SEE Action

STATE & LOCAL ENERGY EFFICIENCY ACTION NETWORK

SEE Action Existing Commercial Buildings Working Group

Energy Audits and Retro-commissioning: State and Local Policy Design Guide and Sample Policy Language

This information was developed as a product of the State and Local Energy Efficiency Action Network (SEE Action), facilitated by the U.S. Department of Energy/U.S. Environmental Protection Agency. Content does not imply an endorsement by individuals or organizations that are part of SEE Action working groups, or reflect the views, policies, or otherwise of the federal government.

About SEE Action

- Network of 200+ leaders and professionals, led by state and local policymakers, bringing energy efficiency to scale
- Support energy efficiency policy and program decision making for:
  - Utility regulators, utilities and consumer advocates
  - Legislators, governors, mayors, county officials
  - Air and energy office directors, and others
- Facilitated by DOE and EPA; successor to the National Action Plan for Energy Efficiency

The SEE Action Network is active in the largest areas of challenge and opportunity to advance energy efficiency

SEE Action
STATE & LOCAL ENERGY EFFICIENCY ACTION NETWORK

What SEE Action Does

Offers ***investment-grade decision support*** for state and local policy makers.

Goal: All cost-effective energy efficiency by 2020

Provides ***solution pathways through market and policy barriers*** to greater investment in cost-effective energy efficiency.

- Guidance Documents
- Trainings
- Peer-to-peer dialogue
- Technical Assistance

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STATE & LOCAL ENERGY EFFICIENCY ACTION NETWORK

Benchmarking and Disclosure:
State and Local Policy Design Guide
and Sample Policy Language

Existing Commercial Buildings Working Group

May 2012

The State and Local Energy Efficiency Action Network is a state and local effort facilitated by the federal government that helps states, utilities, and other local stakeholders take energy efficiency to scale and achieve all cost-effective energy efficiency by 2020.

Learn more at www.seeaction.energy.gov

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STATE & LOCAL ENERGY EFFICIENCY ACTION NETWORK

Agenda

Barry Hooper, City and County of San Francisco

- Review of the Audits and Retro-Commissioning Guide
- San Francisco's Existing Commercial Building Energy Performance Ordinance

Elena Alschuler, U.S. Department of Energy

- DOE Data and Reporting tools: Building Performance Database, Standard Energy Efficiency Data Platform, Building Energy Data Exchange Specification

Holly Savoia, New York City Department of Buildings

- Best Practices and Lessons Learned from New York Local Law 87

Chris Plum, Minnesota Center for Energy and Environment

- Design, Results, and Lessons Learned from Minnesota's Enhanced Energy Efficiency Program

Question & Answer

Energy Audits and Retro-Commissioning: State and Local Policy Design Guide Sample Policy Language

San Francisco's Existing Commercial Building Energy Performance Ordinance

Barry Hooper

City and County of San Francisco, California

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Mayor's Task Force
on
Existing Commercial Buildings

Final Report and Recommendations For The City and County of San Francisco

December 2009

Scope

- Existing Commercial

Composition

- Owners' Representatives
- Property Managers
- Contractors
- Operators
- Engineers
- Architects
- Finance
- Utilities

The Task

- Cost effective energy savings
- Minimum costs
- Measureable

Existing Commercial Buildings Ordinance

All commercial buildings must have:

A Benchmark

An Action Plan

Transparency

Existing Commercial Buildings Ordinance

3 year phase-in: 2011-2014

Mandatory:

- Benchmarking with limited public disclosure (every year)
- Energy audits or retro-commissioning (every 5 years)

Voluntary:

- Capital improvements
- Operations and calibration
- Tenant engagement
- Financing & incentives

Municipal Portfolio

SFPUC 2012 Analysis:

- 26 agencies in 450 buildings, totaling 46M sq ft
- 79% outperform national median
- Potential eligibility for ENERGY STAR:
  - 11 of the 33 ratable city buildings
  - 42 of 109 schools
- 5 sites rank in bottom 25% compared to national peers
- Carbon reduction:
  - 5% since 2011
  - 7% since 2009

Benefits of Retro-Commissioning

- Cost
  - The median cost of retro-commissioning is about $0.30 per sq. ft.
  - Typical payback is just above one year.
- Median whole-building energy savings
  - Existing buildings: 16%
  - New construction: 13%

Source: See Mills, E. Building Commissioning: A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions. July 21, 2009. Berkeley, CA: Lawrence Berkeley National Laboratory. http://cx.lbl.gov/documents/2009-assessment/LBNL-Cx-CostBenefit.pdf.

Retro-Commissioning and Energy Audits Sample Language: Overview

- Audience: state and local policymakers
- Sample legislation based on **early adopters**
- Policies to date require audits along with benchmarking
- Couples with the work underway on performance-based policies:
  - Developing a **framework for a unified suite of policies** to guide the adoption, execution and ultimately achievement of desired energy outcomes for existing buildings

Retro-Commissioning and Energy Audits Sample Language: Key Considerations

- Stakeholders: governments, owners, operators, tenants, utilities, education/outreach partners, energy professionals
- Benefits
  - Better asset information
  - Improved operations
  - Persistent long-term energy savings
  - Potentially a whole building approach
- Frequency of audits/RCx
  - Every __ years
  - Time of sale or major tenant turnover
  - Renovation or Capital improvement
- Workforce Development/Capacity
- Service provider qualifications
  - Present: Menu of minimum qualifications
  - Future: DOE National Certification Program
- Quality assurance
- Cost vs. comprehensiveness
  - Whole building vs. common area
  - Audits, RCx: AND vs. OR?
  - Reporting mechanism & level of detail
- Standard format for data collection
- Coordination with utility incentive programs and financing
- Data sensitivity
- Exemptions
- *[Innovation]*

Retro-Commissioning and Energy Audits Sample Language: Audits

Audit Standard

1. References ASHRAE Procedures (in the works: ASHRAE SPC 211P – audit standard written as code)
2. Level II Audit for 50,000 sq. ft. or more, Level 1 audit for 10,000-49,999 sq. ft.

Auditor Qualifications

1. Present: Menu of minimum qualifications
2. Placeholder for: DOE National Certification Program

Audit Report Includes

1. Auditor identity and qualifications
2. Date of Audit and Certification that the Audit complied with policy
3. Building information: owner, address, sq. ft. conditioned area, systems + baseline conditions, estimated impact of systems on energy
4. Recommendations: RCx measures, EE measures (EEMs), cost (including incentives), savings estimates (including operating), aggregation of recommendations by system
5. Implemented EE measures

Retro-Commissioning and Energy Audits Sample Language: Retro-Commissioning

Retro-Commissioning Standard

1. References ASHRAE Standard 202
2. Extensive list of what should be included in Retro-Commissioning

Agent Qualifications

1. Present: Menu of minimum qualifications
2. Placeholder for: DOE National Certification Program

RCx Report Includes

1. Agent information and qualifications
2. Date of Audit and Certification that the Audit complied with policy
3. Building information: owner, address, sq. ft. conditioned area, systems
4. RCx findings: measures, savings, costs, simple payback
5. Deficiencies corrected: date, by whom, cost and projected savings

Retro-Commissioning and Energy Audits Sample Language

Report Compliance

1. Submit based on format to be prescribed
2. Rolling deadline based on sq. ft. over 4 years for processing

Exceptions (certified by a registered design professional)

1. New Buildings,
2. ENERGY STAR Certification for 2 of 3 years prior to report deadline
3. LEED-EB certification
4. Updated code compliance for simple buildings
5. Insufficient workforce (for 1 year)
6. BOTH: financial hardship and common ownership and multiple deadlines

Some data is made public and the report must be made available to tenants and prospective purchasers or investors with provisions for confidentiality.

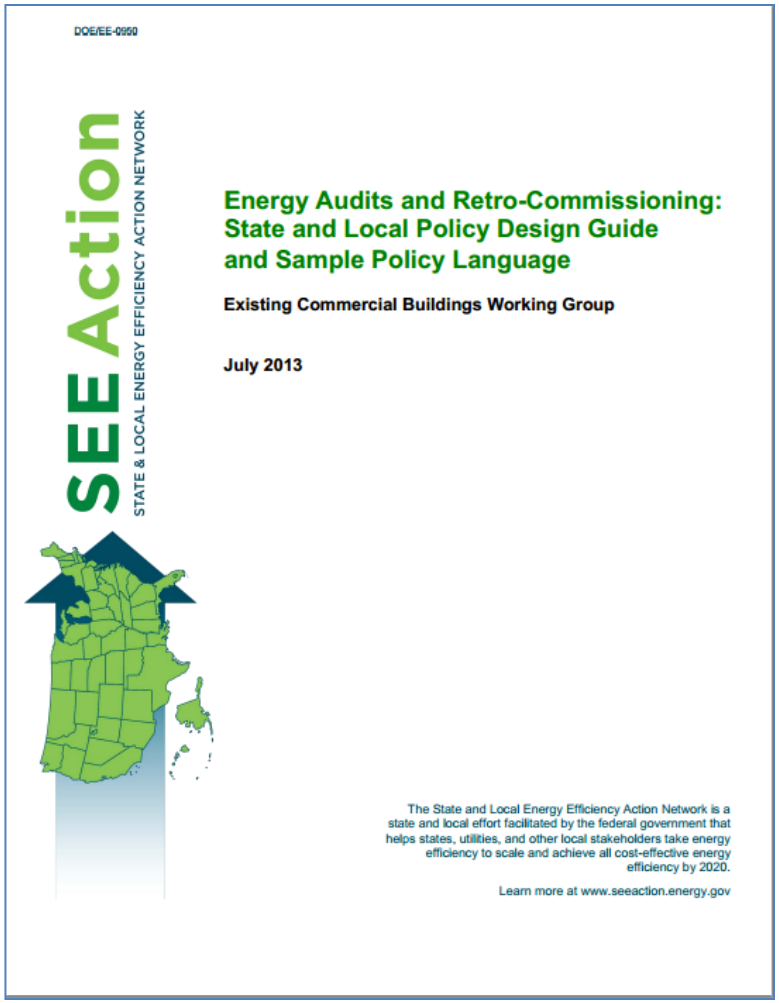
Enforcement through warning and eventually fines.

For More Information

Available online at:

http://www1.eere.energy.gov/seeaction/pdfs/commercialbuildings_audits_rcx_policy_guide.pdf

http://tinyurl.com/auditrcx (Same link for those typing.)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July 2013

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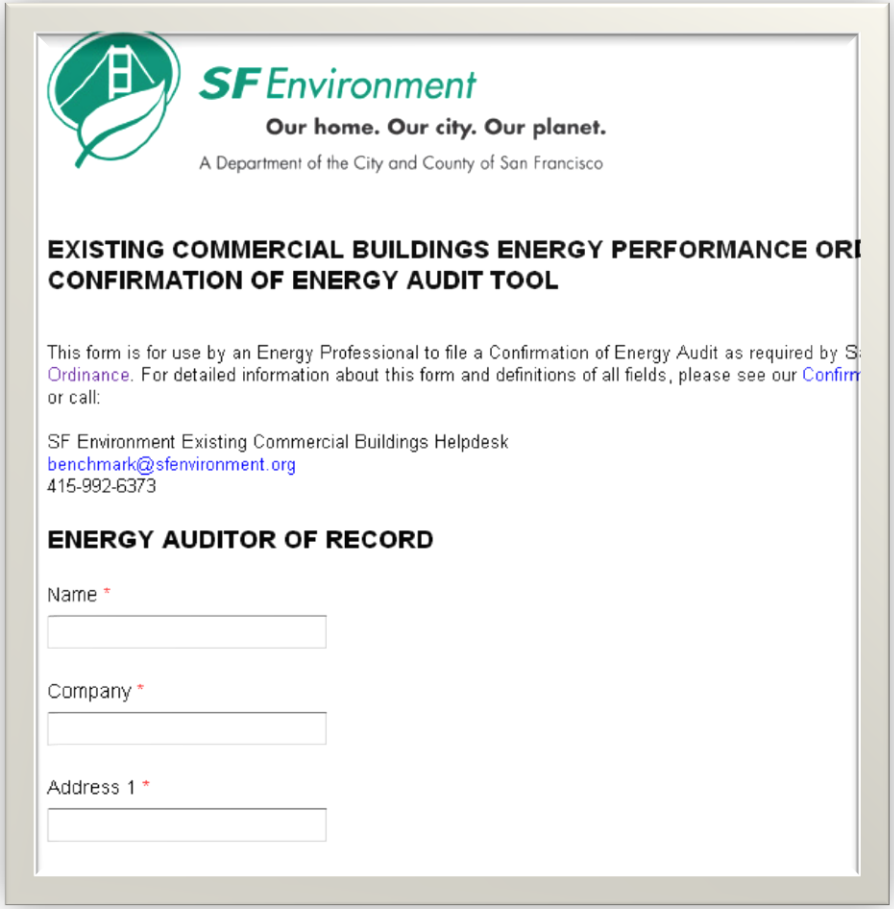
Audit reporting in San Francisco

- Online data entry
- Building owner receives full detailed audit
- City receives only limited summary
  - Audit report collected for QA review when necessary
- Emphasis:
  - Actionable EEMs
  - PEA as validation of benchmark
  - Structured data - BEDES compatible
- Beta version - driven by ordinance deadlines
- Anticipate replacement when SEED is delivered



SF Environment

Our home. Our city. Our planet.

A Department of the City and County of San Francisco

EXISTING COMMERCIAL BUILDINGS ENERGY PERFORMANCE ORI
CONFIRMATION OF ENERGY AUDIT TOOL

This form is for use by an Energy Professional to file a Confirmation of Energy Audit as required by S
Ordinance. For detailed information about this form and definitions of all fields, please see our Confirm
or call:

SF Environment Existing Commercial Buildings Helpdesk
benchmark@sfenvironment.org
415-992-6373

ENERGY AUDITOR OF RECORD

Name *

Company *

Address 1 *

Audit example: Flood Building

- 290,000 sq ft historic landmark
- Level 2 in Q3 2012
- Updated lighting and HVAC controls
- $1.2M estimated lifetime savings

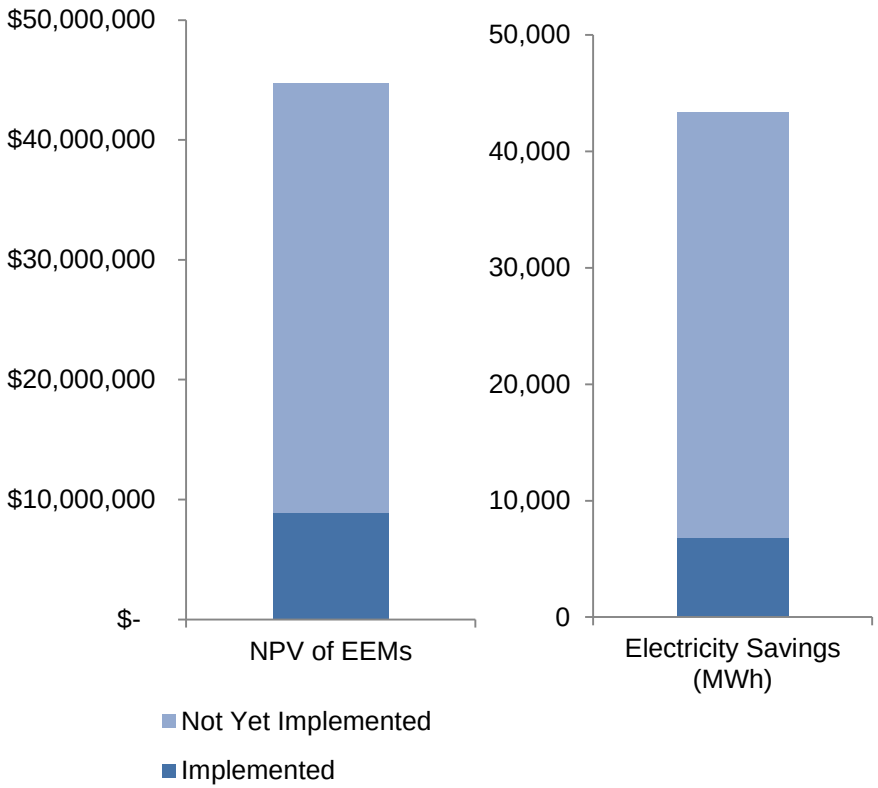
Image : Joe Mabel

After "Compliance"
How to move from Audits …to Action

- Policy as opportunity to build relationship

Ingredients:

- Engineering talent
- Actionable data
- Rebates & incentives
- Financing



Preliminary result of first 120 Level II Audits

NPV of $2 per square foot

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Performance-Based Approaches to Energy Efficiency

Overview of DOE Tools

October 2013

Elena Alschuler

Elena.Alschuler@ee.doe.gov

Overview

DOE's Data Ecosystem

Standard Energy Efficiency Data Platform

Buildings Performance Database

Building Energy Data Exchange Specification

DOE's Vision for Performance-Based Approaches

By making building energy performance clearly traceable:

- **Owners, operators, and product and service providers** can understand the drivers of variations in building performance, identify efficiency investment opportunities, and project the likely savings from investments.
- **Public sector actors** can tailor the design and implementation of energy efficiency programs and policies to be most effective given local market conditions and trends.

DOE is establishing a foundation that the private sector can build on, through:

- **Tools and methods** to analyze actual performance, and
- Standard **definitions and data exchange specifications**

Analytical tools collect data and conduct diagnostic analysis about individual buildings

Data Sources

- Basic Building Info
- Energy Consumption
- Audits
- Commissioning studies
- Operating characteristics
- Equipment & asset info
- Public records

Tools & Databases

ENERGY STAR® PortfolioManager®

An energy management tool that tracks & assesses energy & water consumption in user's buildings.

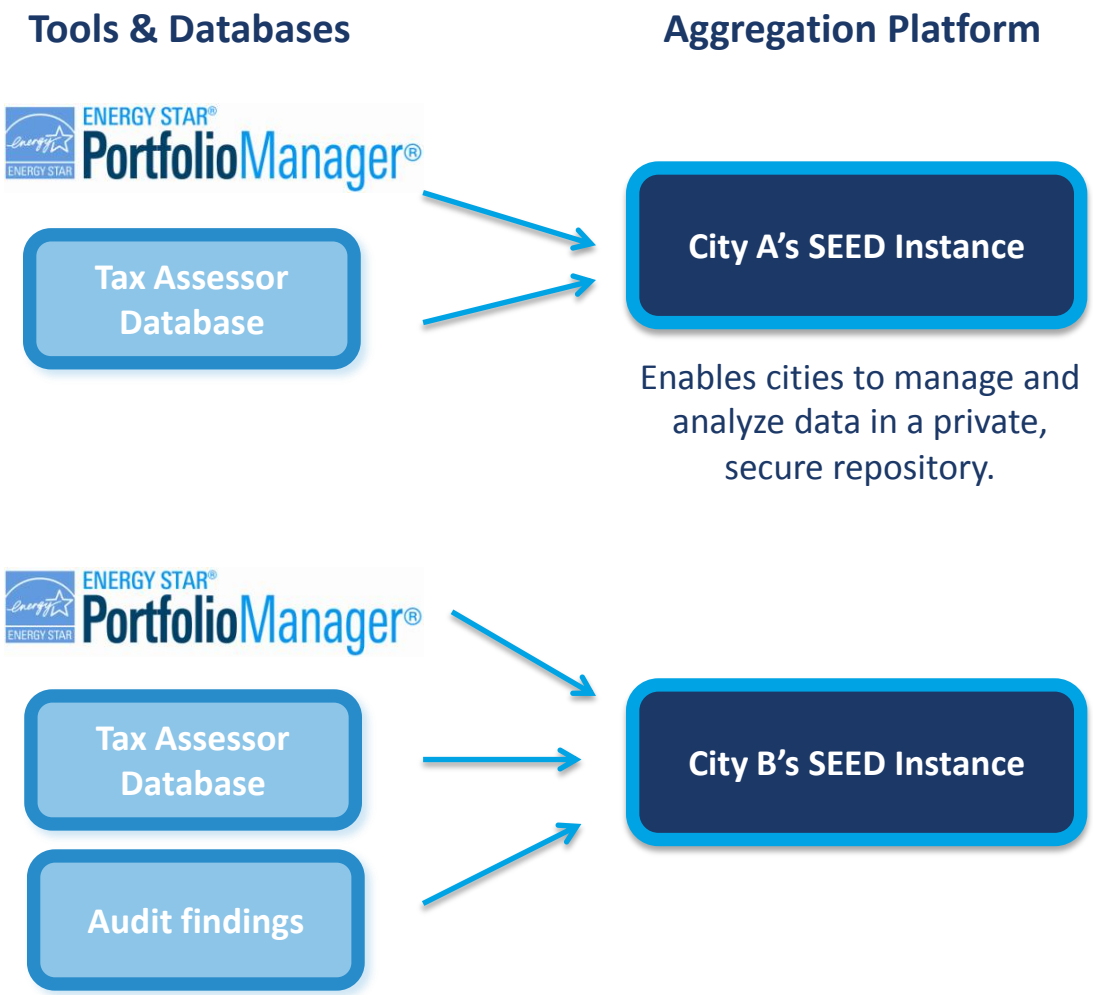
DOE's Building Rating Tools

Home Energy Score & Commercial Building Energy Asset Score

Other Tools & Databases

e.g. Building Management Tools, Energy Efficiency Program Administration Databases, Property Tax Assessor Databases

To manage benchmarking programs, Cities combine data about many buildings from a range of tools and sources



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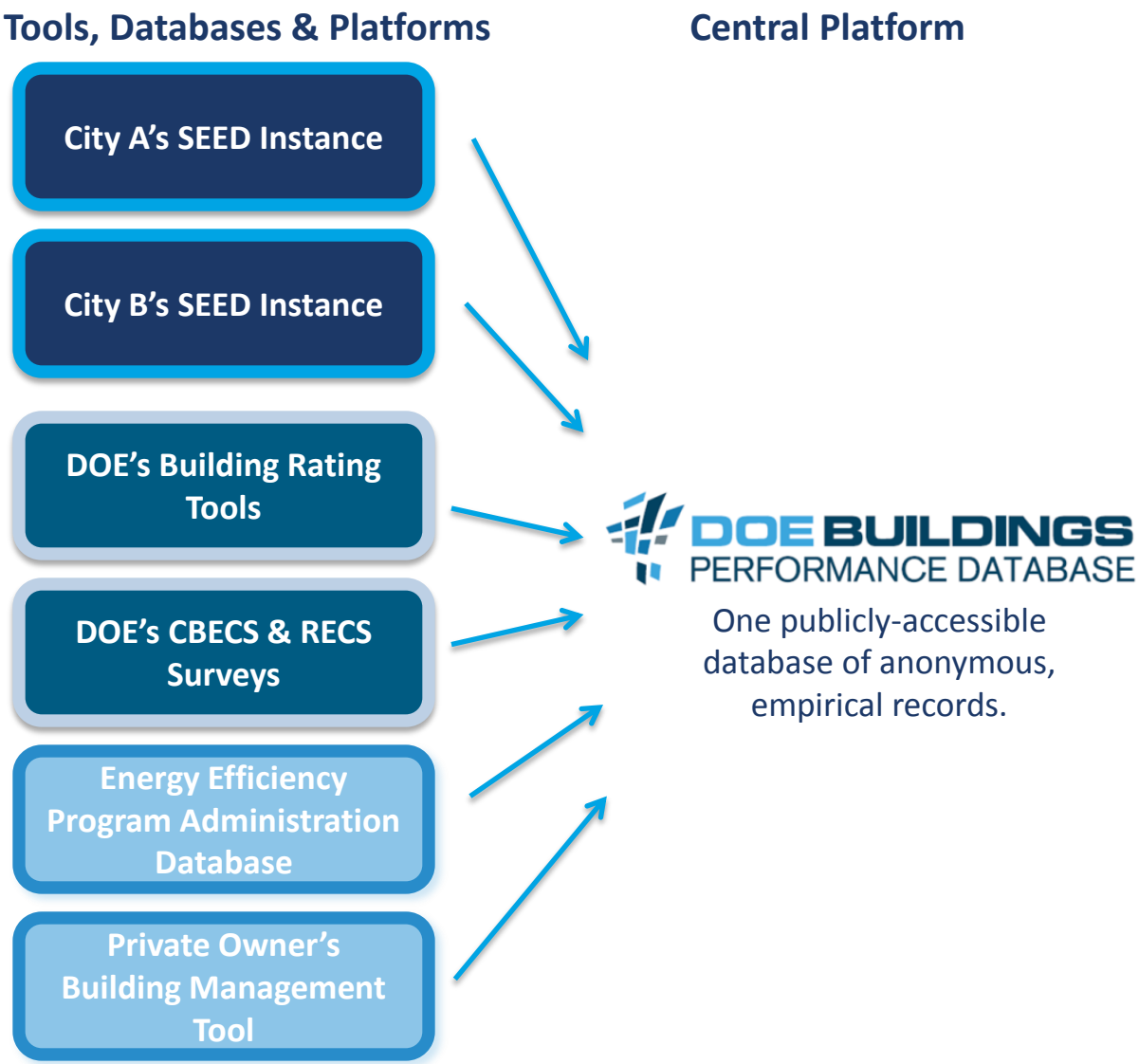
All of this data can be contributed to the Buildings Performance Database, where it can be accessed in aggregate by the public.



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A common data format makes it easier to exchange and combine data among all the tools, databases and platforms

The Building Energy Data Exchange Specification (BEDES)

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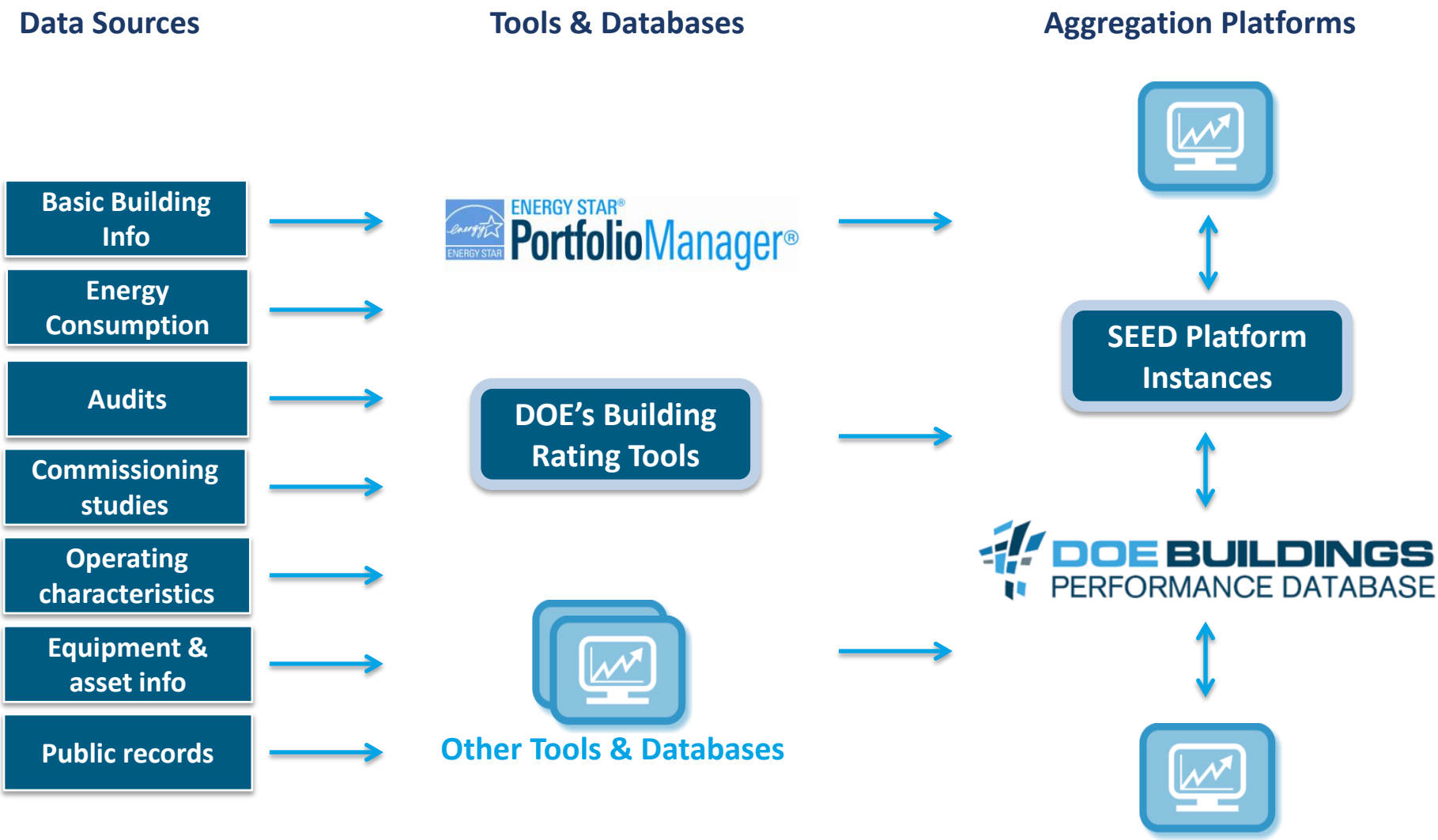
The goal is an ecosystem of interoperable private and public data tools



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DOE's Data Ecosystem

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The Standard Energy Efficiency Data Platform

SEED is designed to help State and local governments implement building performance reporting regulations for private and/or public buildings

In the future it could be used by large portfolio owners, energy efficiency programs, and energy efficiency service providers.

San Francisco

Seattle

Austin

Washington D.C.

New York City

Philadelphia

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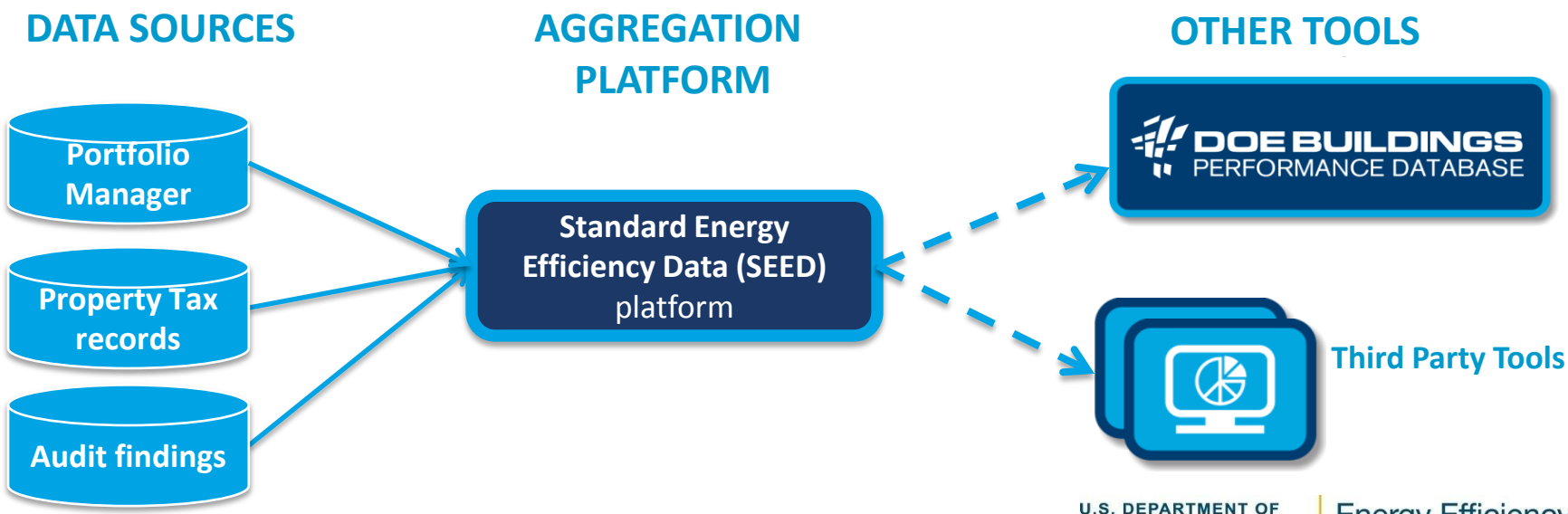
How the SEED Platform works

- SEED enables users to **import data from multiple sources** about the same group of buildings, and **conduct analysis and reporting** of the information.
- The SEED platform is a blank database; each user has their own private copy.
- The SEED platform utilizes the standard data format (BEDES).
- The owner of each SEED instance can choose which external parties can access their information, and what records and fields to share.
- An application programming interface (API) will enable third-parties to access the data, and offer add-on tools and services, in a replicable way.



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Version 1.0 Functionalities (release planned April 2013)

Data importing and merging

- Support for importing datasets via API, XML, excel and .csv
- Ability to import multiple years of data
- Help users to reformat and match-up records from different sources

Data editing, matching and updating

- View/edit all data for given building and/or for select periods of time
- Assist with data cleansing and management
- Annotation: error log, edit log, etc.

Data reporting and exporting

- Generate custom reports with ability to add/edit/delete reports
- Define fields and records than can be viewed publicly or by authorized parties
- Ability to export data in various formats, including via the API

Platform Architecture

- Open Source
- Host on local servers or cloud
- Application Programming Interface & Plug in architecture
- User roles & permissions

Overview

DOE's Data Ecosystem

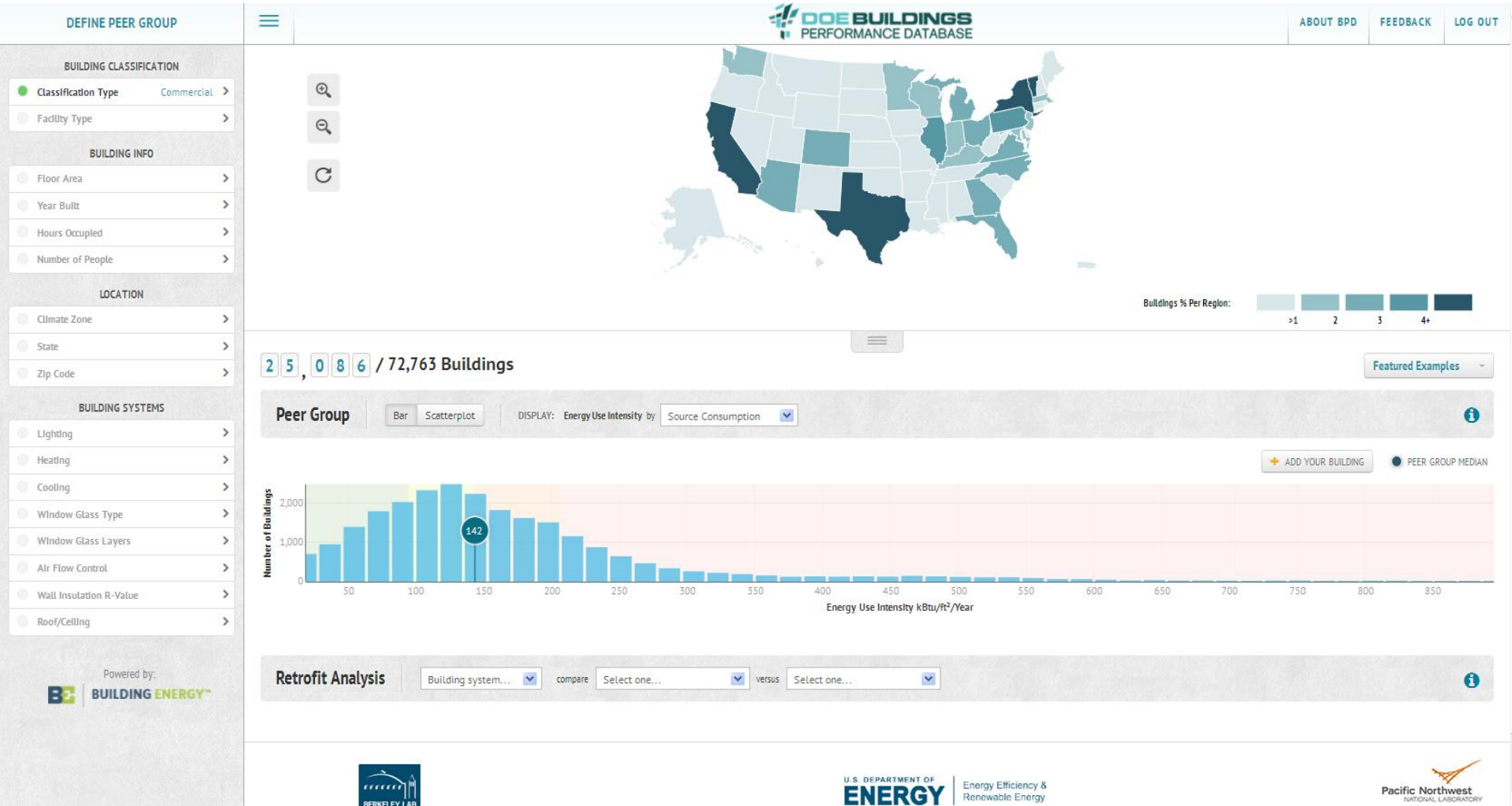
Standard Energy Efficiency Data Platform

Buildings Performance Database

Building Energy Data Exchange Specification

The Buildings Performance Database

The BPD statistically analyzes trends in the energy performance and physical & operational characteristics of real commercial and residential buildings.



The Power of Building Energy Performance Data

Inputs: The BPD

- Large dataset of real buildings

Outputs: Activities

- Assess opportunities
- Forecast project performance
- Quantify performance risk

Outcomes

- More energy efficiency projects undertaken
- More data on EE project performance

Design Principles

- The BPD contains **actual data** on existing buildings - not modeled data or anecdotal evidence.
- The BPD enables statistical analysis without revealing information about individual buildings.
- The BPD cleanses and validates data from many sources and translates it into a standard format.
- In addition to the BPD's analysis tools, third parties will be able to create applications using the database.

Current Data Sources

>70,000 buildings, with information from both public and private datasets.

More datasets are being added regularly. There is no upper limit for the number of buildings the BPD can hold.

Public Sector

U.S. Energy Information Administration
U.S. General Services Administration
U.S. Environmental Protection Agency
New York City Dept. of Citywide Administrative Services
Pennsylvania Keystone HELP Home Energy Loan Program
San Francisco Department of the Environment
State of California Public Utilities Commission
State of California Energy Commission
University of Arizona
University of Dayton
District Department of the Environment: Washington, DC
Vermont Energy Investment Corporation
Virginia Beach City Public Schools

Private Sector

Brandywine Realty Trust
Connexion Asset Group
Kohl's
Liberty Property Trust
Lucid Design Group
Prudential
Related
Tishman Speyer
Transwestern
USAA
And other private building owners

Strategy for Taking BPD to Scale

The BPD demonstrates the value of aggregating the kind of data that is commonly collected today.

As stakeholders begin to collect and contribute richer data, the BPD will support more advanced analysis.

Short term	- Basic building data - Monthly energy consumption data	- Compare similar buildings - Identify high/low performers
Medium term	- Asset and equipment data - Interval meter data	- Statistical analysis of likely ECM performance

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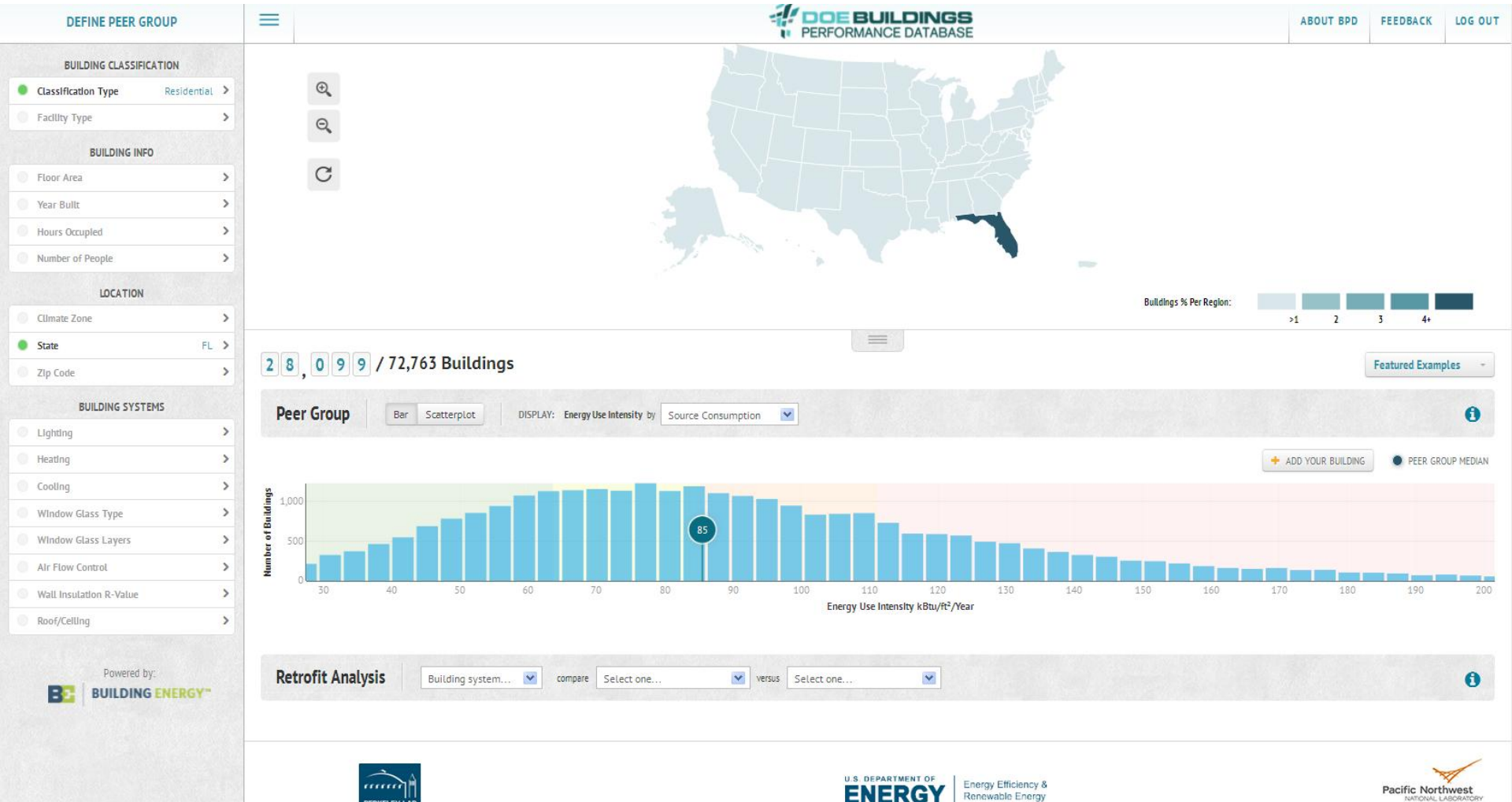
Peer Group Tool

Florida Homes

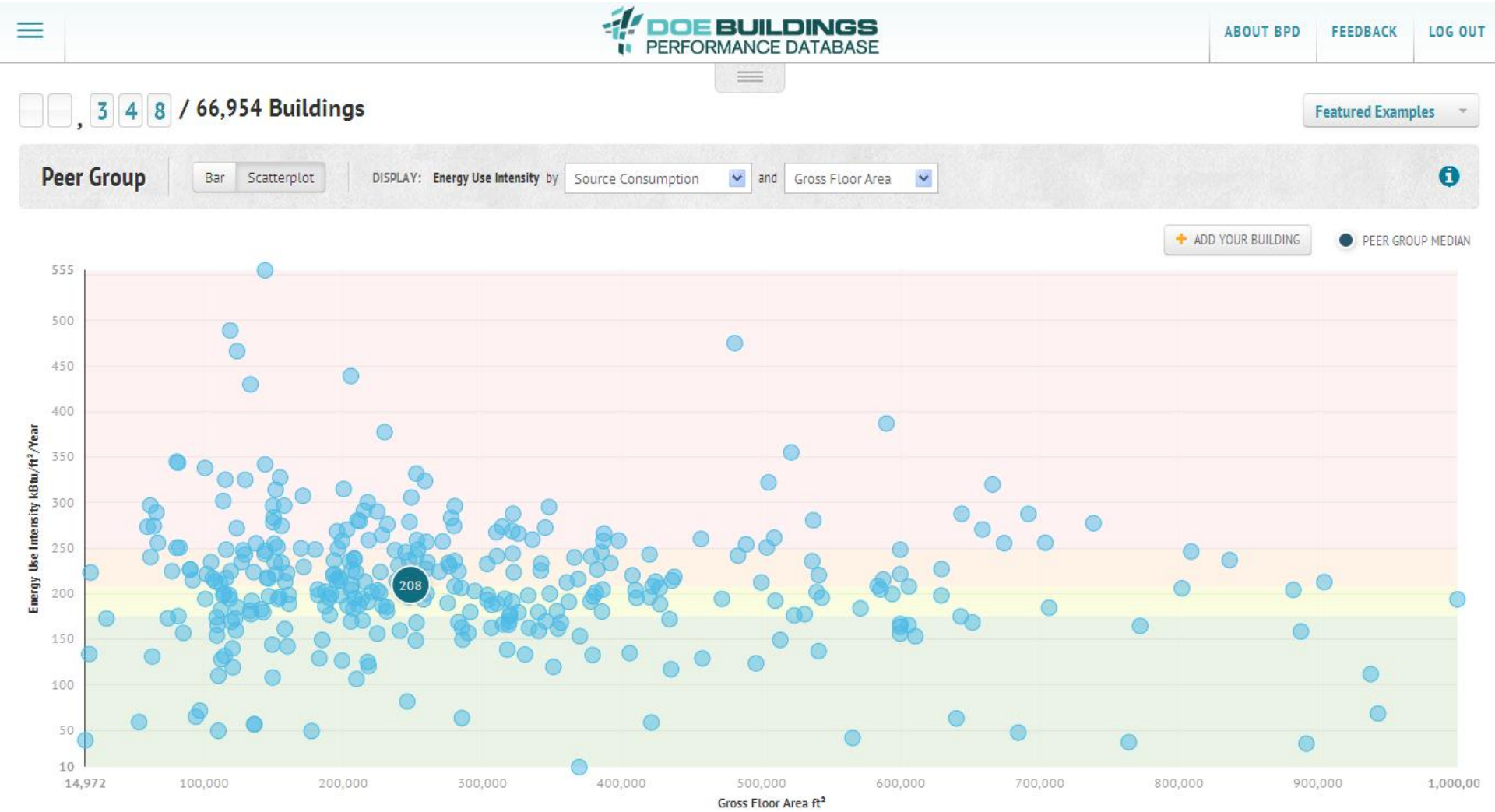
Building Count by Source kBtu/SF/yr



Peer Group Tool

Washington, DC Office Buildings <1M SF, built since 1900

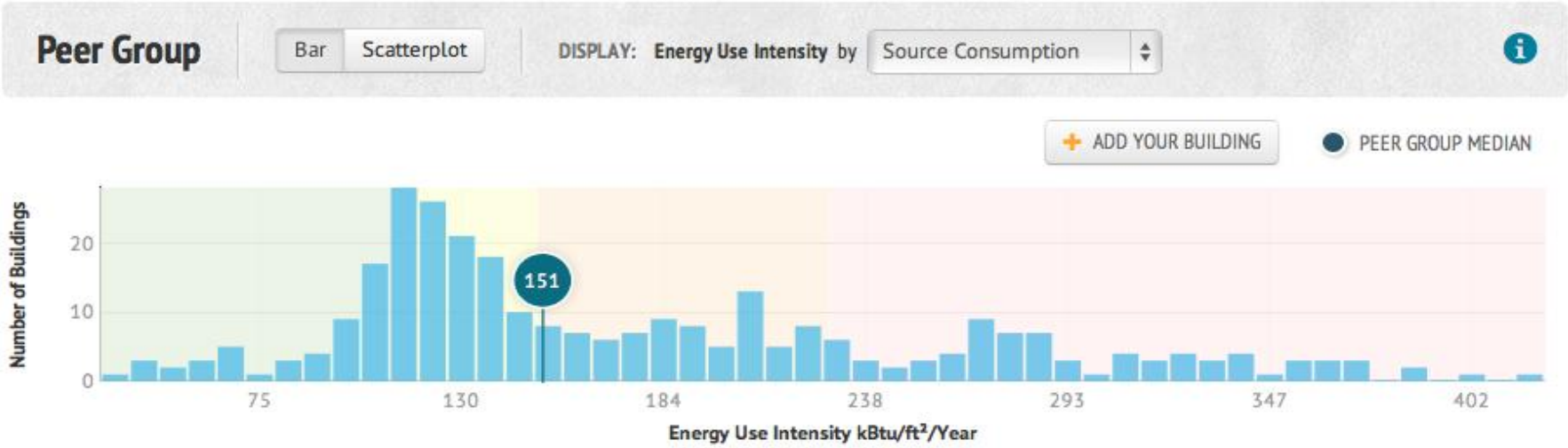
Source Consumption by Gross SF

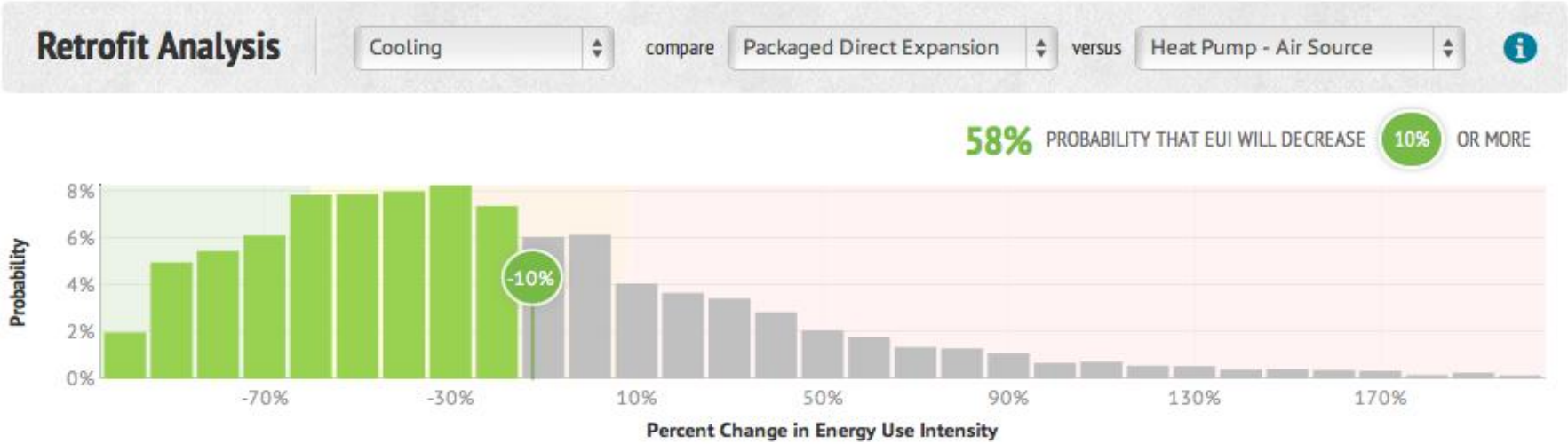


Retrofit Analysis Tool: Cooling Retrofit

California Big Box Retail>50,000 SF; N = 320

Compare Packaged Direct Expansion *to* Air Source Heat Pump

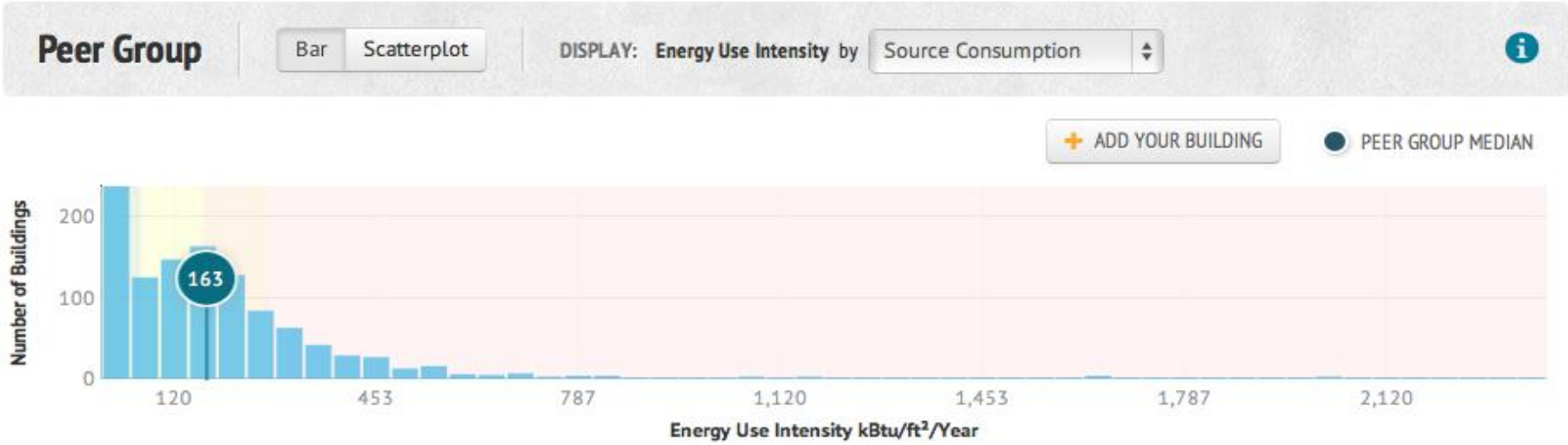


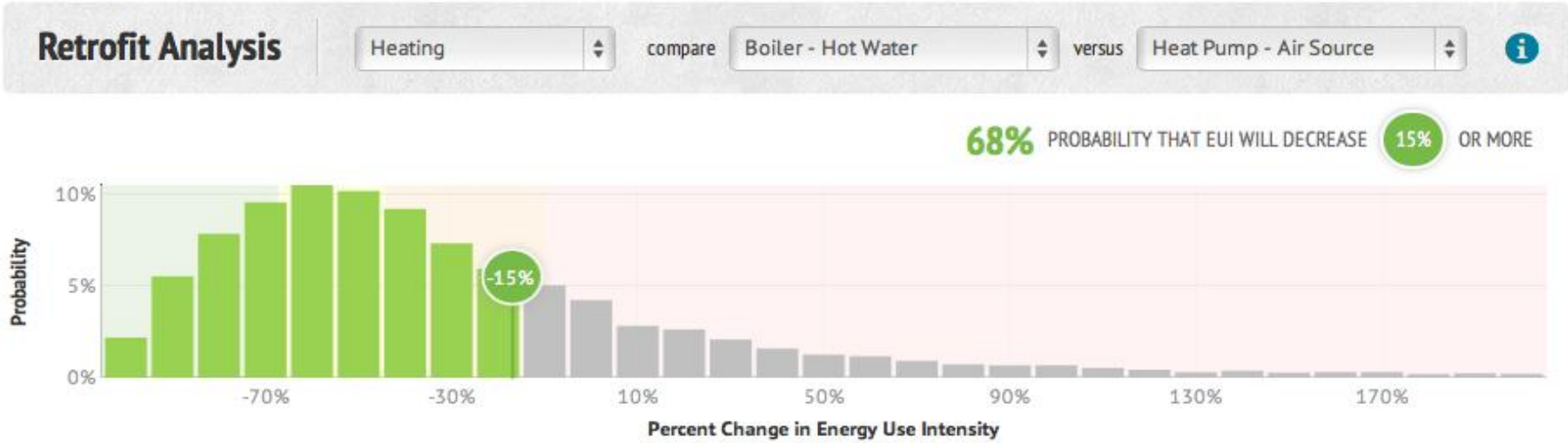


Retrofit Analysis Tool: Heating Retrofit

California Office Buildings; N = 2,022

Compare Packaged Hot Water Boiler *to* Air Source Heat Pump





Overview

DOE's Data Ecosystem

Standard Energy Efficiency Data Platform

Buildings Performance Database

Building Energy Data Exchange Specification

DOE's Vision for a Common Data Specification

Enable a robust ecosystem of interoperable private and public data tools that:

- **Increase available information**
- **Lower transaction costs**
- **Facilitate growth of the energy efficiency market**

Building Energy Data Exchange Specification (BEDES)

BEDES is *a common format for empirical data about building energy performance.*

The current version is based on a review of 40 common data formats.

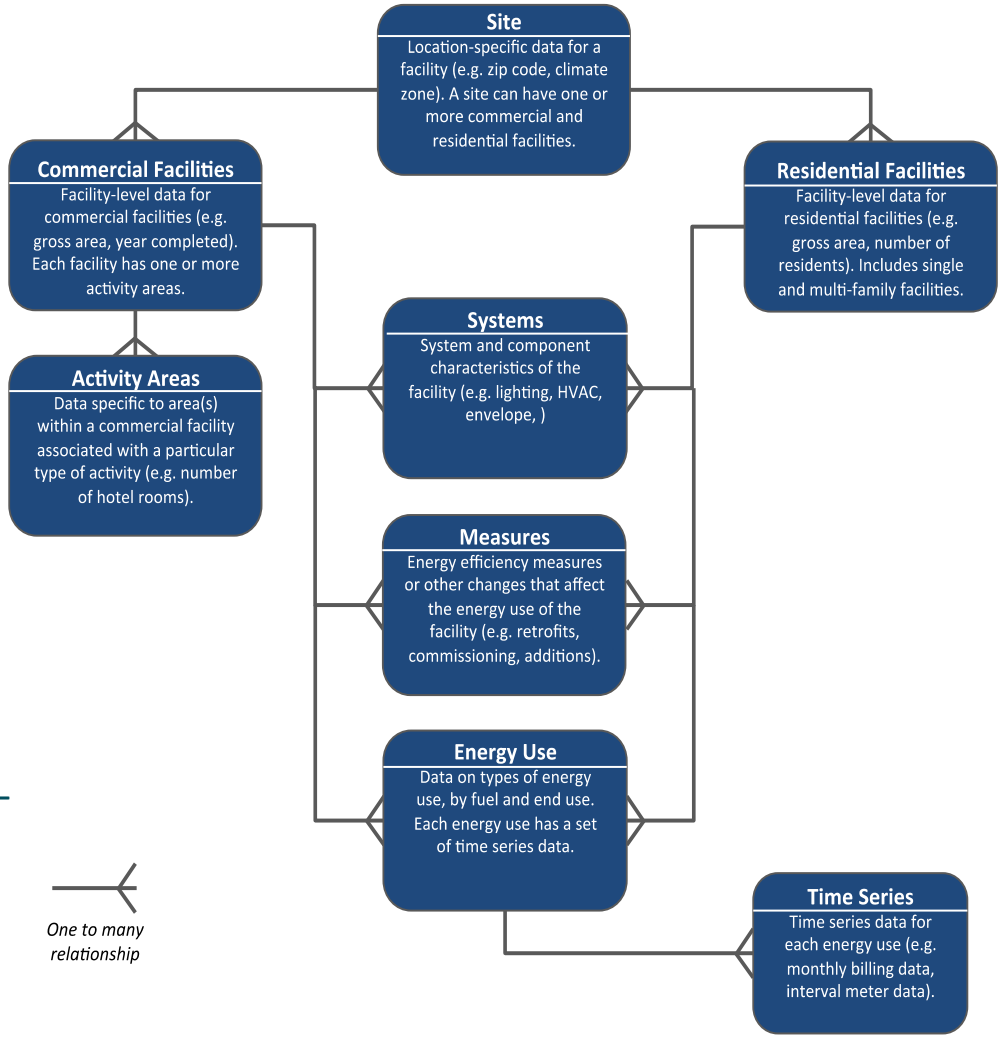
BEDES beta covers:

- Equipment and operational characteristics, energy consumption, ECM projects, etc.
- Future expansions could cover modeling data, project financials, on-site renewables, etc.

BEDES beta establishes:

- data fields, definitions, units of measure, and file formats

BEDES beta structure



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History of BEDES

BEDES was originally developed for use by the DOE

A common data format will:

- Make DOE tools interoperable
- Reduce reporting burdens for grantees and contractors
- Make it possible for DOE to combine the resulting datasets to conduct further analysis.

The DOE is using it as the data format to support:

- Tools such as the Buildings Performance Database (BPD), the Commercial Building Energy Asset Score and Home Energy Score.
- Data collection for the Better Buildings program, State Energy Program grants and Federal building benchmarking and energy performance contracting activities.
- Analysis that is conducted following the UMP methodology

External Stakeholders: Need for a Common Format

Efficiency programs and state & local governments

- Drive a significant volume of data collection through their programs and policies
- Wish to align data formats to ease program reporting and evaluation burdens, facilitate comparisons between jurisdictions, and make it easier to combine data for other uses.

Building owners and managers

- Make decisions about capital investments or the operation of their buildings
- Better data would lower the cost and effort required to assess savings opportunities in individual buildings and develop strategies across portfolios

Software developers and project contractors

- Are often ultimately responsible for directly collecting and managing this data
- A common format would decrease the cost and increase the availability of data-driven products and services

LBNL's Working Group Process

Many external stakeholders expressed interest in using BEDES, so LBNL undertook a scoping study. Most of the stakeholders:

- Reported challenges in data collection and management
- Felt they would benefit from widespread adoption of a common format
- Expressed interest in using BEDES beta as the basis, and said that DOE should lead refinement of the spec for broader use.

Over the next year, LBNL will be convening two working groups:

- The **Technical Working Group** will be tasked with the creation of a new Version 1.0 of the BEDES by mid-2014.
- The **Strategic Working Group** will be tasked with the creation of a strategy for widespread adoption and future management of BEDES
- To get involved, visit **www.buildings.energy.gov/BEDES** or contact **bedes@raabassociates.org**

Get Involved

http://www1.eere.energy.gov/buildings/commercial/activities.html

SEED Platform

- Sign up for updates, V1 release in April 2014
- Contact: SEEDPlatform@ee.doe.gov

Buildings Performance Database

- Check it out and contribute data
- Contact: buildingsperformancedatabase@ee.doe.gov

Building Energy Data Exchange Specification

- Participate in the technical or strategic working group
- Contact: bedes@raabassociates.org

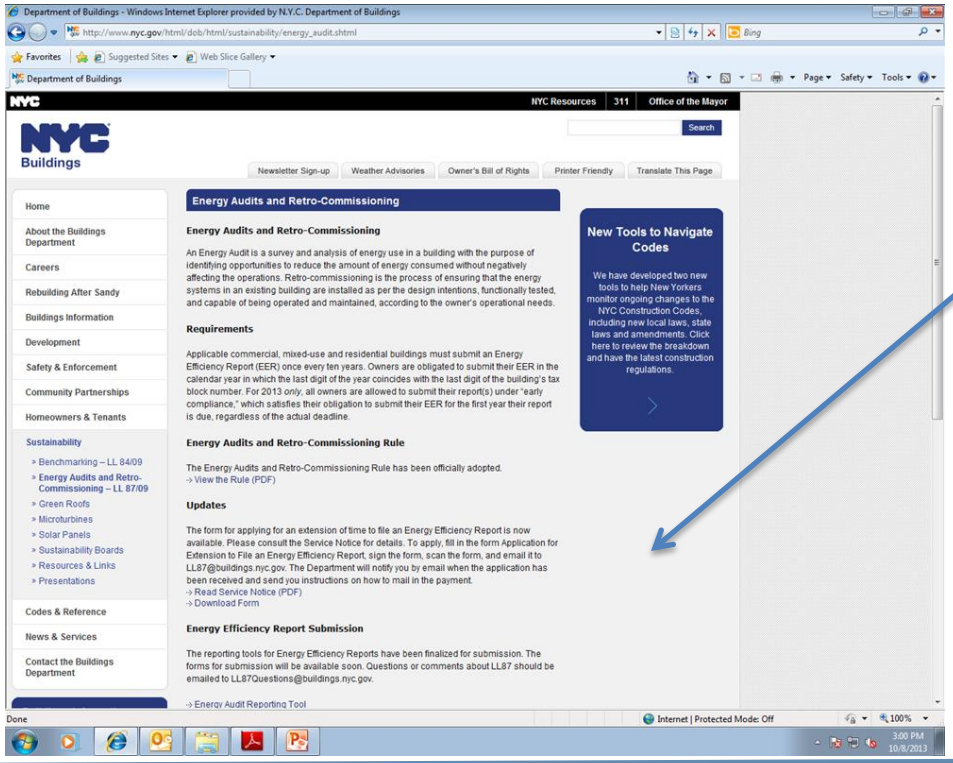
Best Practices and Lessons Learned from New York Local Law 87

NYC Department of Buildings
October 29, 2013

NYC Buildings

LL87/09 Webpage

http://www.nyc.gov/html/dob/html/sustainability/energy-audit.shtml



Forms, Reporting Tools, Service Notices, How To Guide, FAQs, law, rule, etc.*

Issues Along the Way

- <u>Market Concerns:</u>
  - Reporting Tools
    - Tools do not replace reports
  - Non-licensed, Credentialed Individuals (Registered Agents)
    - Entry into the market

Issues Along the Way

- <u>Building Owner Concerns:</u>
  - Triple Net Lease Scenario
    - Scope
  - Vacant Tenant Spaces
    - Included?
  - Properties in Transfer Between Parties
    - Who's responsible?

Issues Along the Way

- <u>Technical Concerns:</u>
  - Balancing Steam Systems / Central Exhaust Systems
    - Absence of standards
  - Square Footage Discrepancies
    - Guidelines?

Issues Along the Way

- <u>Implementation Concerns:</u>
  - Multiple EERs for the Same Block/Lot
    - Confusion in the market
    - Ramification with Fees
  - Deficiency Correction in System Components Planned for Near-term Replacement
    - How to handle?
  - Use of Pre-existing Studies

Food for Thought for Future Programs

- Begin With Implementation in Mind
- Place Great Importance on Outreach Efforts

Center for Energy and Environment

Results of Minnesota's Public Buildings Enhanced Energy Efficiency Program (PBEEEP)

SEE Action Audits and Retrocommissioning Policy Webinar
October 29, 2013

Christopher Plum
Center for Energy and Environment
212 3rd Avenue North, Suite 560
Minneapolis, MN 55401

Program Goals

- Save energy in state buildings
  - Support state's 1.5% annual reduction goal
- Standardize Existing Building Commissioning
  - Investment grade analysis with quality assurance
- Demonstrate the savings potential of EBCx in large buildings

Funding from State of Minnesota Department of Administration with additional funds from American Recovery and Reinvestment Act of 2009

Admin Minnesota
DEPARTMENT OF ADMINISTRATION

Definition of Recommissioning

- Recommissioning provides healthy, comfortable and productive work environments by bringing ventilation and indoor air quality up to standards, solving persistent problems with building operation and training Operations and Management (O&M) staff to improve building performance.

The Investigation Process

- Customer input, functional testing and data collection
- Trending of hundreds/thousands of individual monitoring and control points
- Engineering calculations to create a financial grade report
- Average investigation cost $88,000
  - 400,000 sq ft was the average area
- Quality assurance reviews
- Payback on energy savings only, and full cost

The Screening Process

- The value proposition:
  - Study paid for with ARRA funds in exchange for implementation of all measures with a 3 year payback (energy savings only)

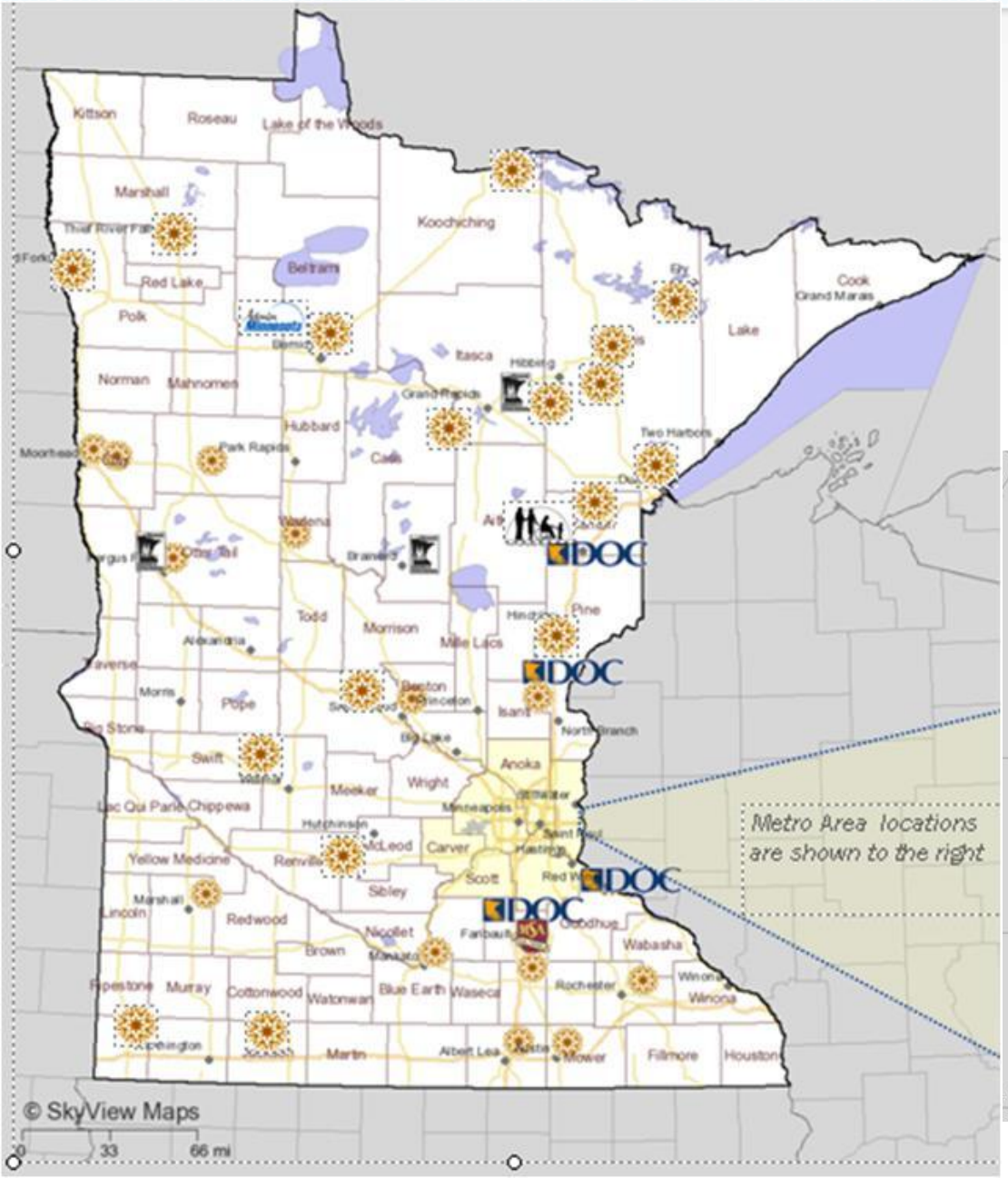
- Screening used to determine energy savings potential and get accurate information for investigation phase
  - Standardized assessment
  - Gave QA engineers good background on sites
  - Cost of $.01 per sq ft; 2 people on-site for a day
  - 25 to 50% of all buildings are good candidates

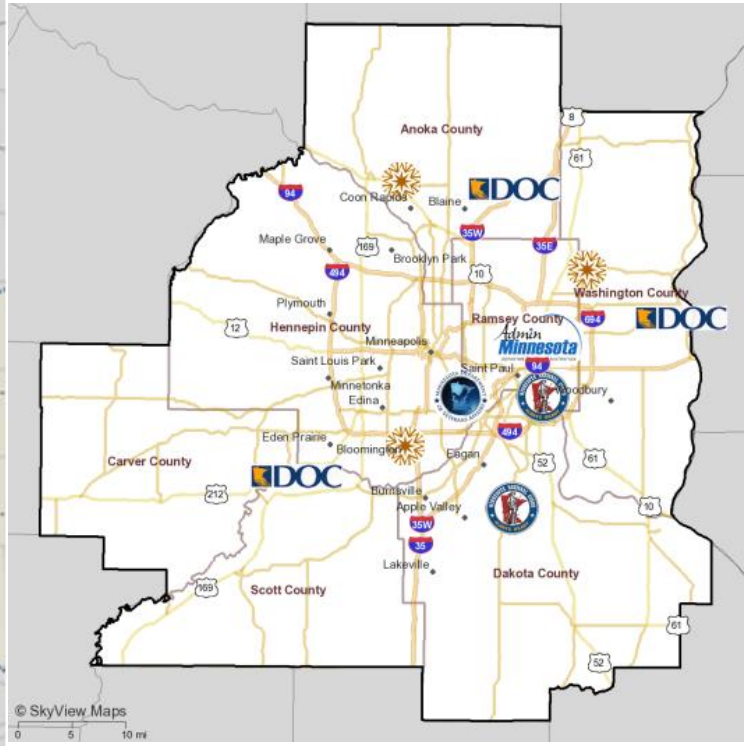
The Screening Process: Selection Criteria in Minnesota

- HVAC attributes
  - Pump and motor sizes, prefer > 5HP
- Building automation system
- Building area >100,000 sq ft
- Observations
- Hours of operation
- Whole building (site) energy use
  - EUI > 110 kbtu/ft^2 and/or value relative to peers

Center for Energy and Environment

Project Geographic Distribution





Results: Energy Savings

Site Type	# Sites	# of Bldgs	Building Area	Total Energy Savings		
				Median	Low	High
State University	5	87	6,268,865	9.6%	2.1%	24%
Community College	15	176	4,483,939	4.7%	0.2%	9.9%
State Prison	7	100	3,195,200	5.7%	2.2%	15.3%
Office Building	6	6	1,525,822	5.8%	1.0%	15.2%
Other	10	26	1,791,584	10.6%	1.3%	27.5%
Total	43	395	17,265,410	7.3%	0.2%	27.5%

Results: Energy Savings

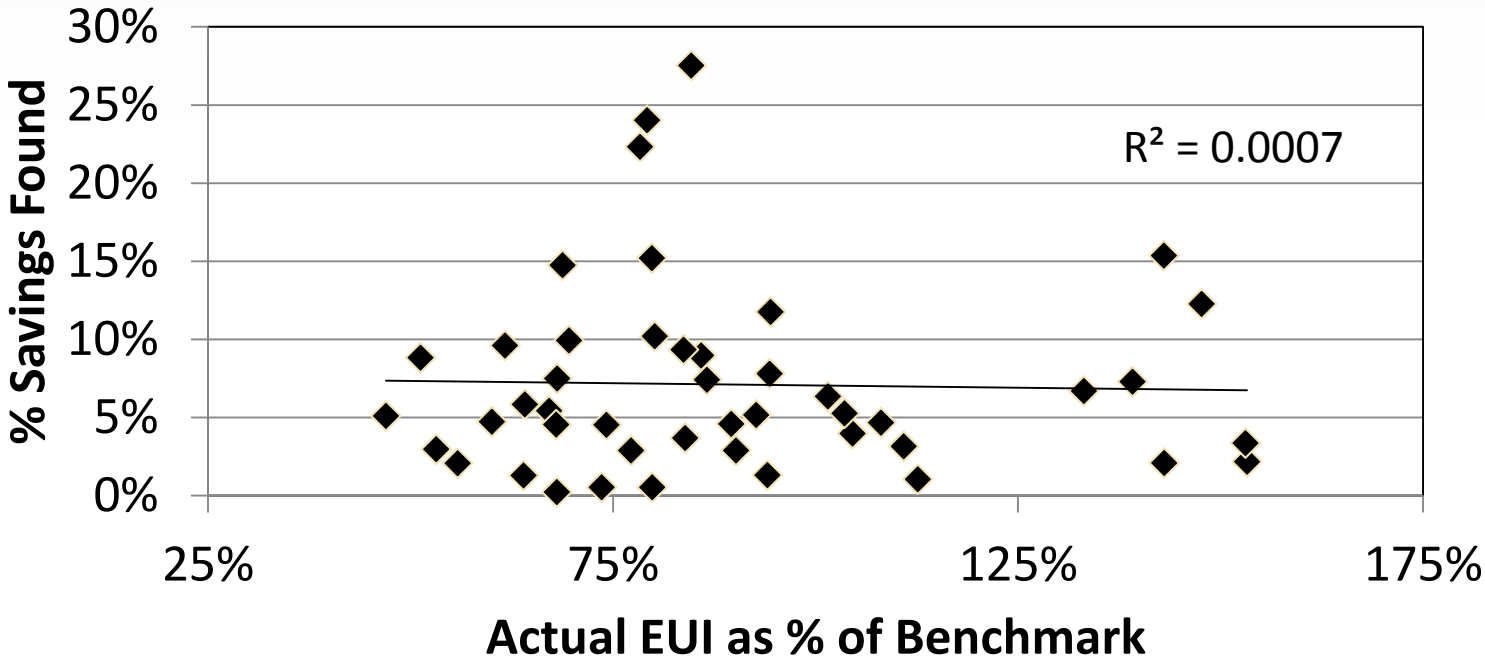
Number	Finding Type	Payback (years)	Affected area (%)	Site energy savings (kBtu/ft^{2}yr)
135	Time of day enabling is excessive	1.1	66%	3.3
97	Economizer operation not optimal	4.4	71%	2.0
88	Excess enabling of equipment	0.7	68%	2.1
88	Retrofit - Efficient Lighting	8.2	33%	1.2
44	Zone setup/setback	0.9	16%	2.6
23	Other controls	11.3	14%	3.1
21	Lighting on more hours than necessary	4.7	12%	1.1
21	Other retrofit (mostly faucet aerators)	1.9	10%	0.8
17	Deferred maintenance	2.9	12%	1.2
14	Leaky/stuck valve	1.9	4%	3.9
116	All others	6.7	107%	1.7
664	Total	3.9	412%	2.1

Average of 4.1 findings per building with a 3.9 year payback

Results: Program Payback

Project Phase	Average Project
Screening	$5,542
Investigation	$70,360
Implementation	$108,768
Total Cost	$184,670
Savings	$32,886
Payback	5.6 yrs
Implementation Only Payback	3.9 yrs

Lessons Learned: Using Benchmarks for Site Selection



- Simple comparison to a benchmark was not a good predictor of energy savings potential so don't automatically drop "top performers"

Implications for Program and Policies

- EBCx saved an average of 7.3% and as much as 27% in managed facilities
- Facilities that are engaged save energy
- On-site screening is a cost effective way to select good candidate buildings

To Learn More

- Results of Minnesota's Public Buildings Enhanced Energy Efficiency Program (PBEEEP). Chris Plum, Mark Hancock and Christie Traczyk. 2012 ACEEE Summer Study on Energy Efficiency in Buildings.
  - http://mncee.org/getattachment/74f7af53-f9b3-4917-8e8b-7f98de246b1d/

- Program Results from the State of Minnesota's Existing Building Commissioning Program. Chris Plum, Mark Hancock and Christie Traczyk. National Conference on Building Commissioning, May 2013.
  - http://www.bcxa.org/ncbc/wp-content/2013-BCA-Presentations/Plum-2013.pdf

Questions

Thank you for your interest.

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Questions

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