



• August 15-18, 2010 • Dallas, Texas •
• Dallas Convention Center •



GSA's Mission to the Moon

Mark Ewing
Director, Energy Division

“Zero environmental footprint is a huge goal. It is really this generation's moon shot. If we think about moving ourselves away from having impact of our environment, moving the government away from having impact on the environment, you can only begin to scratch the surface of what that's going to mean in terms of science, technology, human activity, economic change. We call it ZEF.”

Martha Johnson
GSA Administrator
June 2, 2010



OIL CRISIS



1985



24,027,186

1995



3,165,464

2009



964,068

BRINGING THE RIGHT PEOPLE TO THE JOB

Hiring Greening Expertise

- Enthusiasm
- Expertise
- Knowledge
- Experience

Greening Hero

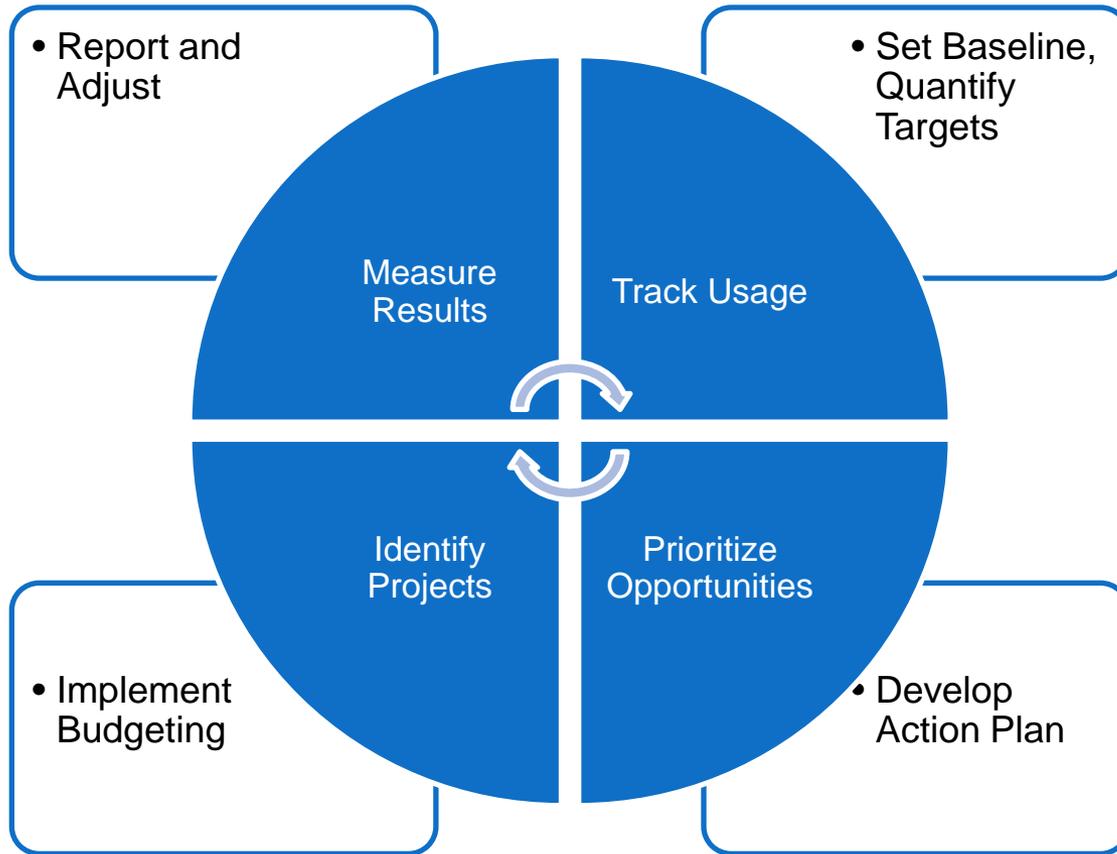


BRINGING THE RIGHT PEOPLE TO THE JOB

Hiring Greening Officer

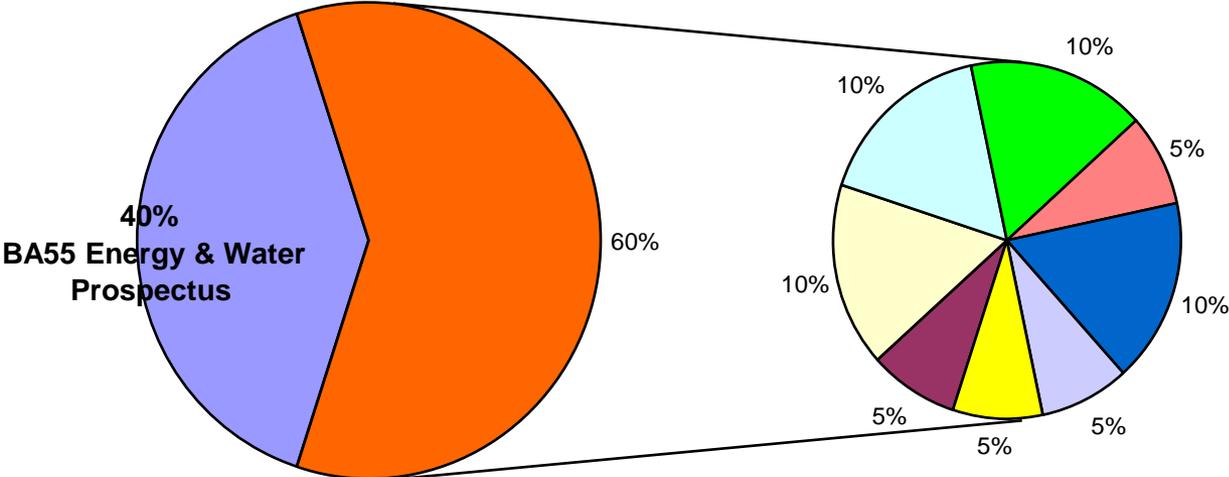
- Enthusiasm
- Expertise
- Knowledge
- Experience

48,333 BTU/GSF FY2020



MMBTU Reduction by Implementation Strategy

5,108,793 MMBTU to Reduce!



- BA55 Energy Prospectus
- Design Review- New Constr/Major Modern
- Cxg / Energy & Water Evaluations
- Operations & Maintenance
- Renew Energy Generation & Purchase
- Education & Awareness
- Combined Heat & Power Plants
- Advanced Metering
- Alternative Financing

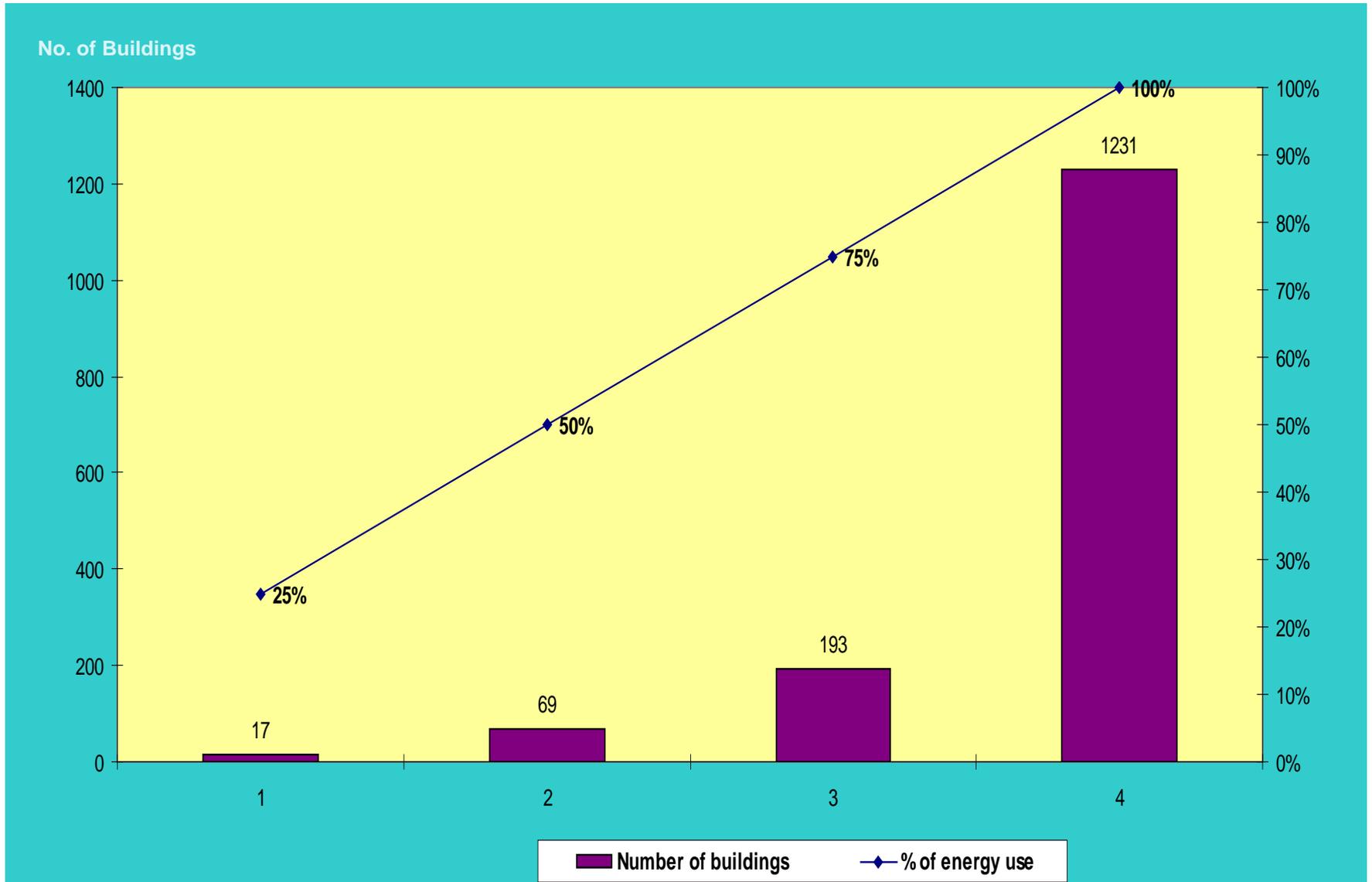
1. Prioritize Buildings

- i. 75% of GSA's total energy usage is in 198 buildings; these sites have been designated "covered facilities" under EISA.
- ii. Evaluate building energy usage annually to update list of facilities.

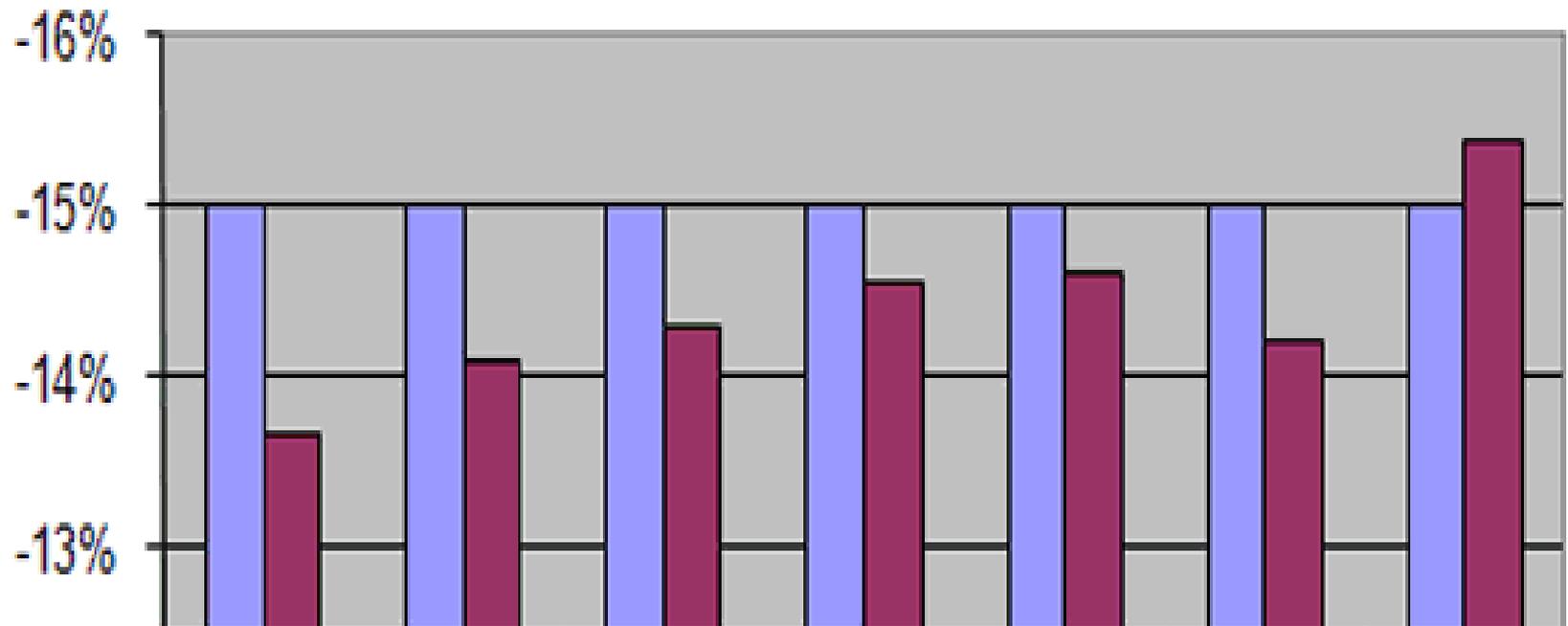


Representation of Number of Buildings with Percentage of Energy Use

FY 2009 – All Buildings



PBS Energy Reduction Target vs. Actual



	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Target	-15.00%	-15.00%	-15.00%	-15.00%	-15.00%	-15.00%	-15.00%
Actual	-13.66%	-14.10%	-14.30%	-14.54%	-14.61%	-14.22%	-15.37%

2. Design Review for New Construction/Major Modernization Projects (5% estimated contribution to BTU goal starting in 2014)

- i. Design prospectus-level projects to regional BTU/SF or lower. (Regional performance averages are generated from the Energy Usage Analysis System or EUAS).
- ii. Comply with “P100 2005” Public Buildings Service (PBS) Facilities Standards
- iii. Meet LEED Silver certification requirements and Energy Star standards
- iv. Efficiently design:
 - i. Repair and Alteration projects
 - ii. Service Center Initial Space Alterations (ISA's)

New P-100

- **Ground-Source and Water-Source Heat Pump Systems**

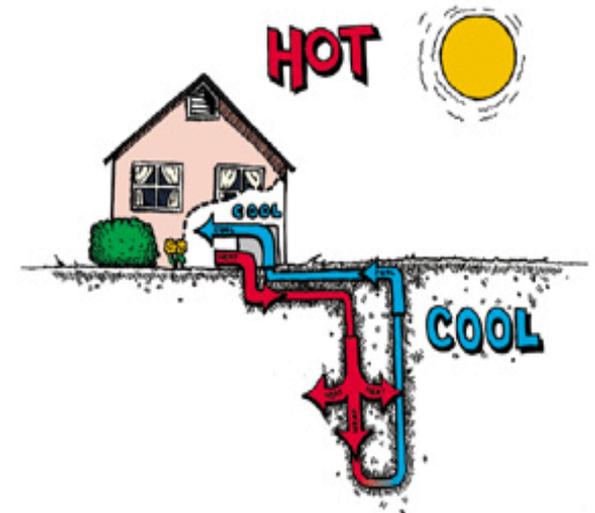
Based on the results of a geotechnical survey, a ground-source or water-source heat pump system must be considered.

The ground-source or water-source heat pump systems must have field-installed controllers, current-sensing devices that transmit information to the BAS for calculating the energy consumption of the pump and compressor motors, and metering devices for determining energy consumption data and must be capable of transmitting the data to the central building automation system.

Ground-Source Heat Pumps

14

- Ground Source Heat Pump (GSHP)
 - Central heating and/or cooling system that pumps heat to and from the ground
 - Winter
 - GSHP moves heat from ground to the building
 - Summer
 - GSHP discharges heat from the building into the ground



GSA's IRS Andover, MA

15

- Single story 403,504 GSF building
- Constructed 1966
- Land Acreage: 36.3 acres
- Modernized in 2 phases
 - Phase 1 – 10/2009 – 7/2011
 - Phase 2 – 7/2011 – 9/2012
- BA 55 & ARRA

IRS Andover, MA Borefield

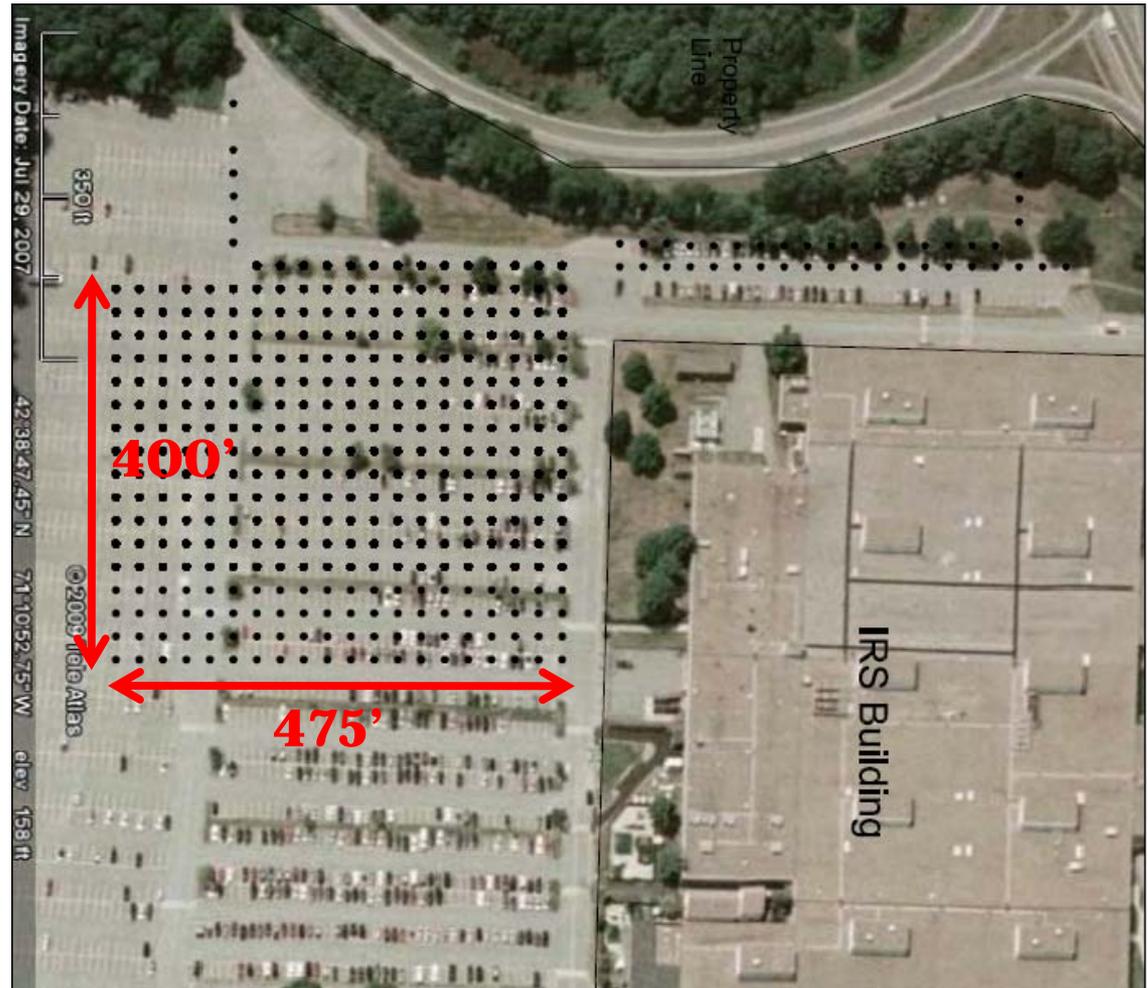
16



Geothermal Well Layout

17

- IRS Andover, MA
- 400 geothermal wells (black dots)



Cost Comparison

18

- Initial Estimated Cost of Installation
 - GSHP System - \$11,823,448
 - VAV System - \$11,221,000
- Maintenance Costs
 - GSHP System - \$300,000 per year
 - VAV System - \$400,000 per year
- 13% Energy Savings over VAV System
- Payback Period - 3 years
- Life Cycle Cost Savings - \$2,685,302
 - Life Cycle - 20 years

3. Commissioning / Energy and Water Evaluations (10% estimated contribution to BTU goal from now through 2015)

- i. Ensure new building systems function as designed
- ii. Require operator training and enhanced operations and maintenance (O&M) documentation
- iii. Ensure repair and alteration (R&A) projects are properly designed and field-tested
- iv. Meet goals of EISA Section 432 by completing Energy and Water Evaluations, including by retro-commissioning 25% of covered facilities every year so that all covered facilities are evaluated every 4 years. This will help achieve optimal performance and identify capital energy projects.
- v. Require commissioning for all new construction and major modernization projects
- vi. Regional monitoring-based continuous commissioning

GSA Covered Facilities (EISA Sec. 432)

Region 10 has 13 covered facilities

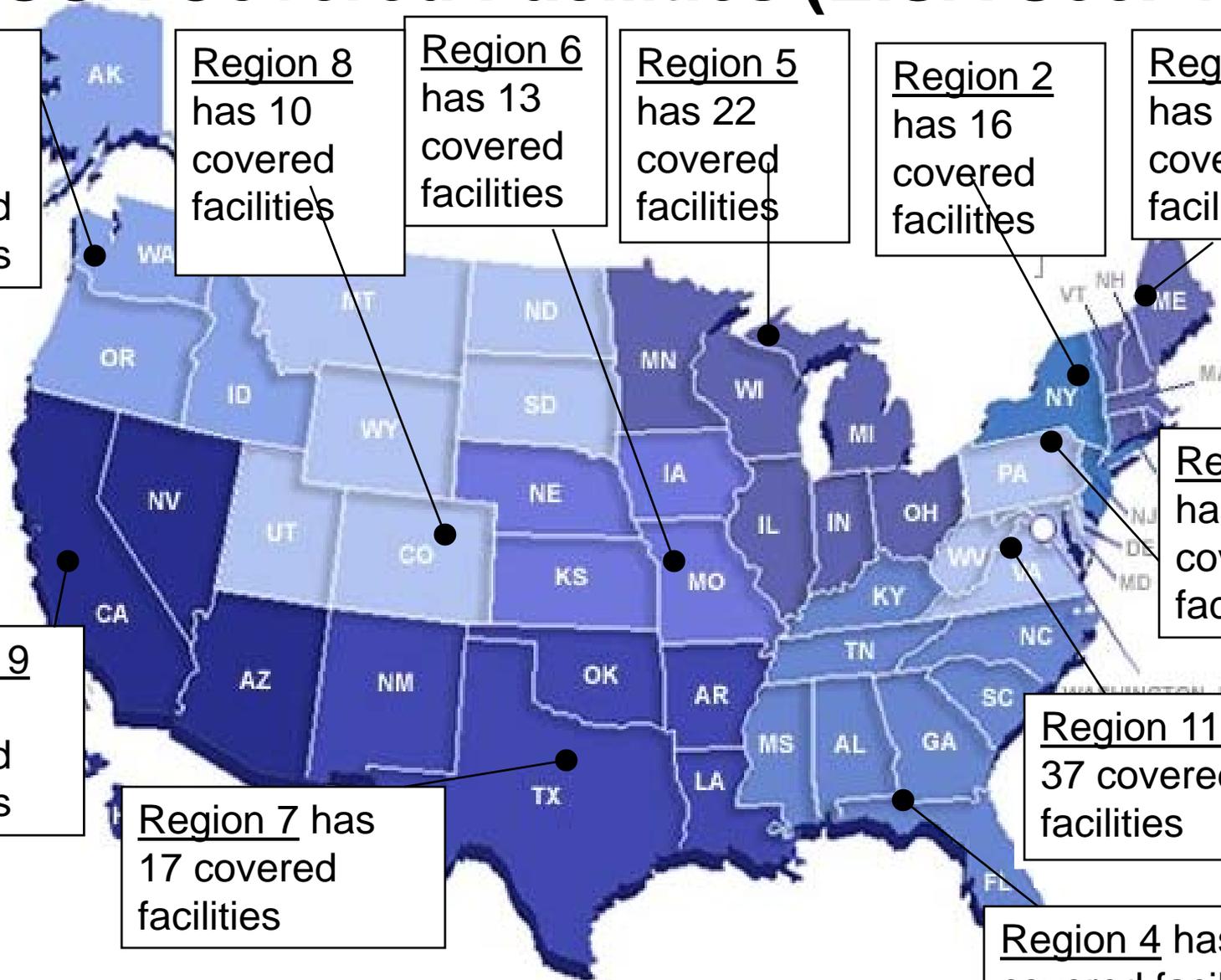
Region 8 has 10 covered facilities

Region 6 has 13 covered facilities

Region 5 has 22 covered facilities

Region 2 has 16 covered facilities

Region 1 has 6 covered facilities



Region 9 has 21 covered facilities

Region 7 has 17 covered facilities

Region 3 has 21 covered facilities

Region 11 has 37 covered facilities

Region 4 has 22 covered facilities



GSA's "covered facilities" under EISA 2007 are the 198 facilities that represent 75% of GSA's total energy usage.

GovEnergy 2010

4. Energy and Water Conservation Projects (“BA55” Major Repairs and Alterations Program) (40% estimated contribution to BTU goal from now through 2015)

- i. Prioritize existing buildings based on performance
- ii. Identify and implement life-cycle cost effective energy saving measures
- iii. Select energy retrofit projects and seek Congressional appropriations (See Attachment 2: *Formal Project Call letter*)
- iv. Evaluate/rank project submissions based on 4 factors:
 - i. Savings Investment Ratio (SIR)
 - ii. Simple Payback
 - iii. Million British thermal units (mmBTU) saved per dollar invested
 - iv. GHG reduction potential based on project’s U.S. EPA Emissions & Generation Resource Integrated Database (eGRID) electricity generation region

5. Operations and Maintenance (10% estimated contribution to BTU goal from now through 2015)

- i. Maintain building efficiency through remote monitoring
- ii. Require enhanced operator training
- iii. Provide building automation system (BAS) technical expertise to Design & Construction Divisions and Regional Service Centers



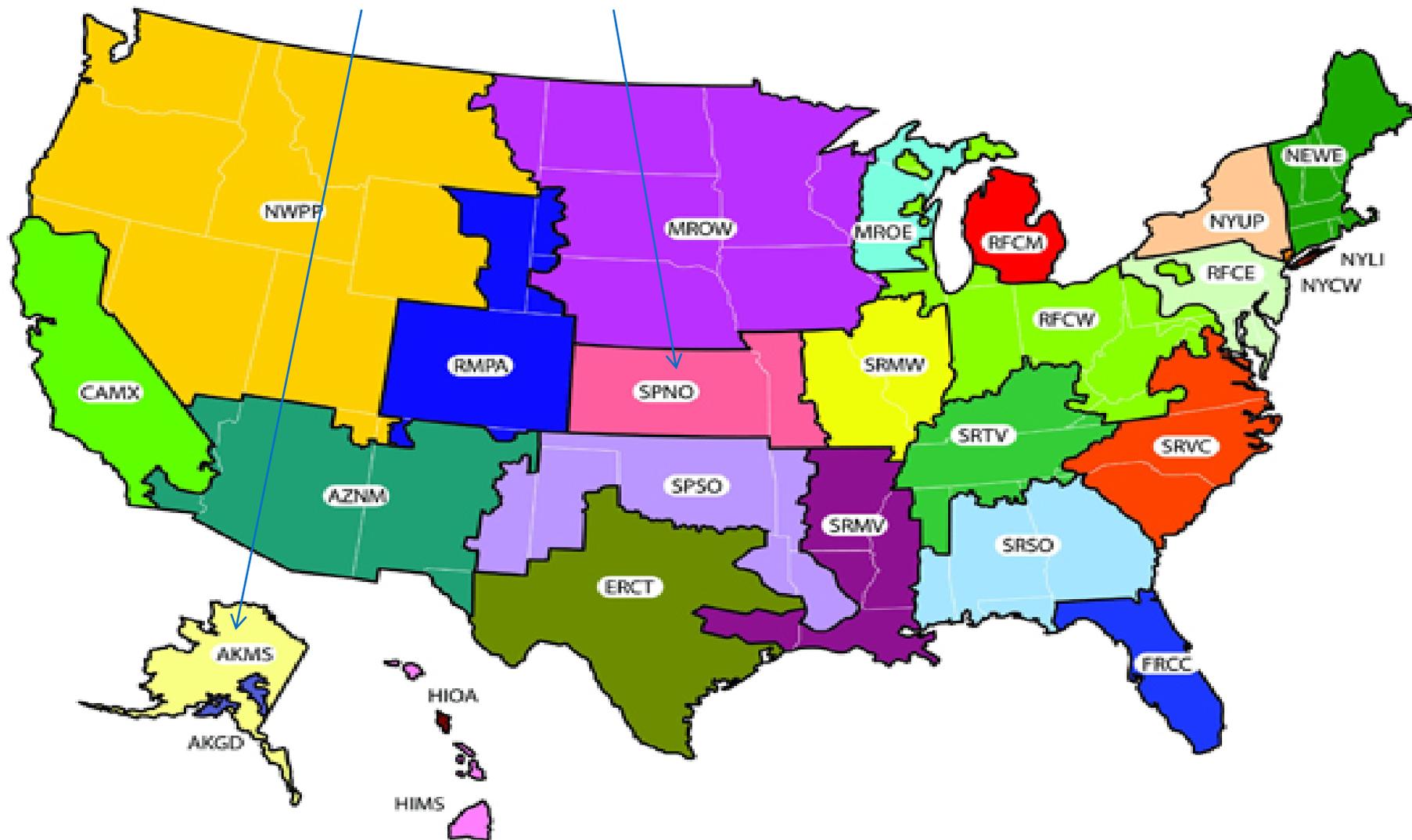
6. Renewable Energy Generation and Purchase (10% estimated contribution to BTU goal via credits from now through 2015)

- i. Procure at least 5% renewable energy through electricity purchase contracts
- ii. Contract for RECs directly in stand-alone contracts
- iii. Fund new renewable energy generation projects at GSA facilities
 - i. Explore viability of wind turbine projects at border stations, etc.

eGRID2007

GHG Annual Output Emission Factors

498.86 – 1960.94 (CO₂)(lb/MWh)







Major General Emmett J. Bean Federal Center
Lawrence, IN
\$36,650,000
Solar Research Project





7. Education and Awareness (5% estimated contribution to BTU goal from now through 2015)

- i. Effect culture change through ongoing training and education at all levels of organization
 - i. Overcome resistance to change
- ii. Improve motivation and self-sufficiency of employees & building managers



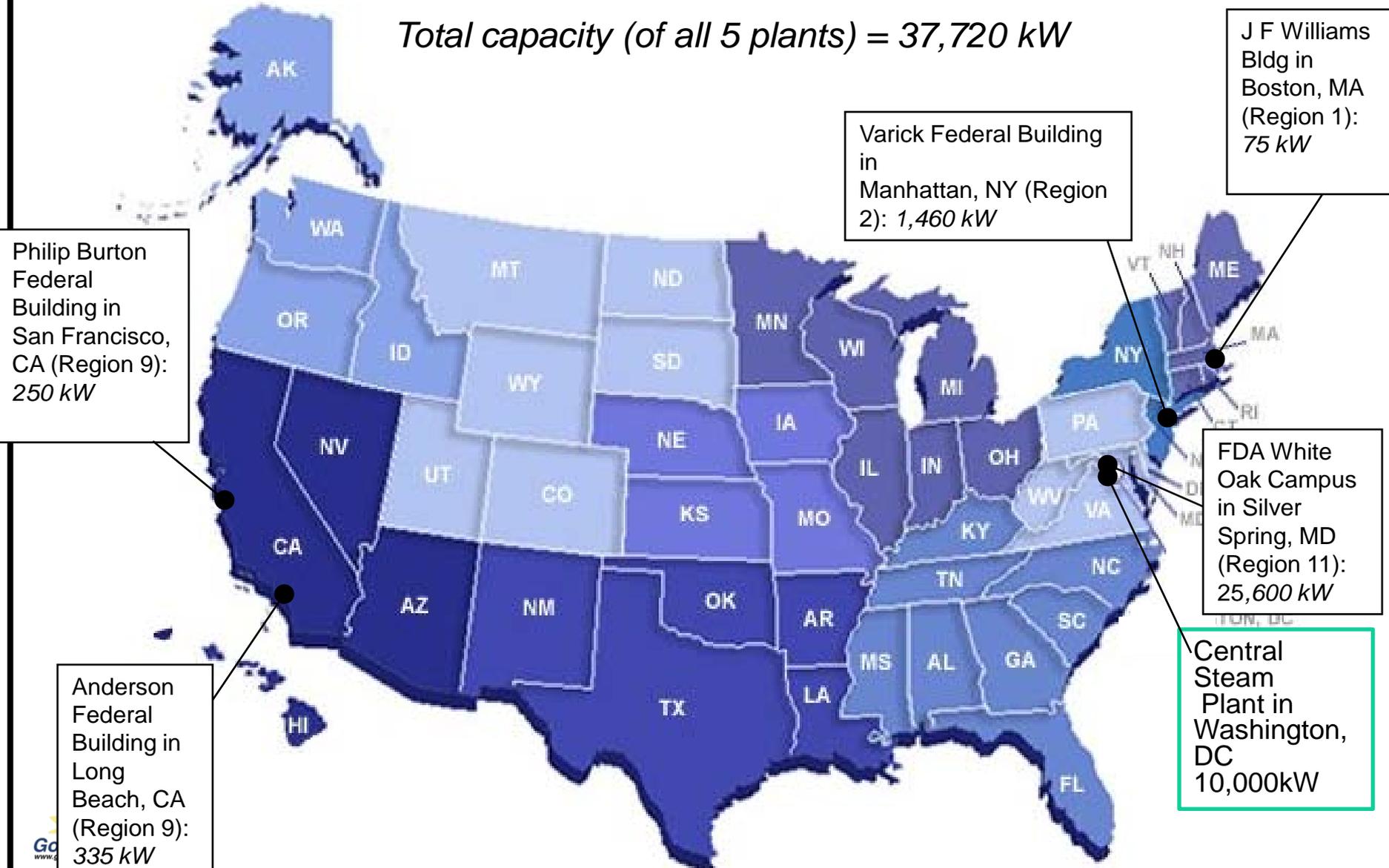
SAVE ENERGY

8. **Combined Heat and Power Plants (Cogen or CHP) (10% estimated contribution to BTU goal from now through 2015)**
 - i. Emphasize the installation of new CHP plants and monitor daily operations to maximize carbon reduction through optimal onsite generation of electricity.
 - ii. Monitor O&M of all five existing combined heat and power plants to maximize onsite generation and continued accrual of source use credits.

**SAVE ENERGY
NOW**

There are 5 Cogen Plants in GSA's Inventory

Total capacity (of all 5 plants) = 37,720 kW



Philip Burton Federal Building in San Francisco, CA (Region 9): 250 kW

Anderson Federal Building in Long Beach, CA (Region 9): 335 kW

Varick Federal Building in Manhattan, NY (Region 2): 1,460 kW

J F Williams Bldg in Boston, MA (Region 1): 75 kW

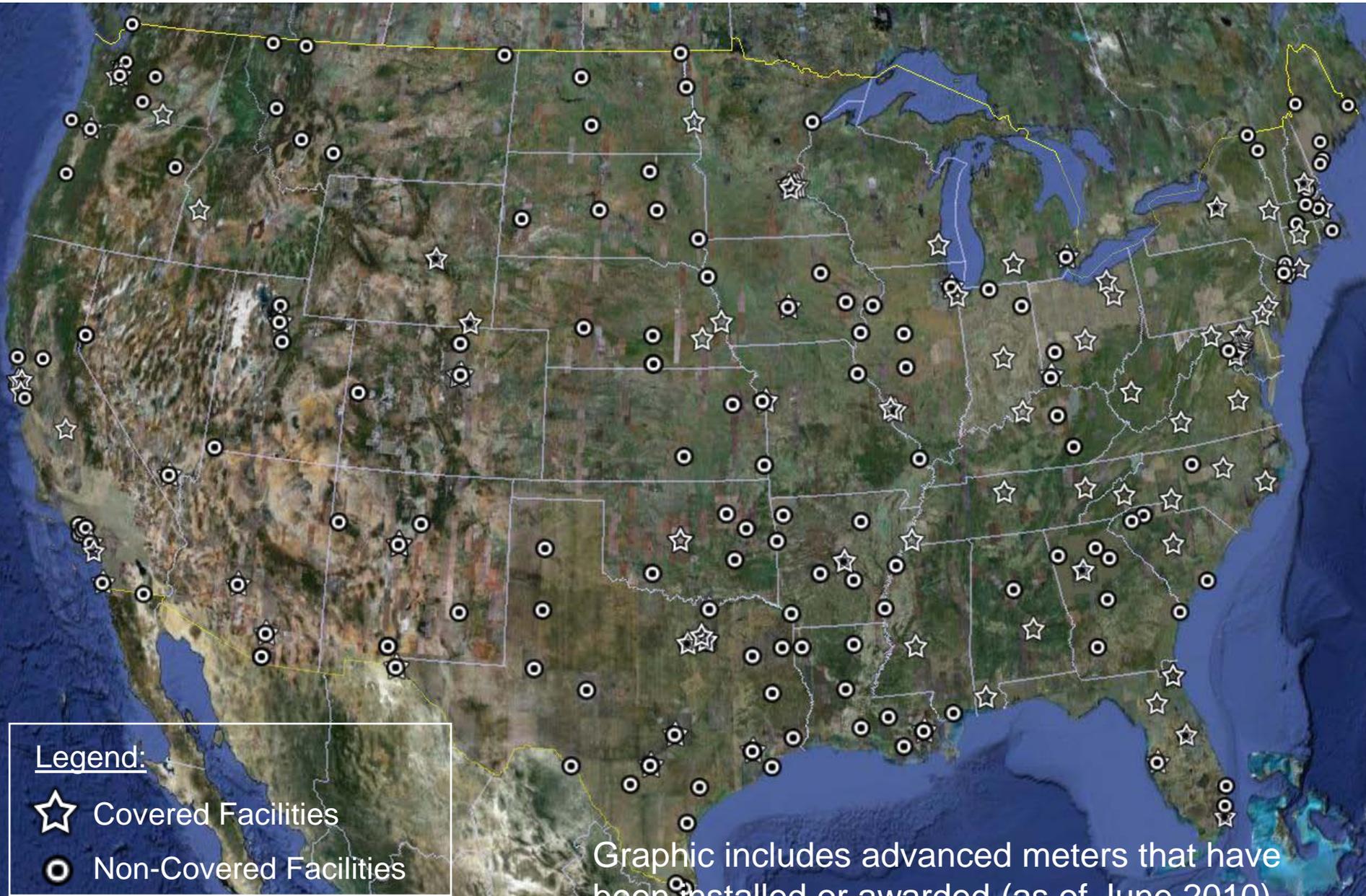
FDA White Oak Campus in Silver Spring, MD (Region 11): 25,600 kW

Central Steam Plant in Washington, DC 10,000kW

9. Advanced Metering (See Attachment 3: *Advanced Metering Plan*) (5% estimated contribution to BTU goal from now through 2015)

- i. Contract with Schneider-Electric to integrate its national ION-EEM web-based front-end interface (detailed in Attachment 3) with advanced meters.
- ii. Phase 1 (2012) - Advanced electricity meters will be installed in all covered facilities and sites receiving Recovery Act funds
- iii. Phase 2 (2016) – Expand Advanced metering to measure natural gas and steam usage

GSA Advanced Metering Status



Legend:

- ☆ Covered Facilities
- Non-Covered Facilities

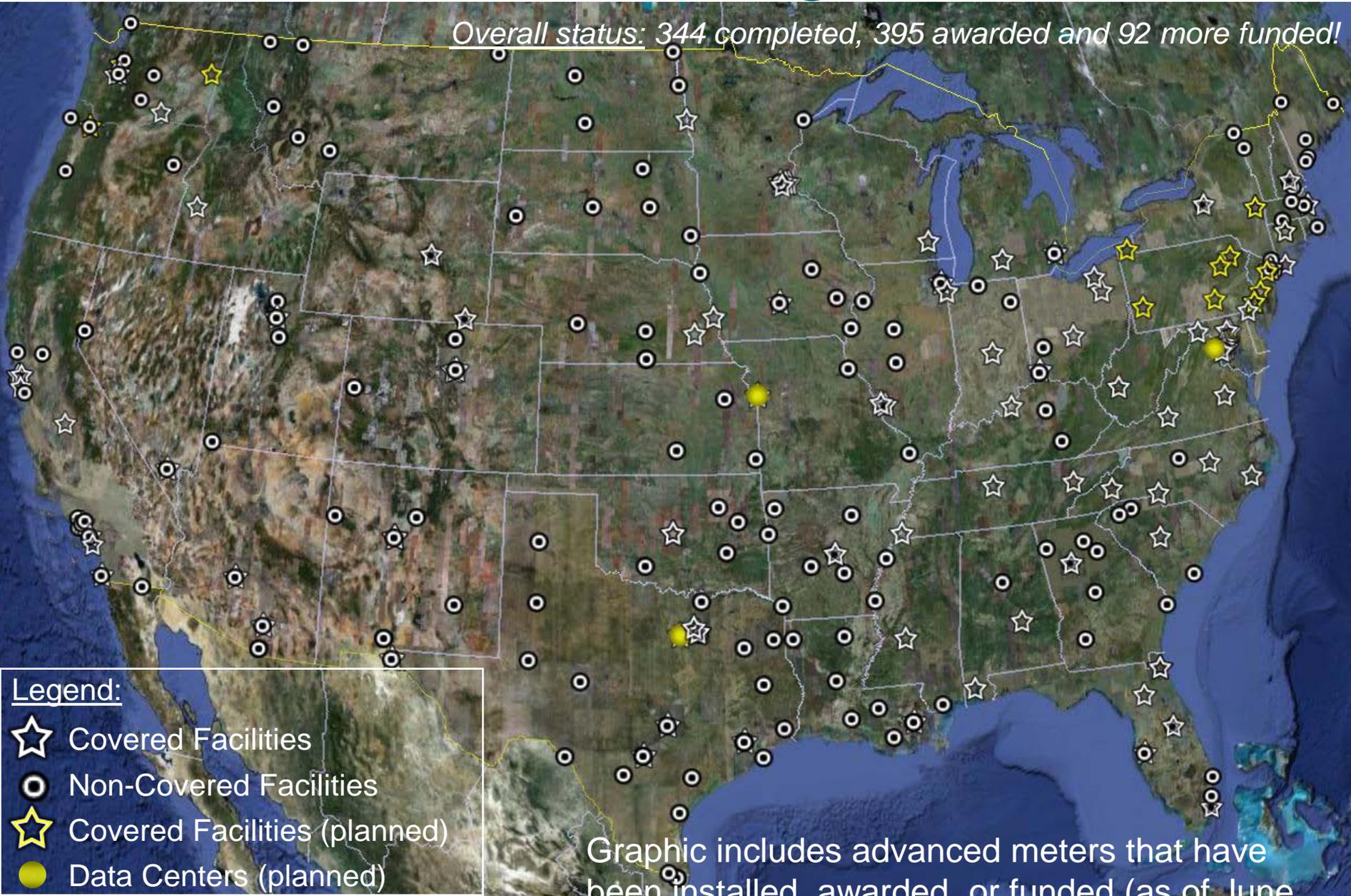
Graphic includes advanced meters that have been installed or awarded (as of June 2010).

GSA Advanced Metering Status (AK, HI, PR)



GSA Advanced Metering Status

Overall status: 344 completed, 395 awarded and 92 more funded!

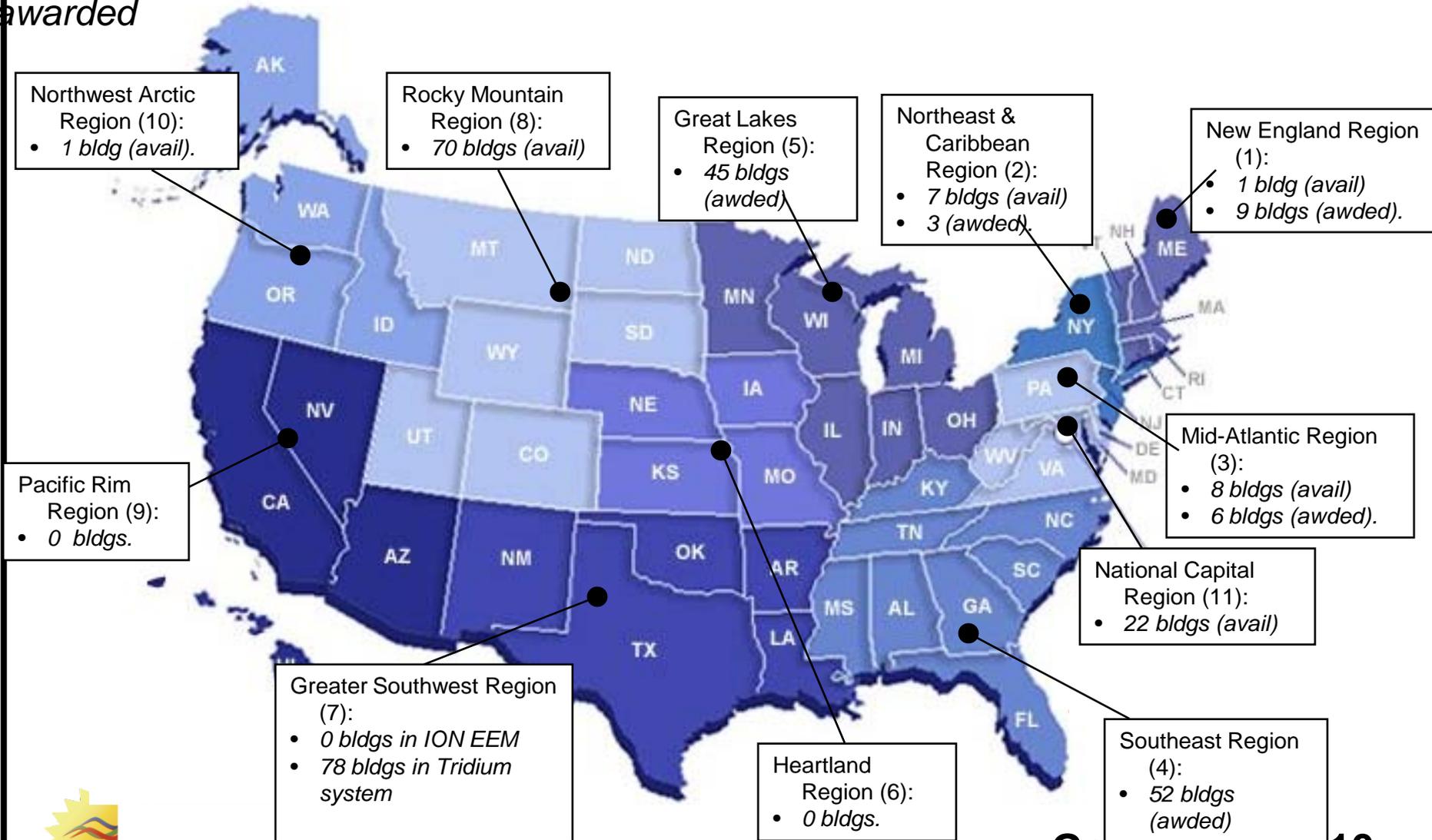


10. Integrate Energy Usage Analysis System (EUAS) & Advanced Metering Into Regional Decision Making (www.euas.gsa.gov)

- i. EUAS data is used to benchmark building performance and to prioritize buildings for energy and water projects and re-commissioning evaluations.
- ii. The ION-EEM system graphs and compares baseline, start-up, and off-peak energy usage of buildings to help GSA regions understand facility and regional energy usage.
- iii. GSA's PBS Facilities Management and Services Programs (FMSP) organizations and Service Center staff will use EUAS Advanced Metering and ION EEM data to compare trends in order to understand how buildings are performing and to facilitate optimization of building systems.

Sites Available on National Ops Center*

Overall status: 111 bldgs. available for trending right now, with 61 more that have been awarded



Data completed or awarded and for all facilities, covered & non covered (as of June 2010).

GovEnergy* 2010

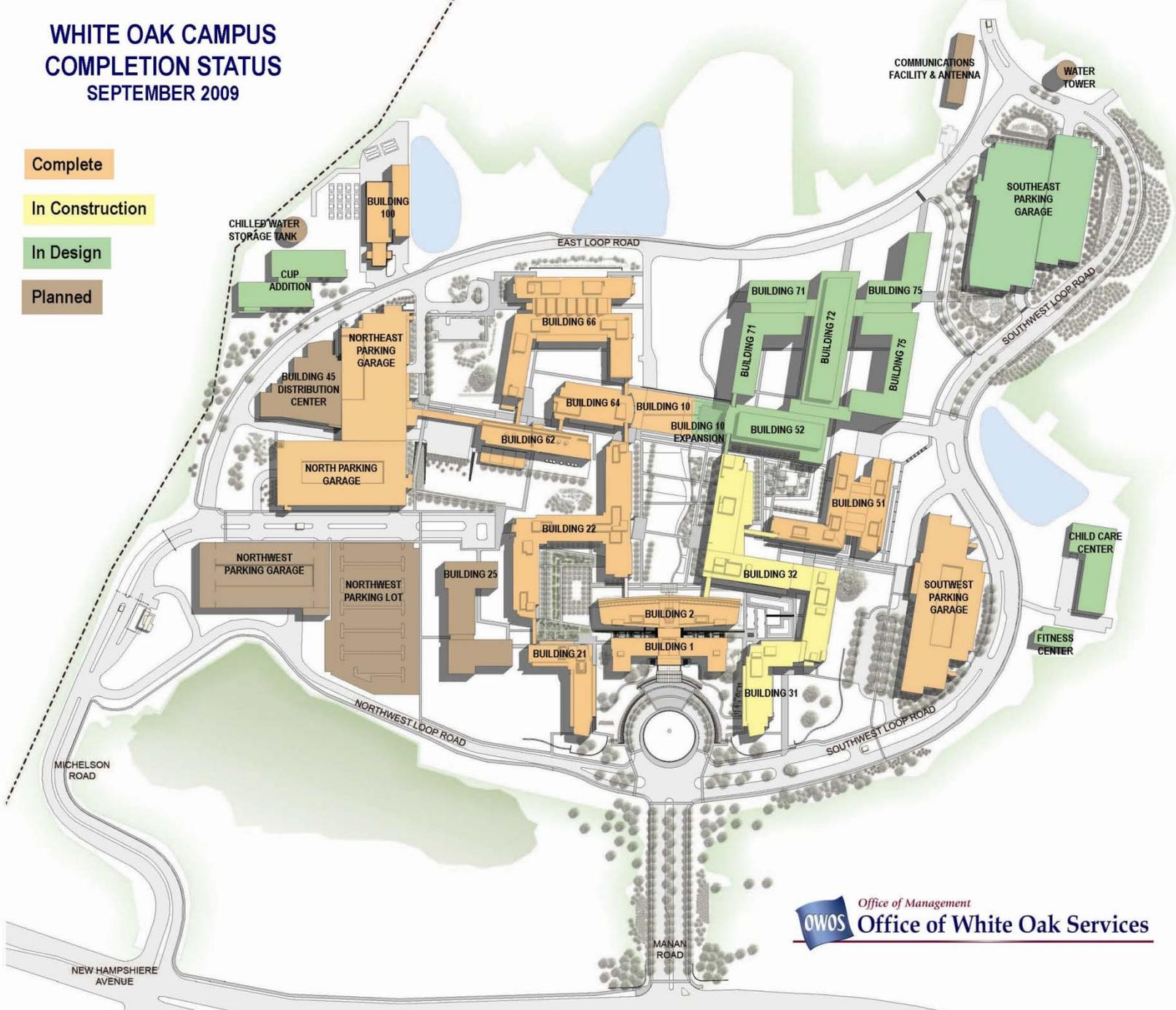
ION-EEM

11. Alternative Financing (5% estimated contribution to BTU goal starting in 2012)

- i. Utility Energy Savings Contracts (UESCs) using GSA Public Utility Areawide Contract mechanism.
- ii. Energy Savings Performance Contracts (ESPCs) using DOE Super ESPC.
- iii. Power Purchase Agreements to install onsite generation plants.

WHITE OAK CAMPUS COMPLETION STATUS SEPTEMBER 2009

- Complete
- In Construction
- In Design
- Planned



ESPC III: Development Considerations

- Critical Load Redundancy
- Additional Dual-fuel Generation Assets
- Steam from CUP vs. Local Steam Generators for Labs and Vivariums
- Challenging Site for CUP Expansion

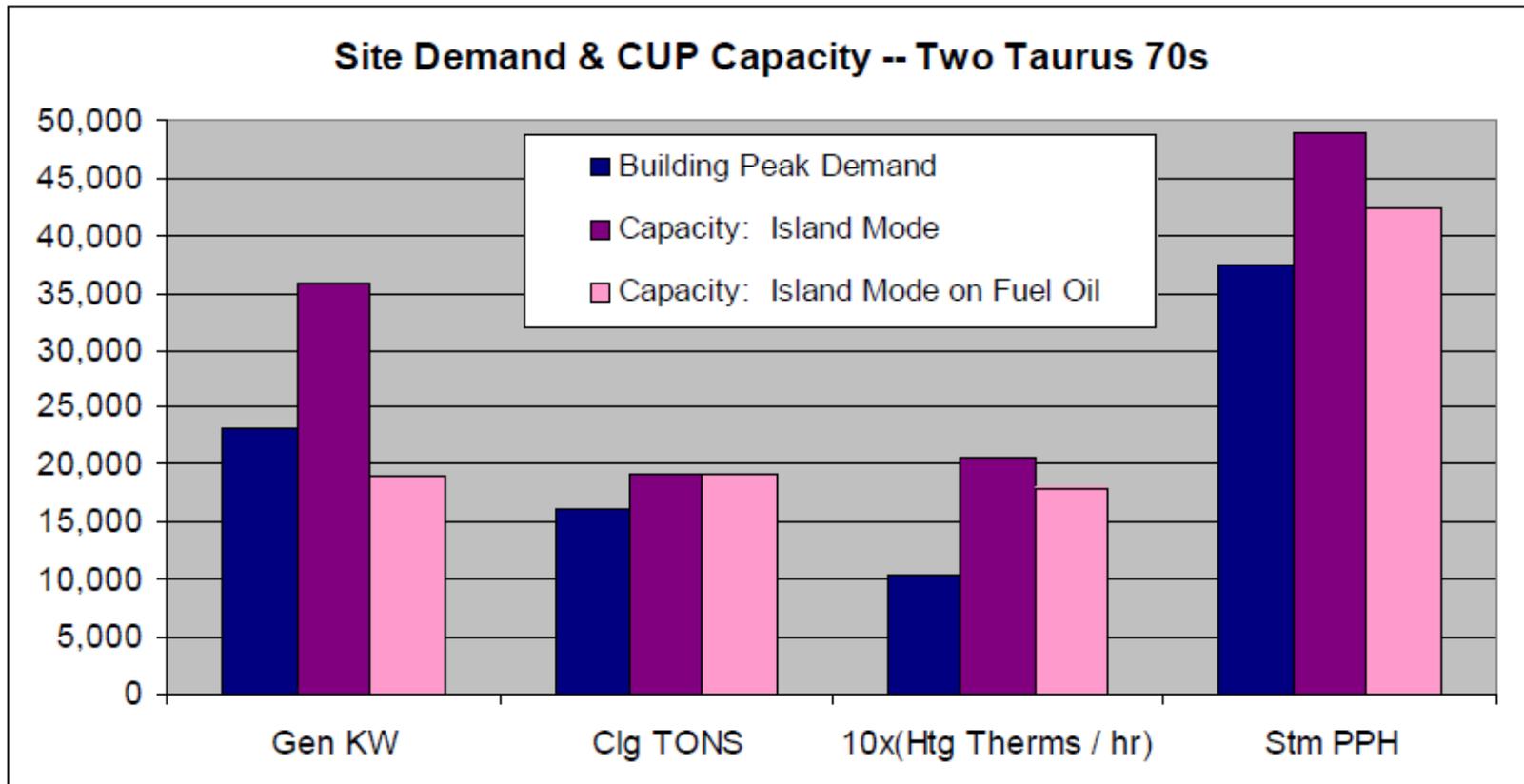


ESPC III: CUP Major Physical Features

- Electrical Generation
 - 4.5 MW turbine-generator installed under ESPC II “Elec Gen Mod”
 - Relocate to new CUP
 - Two - 7.5 MW turbine-generators
 - One - 5 MW steam turbine-generator
 - Two - 2 MW diesel black-start generators
- Back-up Fuel Storage (80,000 gal)
- Chilled Water (3 ea. 2,200 ton electric chillers)
- Cooling Towers for Chillers and Steam Condensers
- Thermal Energy Storage (2 million gal)
- Heat Recovery Steam Generators (162 MMBTUH)
- Dual-fuel Steam Back-up Boiler (2 - 20 KPPH)
- Heating Hot Water Converters (120 MMBTU)

ESPC III Base Demand and Capacity

45



WHAT WOULD ZEF LOOK LIKE?

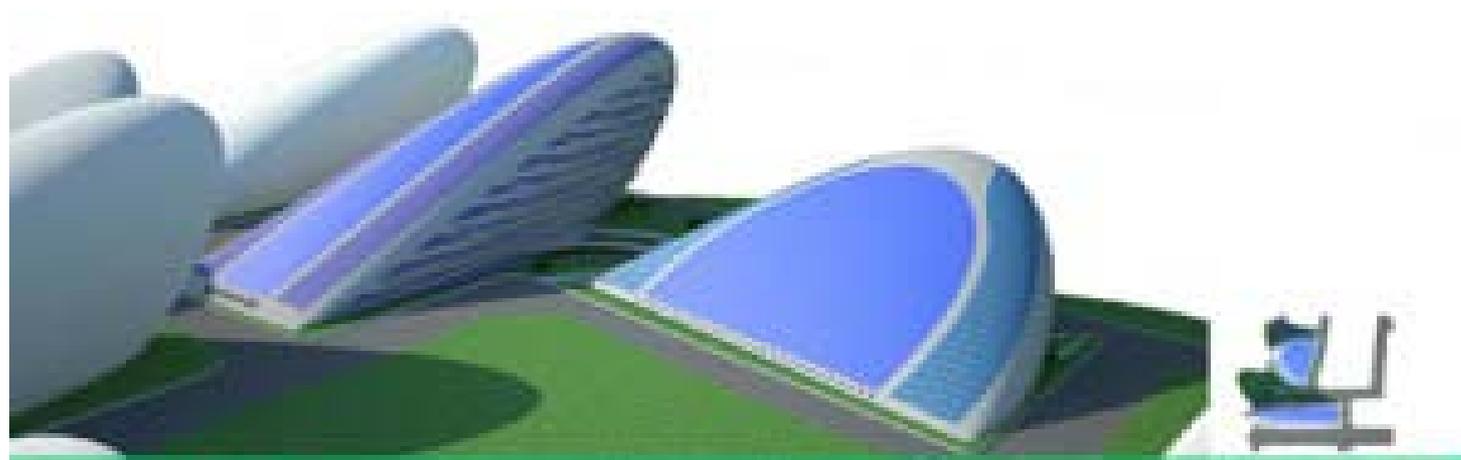






Different kind Of Living For Different kind Of People

SeaO₂



Different kind Of Living For Different kind Of People

SeaO₂





