



States & Emerging Energy Technologies

August 15, 2013

DOE's State and Local Technical Assistance Program

DOE's Technical Assistance Program



Priority Area: EE & RE Technologies

- **Trainings, peer exchange, and partnering with DOE**

- Upcoming TAP Webinars:

- Energy Efficiency in Water and Wastewater Treatment Facilities, 9/11
- States Applications for Combined Heat and Power Technologies, 9/25
www.eere.energy.gov/wip/solutioncenter/wip_events.html

- Better Buildings Alliance & Technologies Solutions Teams
www.eere.energy.gov/alliance/activities/technology-solutions-teams

- **Resources**

- Building Technologies Office's Emerging Technologies page
www.eere.energy.gov/buildings/technologies/index.html

- DOE's Solar Energy Resource Center
www.eere.energy.gov/solar/sunshot/resource_center/

- DOE's Alternative Fuels Data Center
www.afdc.energy.gov/fuels/

- Updated Solution Center resource portal for technology deployment live later this year

How to Tap into These and Other TAP Offerings

- Visit the ***Solution Center***
www.eere.energy.gov/wip/solutioncenter/
- Submit an ***application*** for assistance
www.eere.energy.gov/wip/solutioncenter/technical_assistance.html
- Sign up for ***TAP Alerts***, the TAP mailing list, for updates on our latest and greatest
TechnicalAssistanceProgram@ee.doe.gov



TAP Webinar: Emerging Technologies



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**National Renewable
Energy Laboratory**

August 15, 2013

Introduction

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August 15, 2013

Emerging Technologies



Outline

- Emerging Technology Definitions: *The What, Why and How?*
- Program Examples
 - Federal
 - State/Utility
- Questions



PIX: 20311

Background: *What?*

What is an emerging technology?

- An emerging technology is a product or practice that hasn't yet been widely adopted by customers for various reasons, yet has the potential for large energy, water or cost savings
 - In the majority of programs, the product is commercially available.

Background: *What?*

What is an emerging technology demonstration program?

- Act as a bridge to help energy efficiency and renewable energy technologies overcome the “valley of death” between early innovation and widespread market adoption.

Background: *What?*

What is an emerging technology demonstration program?

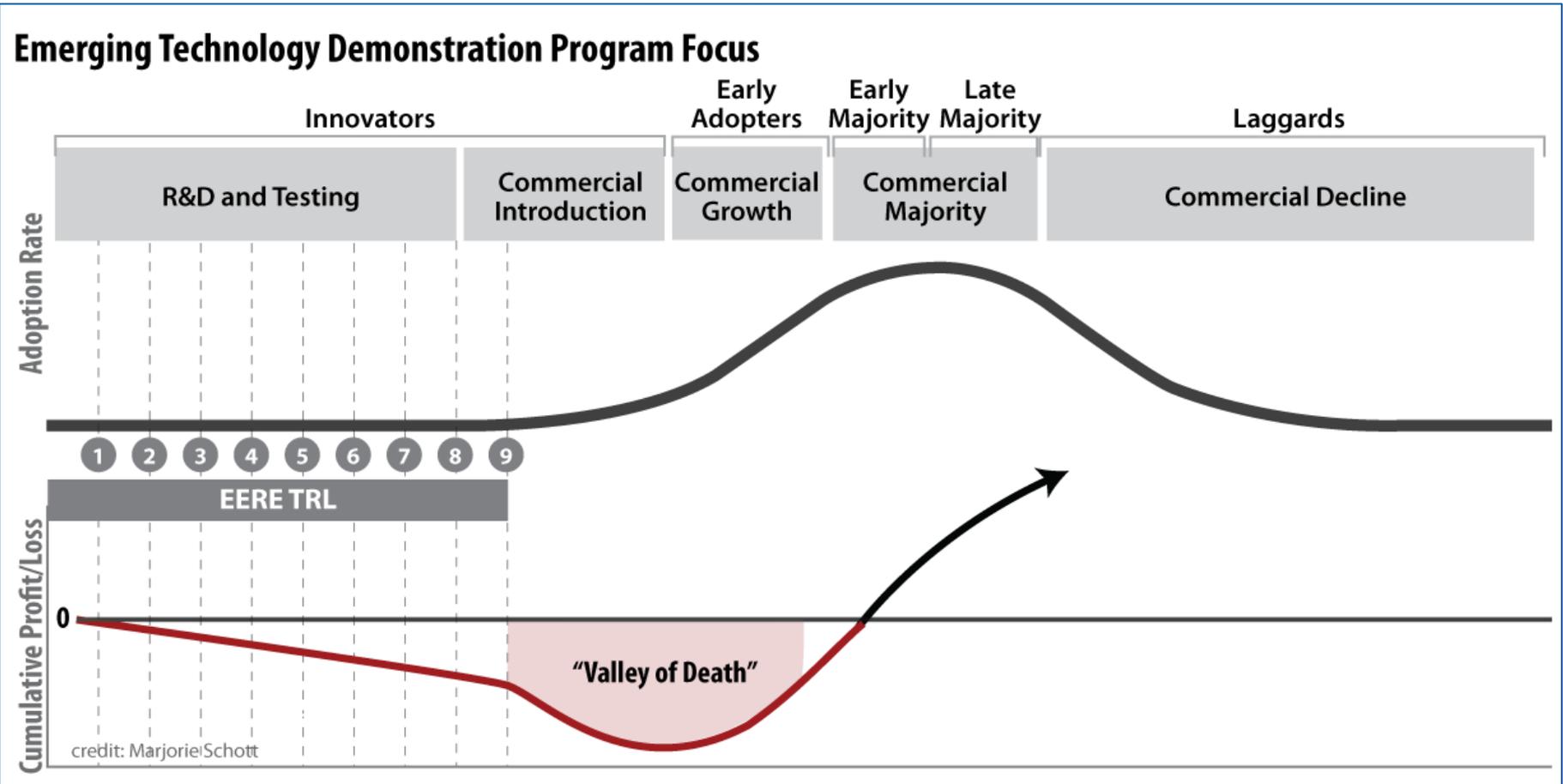


Image by Marjorie Schott, NREL

Background: *What?*

What are the goals of an emerging technology demonstration program?

- Reduce user risk, and ultimately increase the adoption rates for promising technologies.
 - Validate the performance of emerging technologies, as well as installation procedures, operations and maintenance impacts, and occupant impact
- Identify appropriate applications for a technology
- Identify appropriate mechanisms to support adoption of a technology, such as through a utility's rebate programs.

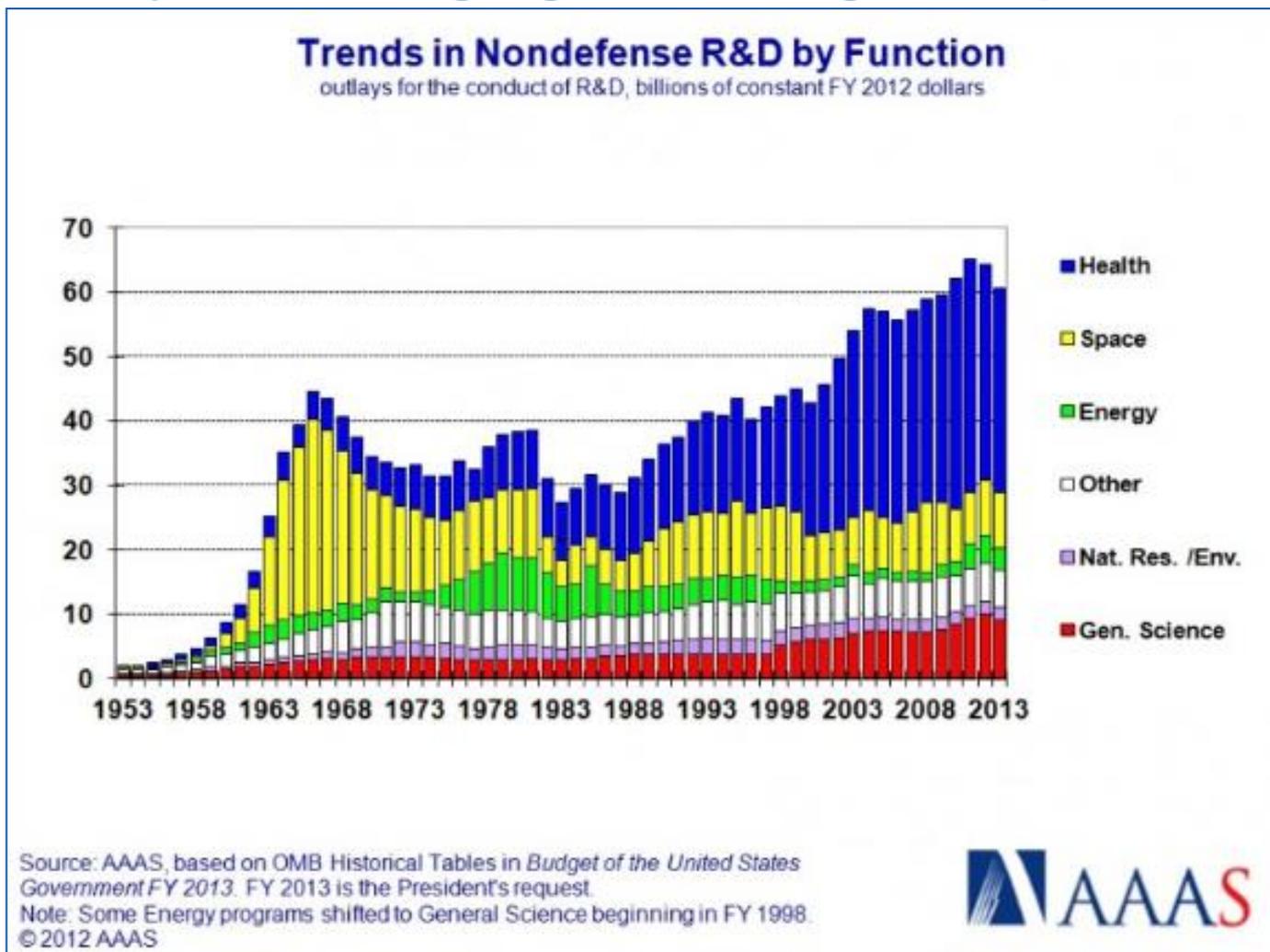
Background: *Why?*

Why are emerging technologies important?

- Many high-performing technologies are not readily adopted in the marketplace due to lack of information about their real-world performance.
- Efficient new building technologies can help meet energy and GHG reduction goals, stimulate U.S. manufacturing, create jobs, and improve the environment.
- New, innovative technologies are necessary to meet energy and greenhouse gas reduction goals; more R&D investment is needed.

Background: *Why?*

Why are emerging technologies important?



Background: *How?*

How can this information be useful for state and local stakeholders?

- Become aware of energy saving technologies
- Encourage the support of emerging technology programs through policies
- Help businesses reduce energy use and become more competitive
- Help consumers reduce energy bills in a tough economy

Background: *How?*

How can this information be useful for state and local stakeholders?

- Help cities and states achieve their goals for energy savings and greenhouse gas reduction
- Promote green jobs that benefit communities more than energy purchases.

TAP State and Local Solution Center:

http://www1.eere.energy.gov/wip/solutioncenter/one-on-one_technical_assistance.html

Example Programs: *Federal*

The U.S. Department of Energy's (DOE) Technology Demonstration Program:

www1.eere.energy.gov/buildings/commercial/techdemo.html

- **Focus:** Technologies that are energy-efficient, market-ready, cost-effective, and create U.S. jobs
- Coordination with other federal programs
- Two DOE programs (the Federal Energy Management Program and the Building Technologies Office) are leading the development of Technology Performance Exchange (TPE)



Example Programs: *Federal*

The U.S. Department of Defense's (DoD) Environmental Security Technology Certification Program (ESTCP):

www.serdp.org

- **Focus:** Innovative technologies that have successfully established proof of concept to field or production use
- Identifies and demonstrates the most promising innovative and cost-effective technologies and methods that address DoD's high-priority environmental requirements
- Ten completed and 83 active projects:
[www.serdp.org/Program-Areas/Energy-and-Water/\(list\)/1/](http://www.serdp.org/Program-Areas/Energy-and-Water/(list)/1/)



Example Programs: *Federal*

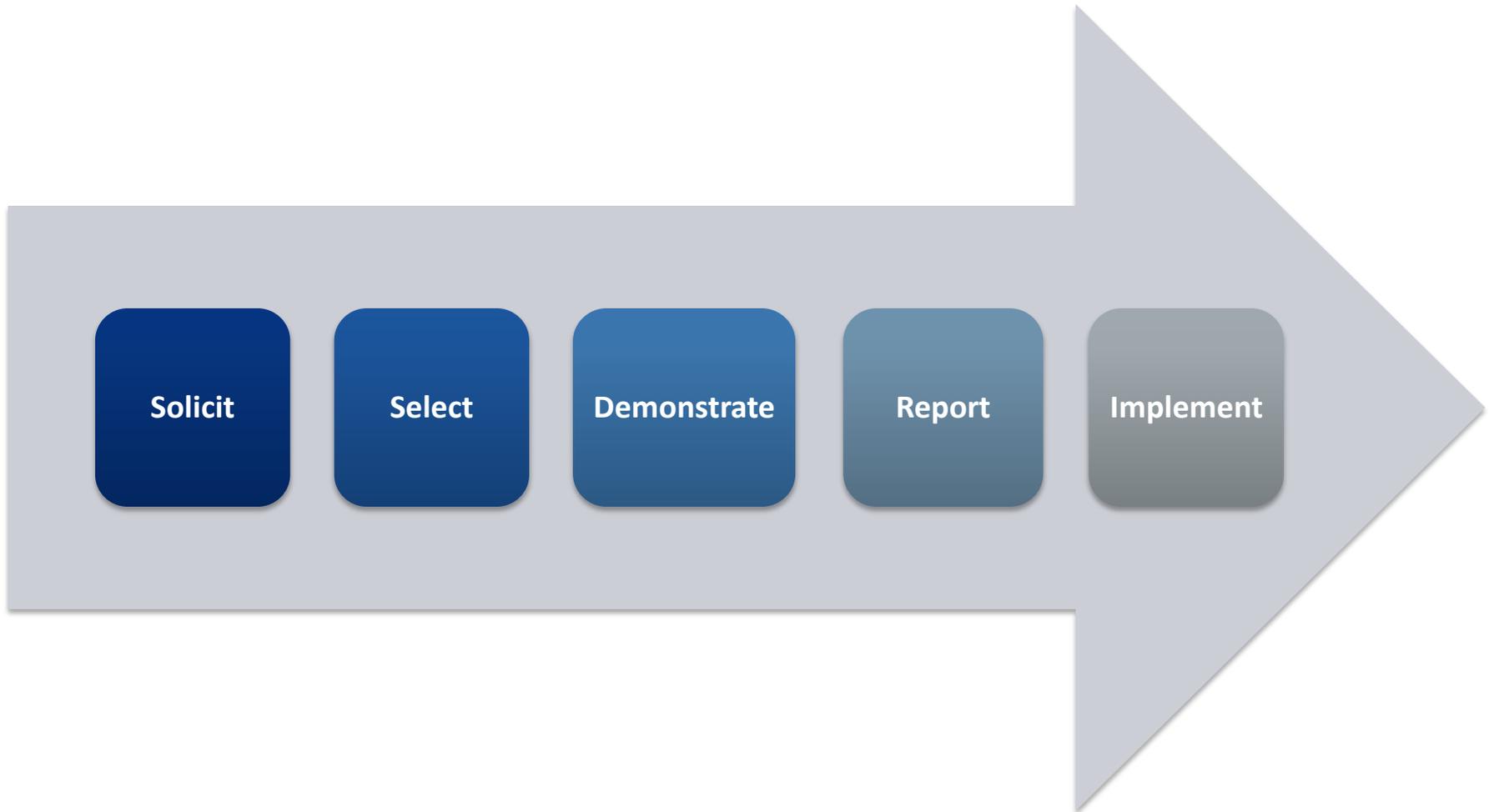
The U.S. General Services Administration's (GSA) Green Proving Ground (GPG) Program:

www.gsa.gov/portal/category/102491

- **Focus:** Commercial, underutilized, innovative technologies
- Leverages GSA's real estate portfolio to evaluate innovative sustainable building technologies
- Demonstrates about 12 technologies/year in Federal buildings



Federal Process Outlined



GPG: Demonstrated Technologies

HVAC/Energy Management

Chilled Beams

Commercial Ground Source Heat Pump

Condensing Boilers

Magnetic Bearing Compressor

Plug Load Control

Variable Refrigerant Flow

Variable-speed Chiller Plant Control

Wireless Sensor Networks

Central Plant Optimization Strategy

Wireless Pneumatic Thermostat

Building Envelope

High R-Value Windows

Smart Windows

Electrochromic Windows

Glazing Retrofit Coating

Vacuum Sealed Roof Insulation

GPG: Demonstrated Technologies

Lighting

Integrated Daylighting Systems

Occupant Responsive Lighting

LED Retrofit Luminaire

Wireless Lighting Control System

Water

Non-chemical Water Treatment

Nonchemical Prevention of Hard Water Scale

Wireless Moisture Sensing Irrigation System

Wireless Weather Station Irrigation Control System

On-Site Power Generation

Photovoltaics (PV)

PV with Solar Water Heating

Wood-Pellet Biomass Boiler

Honeycomb Solar Thermal Collector

GPG: Example Findings



Plug Load Reduction: *Technology Overview*

An advanced power strip (APS) can control plug-in devices by deploying three key strategies:

1. **A timer** which sets the day and time that a circuit will be turned on/turned off (e.g., ON: Monday at 8am and OFF: Monday at 5pm);
2. **A load-sensing control** monitors a specific device's power state and will turn off auxiliary devices if the master device drops below a predetermined threshold;
3. **An occupant sensor** detects when a user is not present and deactivates controlled loads.

* Metering is an additional capability that can be paired with any of these strategies.

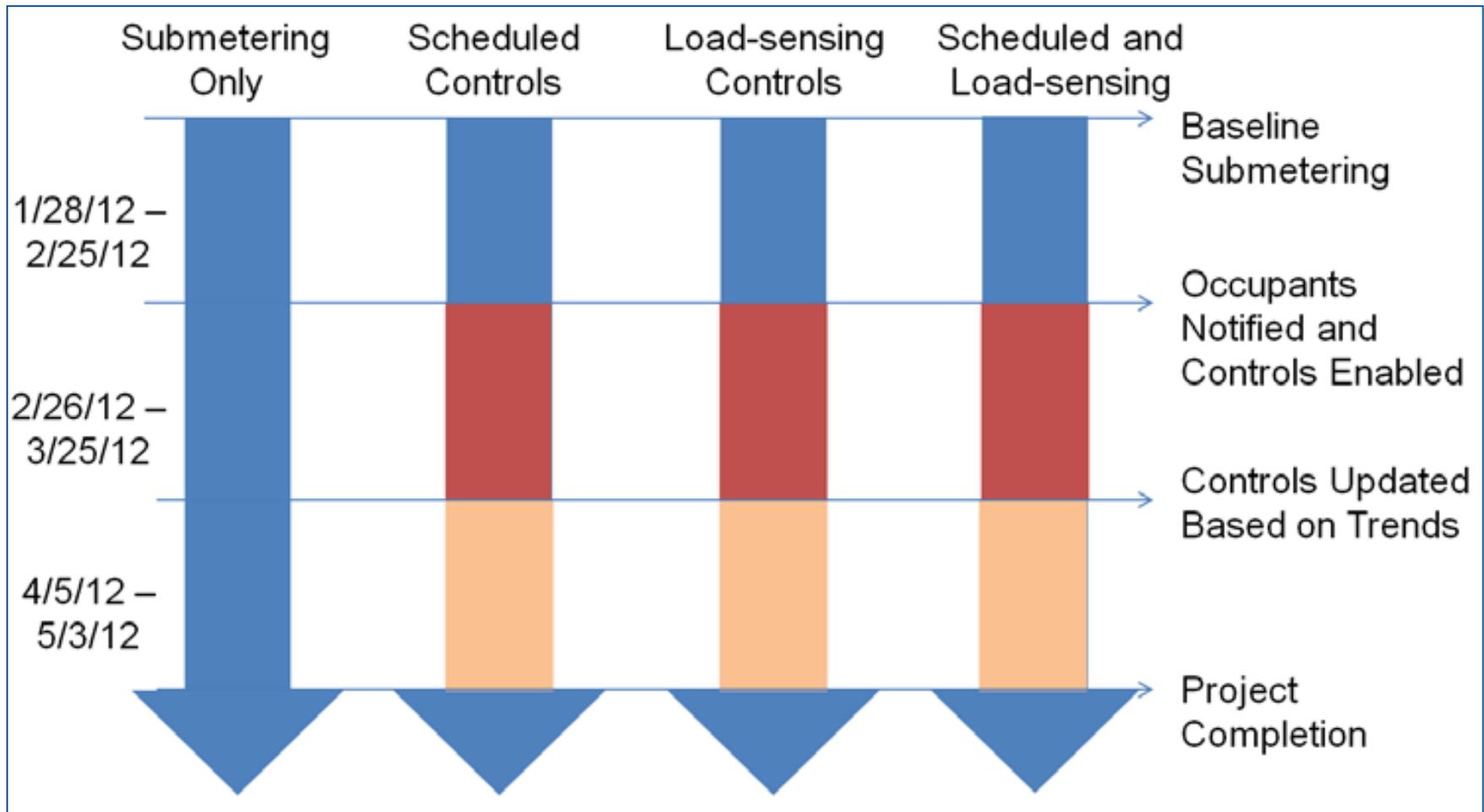
GPG: Example Findings

Plug Load Reduction: *Project Overview*

- In eight GSA buildings, approximately 12 standard power strips with no control capability were replaced with advanced power strips (APSs).
- 96 APS were deployed, which monitored and provided power to 295 devices.
- Three separate phases:
 - Inventory and Baseline
 - Initial Controls Deployed
 - Controls Refined

GPG: Example Findings

Plug Load Reduction: *Project Overview*



GPG: Example Findings



Plug Load Reduction: *Findings*

- The schedule timer control was the most successful strategy
 - Average energy savings of 48%
 - Largest savings achieved when schedule timer controls were applied to devices that were powered 24/7
- Simple payback at the demonstration project locations for the schedule timer was less than 8 years in all applications
 - Kitchens/Breakrooms (0.7 years)
 - Printer rooms (1.1 years)
 - Workstations (7.8 years)

GPG: Example Findings



Plug Load Reduction: *Findings*

		Printer	Laptop	Monitor	Under-Cabinet Light	Misc. Equipment	Kitchen Equipment	Total
Schedule timer	Edward A. Garmatz U.S. Courthouse	68%	13%	14%	14%	25%	13%	43%
	William J. Green, Jr. Federal Building	31%	54%	27%	34%	67%	79%	52%
Load-sensing	Robinson and Merhige Courthouse	69%	-4%	-6%	n/a	51%	n/a	23%
	Veteran Administration Building	-5%	16%	11%	0%	54%	n/a	10%
Both	Robert C. Byrd U.S. Courthouse	18%	35%	-2%	22%	40%	n/a	23%
	Cohen Complex	27%	14%	-1%	-1%	68%	n/a	12%
Average	Average	35%	21%	7%	14%	51%	46%	27%

Example Programs: *Utility*

California Investor-Owned Utilities' Emerging Technologies Coordinating Council:

www.etcc-ca.com

Bonneville Power Administration's Emerging Technologies for Energy Efficiency (E3T) Initiative

www.bpa.gov/energy/n/emerging_technology

In Closing

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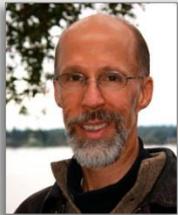
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Sharing Objective Assessments of Emerging Technologies

U.S. Department of Energy
Technical Assistance Program (TAP)



August 15, 2013

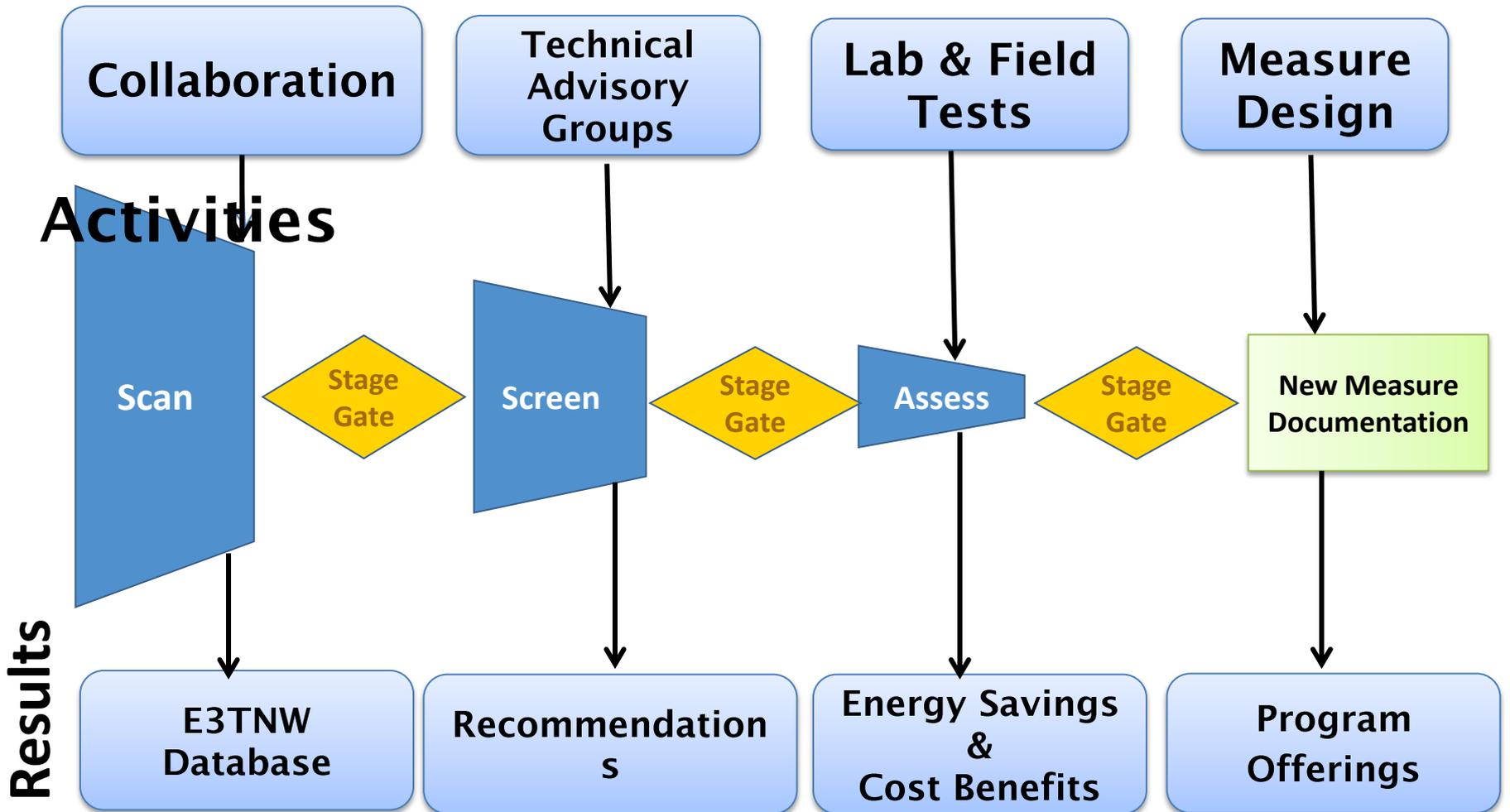
Rob Penney, PE
Washington State University Energy Program

What To Expect in the Next 20 Minutes

- Overview of E3T Assessment
- Database of Technologies
- Sample Technologies
- Information resources



BPA E3T Framework



TAG Process Example: HVAC

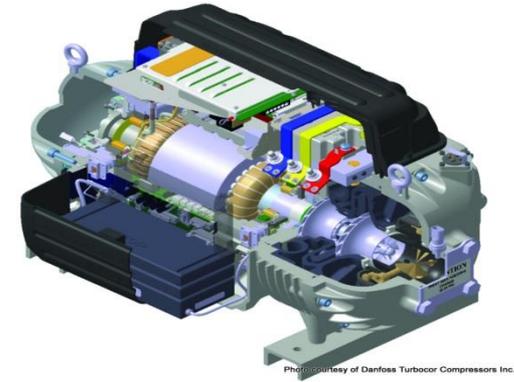


Photo courtesy of Danfoss Turbo Compressors Inc.

Technical Advisory Groups (TAGs)

Lighting - 2009

HVAC - 2009 & 2010

Energy Management - 2011

LED/SSL - 2012

Smart Thermostats - 2012

Lighting Controls - 2013



Sm/Md Data Centers - 2013

Technical Advisory Group Partners



E3TNW Database



HOME ABOUT DATABASE TAG PORTAL WEBINARS SUBMIT NEW ET

Emerging Technologies Database:

Database | TAG

a collection of energy efficiency emerging technologies submitted and scanned by energy experts and engineers; the technologies consist of basic and detail level information that highlights commercially available electricity saving technologies. You may [submit](#) new technologies, use the [search](#) and [browse](#) features in the above menu, or see the complete list of technologies.

Featured Emerging Technologies

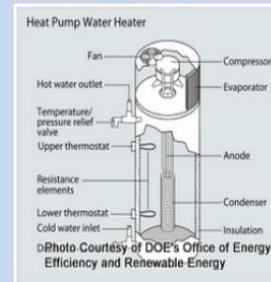
Lighting Technologies (by Energy System)



Energy Management Technologies (by Focus Area)



Residential Technologies (by Sector)



Browsing Technologies

E3T Technologies -- Browse

Energy Systems Sectors Focus Areas Completed Forms TAGs

Key Words and Phrases

GO >

Reset

Search Tips

Showing 50 items per page

Page: 1 2 3 4 5 6

370 results

Basic Info
Detailed Info
Scorecard
TAG Scorecard
EPA Scorecard
Market Potential



Bi-Level Stairwell Lighting Controls

Typically combine bi-level LED drivers or fluorescent bi-level ballasts and occupancy sensors to reduce lighting levels in stairwells when the stairwell is unoccupied.

TAG Score: ★★★★★ BPA Score: ★★★

✓ ✓ ✓ ✓ ✓

ID: 108



LED Street Lighting

Fixtures that employ light-emitting diode (LED) technology to deliver better light quality and use less energy.

TAG Score: ★★★★★

✓ ✓ ✓ ✓

ID: 78



LED Outdoor Wall-Mounted Area Luminaires

Designed to light walkways and egress areas and provide security lighting for areas adjacent to buildings. Wall-mounted area luminaires using light-emitting diode (LED) sources are becoming widely ...

TAG Score: ★★★★★

✓ ✓ ✓ ✓

ID: 395



Bi-Level Office Lighting with Occupancy Sensors, Auto-On 50%

Office lighting that turns half the lighting on when occupancy is detected. The other half of the lighting can be brought on manually or turned off as desired for more detailed work, for guests, or...

TAG Score: ★★★★★ BPA Score: ★★★

✓ ✓ ✓ ✓ ✓

ID: 222

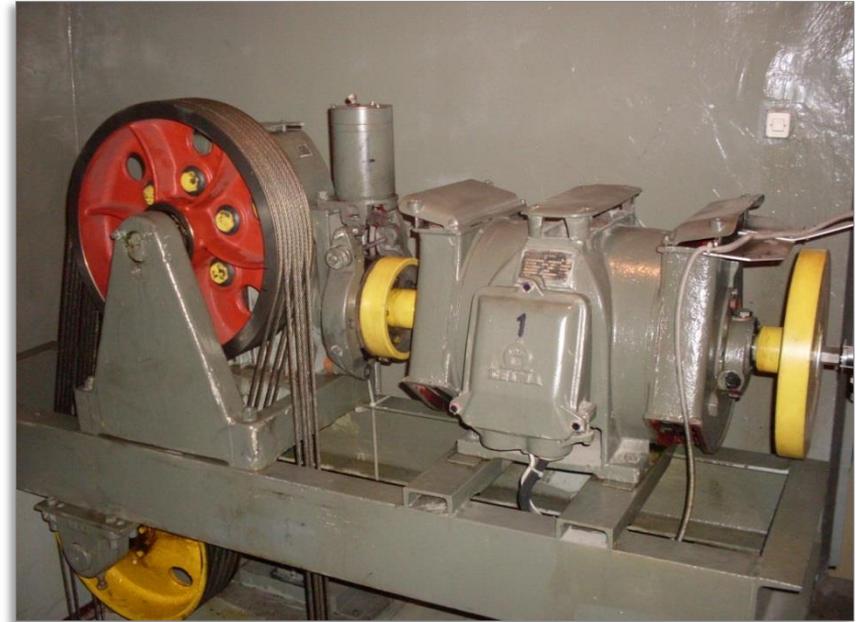


Assessment Information

- Synopsis
- Detailed description
- Standard practice
- Development status
- Energy savings claims, reliability, and dependencies
- Installed and O&M costs
- Effective life
- Non-energy benefits
- End-user drawbacks
- Competing technologies
- Prior assessment work
- Additional resources
- Performance trajectory
- Competing technologies

Efficient Elevators

- Gearless permanent magnet motors
- Advanced materials such as traction belts instead of steel ropes
- Motors with regenerative braking capability



Mirrored Light Pipe

- Translucent pipe that collects light from outside a building or from an artificial light source
- Conveys the light to locations within a building's interior where conventional daylight cannot reach directly



Low-E, High Visible Transparent Film

- Thermal efficiency equal or better than most films (U=.61)
- Visible transmittance is 70% on single pane
- Consumer selling point is light—happy people with great views using less electric lighting



Anti-Fog Film for Cold Cases

- Film installed inside reach-in supermarket refrigerated cases
- Reduces condensation and the need for anti-sweat controls, thus reducing energy use
- Reduces compressor load



Variable Refrigerant Flow (VRF)

- Heating and cooling distribution through refrigerant piping rather than ductwork
- Transfer heat among zones
- Variable-speed fans and compressors
- Very popular in Asia and Europe for decades



Photo Courtesy of Mitsubishi Electric Cooling and Heating Solutions

Smart LED Street and Parking Lights

- All the energy efficiency and long life of LEDs
- Controllable light levels for time-of-day, events, emergencies, and occupancy



CO₂ Heat Pumps

- Air- or water-source heat pumps that use CO₂ as a refrigerant, less GWP
- Produce hot air or water while generating chilled water or air
- Common in Japan
- Combined COPs up to 8
- Industrial model available, residential model soon



Smart Thermostats

- Web-enabled
- Smart-phone accessible
- Self-learning
- Occupancy sensors
- Weather forecast inputs
- Data sent to utilities and third parties
- Energy tips



Liquid-cooled Servers

- More efficient to cool a small amount of liquid than a lot of air
- Three examples:
 - Water-cooled server racks
 - Spray cooling
 - Submerged servers with dielectric oil



Circadian Light Color Tuning

Adjusting the level and color temperature of lighting at different times of the day can help avoid disrupting circadian rhythms, the biological cycles that can impact productivity and sleep



Showcase Webinars

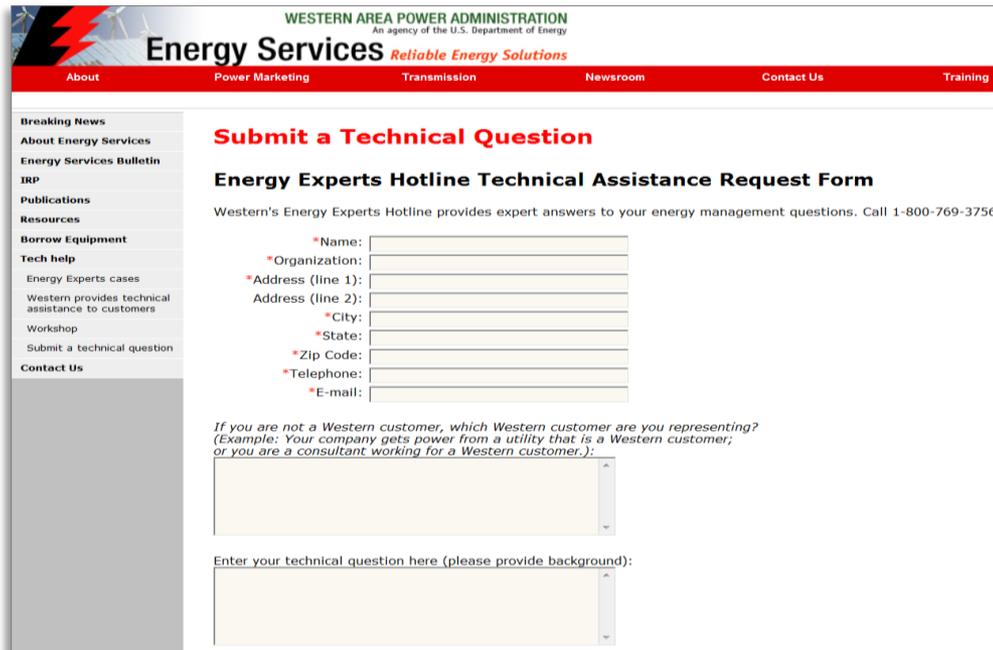
- LED Parking and Area Lighting
- Image Processing Occupancy Sensors
- Variable Refrigerant Flow (VRF)
- Smart Residential Thermostats
- Advanced Rooftop Unit Controls
- Demand Ventilation Control for Kitchens

Showcase Webinars

- Advanced Lighting Control Systems
- Low-Energy Precision Application
- Residential Window Treatments
- Behavior-Based Energy Efficiency Programs
- Non-Intrusive Load Monitoring

Western's Hotline

- Free technical assistance hotline for Western (WAPA) customers, including engineering assistance: (800) 769-3756



WESTERN AREA POWER ADMINISTRATION
An agency of the U.S. Department of Energy

Energy Services *Reliable Energy Solutions*

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Submit a Technical Question

Energy Experts Hotline Technical Assistance Request Form

Western's Energy Experts Hotline provides expert answers to your energy management questions. Call 1-800-769-3756.

*Name:

*Organization:

*Address (line 1):

Address (line 2):

*City:

*State:

*Zip Code:

*Telephone:

*E-mail:

*If you are not a Western customer, which Western customer are you representing?
(Example: Your company gets power from a utility that is a Western customer,
or you are a consultant working for a Western customer.):*

Enter your technical question here (please provide background):

Breaking News
About Energy Services
Energy Services Bulletin
IRP
Publications
Resources
Borrow Equipment
Tech help
Energy Experts cases
Western provides technical assistance to customers
Workshop
Submit a technical question
Contact Us

Western's Service Area



Energy Experts

The screenshot shows the homepage of the Energy Experts website. At the top left is the logo, a stylized 'e' with blue and yellow rays, followed by the text 'energy experts' and the tagline 'Making it easier to implement energy efficiency or renewable energy technologies and best practices'. To the right are three circular icons: 'Ask an Expert' (a person with a hand raised), 'Community' (three people), and 'News & Feeds' (a person with a hand raised and a signal wave). Below the header is a green banner with the text 'Tip Of The Day: Paint walls with light colors to help keep interiors cooler. A white wall can'. On the right side of the banner are social media share icons for Facebook, Twitter, and Email. A left sidebar contains a list of navigation links: Home, About Us, Energy Solutions Database, Calculators & Tools, Training, Education and Employment, Utility Resources, Energy Experts eNews, and Inventors. The main content area features a blue box with the text 'Find Technology/Program Resources for:' above a yellow hard hat on blueprints, and the text 'Building Professionals' to the right. Below this is a vertical stack of five colored circles (orange, blue, blue, blue, blue). At the bottom of the main area are Facebook and Twitter icons with the text 'follow the expert'. The footer contains links for 'CONTACT US', 'LEGAL INFO', 'SITE MAP', and 'SEND TO A FRIEND', along with the copyright notice '© 2011 Washington State University Extension Energy Program' and the 'EnergyServices Western Area Power Administration' logo.

www.EnergyExperts.org

Energy Solutions Database



energy experts



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Inventors

Energy Solutions Database

This database contains thousands of links to objective and timely resources selected by our energy experts.

Type in a keyword and / or click on the Topic, Sector and Content Type filters to narrow your search. Your results will be displayed on a separate page. Please use quotation marks for phrases or groups of words to narrow the search. (ex. "heat pumps" or "energy management" or "distributed energy")

Keyword:

Go!

Reset

Topic:

- Agricultural Technologies
- Appliances
- Building Design
- Building Envelope
- Building/Plant Energy Management
- Building/Space Type

Subtopic:

- Compressed Air
- General
- Heating/Cooling/Ventilation
- Laundry
- Process Heating
- Refrigeration

Sector:

- Residential
- Commercial
- Industrial
- Agricultural
- Other
- Utility

Content types:

- Article/Factsheet (33)
- Case Study (5)
- Code/Standard (1)
- Directory (0)
- e-List (0)
- Event Provider (0)

Plant Operations Support Consortium

- **Mission:** To increase the efficiency and sustainability of facility operations by providing timely and creative technical assistance, education and consultation to support facility construction, operation and maintenance
- **Services:**
 - Equipment exchanges
 - Energy audits
 - Energy monitoring and reporting
 - Facility assessments
 - Capital needs assessment and planning
 - Hotline and solution sharing
- (360) 956-2230

SEE Action

- A state- and local-led effort facilitated by the U.S. DOE and EPA to achieve all cost-effective energy efficiency improvements by 2020
- Offers publications, events, and technical assistance to state and local decision makers
- www1.eere.energy.gov/seeaction/



More Information

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E3T Database & Webinars: www.E3TNW.org

Got Questions?

