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Virtual Tour of the Pacific Northwest National Laboratory

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ENERGY & ENVIRONMENT DIRECTORATE
PACIFIC NORTHWEST NATIONAL LABORATORY

Federal Utility Partnership Working Group, Fall Seminar
November 3, 2016

DISCOVERY *in Action*

U.S. DEPARTMENT OF
ENERGY

The National Laboratory system

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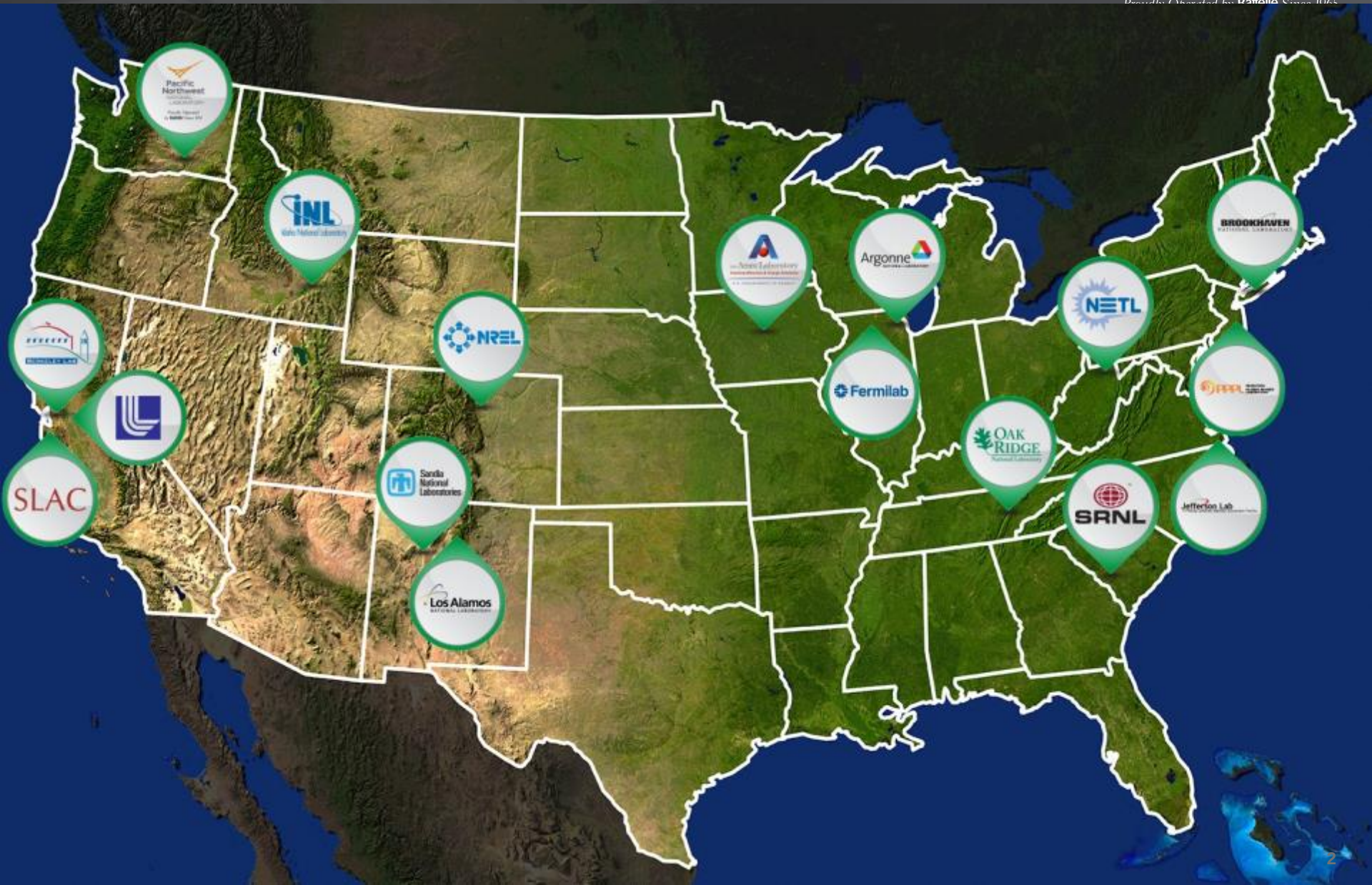

PNNL: FY2016 at a Glance

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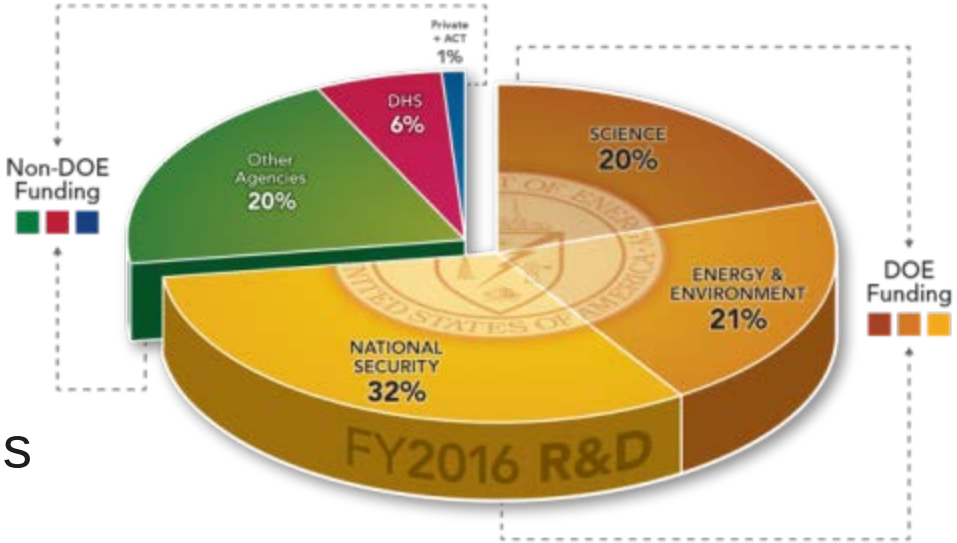
- $920 million budget
- 4,400 staff
- 104 patents
- 1,058 peer-reviewed publications



Pacific Northwest National Laboratory
Richland, Washington

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PNNL's Distinctive Science Vision

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Energy for National Security
Capabilities

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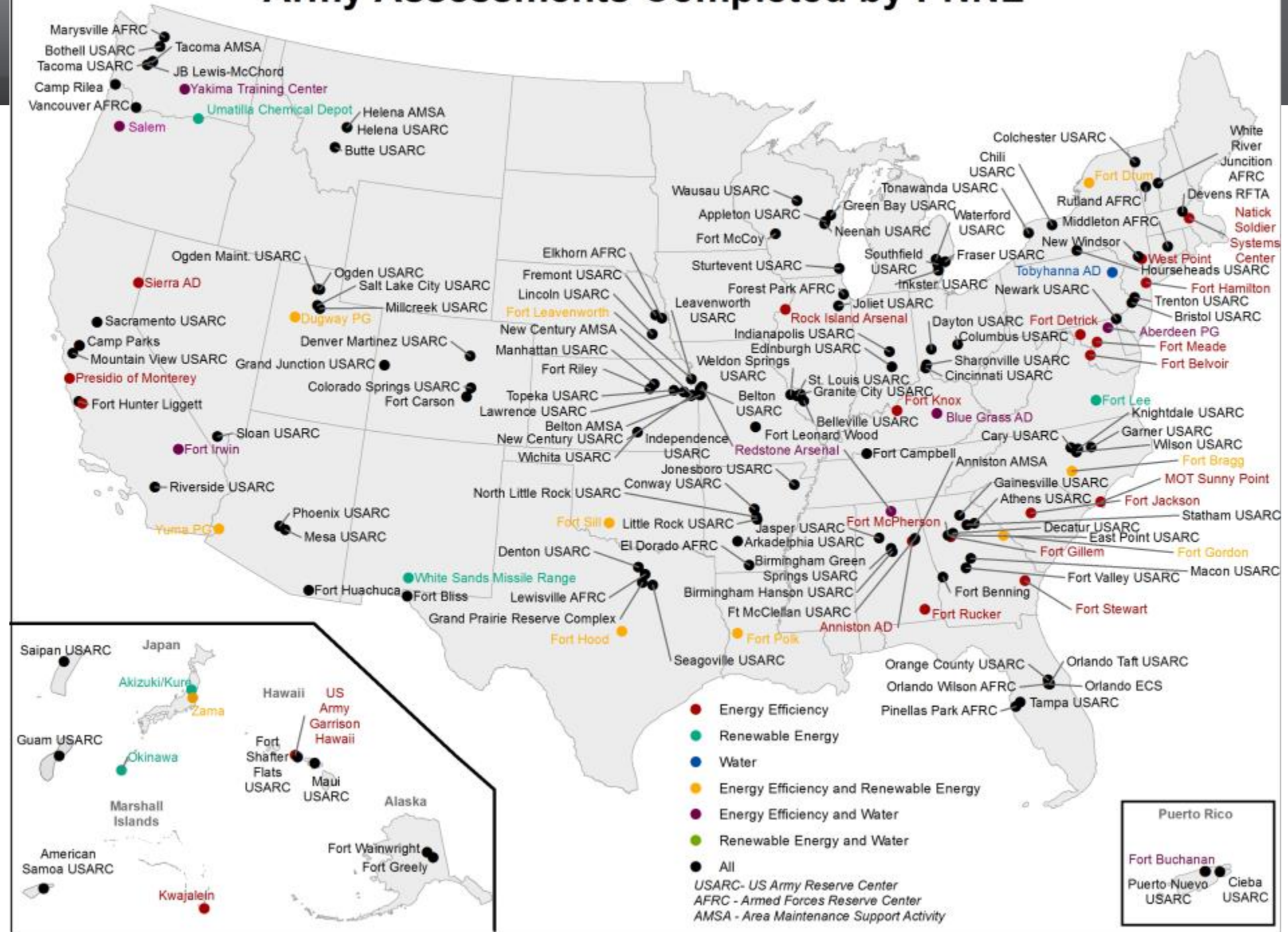
Army Assessments Completed by PNNL



Comprehensive Energy and Water Evaluations (CEWE)

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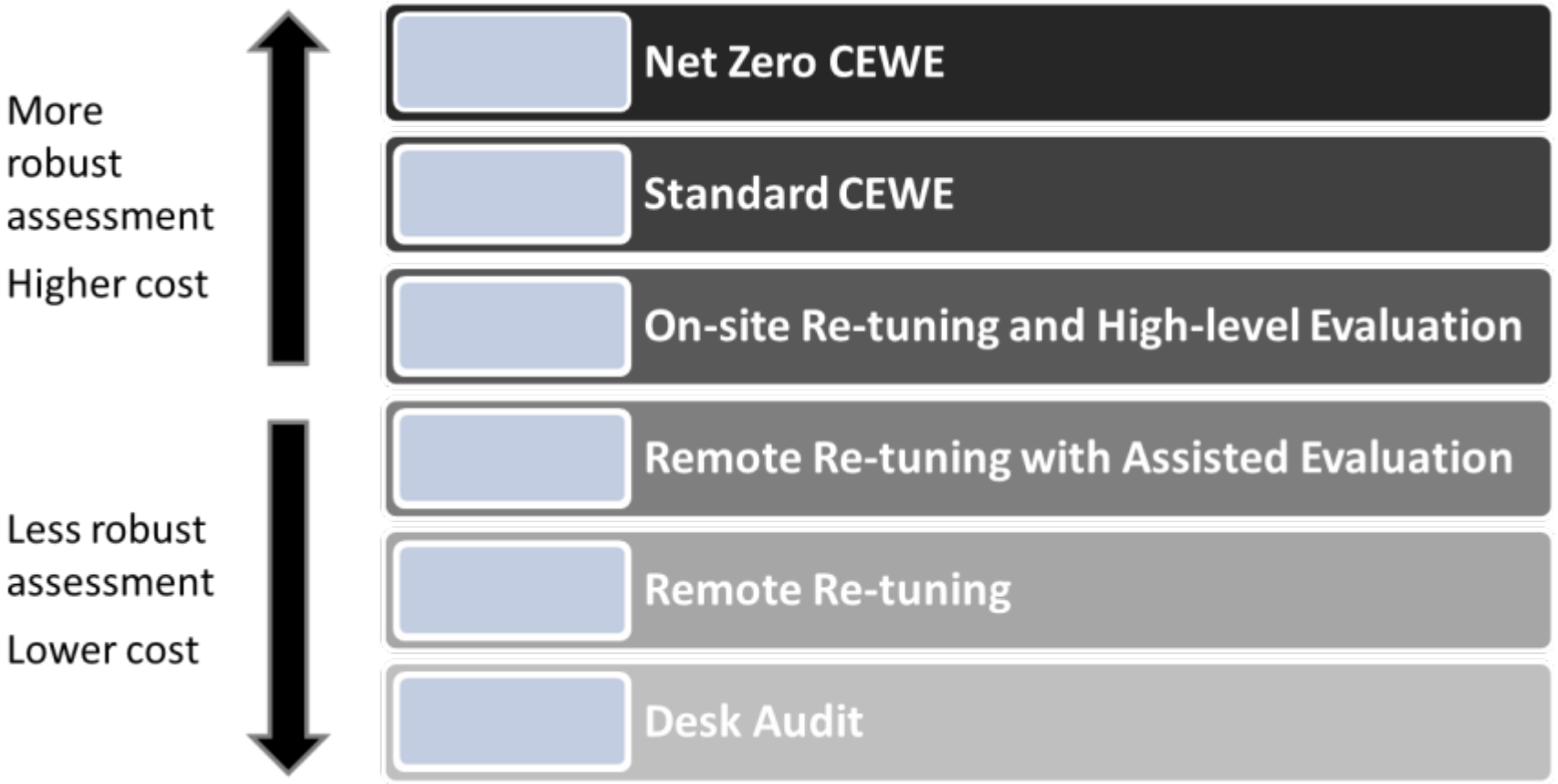
- EISA compliant audits resulting in life-cycle cost effective energy and water conservation measures in project-ready format



Renewable Energy Assessment Types

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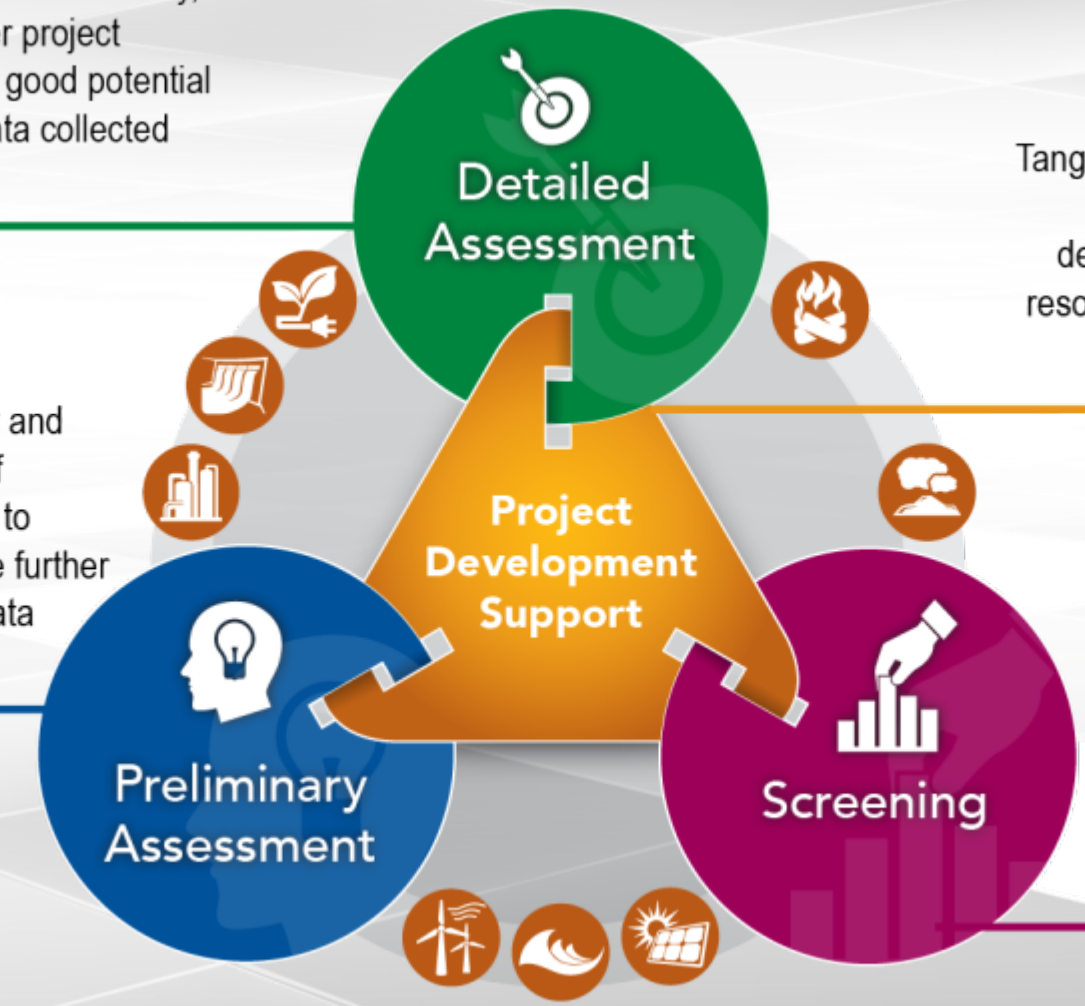
10% design if resource availability, economics, and other project considerations show good potential based on detailed data collected during a site visit



Tangible products that move a specific project closer to development (e.g., detailed resource data collection, RFI, 1391, proposal reviews)

Resource availability and economic analysis of site-specific projects to show what should be further investigated using data provided by the site

Resource availability and economic analysis of prototype projects for comparison across multiple sites using data provided by the client

Cybersecurity

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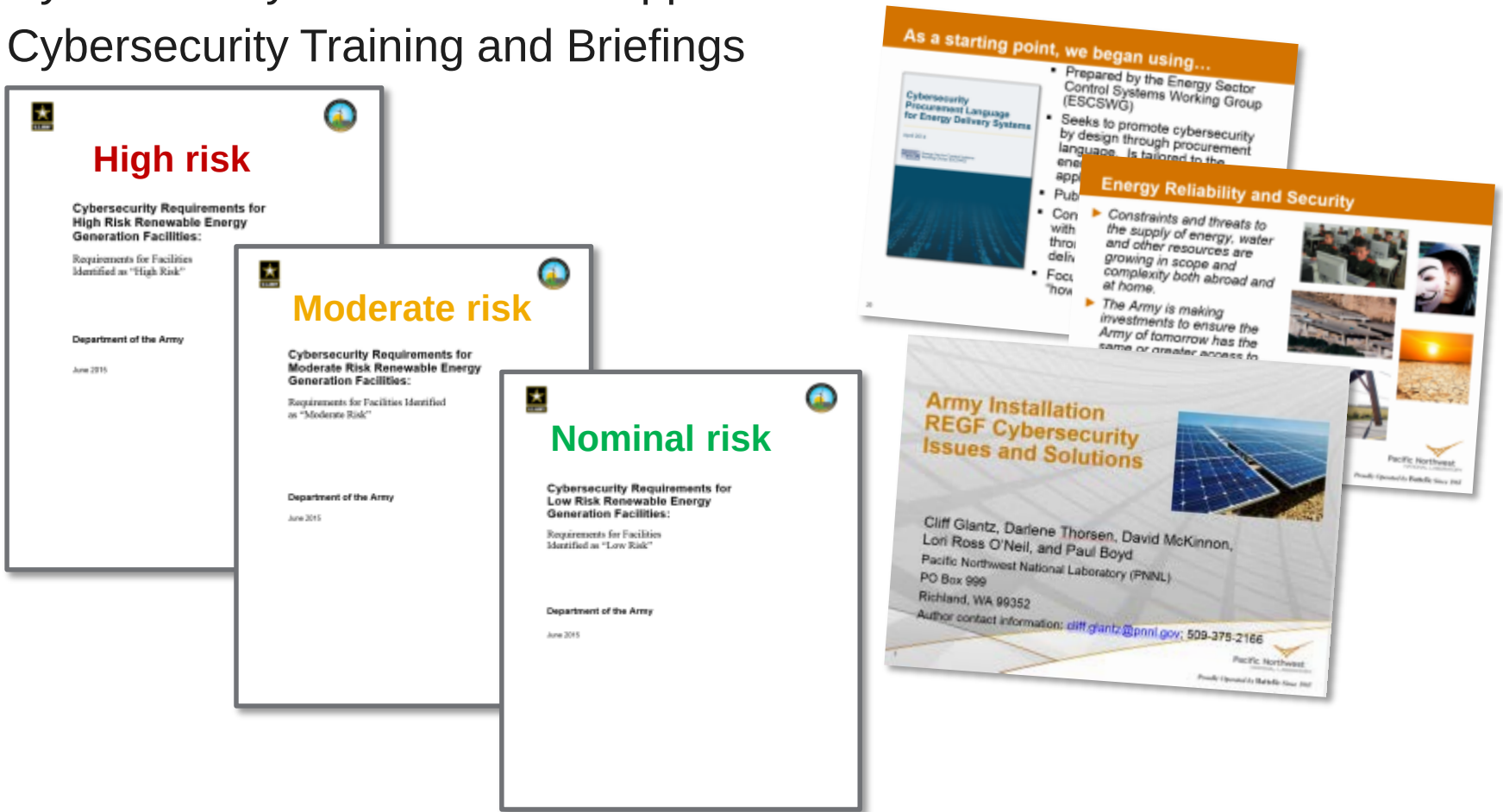
PNNL Developed Cybersecurity Products for OEI REGF:

- Cybersecurity Risk Assessment of Proposed REGF Implementations
- Cybersecurity Protections in support of REGF Procurements
- Cybersecurity Training and Briefings



Buildings Cybersecurity Capability Maturity Model (C2M2)

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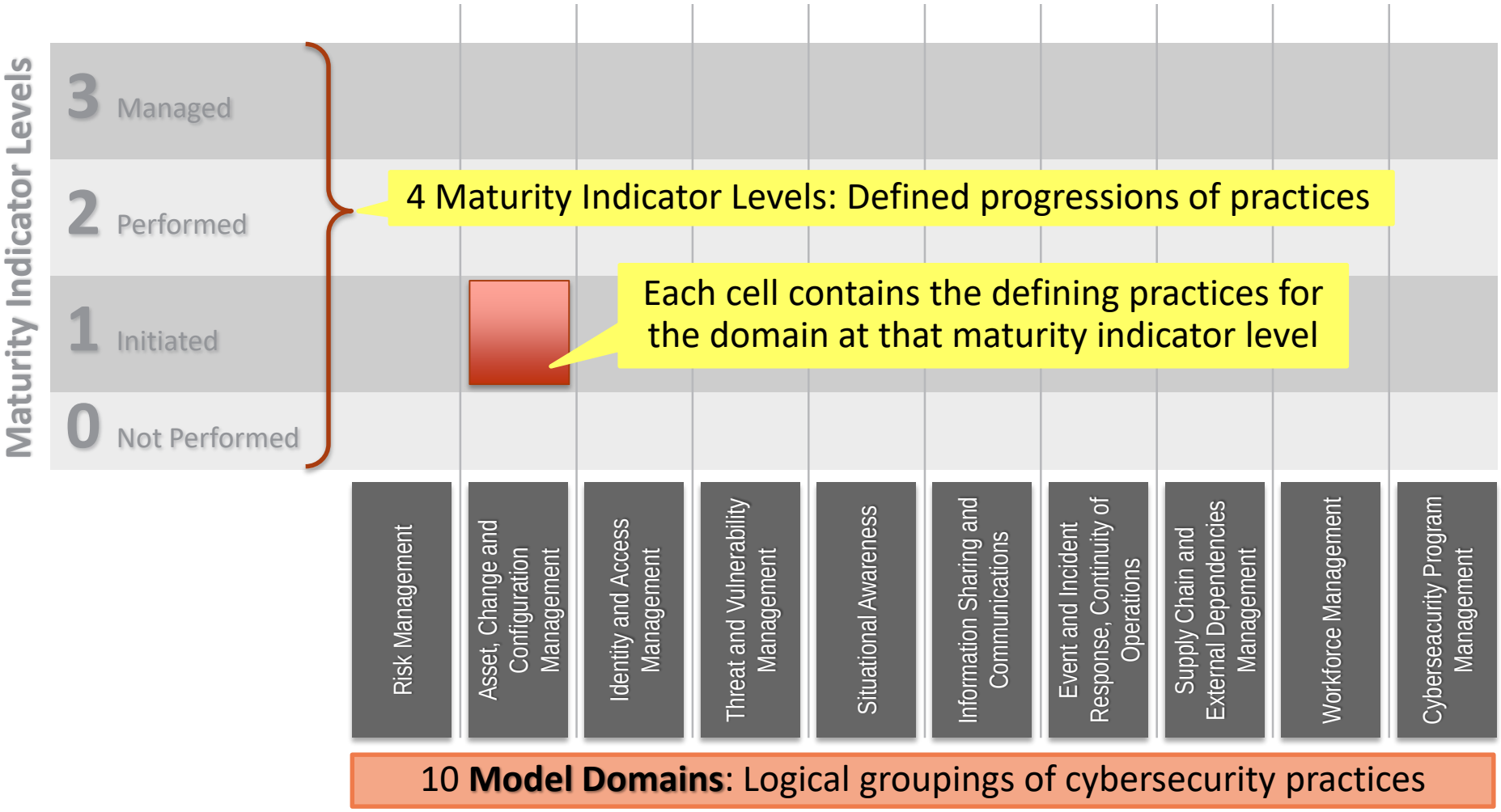

Energy Data Analysis Roadmap

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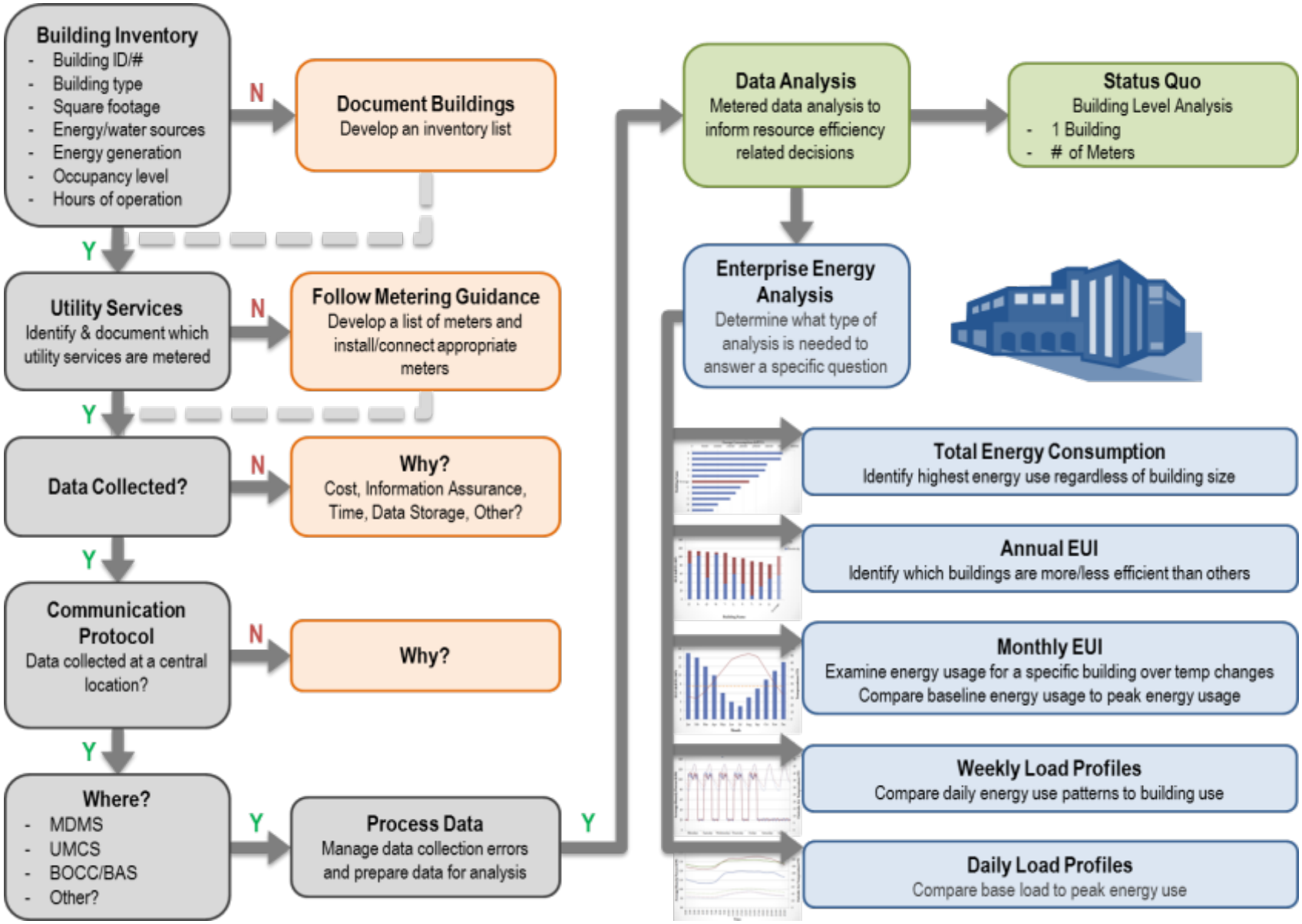

Example Energy Data Analysis

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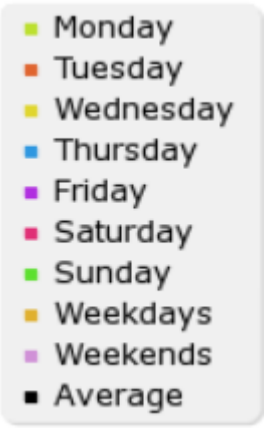
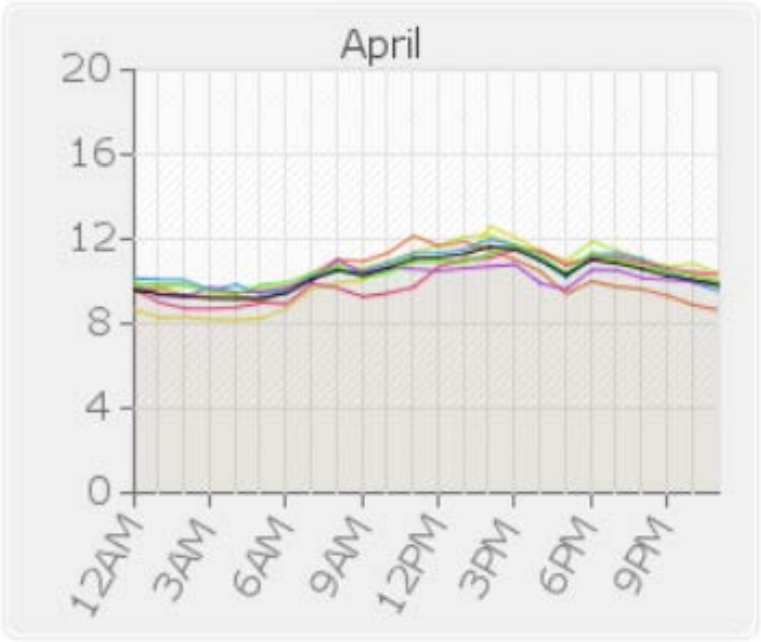
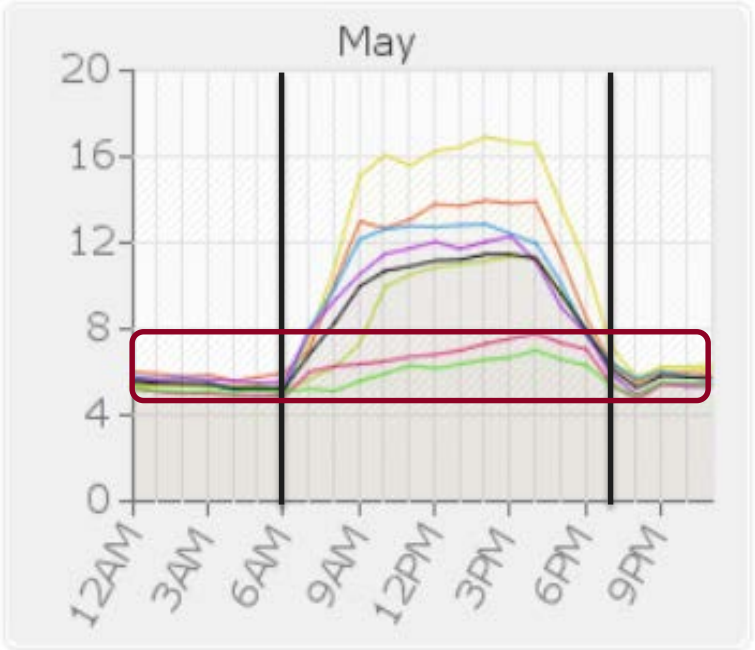
Night and weekend setbacks

- Identified by a change in consumption patterns between night, weekday, and weekend hours





No Setbacks



Night and Weekend Setbacks

Energy Management, Controls, and Diagnostics

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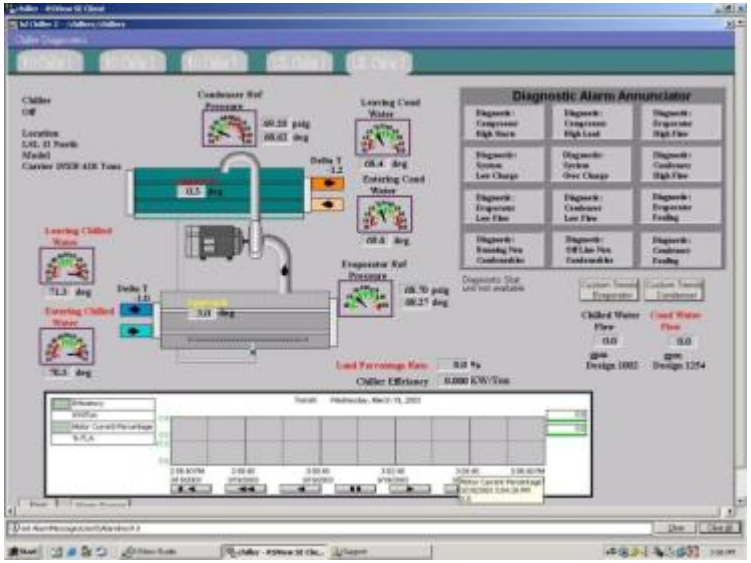
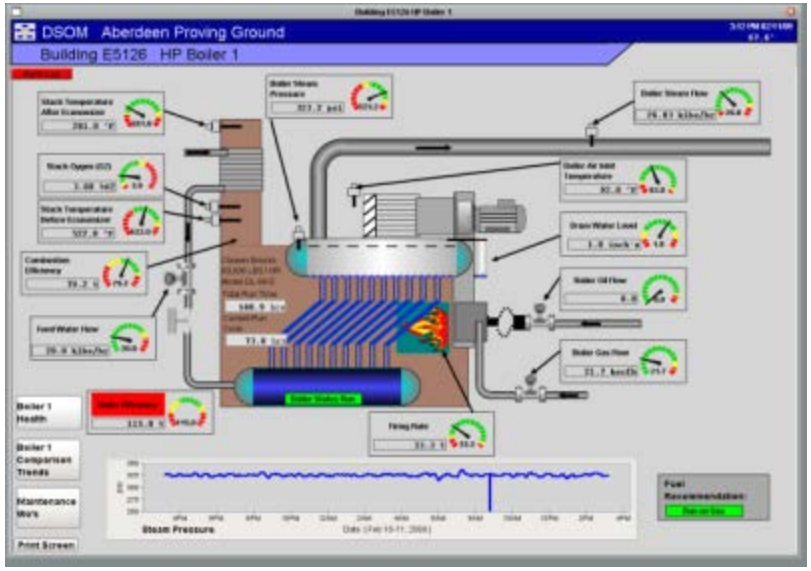


- Decision Support for Operations & Maintenance (DSOM)
  - Building-level controls integration
  - Central plant optimization
    - Boilers, chillers, cogeneration



http://www.pnl.gov/DSOM/

Building Automation System Re-tuning

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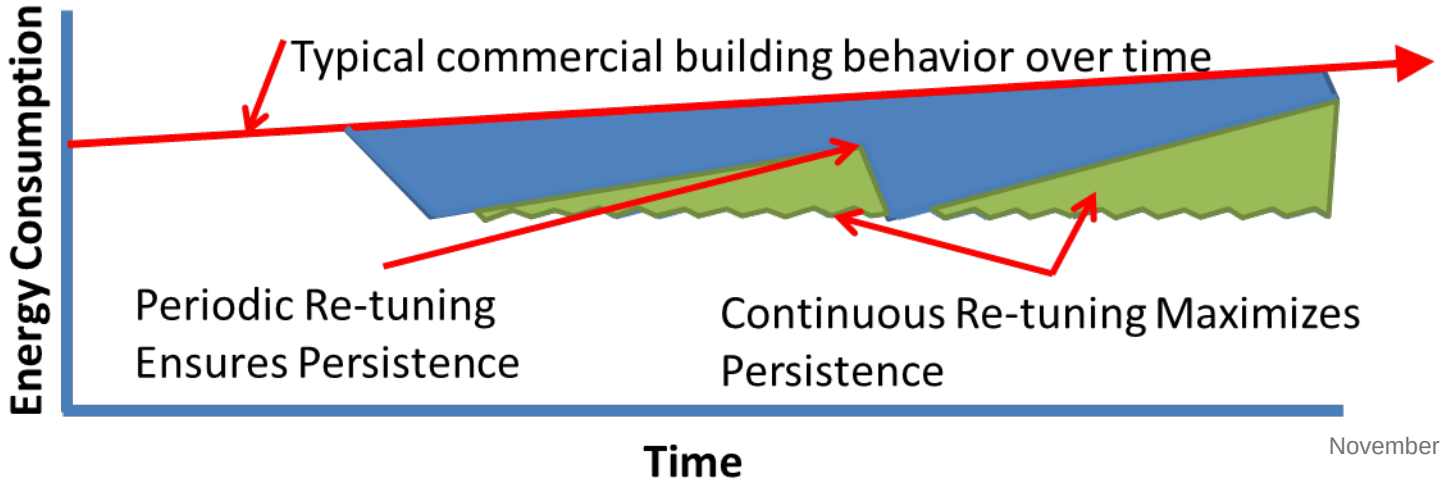
- Re-tuning is a systematic process to identify and implement low-/no-cost energy efficient solutions to building operational problems (primarily through control system changes). The PNNL approach includes
  - Training of building operations staff with the goal of embedding re-tuning into daily operations
  - Identifying control system, operations and maintenance, and additional energy efficiency opportunities that may require investment
  - Calculating the potential savings of the proposed control system recommendations, followed by measurement of the actual savings



Supporting Federal Participation in DOE Lighting Campaigns

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Exterior Lighting	**LEEP Campaign – www.leepcampaign.org**
	Overview: • Recognition and guidance program supporting adoption of high efficiency parking lighting • Sponsored by DOE Commercial Buildings, BOMA, IFMA, Green Parking Council • *For Federal Users* page on the web site • Free technical assistance to federal sites Results: • Documented energy savings of up to 90% (LED with controls) • Simple paybacks of 2-4 years not uncommon • 30 LEEP Award winners saving nearly 30 million kilowatt-hours and $3 million per year o 5 federal sites received awards to date; no Air Force sites
Interior Lighting	**Interior Lighting Campaign – www.interiorlightingcampaign.org**
	Overview: • Recognition and guidance program supporting adoption of high efficiency troffer lighting • Sponsored by DOE Commercial Buildings, BOMA, IFMA, IES, and possibly GSA • Launched at 2015 Better Buildings Summit, June 28, 2015 • Free technical assistance to federal sites • FEMP-developed resources on wireless occupancy sensors (September 2015) Anticipated Results: • Savings of 60% on one-for-one replacement basis; up to 75% with the use of controls. • Awards – Summer 2016

Suggested Next Steps

- Define technical assistance needs of the Air Force
- Identify ways to get Air Force sites to join DOE lighting campaigns

Smart Grids and Microgrids

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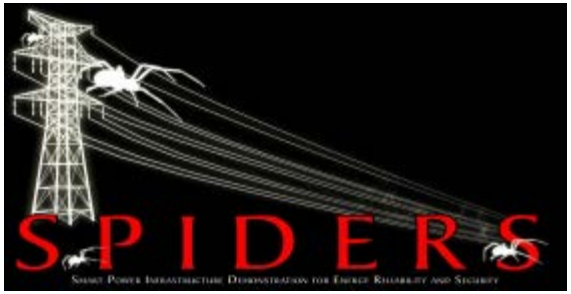
- DoD - Smart Power Infrastructure Demonstration for Energy Reliability and Security (SPIDERS)
  - Phase 1: Joint Base Pearl Harbor Hickam
  - Phase 2: Ft. Carson
  - Phase 3: Camp Smith



- DOE – Smart and Micro-grids as a Resiliency Resource
  - Modeling and analysis with Grid-LabD
  - Local Resource
  - Community Resource
  - Black Start Resource

Regulatory Analysis

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Appliance Efficiency Standards

- **Program Impact (**2005 to 2016)
  - 11 Quads of Energy Savings
  - Saves Consumers $35B
  - 355 million tons of avoided CO_2

Building Energy Efficiency Codes

- **Program Impact (**1992 to 2014)
  - 28 Quads of Energy Savings
  - Saves consumers $170B
  - 1.8 billion tons of avoided CO_2

Solid State Lighting Program

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Impact Goal: Drive LED market penetration, reducing energy consumed for lighting by more than 30%

- Measurements, technical reports have changed the SSL industry – better products!
- Organized development of most major SSL industry standards and test methods
- L Prize led to market introduction of most advanced bulb
- Creating market pull for new products: the SSL Municipal Consortium is the most influential lighting organization for streetlights
- Providing information that creates consumer confidence in purchasing decisions

Buildings-Grid Integration

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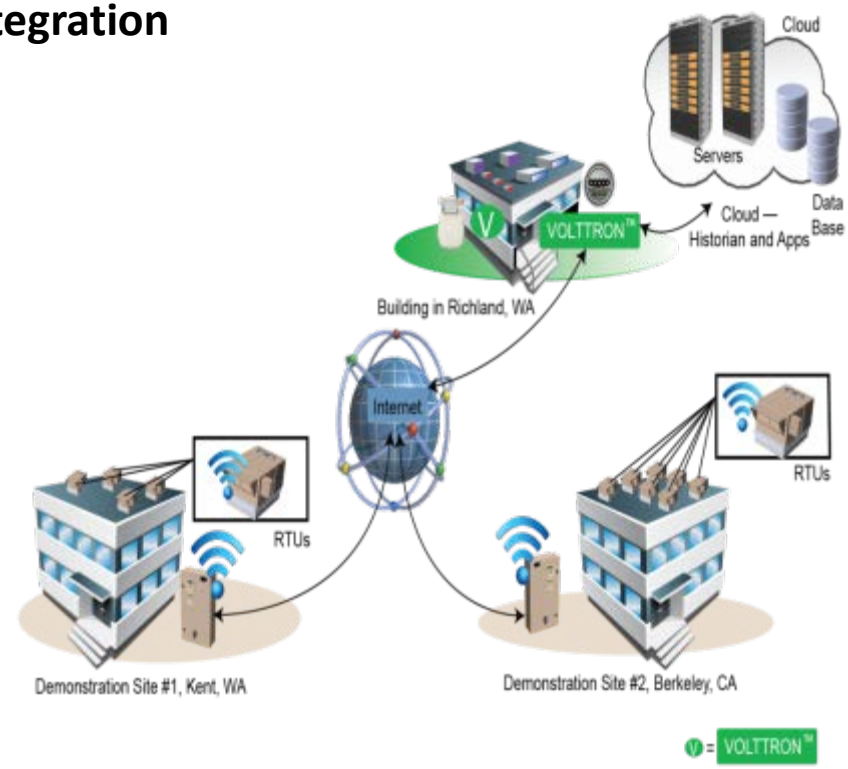
Impact Goal: Improve building energy efficiency by 20%-30% through enhanced control and enable low-cost building-grid integration.

Significant Accomplishments:

- Development of cost-effective automated diagnostic and control technologies, many of which are now embedded in commercial products
- Pioneered “re-tuning” for commercial buildings with BAS’s
- Application of our tools saved PNNL $400K in FY13

We Are Leading The DOE Transactive Energy Program, The Cornerstone Of Buildings-Grid Integration



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