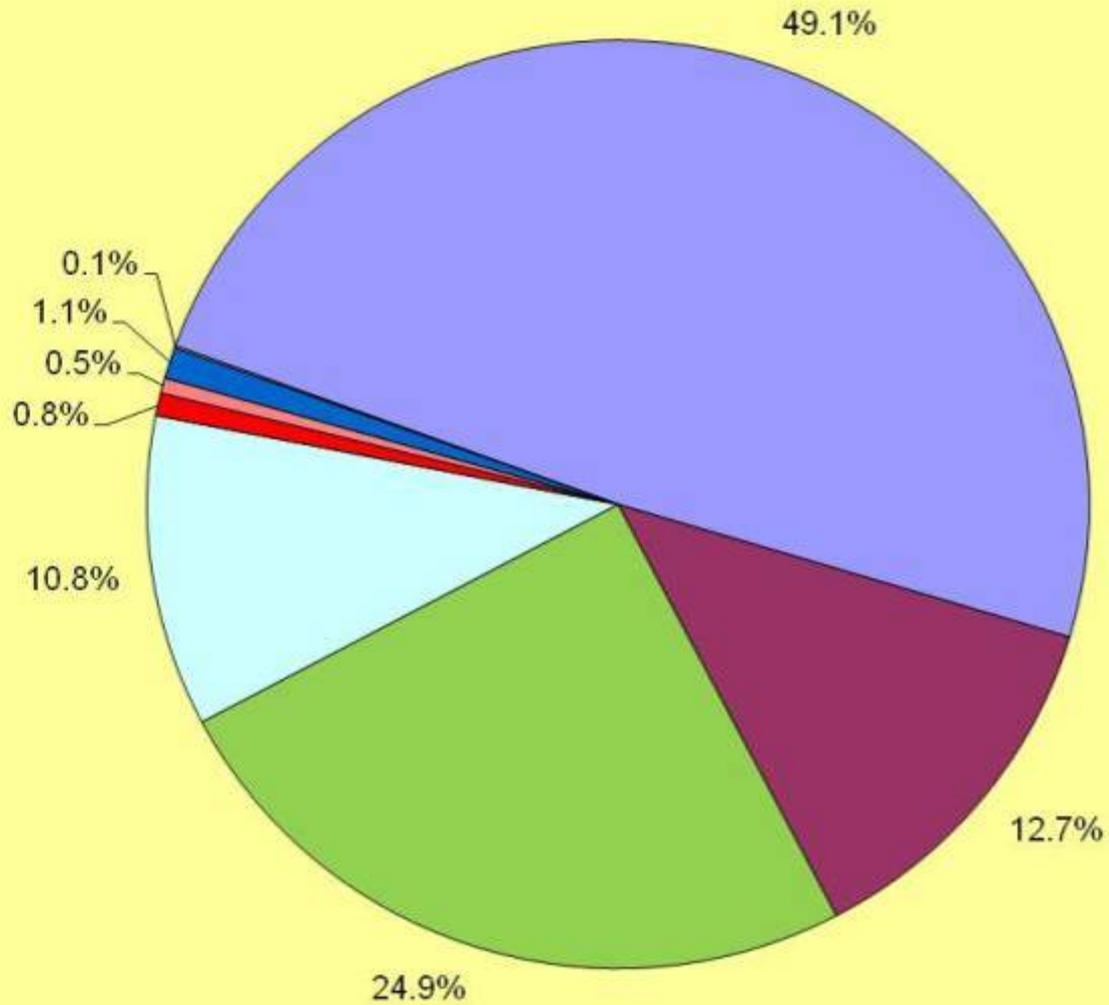
INSIDE FIRST POWER HOUSE

# City of Port Angeles 2010 Electricity Consumption

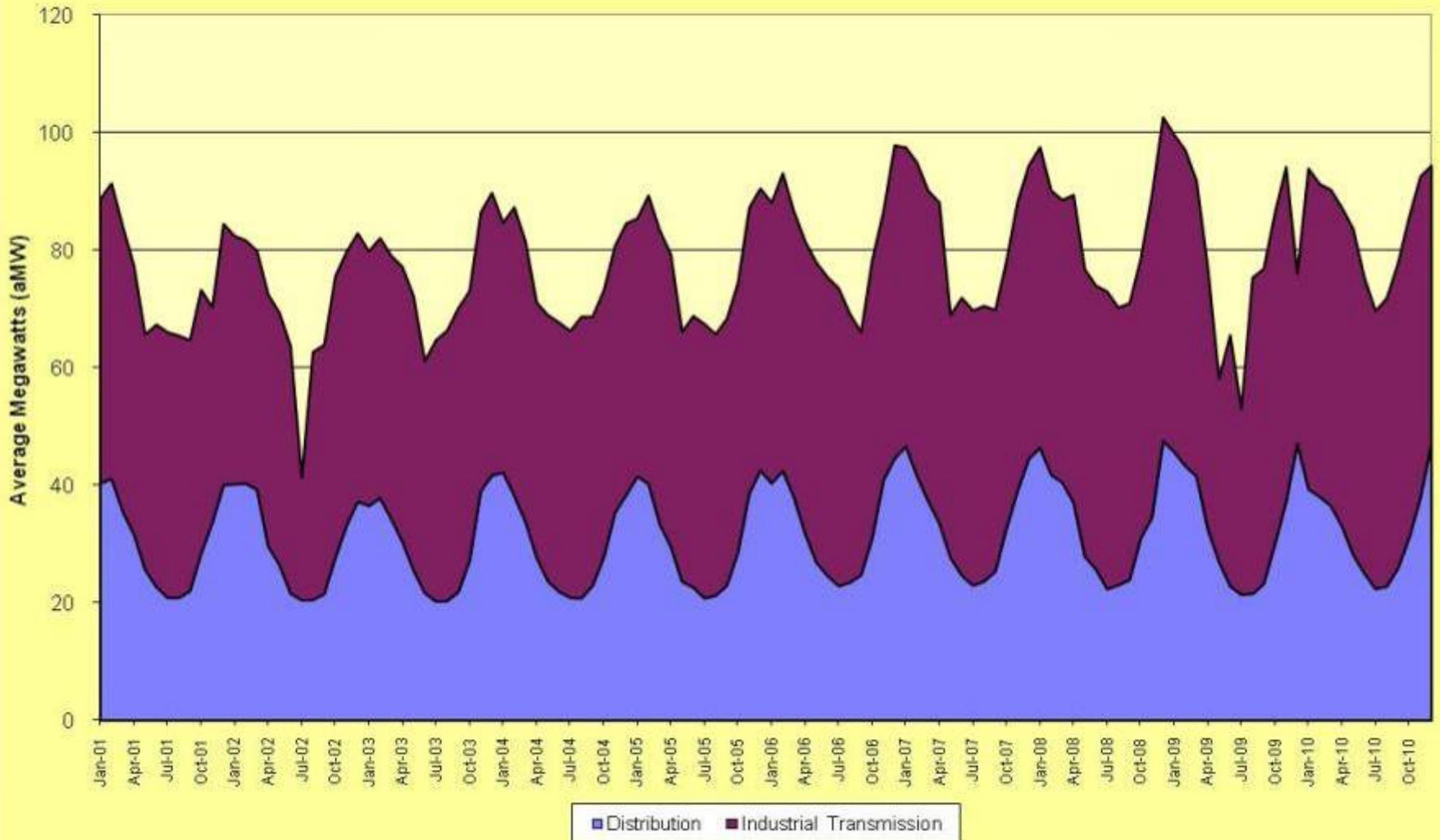


Residential	General Service	GS Demand
Primary	Municipal Water Pumping	Street Lights
Non-Profit	Yard Lights	Industrial Transmission

# City of Port Angeles 2010 Electricity Consumption



### City of Port Angeles Monthly Power Loads January 2001 - December 2010



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# Port Angeles Distribution Utility Forecast

- Distribution forecast used two load growth rates
    - Baseline (Status Quo)
      - Used historic annual consumption growth rates
      - Higher-priced "Tier 2" wholesale power purchases projected to start in 2017
    - Enhanced Conservation Alternate
      - Used growth rates equal to the Northwest Power and Conservation Council's *Sixth Northwest Conservation and Electric Power Plan* goals
      - Higher-priced "Tier 2" wholesale power purchases projected to start in 2024
        - Avoided annual 10%-15% increase in wholesale power costs compared to baseline
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# Reduce Tier-2 with Two Priorities?

- Seek all cost-effective conservation as the favored resource for meeting future loads
    - Least risk and most cost-effective
      - City Council directed a **doubling** of conservation program
        - Rate payer funds provided to help achieve policy objective
        - Seek additional BPA funding to accelerate the energy savings
      - Enhanced conservation scenario could also effectively reduce annual demand growth rate to 0%
  - Pursue renewable energy & cogeneration
    - Preference for resources located within City limit
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# Strengths, Weaknesses, Opportunities, Threats

## ■ Strengths

- Conservation reduced City's 2009 power purchases by 2.1%, directly saved customers \$869,000 and created a net economic benefit of more than \$2 million

## ■ Weaknesses

- Limited current generation resources on the Peninsula

## ■ Opportunities

- Automated metering infrastructure, enhanced conservation and new renewable choices within City's service territory

## ■ Threats

- Strong potential for significant increases in wholesale power costs and decreases in the BPA "Tier 1" power system
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# Port Angeles' Dual Challenge

- BPA raising regional electricity rates on October 1, 2011
    - Manage contract demand quantity, load shape, and critical peak periods
  - The City's electric and water meters are wearing out
    - Many under measure what people use
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# What Port Angeles Needs To Do

- Minimize the impact of BPA's upcoming rate hikes
  - Give our customers more tools to manage their energy use
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# What's the Sensible Next Step?

- Replace the old meters with new ones that measure accurately
  - Provide customers the chance to use power when it's the least expensive

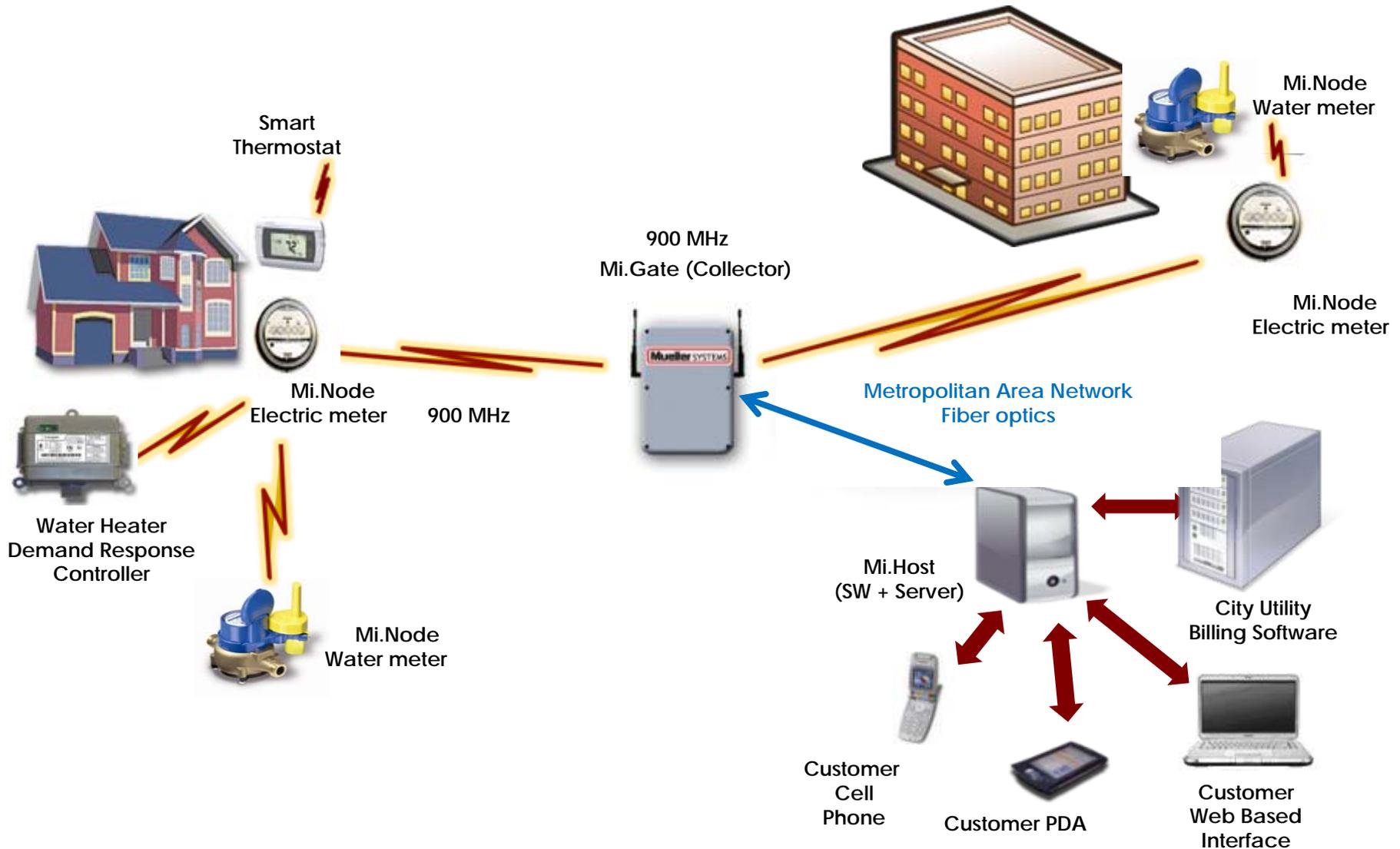


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# Automated Metering Infrastructure Efforts

- All electric and water meters in City's service territory replaced with AMI by 2012
    - 10,600 electric meters
    - 8,400 water meters
  - "Turn-key" solution
    - Procure and install a complete AMI system using one Vendor with minimum City intervention
-

# AMI System Overview



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# Immediate Benefits

- AMI meters are highly accurate so everyone pays for what they use—it's fair
  - The AMI system allows the City to run its electric and water utilities efficiently and at the lowest cost possible
  - Customers can have more control over their bill
    - By using power when it's least expensive
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# Future-Ready Benefits

- State-of-the-art meters will bring more conservation opportunities
    - In the future, smart appliances and technologies will become more commonplace
-



## Your New AMI System

- Bonneville Power Administration will be raising power rates across the Pacific Northwest later this year
- The City's electric and water meters are old and need to be replaced with future-ready technology
- New meters = new opportunities for you to use power when it's least expensive
- Advanced Metering Infrastructure (AMI) enhances the City's abilities to run utilities at the lowest possible cost

THE  
SENSIBLE  
NEXT  
STEP



## What to expect in 2011

All City electricity and water meters will be replaced by the end of 2011

You will know in advance when your meters will be installed

AMI meters send readings via wireless and fiber optic technology

Meters are accurate and future-ready

Receive tips for controlling your bill and saving energy

The City will keep communicating with you every step of the way

Visit:

[www.cityofpa.us/newmeters.htm](http://www.cityofpa.us/newmeters.htm)

Or call 360-417-4595



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# New Electric Utility Rate Design

- **Time-of-Use Rate without demand for residential, general service, and non-profit customer classes**
    - Customer base charge
    - Winter & summer seasons including peak period, off-peak period, and shoulder period energy charges
    - Demand response credits
  - **Time-of-Use Rate with demand for general service demand and primary customer classes**
    - Customer base charge
    - Winter & summer seasons including peak period, off-peak period, and shoulder period energy charges
    - Demand charges during peak period only
    - Reduced demand charges for demand response participants
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# New Rate Design Schedule

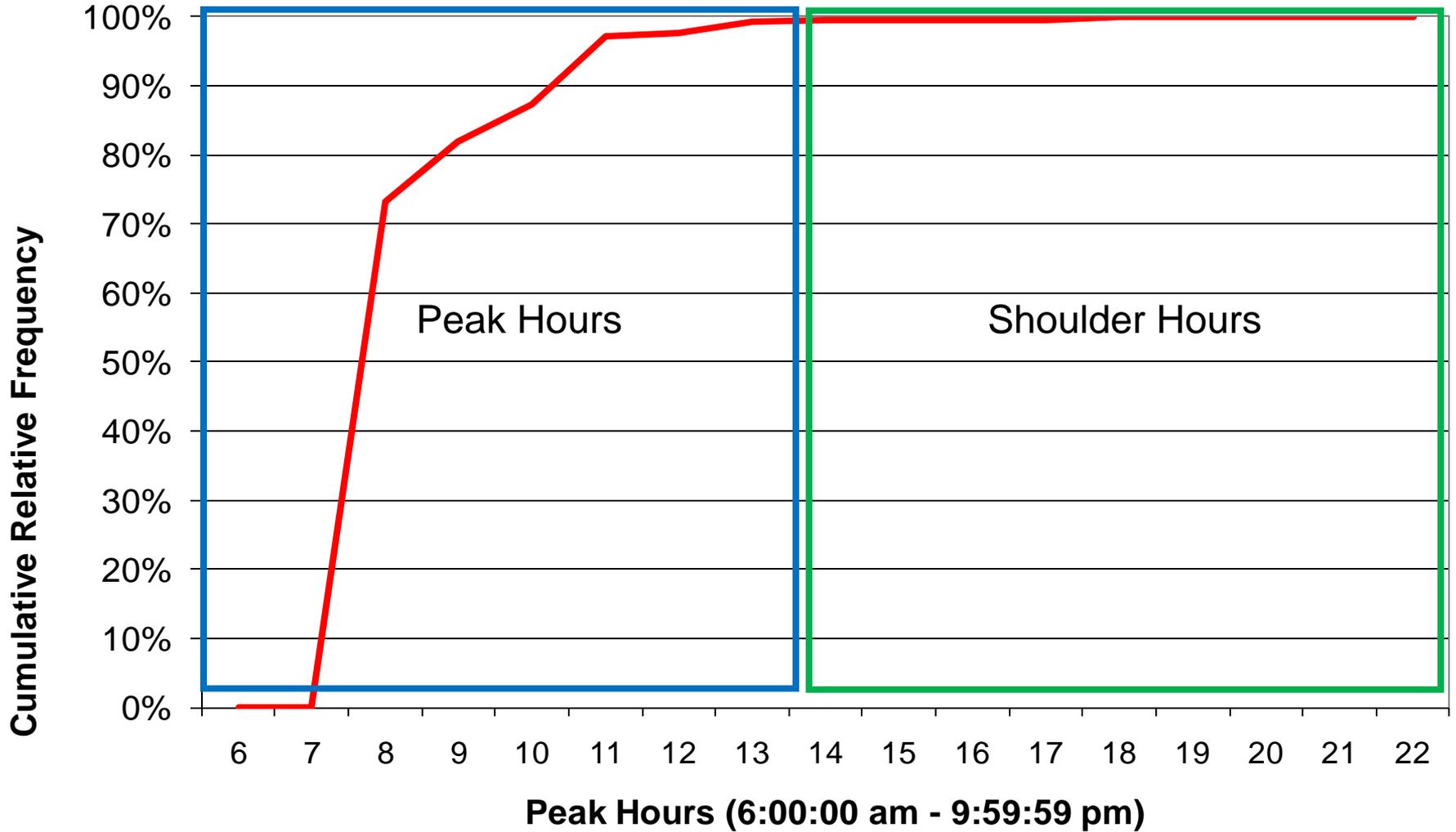
- **Time-of-Use retail electric rate design**

- Rate design incorporated into AMI System
- BPA wholesale rate increase expected October 1, 2011
- Retail rates determined Fall 2011
- Retail rates effective 2012

- **Encourages all electric customers to**

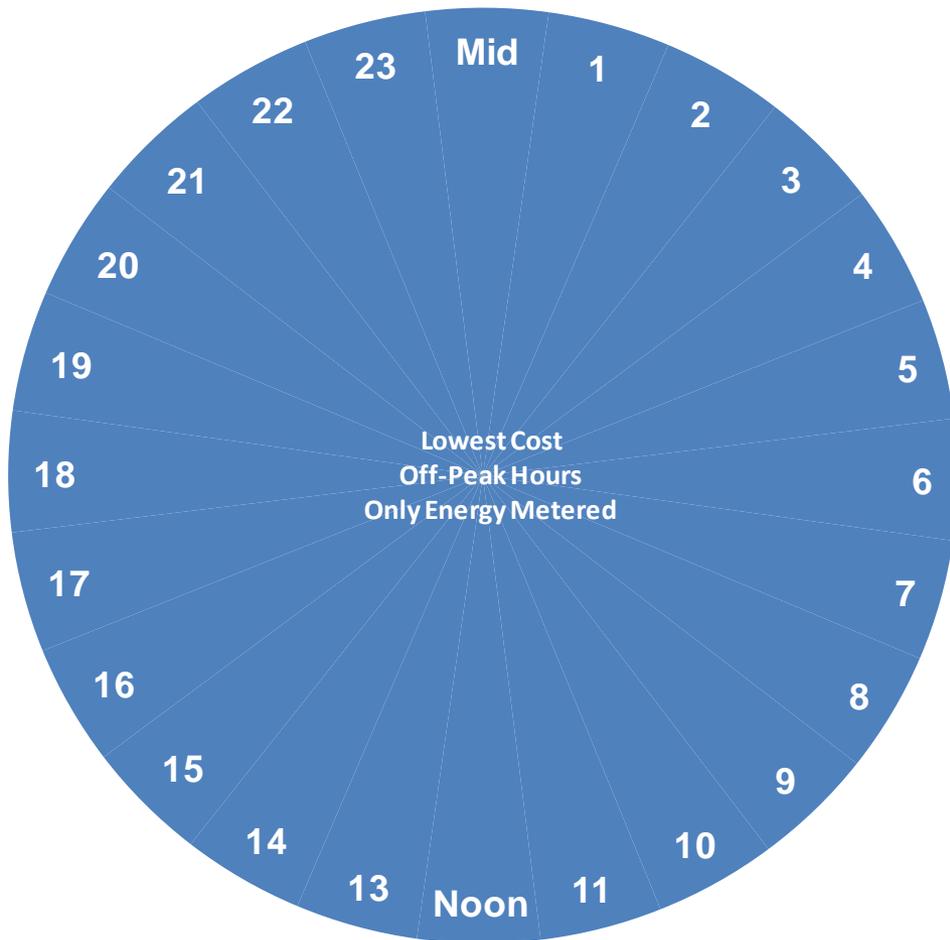
- Reduce winter energy consumption
  - Shift peak period consumption to lower-priced shoulder and off-peak periods
  - Participate in voluntary demand response programs
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# Distribution System Peak Demand (January 1990 - October 2010)

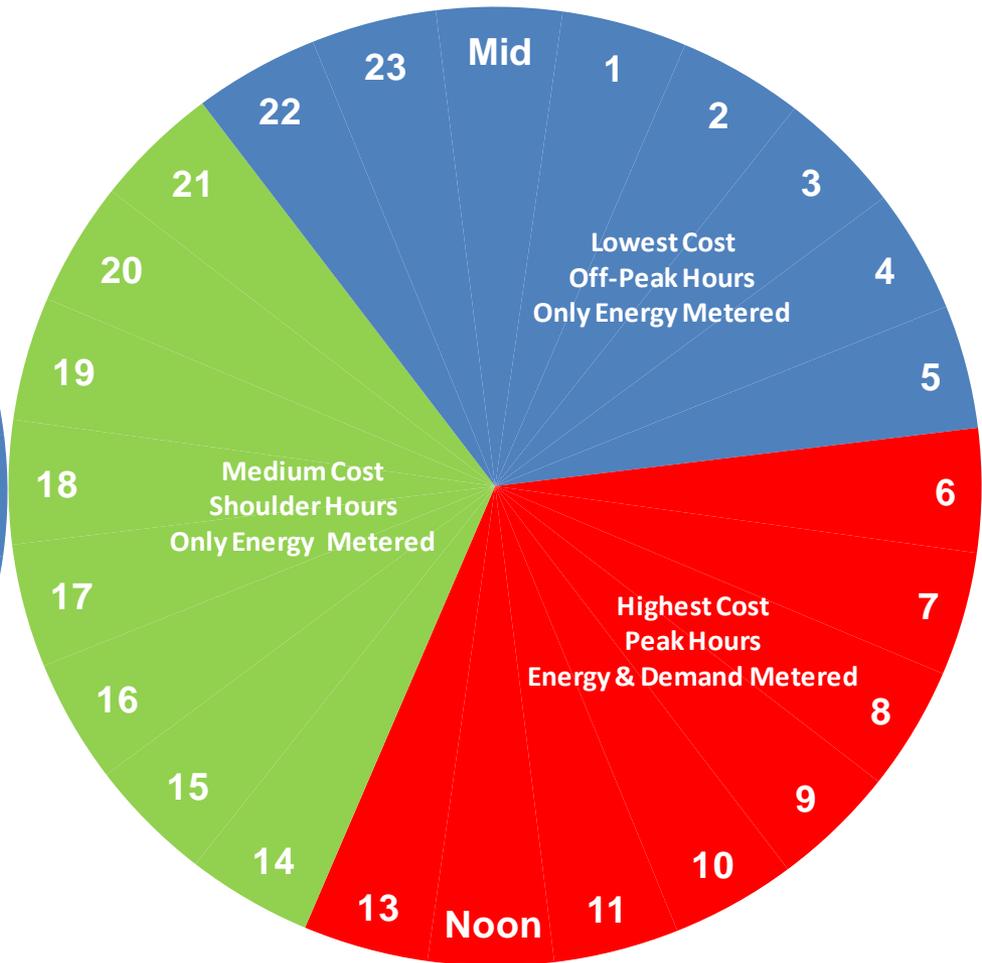


# City Peak Hours, Shoulder Hours, Off-Peak Hours, and Demand via 24-Hour Timeclock

Sundays & NERC Holidays



Monday Through Saturday



# Voluntary Demand Response Efforts

## ■ Customer-Side\*

- Residential DR Pilot (600 customer units)
  - Water heaters, home area networks, thermal storage
- Residential Wind Integration Pilot (41 customer units)
  - Water heaters, thermal storage
- Commercial & Industrial DR Pilot (8 customers)
  - Open Automated Demand Response Communication Standards (OpenADR) communications protocol
- Industrial Wind Integration Pilot (1 customer)

## ■ Utility-Side

- Voltage Optimization (VO)
  - Use AMI to monitor and report lowest end-of-line feeder into City's SCADA system

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\* Made possible with the support of the Bonneville Power Administration

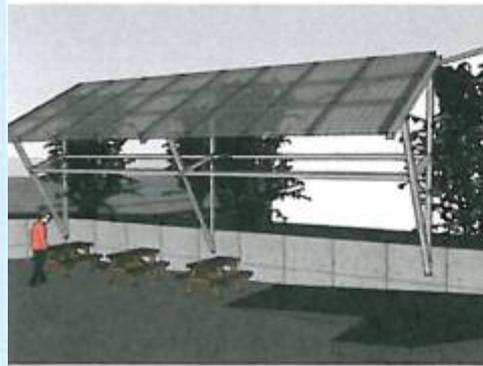
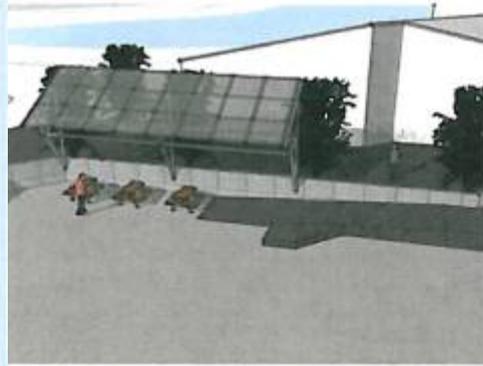
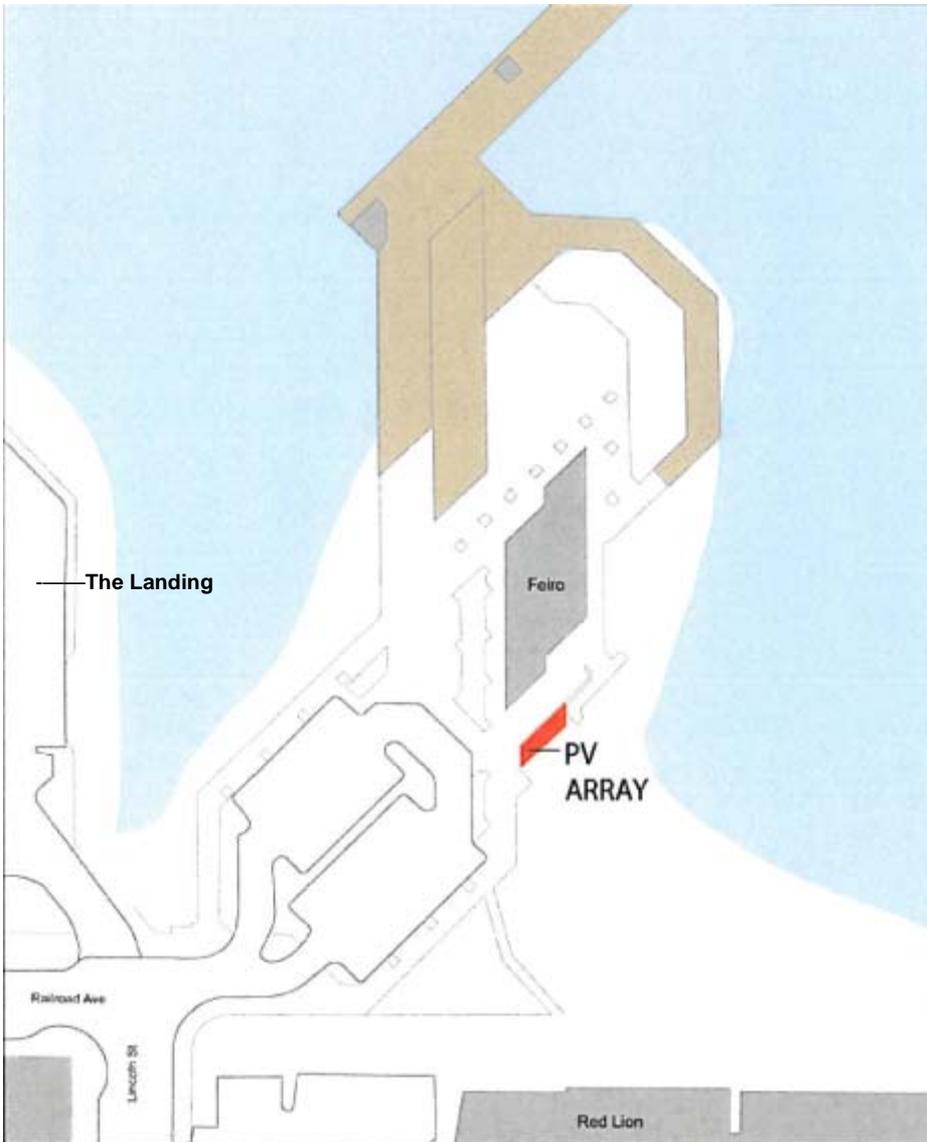
# Fast-DR/Renewable Integration Using LI-Battery Storage (48-kW) Project



# Inverter for LI-Battery Storage Project

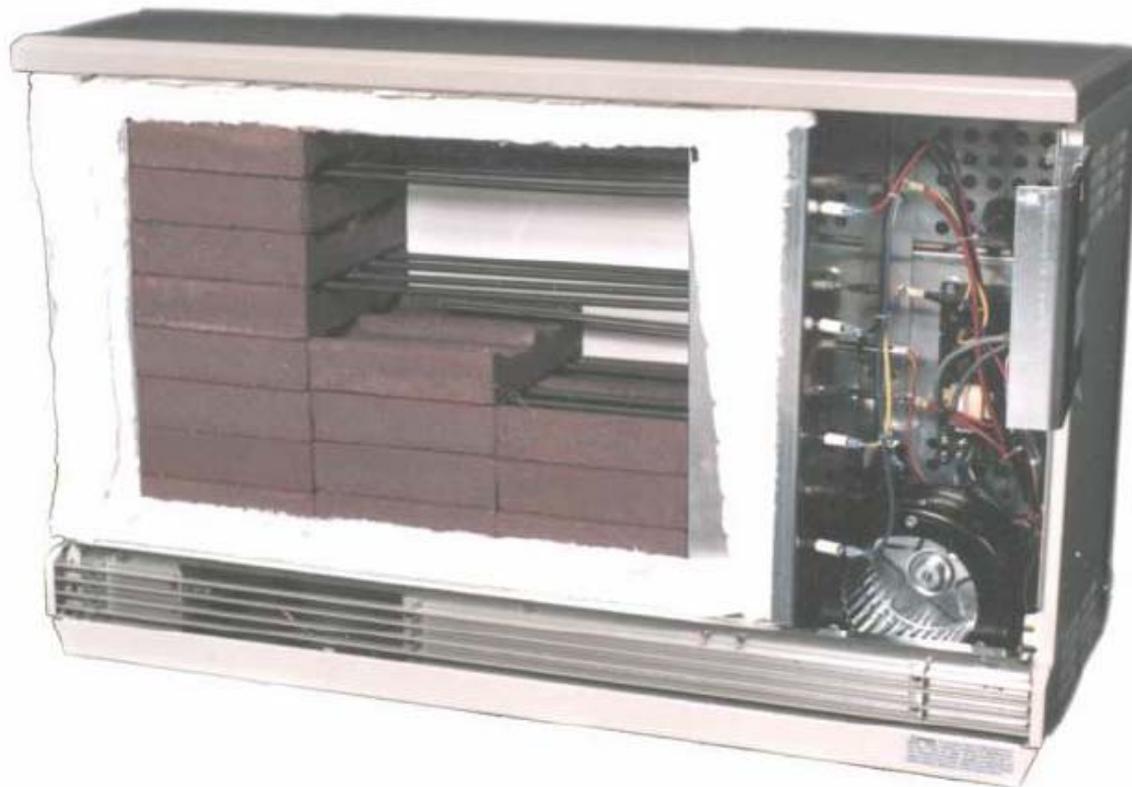


# Integrating Renewables

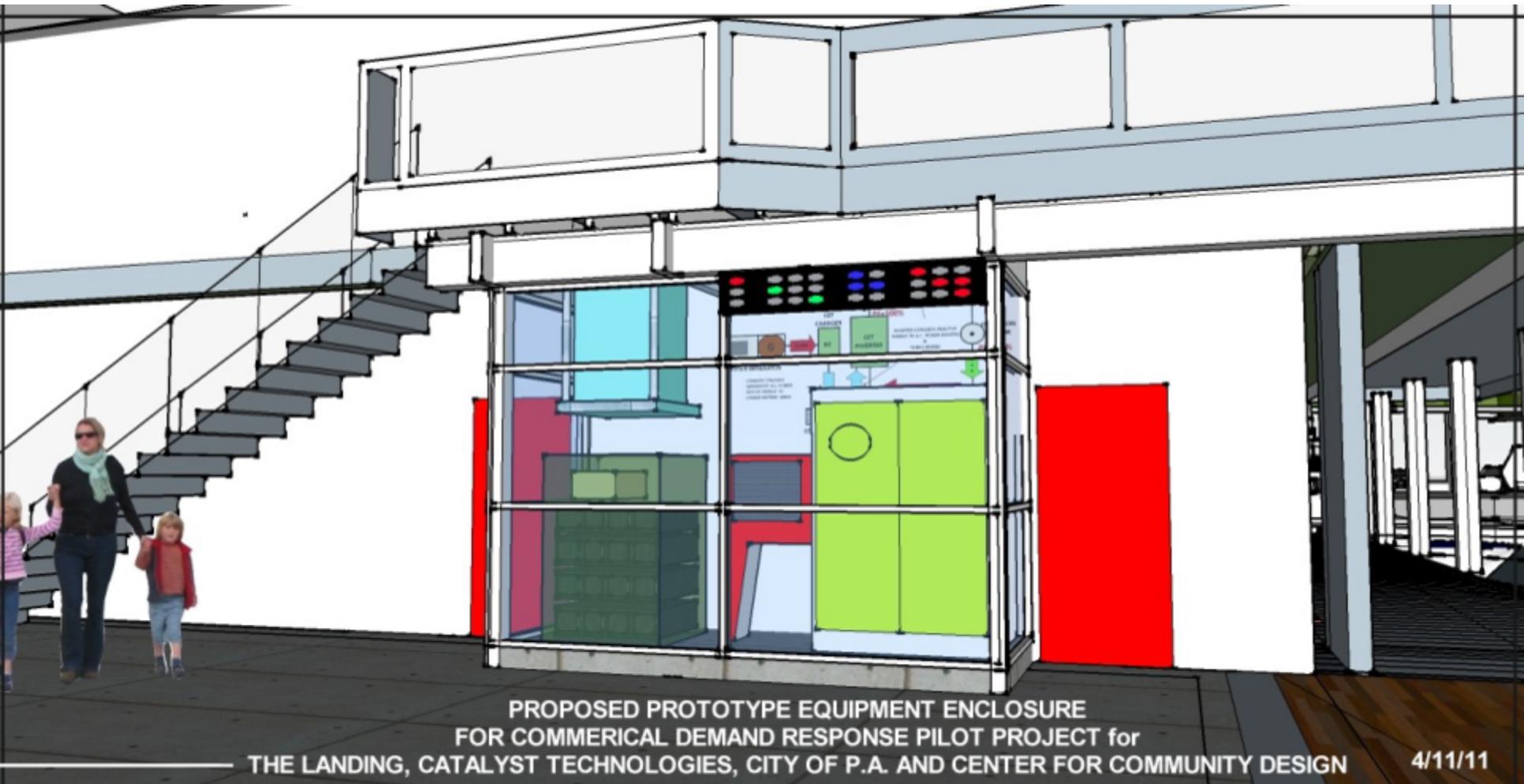


# Thermal Battery Energy Storage Projects

## ETS Room Unit

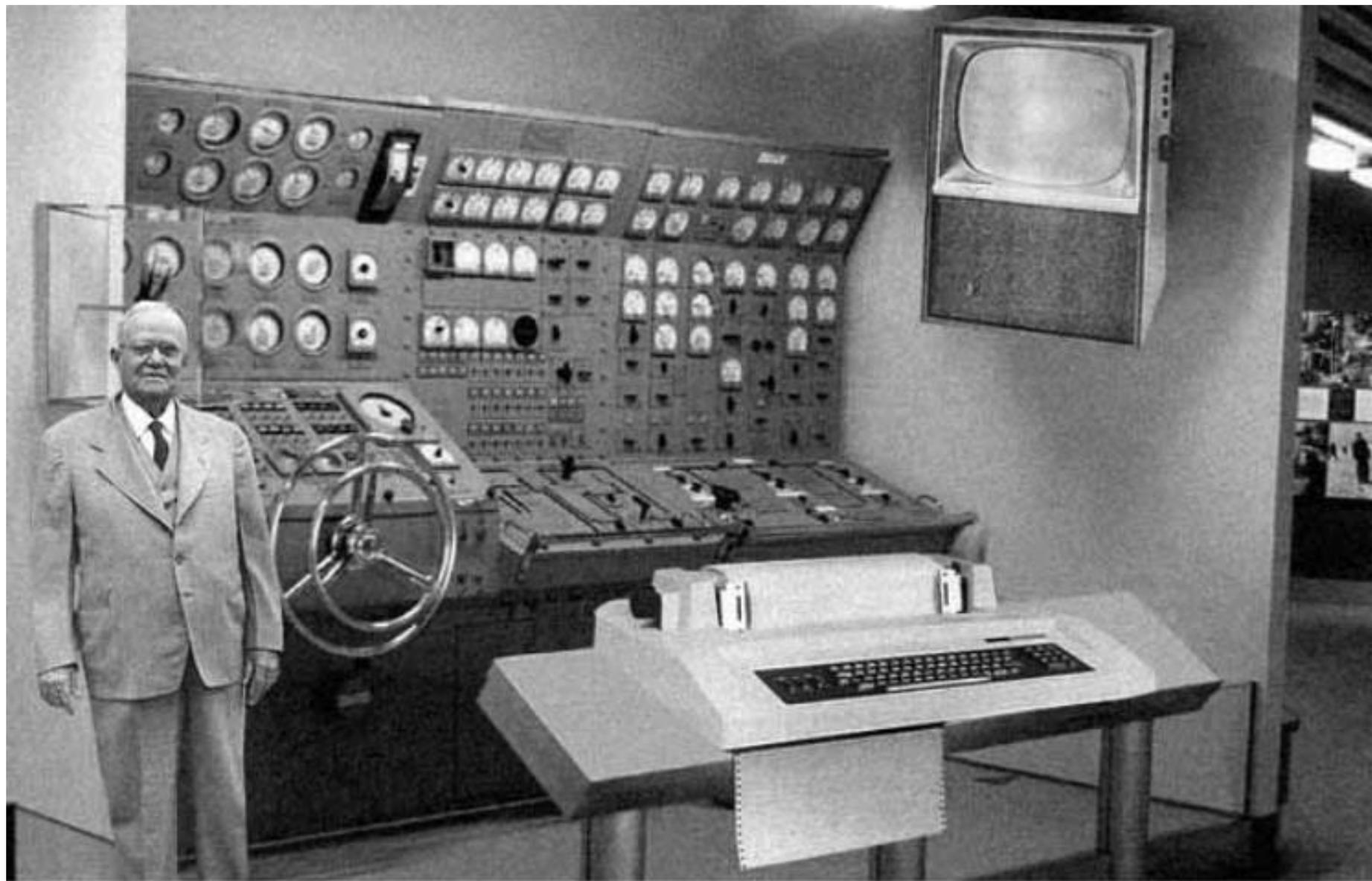


# Unique Educational Outreach Opportunity



PROPOSED PROTOTYPE EQUIPMENT ENCLOSURE  
FOR COMMERCIAL DEMAND RESPONSE PILOT PROJECT for  
THE LANDING, CATALYST TECHNOLOGIES, CITY OF P.A. AND CENTER FOR COMMUNITY DESIGN

4/11/11



*Scientists from the RAND Corporation have created this model to illustrate how a "home computer" could look like in the year 2004. However the needed technology will not be economically feasible for the average home. Also the scientists readily admit that the computer will require not yet invented technology to actually work, but 50 years from now scientific progress is expected to solve these problems. With teletype interface and the Fortran language, the computer will be easy to use.*

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# ISSUE: Current Demand Response Strategies

## ■ DR 1.0 - Load Shedding

- Simple, shuts off a device during peak events, typically fewer than 10 times/year

## ■ DR 2.0 - Load Shifting

- More sophisticated, moves loads away from heavy load hours and system demand peaks, sometimes by preheating or precooling, other times by delaying an activity (clothes dryers, dishwashers, etc.)
-

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# ISSUE: Load-Shape Nirvana?

## ■ DR 1.0 Load Shedding

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## ■ DR 2.0 Load Shifting

- More sophisticated, moves loads away from heavy load hours and system demand peaks, sometimes by preheating or precooling, other times by delaying an activity (clothes dryers, dishwashers, etc.)

## ■ DR 3.0 Load Shaping

- Very sophisticated, constantly fine-tunes system consumption and demand in real time to resemble generation system load shape
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# ISSUE: Who's The Change Agent?

- Recent survey findings
  - 73% of consumers surveyed would consider buying electricity from a company other than their local utility
- A value-add opportunity for utilities?
  - Consumers also indicated they would consider buying in-home energy products and services from non-traditional providers
    - If utilities pair up with an outside services provider, could it be a win-win for both?



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# ISSUE: What Customer's Don't Want?

- The last thing I want is...
    - ❑ Power companies to monitor and potentially restrict the amount of energy consumed each hour of the day with 'time-of-use' billing
    - ❑ Not being provided with clearly understood information about the RF emissions of all devices, including smart meters and DR sub-equipment
    - ❑ Breach of privacy or security
    - ❑ Financial and billing hassles
    - ❑ Property damage risks
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# ISSUE: What Customer's Want?

- 57% of consumers surveyed would use an electricity management program even if it didn't cut their utility bills
  - Almost a third would pay a little more
- While cost is an issue
  - Consumers getting interested in **convenience** of automated energy management
  - Being able to download apps on their cell phone and have **mobility** to track their energy use

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# ISSUE: What Customer's Want?

- Research in 2010 pointed to a focus on in-home displays as a high value-add product
  - The 2011 trend is moving to more set-it-and-forget-it convenience
    - A gender difference
      - Men tend to focus on technology channels, while women are more focused on solutions that are intuitive and easy to use
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# ISSUE: What Customer's Want?

- Consumer preferences driving the need for differentiated propositions and experiences
    - For utilities, this means "one size does not fit all"
      - Additionally, more than 60% of the surveyed customers do not want a heavy, hands-on management of their energy savings
      - Tailoring the programs, products and channels to match customer segments is most important
-

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# ISSUE: What Customer's Want?

- Consumers will respond to programs that consider their full spectrum of values and preferences
    - Programs that are easy to use, simple and convenient, and with some "uniqueness" or customization to fit their own personal needs
-

An aerial photograph of a coastal town and harbor. The water is a deep blue, and the town is built on a peninsula. There are several large buildings, a marina with many boats, and a road that runs along the coast. The sky is clear and blue. The text is overlaid in a bright yellow color.

**Phil Lusk**  
**Power Resources Manager**  
**Public Works & Utilities Department**  
**plusk@cityofpa.us**  
**360.417.4703**  
**<http://www.cityofpa.us>**





*The People's Power*

# BPA Energy Efficiency Utility Summit

May 11, 2011

## *The Business Case for Demand Response*

Rob Currier  
Commercial Energy Services  
Emerald People's Utility District  
Eugene, OR



*The People's Power*

# EPUD PowerSync Pilot: *A Study* in Residential Demand Response



## Program Goals

- Expand upon EPUD's existing Cooper EAS AMI system (installed 2008)
- Measure customer attitudes and response to DR technology
- Determine cost/benefit ratio of this type of program
- Evaluate the capacity savings potential
- Educate customers and staff on DR programs and processes.



# Program Details



200 Communicating Programmable Thermostats

200 Water Heater Control Switches (LCR-5000)



10 Steffes Communicating In-Room Heaters

10 Steffes Water Heater Energy Storage Devices



## Program Details

- One-way radio frequency paging
- DR Devices run in Cooper EAS Yukon Software
  - Cooper EAS Thermostat
    - Cycling and Ramping Controls
  - Cooper EAS Water Heater Switch
    - Timed On/Off Controls
- All adjustments, or “demand savings events” pre-scheduled
- About 20 events per year
- Events to begin second half of June 2011
- Participants can opt out of any event as needed
- One-time enrollment bonus in welcome kit.

# Program Details

<b>EPUD POWERSYNC CAPACITY SAVINGS ESTIMATES AND BUDGET</b>						
	Summer Season			Winter Season		
	DR Capacity (kW)	% of 2010 Seasonal Peak	Installed Cost (\$/kW)**	DR Capacity (kW)	% of 2010 Seasonal Peak	Installed Cost (\$/kW)**
UtilityPRO	280	0.29%	\$892	80	0.08%	\$3,121
LCR-5000	100	0.10%	\$2,496	200	0.21%	\$1,248
Total	380	0.39%	\$657	280	0.29%	\$892

\*\*Installed cost includes marketing, materials, and installation. Does not include EPUD labor and overhead.

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# Marketing/Outreach

Why Join  
PowerSync?

Sign up by  
November 5  
and receive a  
FREE gift!

Ask me

Proud  
Participant

- Webpage
- News Release
- Monthly Newsletter (to all customers)
- Direct Mail (to target group)
- Event Promotion
- E-Blast (to electronic list)
- Social Media Marketing



Join your neighbors in working together to keep  
EPUD electricity low-priced and dependable!

## Public Response (Positive)

### PowerSync Pilot Poll

**How do you feel about EPUD using Smart Grid technology like the PowerSync pilot to explore ways to keep electric rates low?**

In Favor / 92.92 %



Opposed / 2.65 %

Neutral / 4.42 %

Total of votes : 113

I'm excited about this program! Please choose our household! We have an electric water heater, broadband wireless internet and use a heat pump to heat the house.

I'm interested in joining your EPUD PowerSync Pilot Program and going green to save more energy. If my home would fit into your plans, I'm willing to participate.

Get me hooked up!!! 2nd time I have sent this in. I am excited to do it. thanks a bunch.

# Public Response (Negative)

Let me get this right.

I AM TO PAY BIG BROTHER TO

Change my thermostat to a temperature that I do not want

Change my bath water to a temperature that is not desirable

AND

Put monitoring instruments in my home to spy on me ? ? ? ?

# NO THANK YOU

## PowerSync Interest Card

### Interested in participating?

There is no cost to be involved in the pilot program and many benefits given to homes that are close to the EPUD office and meet the following requirements. Preference is given to homes that are close to the EPUD office and meet the following requirements:

- Programmable thermostats: Require an electric water heater
- Water heater controllers: Require electric water heater

### Up to 20 additional households are eligible for the program.

- In-room heater: Requires brick or masonry walls, zonal, etc.
- Water heater energy storage tank: Requires electric water heater, electric resistance heat (ceiling, baseboards, etc.), and electric water heater
- Broadband internet access, and electric water heater

**YES! I meet the eligibility requirements and am interested in joining the EPUD PowerSync Pilot Program!**

Have the following at my home: (Please check all that apply!)

- Electric Heat Pump       Electric Resistance Heat  
 Electric Water Heater       Broadband Internet Access

Name \_\_\_\_\_ Phone \_\_\_\_\_

Address My power is my power, I'll use it when I like



# Marketing/Outreach Challenges

- Response has been overwhelmingly positive, but negative response is VERY negative.
- Complex messaging challenges
- Next...?
- Keeping the Momentum



## Program Details

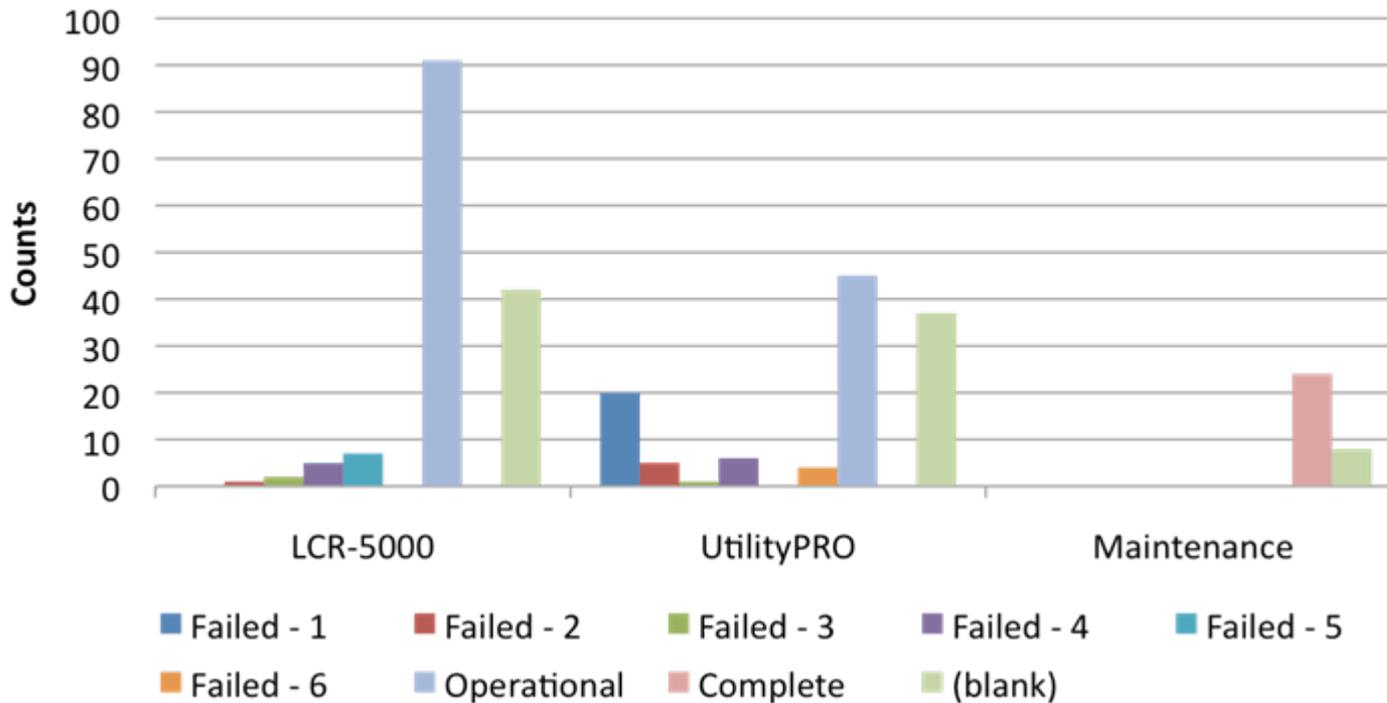
<b>EPUD POWERSYNC</b>			
Progress Update			
	Units Installed	Installed Cost \$/Unit **	Maintenance Costs
UtilityPRO	46	\$466	--
LCR-5000	90	\$238	--
Total	136	\$391	7%

\*\*Installed cost includes materials, installation, and maintenance costs.

# Installation Experience

Updated 5/2/2011

### Count of PowerSync Device Installation Reports



#### End Status Codes

- Failed-1: OSA Temp Sensor
- Failed-2: Old/Broken Appliance
- Failed-3: Customer refused
- Failed-4: Wrong Eligibility
- Failed-5: Physical Space
- Failed-6: Ductless

# Installation Experience *Challenges*

- Installation scheduling has taken a long time.
- Selection of installer was time consuming. Inadequate contractor response.
- Thermostat not compatible with many late model heat pump installations. Outside air temperature sensor.
  - ~ 30% of scheduled Tstat installs have been turned down.
- Interesting and unexpected costs of residential installations.

## Next Steps

- Installs, Installs, Installs
- Demand Savings Events Communication for June
- Establishing plan for ongoing customer communication
  - Site Meetings
  - Specialized Newsletter?
- Installing some basic M&V equipment
- Re-visiting EPUD internal DR organization
- Full summer demand response season to begin June 2011



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## Contact

Rob Currier

[rob@epud.org](mailto:rob@epud.org)

541-744-7402

[www.epud.org](http://www.epud.org)