



Evolving End Uses, and Emerging Energy Efficiency

Utility Energy Forum
5/17/13

Jennifer Williamson

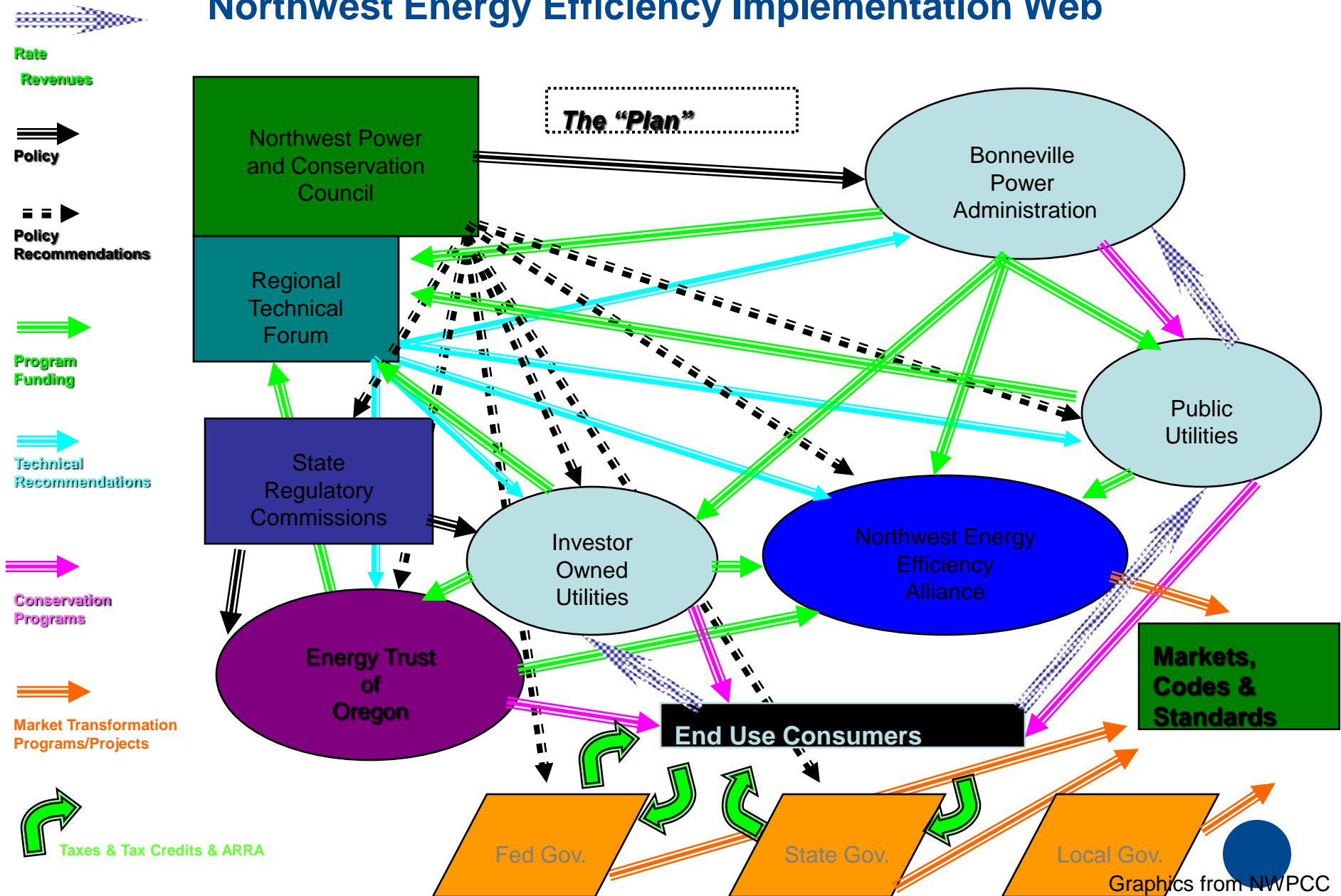


The background image shows a large metal transmission tower in the foreground on the left, partially obscured by green foliage. In the distance, another similar tower stands amidst a dense forest. Beyond the forest, a wide river or lake is visible, with rolling hills and mountains in the far background under a cloudy sky.

Residential Building Stock Assessment Study
Impact of Evolving End Use Loads on the Grid
Technology Roadmapping and R&D Solicitation
Emerging Technologies

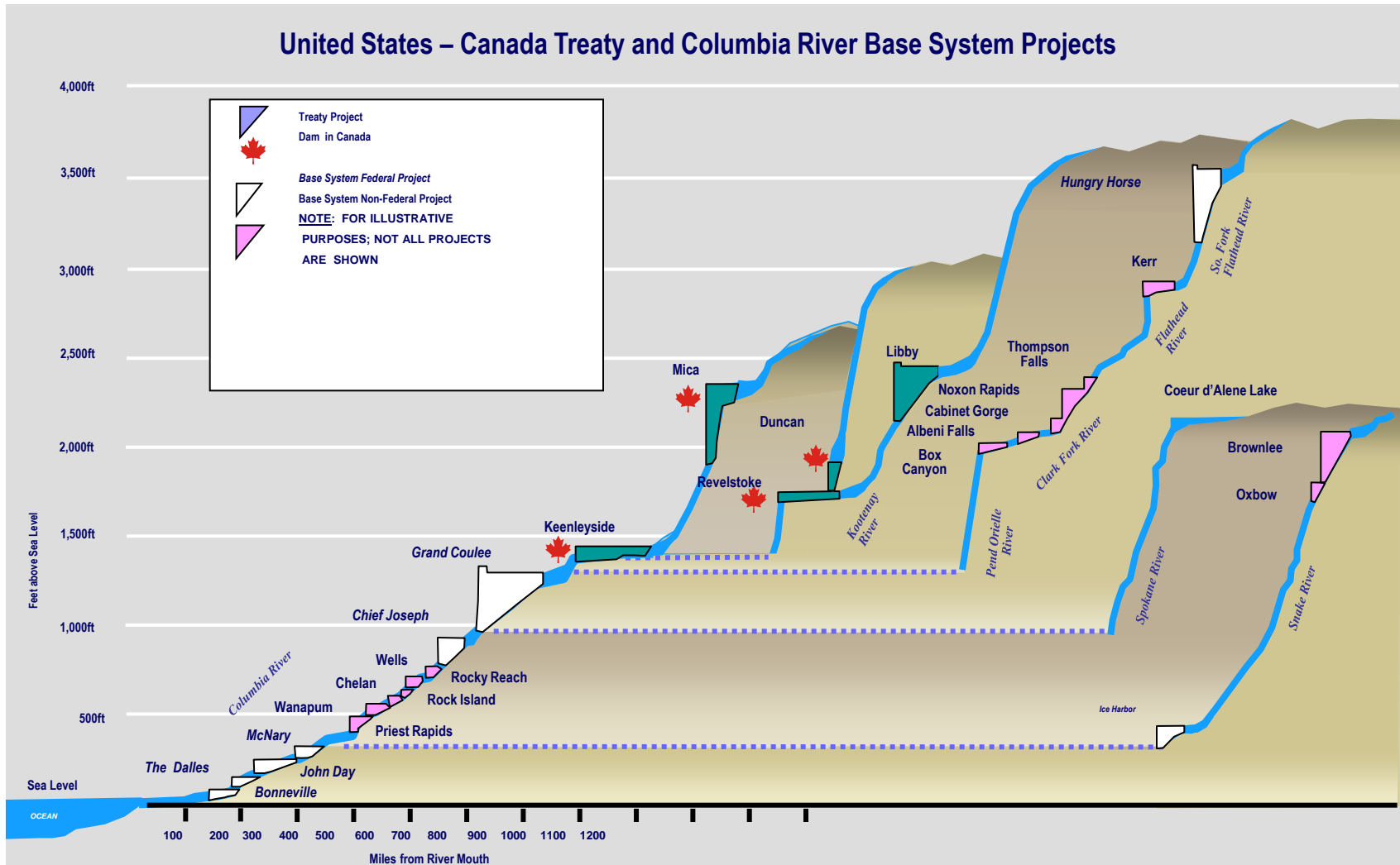


Northwest Energy Efficiency Implementation Web





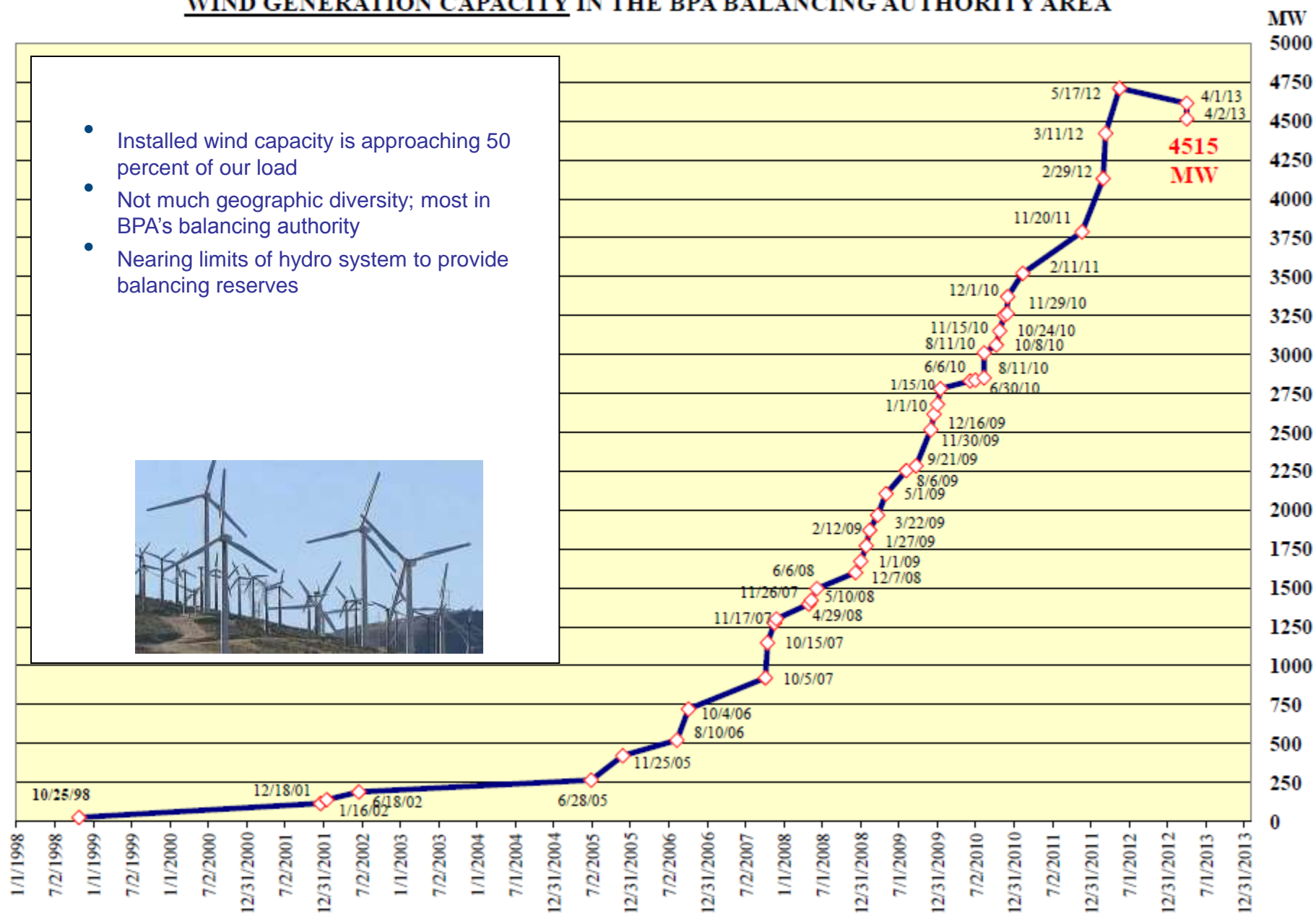
Pacific Northwest Hydro Characteristics





WIND GENERATION CAPACITY IN THE BPA BALANCING AUTHORITY AREA

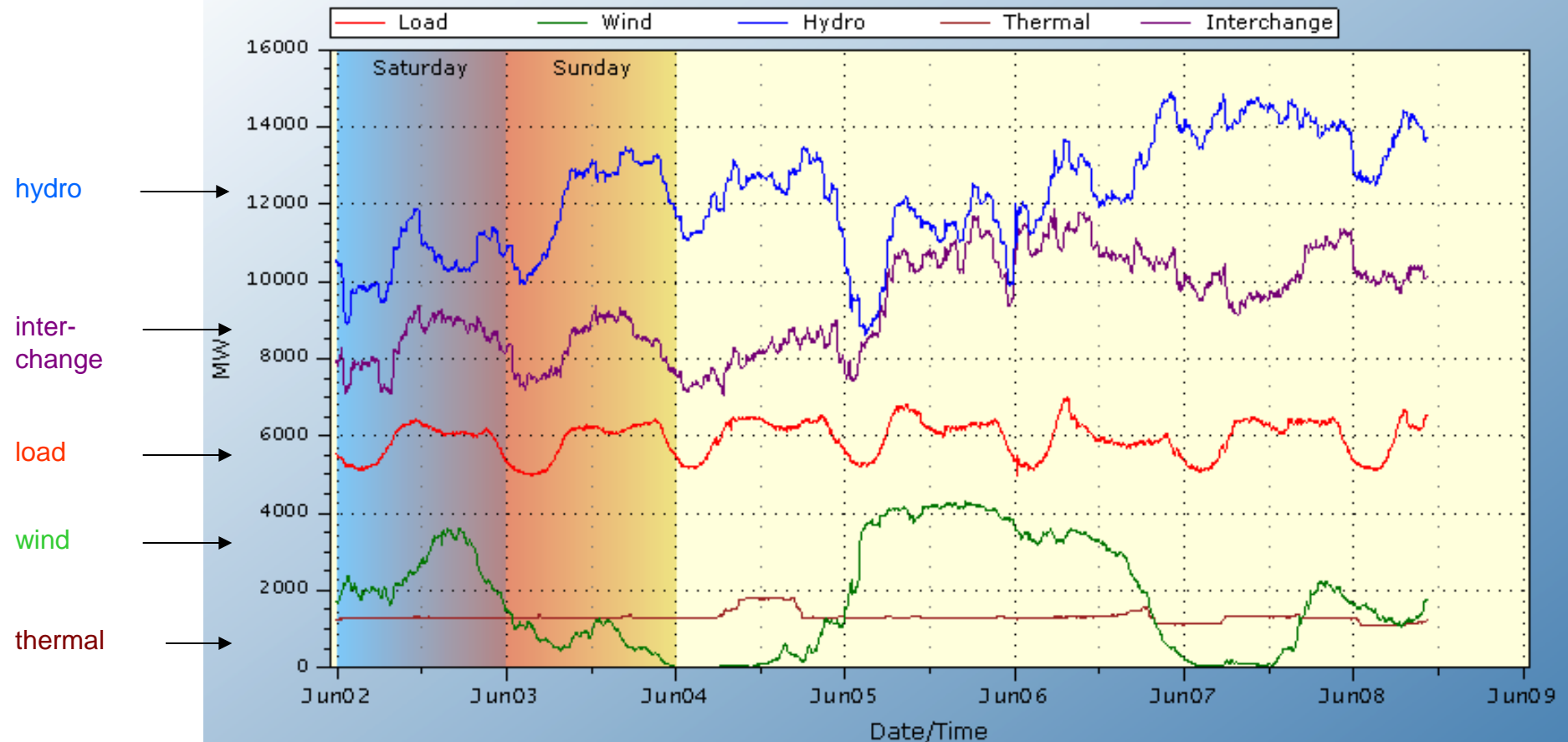
- Installed wind capacity is approaching 50 percent of our load
- Not much geographic diversity; most in BPA's balancing authority
- Nearing limits of hydro system to provide balancing reserves





Balancing Loads and Resources

BPA Balancing Authority Load & Total Wind, Hydro, Thermal Generation, and Net Interchange Last 7 days
02Jun2012 - 09Jun2012 (last updated 8Jun2012 10:31:50)





End Uses – Impact on the Grid

- Opportunities –
 - “Non-wires” solutions
 - “Balancing” for intermittent renewables (load decrease *OR* increase)
- Challenges –
 - Electronic loads causing voltage instability on power lines

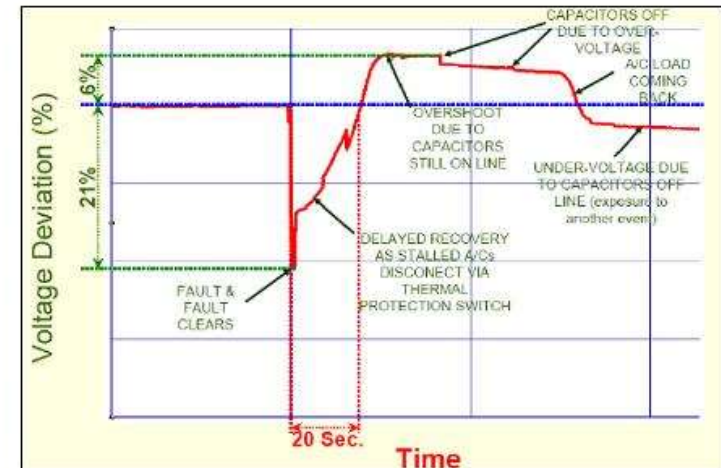


Figure 1: Typical FIDVR Following a 230-kV Transmission Fault in Southern California



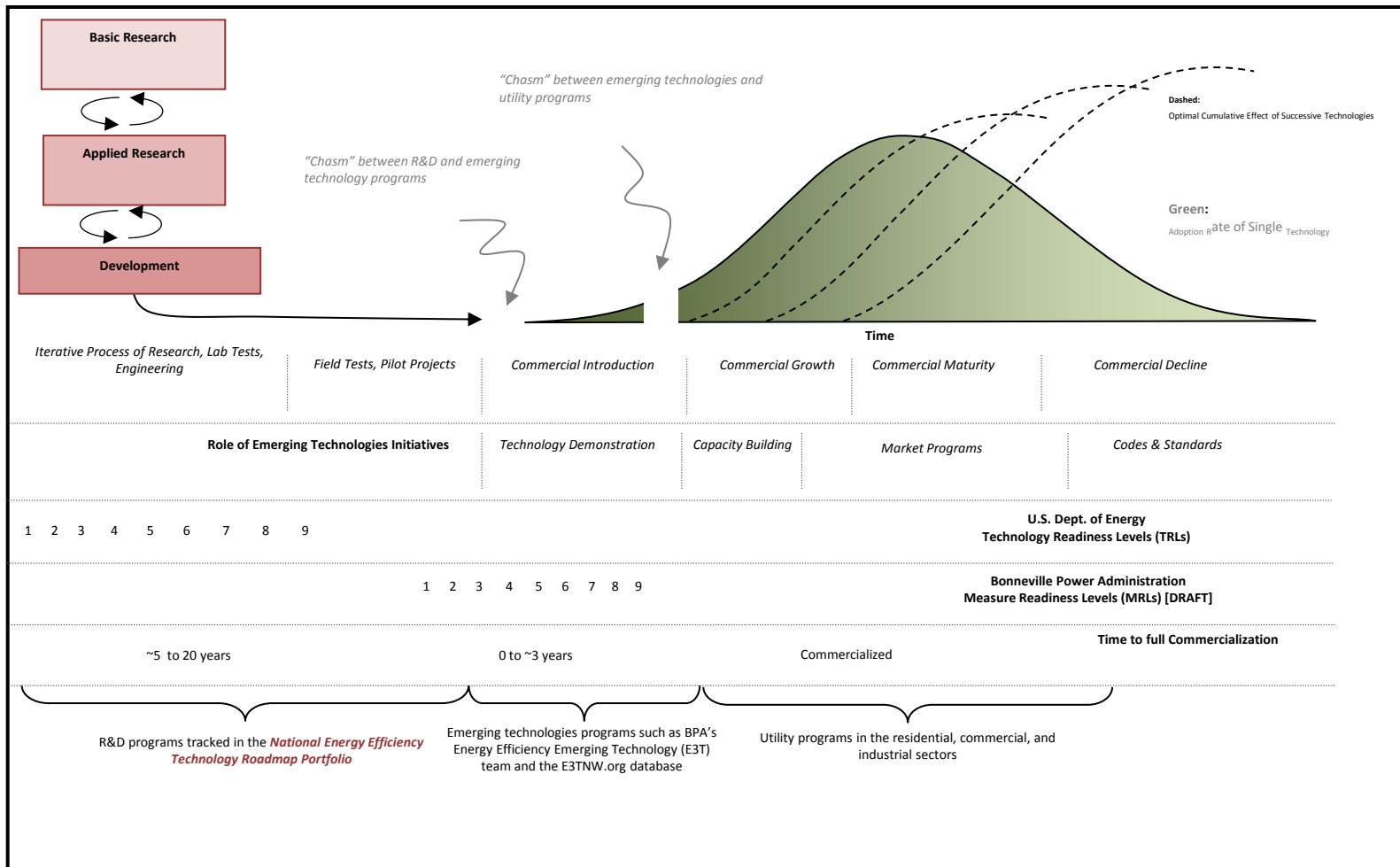
DR Regional Challenges

- **Managing Peak Loads**
- **Managing “overgeneration events”**
- **Transmission expansion needs**
- **Demand rate design impacts on utilities**




































Technology Lifecycle



Sampling of End Use Technologies Under EPRI Evaluation – Current Snapshot

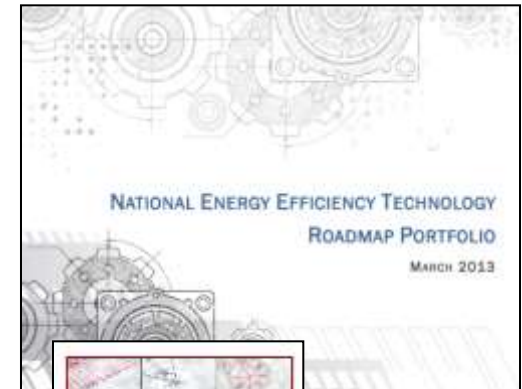
Technology Scouting	Assessment & Lab Testing	R&D Field Tests/Demos	Early Deployments	Program Rollout
Thin Film Electrochromic Windows 	Variable Speed Circulation Pumps 	Integrated Whole Building 	Data Center Dynamic Power Management and Efficient Power Supplies 	2X Incandescent 
Phase-Change Wallboard Materials 	Eco-cute Heat Pumps 	Variable Capacity Space Conditioning 	Data Center Airflow Management 	LED Street and Area Lighting 
Wireless Lighting 	Process Heating Electrotechnologies 	HPWH Commercial 	Data Center DC Power 	High Efficiency Refrigerators 
Non-intrusive load monitoring 	Efficient, DR-Ready Products 	Voltage Optimization 	VRF Heat Pumps 	
Low torque, high speed motors 	Plasma Lighting 	Controllable High Bay Lighting 	Heat Pump Water Heaters 	
Micro-scale DR Aggregation 	Desiccant Dehumidification 	Data Centers Immersion Technology 		
Next generation Heat Pump Water Heater (Res) 	Dimmable CFLs and LEDs 	Evaporative Pre-Cool for Rooftop Air Conditioning 		
	Virtual Audits 	Automated DR and Energy Management 		



Technology Roadmap Portfolio

http://online.etm.pdx.edu/bpa_summit/mon.html

http://www.bpa.gov/energy/n/emerging_technology/index.cfm



Convene technology roadmapping workshops



Transcribe, review, fact-check, & refine output



Publish updated *Roadmap Portfolio*



RBSA

Residential Building Stock Assessment

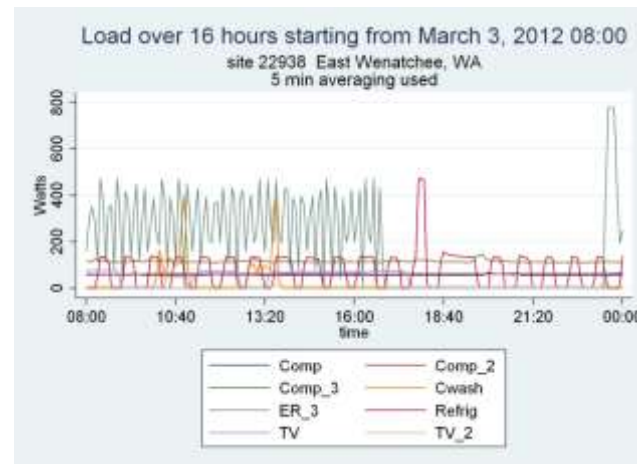
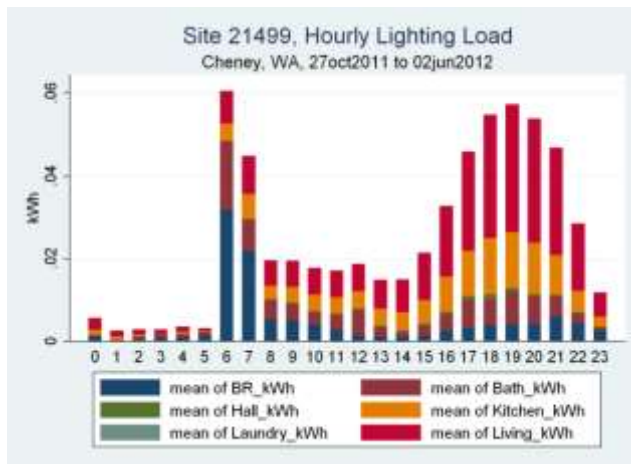
- 1300+ homes studied =
4M homes in PNW
- Est 600 characteristics per home
- Database and summary reports available
 - <http://neea.org/resource-center/regional-data-resources/residential-building-stock-assessment>





RBSA – Metering

- 100 homes with end use meters



(report due Oct 2013)

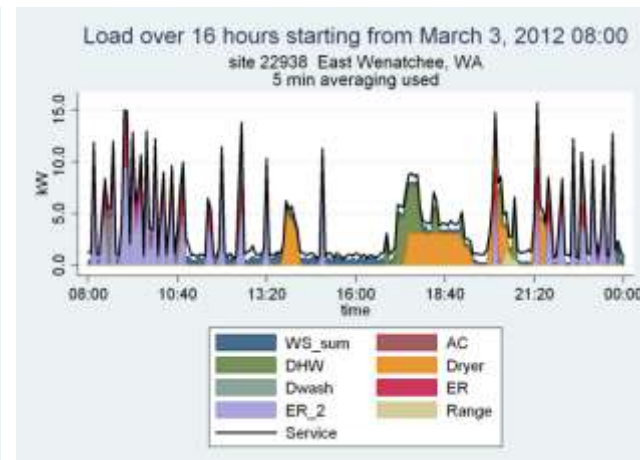
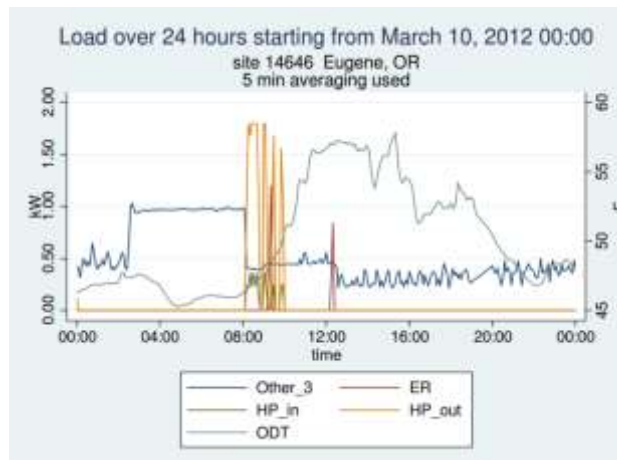




Image Processing Occupancy Sensor

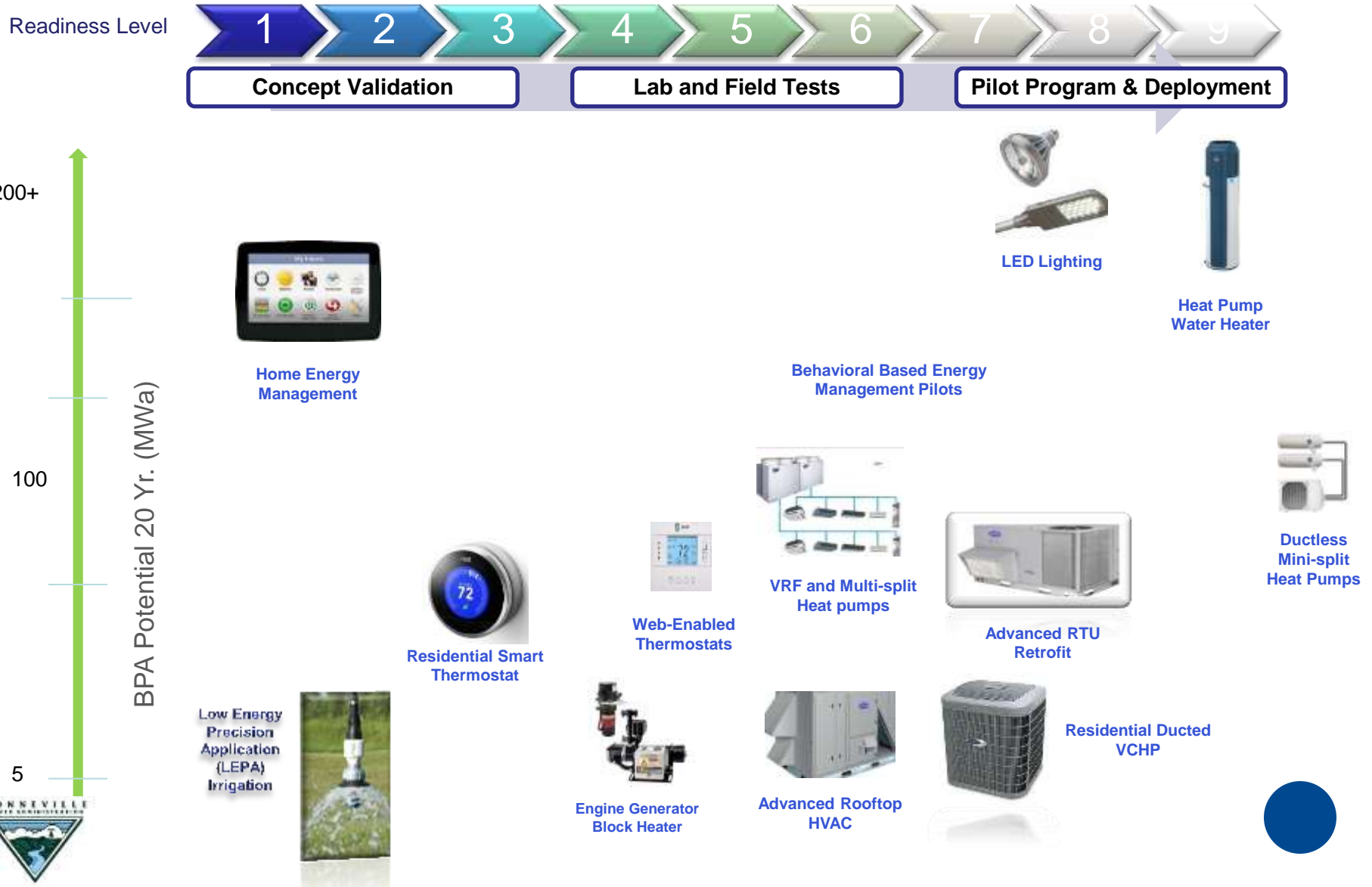
Features

- Instead of infrared or ultrasonic to sense motion, they use cell phone camera technology, and **image processing** techniques.
- Senses **number of occupants, and level of activity** to better control ventilation, and lighting





BPA ET Assessment Pipeline





BPA 2013 ET Assessments

Low Energy
Precision
Application (LEPA)
Irrigation



Engine Generator
Block Heaters



Outdoor Lighting Baseline
Study (w. California Utilities)



Advanced Rooftop Units



Non-Intrusive Load
Monitoring



Carrier Green Speed Variable
Capacity Heat Pump



Premium RTU Retrofit (DCV)



Behavioral Based Energy
Management Pilots – Snohomish, Cowiitz, Clark
O Power, Starbucks

Residential Smart Thermostat



Municipal Water Efficiency
Project



Smart Irrigation Controls





Emerging Technologies Moved (or Moving) to BPA Programs in 2013

Reverse Cycle Chiller
For Multi Family



- Ductless Heat Pump:
- Manufactured Homes
- Forced Air homes
- Cold Climates



Carrier Green Speed Variable
Capacity Heat Pump



Premium RTU Retrofit (DCV)



Variable Refrigerant Flow



Heat Pump Water Heater



Kitchen Demand
Controlled Ventilation



Exterior LED





Engine Generator Block Heater

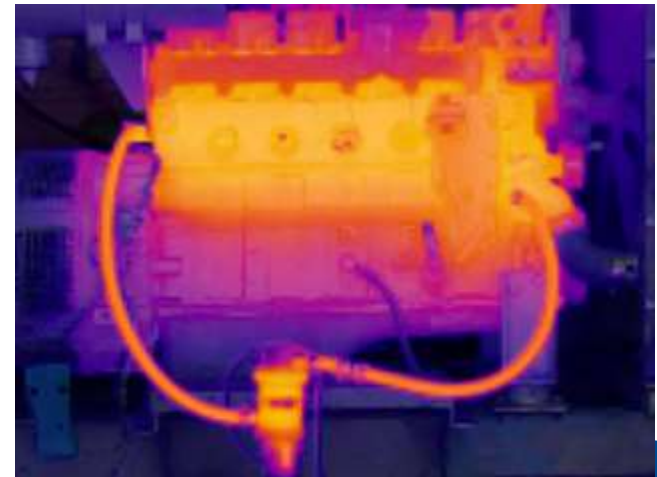
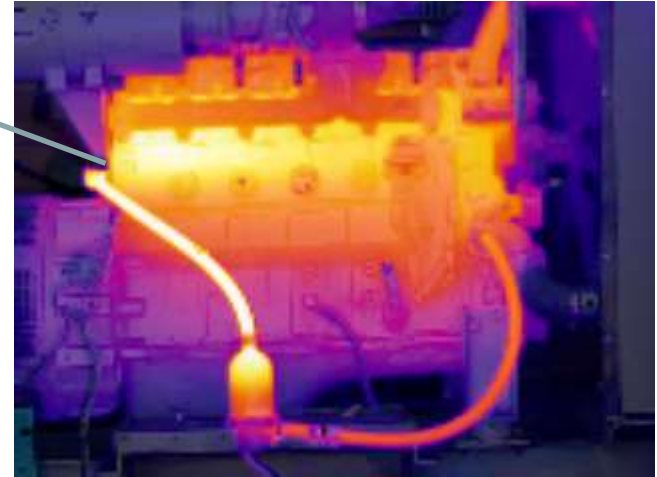
Hot Spot

Features

- Keeps generator ready to operate immediately
- Pump circulates refrigerant

Customer

- Hospitals, schools, utilities, casino, etc







Other Websites

- BPA online resource of ET info www.e3tnw.org
- Conduit www.conduitnw.org
- BPA Research Reports http://www.bpa.gov/energy/n/emerging_technology/index.cfm
- Consortium for Energy Efficiency www.Cee1.org
- FEMP http://www1.eere.energy.gov/femp/technologies/new_technologies.html
- EPRI epri.com
- E Source <http://www.esource.com/>
- NW National lab <http://www.pnnl.gov/>
- Center for Built Environment <http://cbe.berkeley.edu/index.htm>
- American Council <http://www.aceee.org/topics/emerging-technologies-and-practices>
- European council <http://www.eceee.org/>
- LED journal <http://www.ledsmagazine.com/features/9/2/9>
- DOE LED work www.ssl.energy.gov





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