

U.S. DEPARTMENT OF  
**ENERGY**

Office of  
**ENERGY EFFICIENCY &  
RENEWABLE ENERGY**

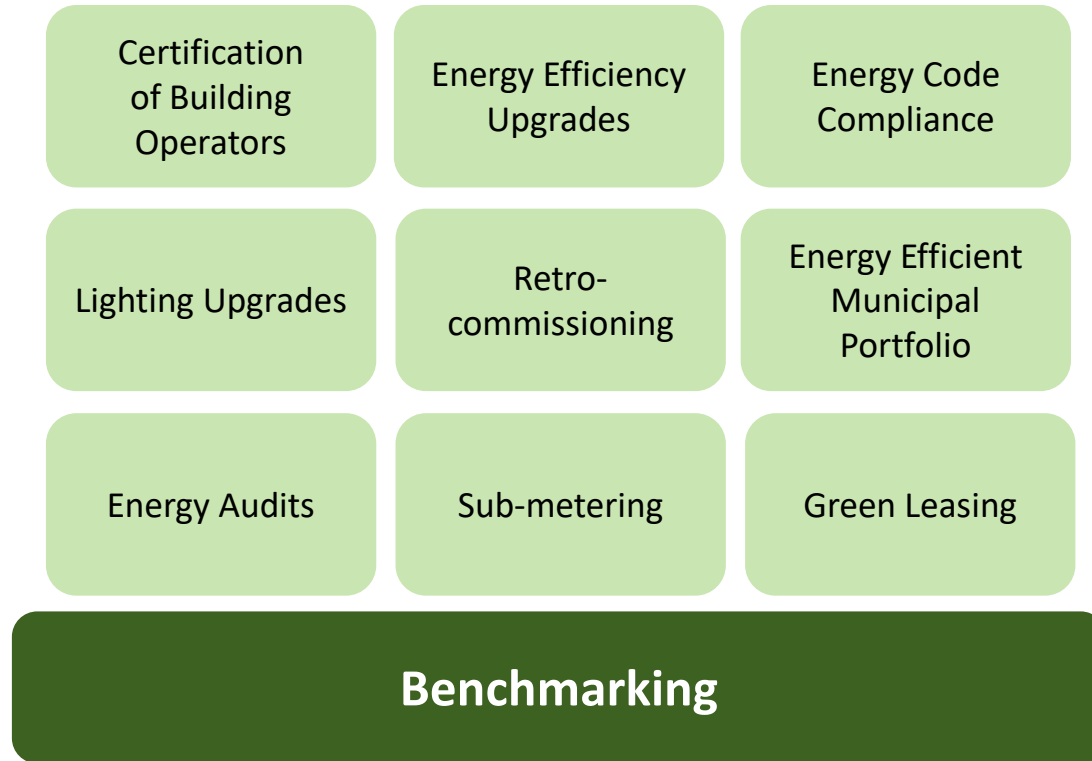
# DOE Building Energy Data Tools

Harry Bergmann

October 12, 2017



# Policy Progression



# Rapid Increase in Data

Tax Assessor Data

Utility Data

Contact Information

Building Use Information

Audit Data

Benchmarking Results

Retrocommissioning



Calendar Year 2012 Disclosure Sheet 1: Whole Building Data  
Page 1 of 17  
District Department of the Environment Energy Performance Benchmarking for Private

DC Real Property ID	Address of Record	Owner of Record	Ward	Property Name	Address 1	City	State	Postal Code	Primary Property Type	Year Built	Reported Building Gross Floor Area (Sq Ft)	Site (Sq Ft)
00080806	2500 VIRGINIA AV NW	WATERGATE EAST INC	2	Watergate East, Inc.	2500 Virginia Avenue, N.W.	Washington	DC	20037	Multifamily Housing	1968	400,000	
00080808	2600 VIRGINIA AV NW	GREENPENZ 2600 VIRGINIA AVENUE LLC	2	Watergate Building	2600 Virginia Avenue	Washington	DC	20037	Office	1963	217,716	
00080811	8600 NEW HAMPSHIRE AV NW	WATERGATE HOLDINGS I LLC	2	8600 New Hampshire Avenue NW (Watergate)	600 New Hampshire Ave NW	Washington	DC	20037	Office	1972	280,271	
00400868	2550 M ST NW	CARR CRP DCVA PROPERTIES LLC	2	Watergate Office Building	2550 M Street NW	Washington	DC	20037	Office	1978	208,325	
00780053, 00780053, 0024	0950 25TH ST NW	CLARIDGE H COOPERATIVE	2	950 25th Street NW	950 25th Street NW	Washington	DC	20006	Multifamily Housing	2000	271,821	
00240102	1520 24TH ST NW	WORLD WILDLIFE FUND INC	2	1520 24th Street NW	1520 24th Street NW	Washington	DC	20037	Office	1985	150,305	
00240103	2400 N ST NW	AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION	2	College of Heart House	2400 N Street NW	Washington	DC	20037	Office	1985	251,707	
00240370	2401M ST NW	LHCW HOTEL HOLDING (2002) LLC	2	2401M Street NW	2401M Street NW	Washington	DC	20037	Hotel	1995	168,891	
00240371	2445 M ST NW	WRT 2445 M LLC	2	2445 M Street N.W.	2445 M Street N.W.	Washington	DC	20037	Office	1995	386,390	
00250808	2400 M ST NW	EDP-IBC 2400	2	2400 M STREET NW	2400 M STREET NW	Washington	DC	20037	Multifamily Housing	2006	321,063	
00251946	1111 25TH ST NW	ATLAS CONDOMINIUM	2	Atlas Condominium	1111 25th Street NW	Washington	DC	20037	Multifamily Housing	2004	287,750	
00251982	2425 L ST NW	THE COLUMBIA RESIDENCES CO	2	The Columbia Residences	2425 L Street NW	Washington	DC	20037	Multifamily Housing	2006	237,971	
00280000	950 24TH STREET NW	COMMERCIAL CO	2	City Hall	950 24th Street NW	Washington	DC	20037	Residence Hall/Dormitory	1989	543,000	Not Assesd
00300837	2475 VIRGINIA AV NW	POTOMAC PLAZA APARTMENTS INC	2	Potomac Plaza	2475 Virginia Avenue, N.W.	Washington	DC	20037	Multifamily Housing	1957	157,672	
00300987	2400 VIRGINIA AV NW	COLUMBIA PLAZA	2	Columbia Plaza All Bldgs	2400 Virginia Avenue, N.W.	Washington	DC	20037	Multifamily Housing	1968	318,550	
00360048	2300 N ST NW	TR 2300 N STREET	2	2300 N Street	2300 N Street	Washington	DC	20037	Office	1968	393,875	
00360853	1201 24TH ST	HYATT EQUITIES	2	Park Hyatt Washington	1201 24th Street NW	Washington	DC	20037	Hotel	1986	304,484	
00370853	2300 - 2330 M ST NW	MEDICAL FACULTY ASSOCIATES INC	2	2300-2330 M St	2300-2330 M Street NW	Washington	DC	20037	Office	1986	381,400	
00400036	300 23RD ST	GEORGE WASHINGTON UNIVERSITY	2	George Washington University	300 23rd Street NW	Washington	DC	20052	Hospital (General Med)	2002	161,222	
00400040	2300 1 ST NW	GEORGE WASHINGTON UNIVERSITY	2	Ross Hall	2300 1st St, NW	Washington	DC	20052	College/University (Campus-Level)	1973	485,000	
00400095	2301 G ST	GEORGE WASHINGTON UNIVERSITY	2	Health and Wellness Center	2301 G St, NW	Washington	DC	20052	Recreation	2001	420,653	
00400026	616 23RD ST	GEORGE WASHINGTON UNIVERSITY	2	616 23rd St NW	616 23rd St NW	Washington	DC	20052	Residence Hall/Dormitory	2004	167,564	
00500095	1250 22ND ST NW	EMBASSY/SHAW D C	2	Embassy/SHAW D C	1250 22nd Street NW	Washington	DC	20037	Office	1981	283,531	
00500086	1255 23RD ST	CAPITOL SO ASSOCIATES	2	Capitol SO Associates	1255 23rd Street NW	Washington	DC	20037	Office	1983	306,123	
00510075						Washington	DC	20037	Hotel	1990	353,382	
00540841	2200 PENNSYLVANIA AV	GEORGE WASHINGTON UNIVERSITY	2	2200 Pennsylvania Avenue	2200 Pennsylvania Avenue NW	Washington	DC	20052	Office	2011	269,000	
00560030	2201 G ST NW	GEORGE WASHINGTON UNIVERSITY	2	Funger, Duques, & Tompkins Halls	2201 G St and 125 23rd St NW	Washington	DC	20052	College/University (Campus-Level)	1970	541,360	
00670053	2100 MASSACHUSETTS	NORFO SOUTH LLC	2	Fairfax Embassy Row	2100 Massachusetts Ave	Washington	DC	20008	Hotel	1921	344,663	
00680088	1421 21ST ST NW	2130 P STREET	2	WestPark Apartments	2130 P Street NW	Washington	DC	20006	Multifamily Housing	1975	217,504	
00700195	1200 NEW HAMPSHIRE AV NW	NH STREET PARTNERS HOLDINGS LLC	2	1200 New Hampshire	1200 New Hampshire Avenue	Washington	DC	20036	Office	1979	184,255	
00700887				3370-Washington West END Marriot	1221 22nd St NW	Washington	DC	20037	Hotel	1981	386,378	
00701653	1177 22ND ST NW	22 WEST CONDO	2	22 West A Condominium	1177 22nd St NW	Washington	DC	20037	Multifamily Housing	2008	304,653	
						Washington	DC	20037	Multifamily Housing	2008	225,474	

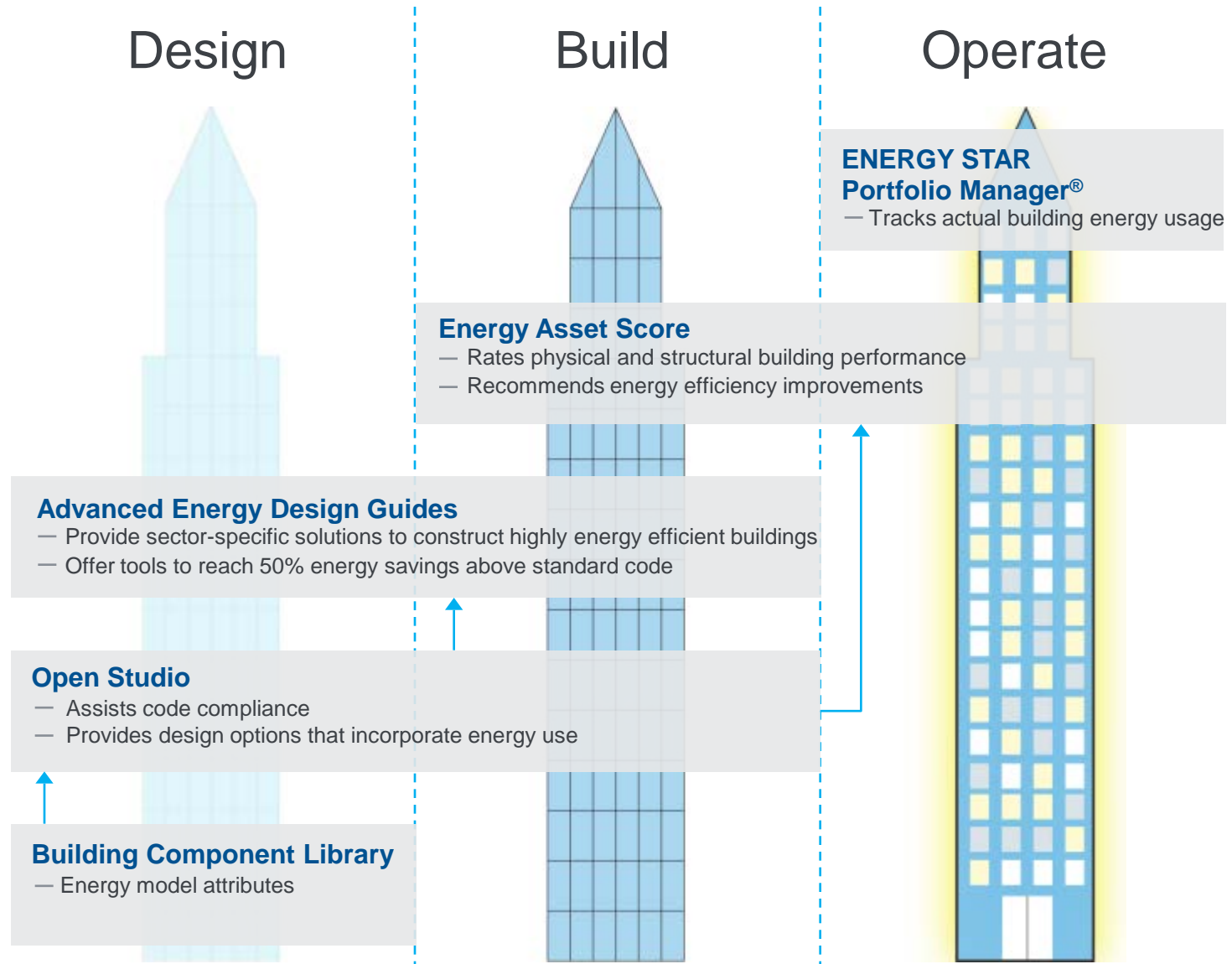


# Hypothesis

- Data Standardization (Format and Definitions)
- Transparency among Market Actors
- Interoperability of Tools



# Interoperability



# Interoperability

## Transmit

**HPMXL** Residential Audit

**BUILDINGSYNC** Commercial Audit

**GREEN BUTTON** Utility Energy Data

## Harmonize



Software that harmonize existing datasets into single platform designed for buildings



Dictionary of common terms to ensure interoperability between data tools

## Compare



Public database of anonymized building energy performance



# Data Tools Overview: BPD

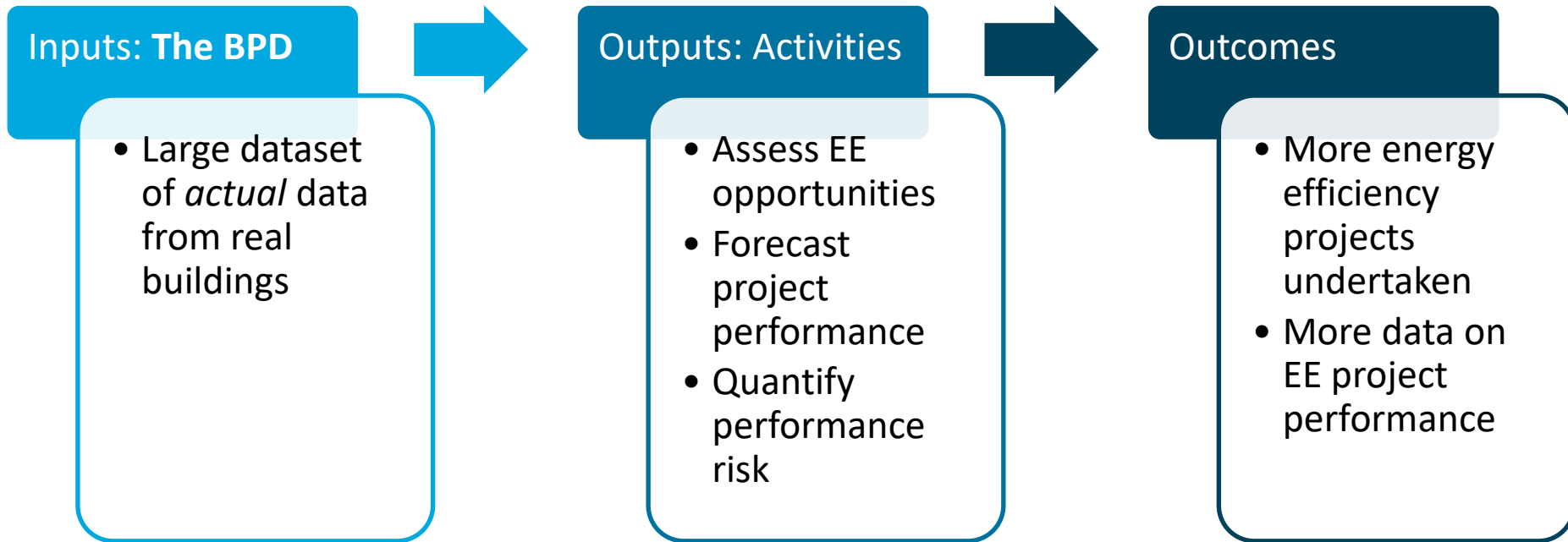
- The nation's largest publicly-accessible dataset of information about the physical and operational characteristics of real buildings
- Contains over 1 MILLION residential and commercial buildings
- Features two main analysis tools: Explore and Compare

The image displays two screenshots of the BPD data analysis interface. The top screenshot shows the 'Explore' view with a histogram of Source EUI (kBtu/sqft/year) and a scatter plot of Source EUI vs. Floor Area (sqft). A table below the scatter plot provides summary statistics for the data.

	Floor Area	Count	Mean	Standard Deviation	0 Percentile	25th Percentile	50th Percentile	75th Percentile	100th Percentile
Summary		476	176.7	136.403	3.378	109.04	162.864	211.495	1234.788

The bottom screenshot shows the 'Compare' view, comparing two datasets: 'MA Office' and 'CA Office Constant Volume'. It features histograms and scatter plots for Source EUI vs. Operating Hours, with a table of summary statistics for the comparison.

	Operating Hours	Count	Mean	Standard Deviation	0 Percentile	25th Percentile	50th Percentile	75th Percentile	100th Percentile
Summary		476	176.7	136.403	3.378	109.04	162.864	211.495	1234.788



**Value for decision-makers (e.g., building owners, policy makers, service providers, financial and research institutions, utilities, program administrators):**

Analyze peer groups defined by geography or building-specific factors

- Regional markets
- Specific building or equipment types
- Range of energy use intensities



# Progress and Accomplishments - BPD

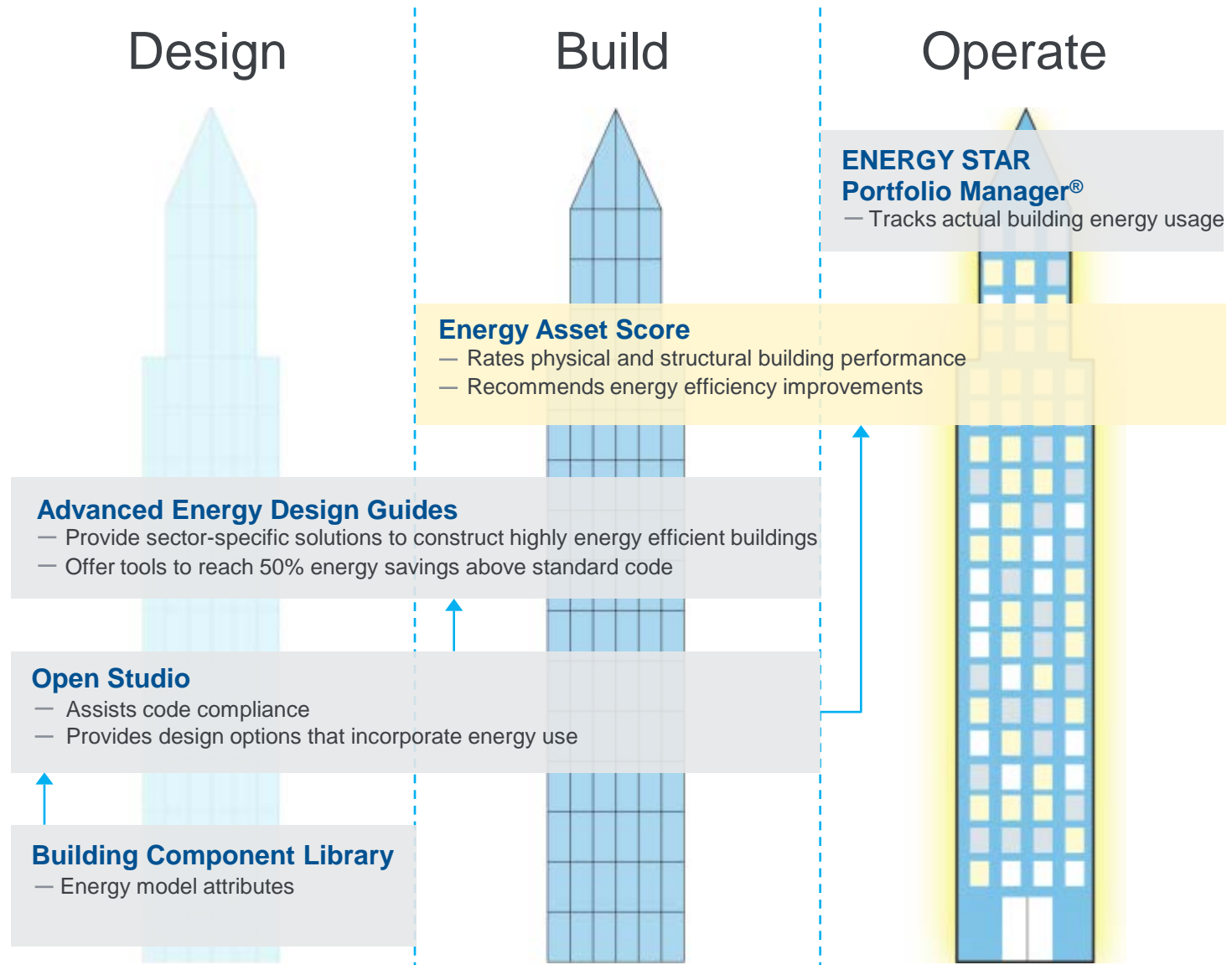
- **> 1,000,000** commercial and residential buildings
- **> 1,200** new users in FY17
  - > 13,000 unique users since inception.
- **~150-200 user sessions per week.**
- Referenced in forthcoming ASHRAE Audit Standard

## API licensees

- 45 API licensees to date.
- 15 new licenses in FY17

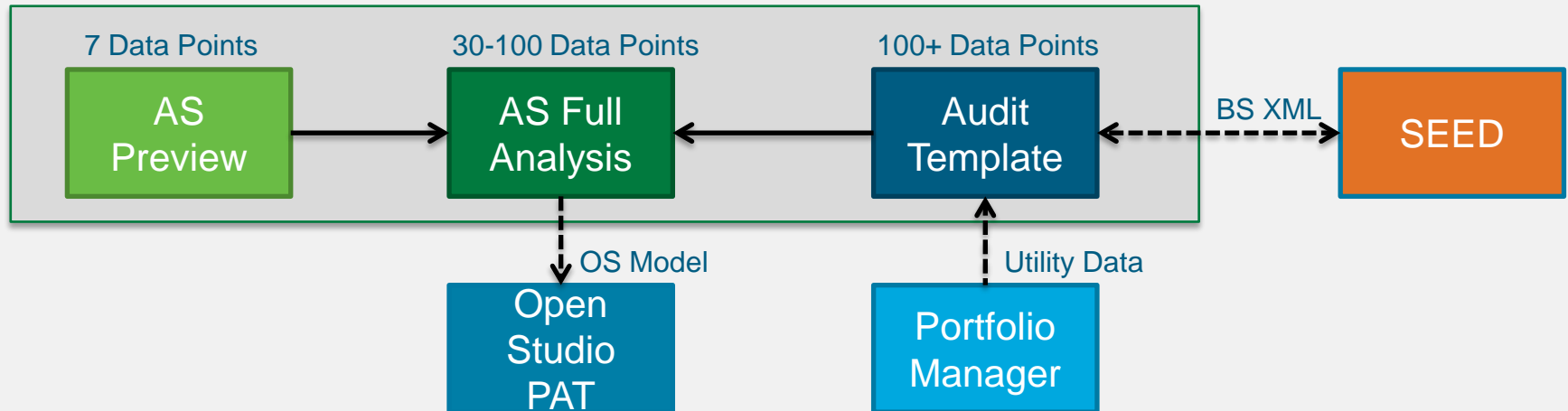


# Energy Asset Score



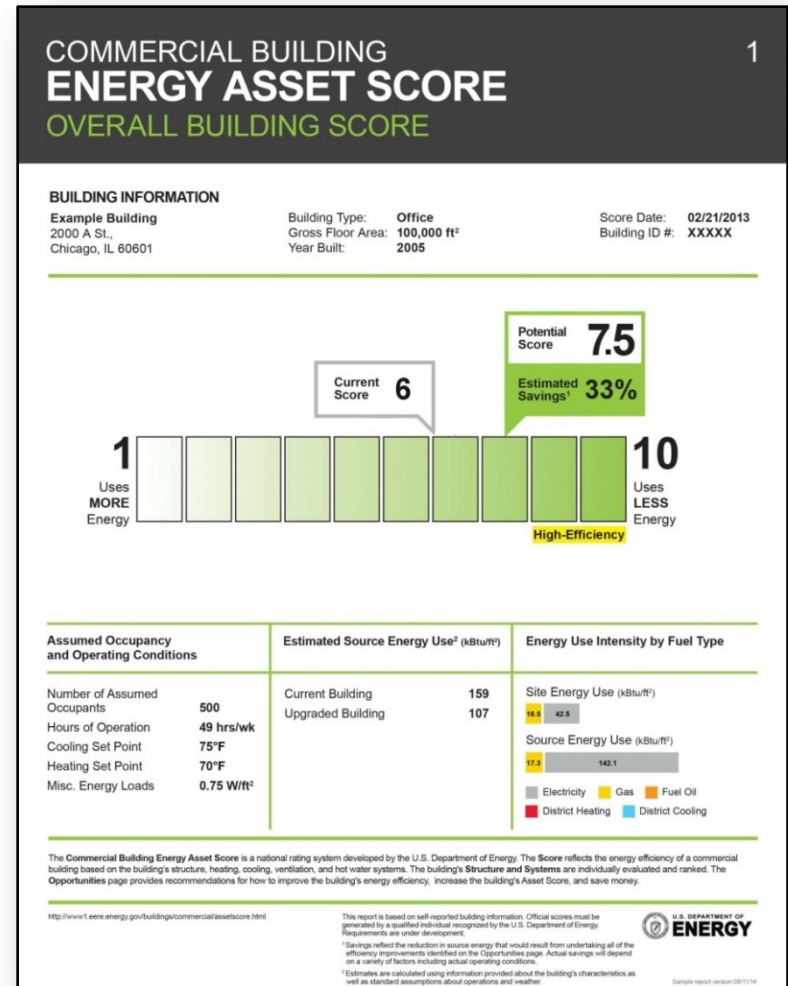
# Asset Score Versions & Ecosystem

AS TOOL

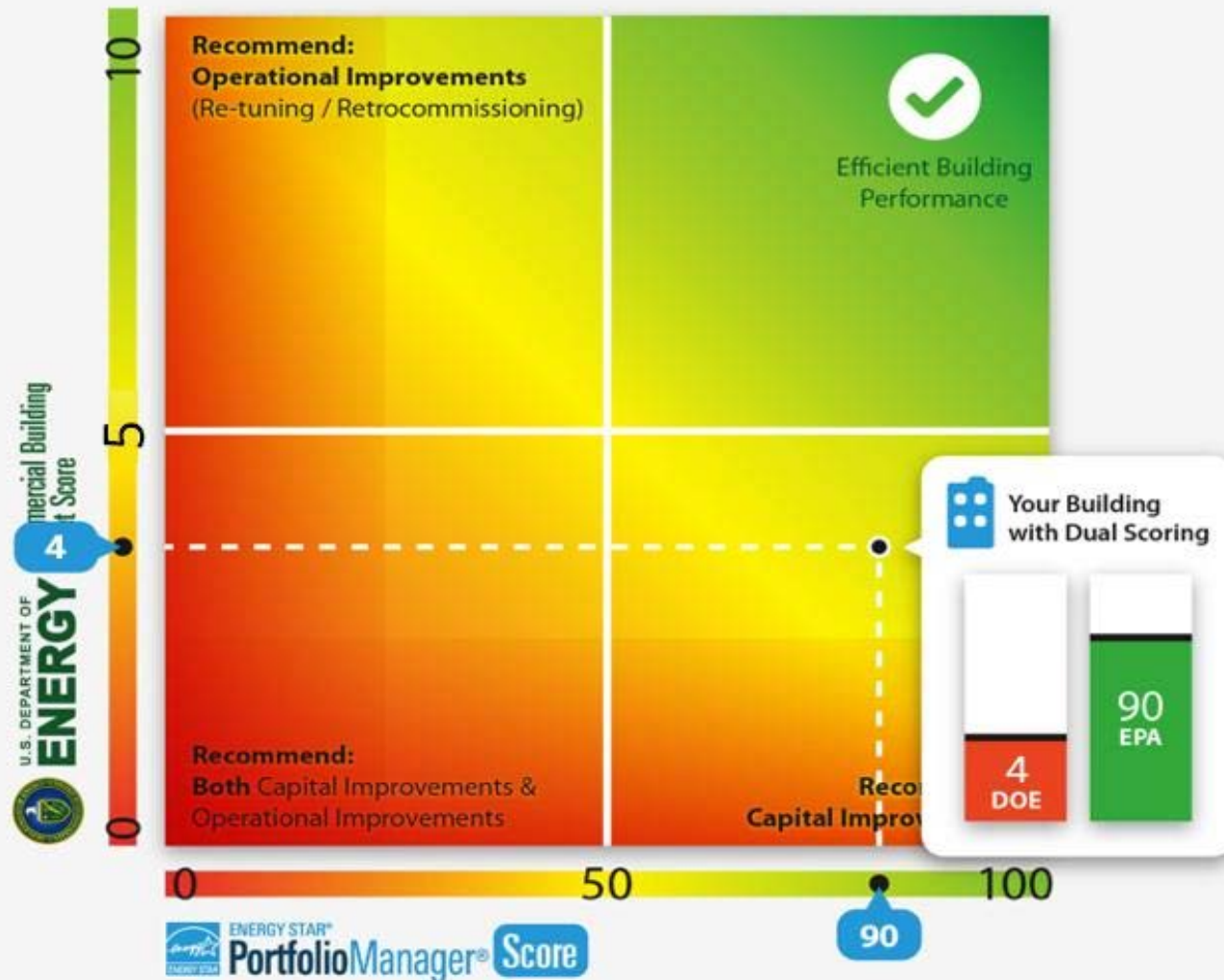


# Asset Score Full

- Provides a score evaluating the energy efficiency of underlying building assets.
- Generates recommendations for improvements based on a lifecycle cost analysis.
- Leverages DOE's EnergyPlus physics engine & the OpenStudio user interface.



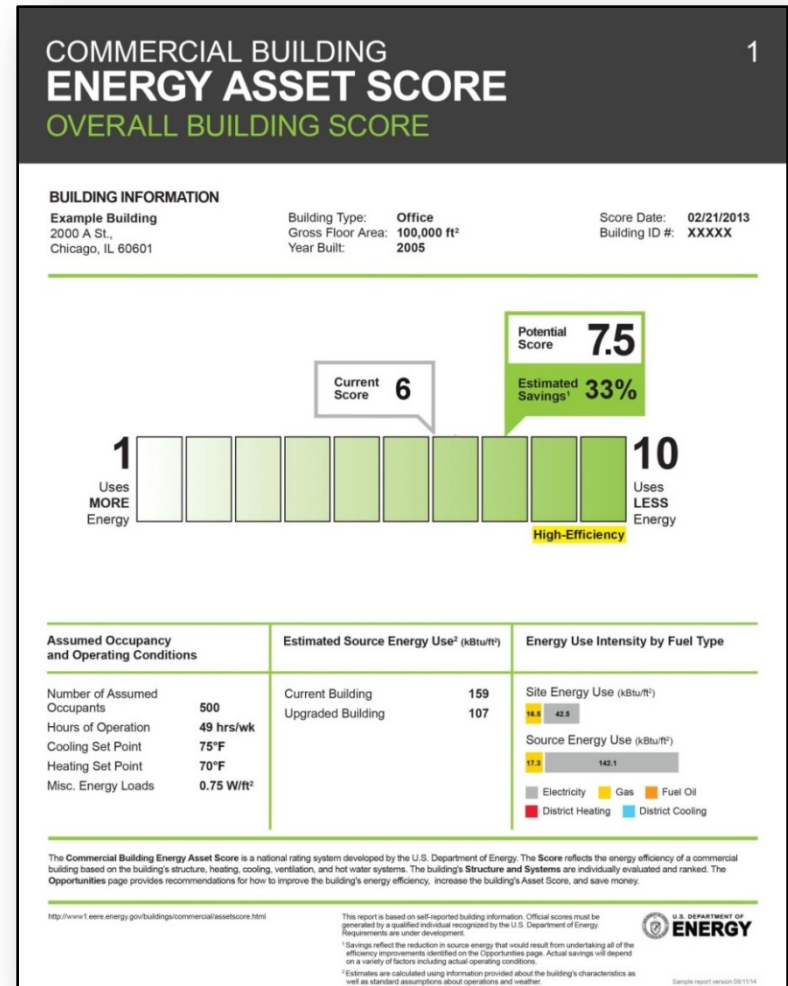
# Asset Score + ENERGY STAR Portfolio Manager



Credit: Performance Systems Development

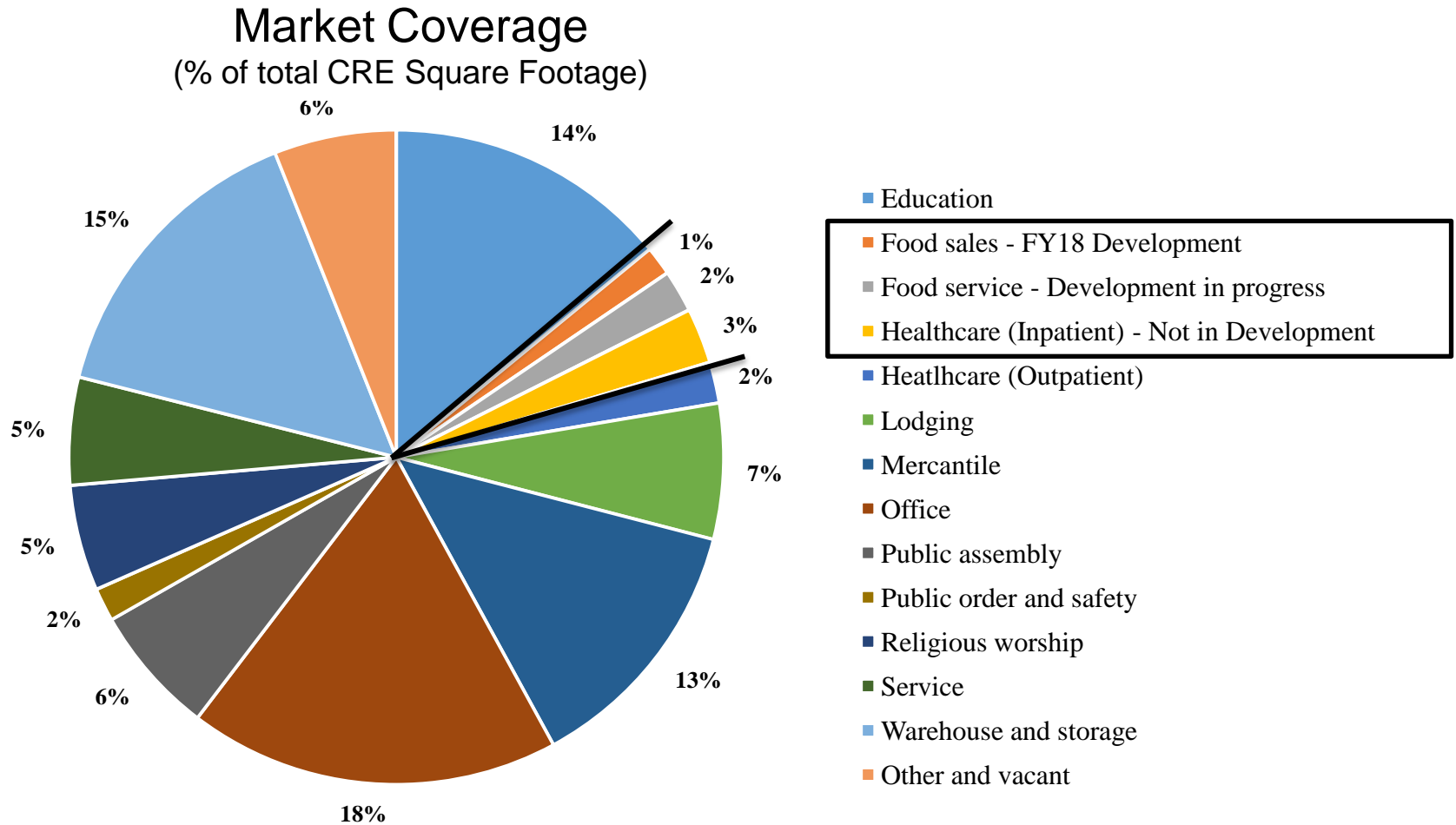
# Asset Score Audit Template

- Creates an on-ramp for Asset Score
- Reduces regulatory burden of audit mandates for both covered buildings and government
- Compliant with BEDES & ASHRAE 211P
- Produces a BuildingSync XML file



# Building Type Coverage

Asset Score can evaluate ~94% of Commercial Spaces



Note: Asset Score also models large multifamily facilities, accounting for ~20% of residential units.

# Asset Score National Leadership Network

21 organizations that work with DOE to use the Asset Score, conduct case studies, and help improve the tool:

- AECOM
- Arup
- Association of Energy Engineers
- CH2M Hill
- City of Milwaukee
- DNV GL
- FS Energy
- Ingersoll Rand
- JBG Companies
- Liberty Property Trust
- Marriott International
- Marx Okubo
- National Oceanic and Atmospheric Administration
- Performance Systems Development
- Skidmore, Owings & Merrill
- State of Missouri
- State of Rhode Island
- Steven Winter Associates
- Transwestern
- U.S. General Services Administration
- YR&G



# Progress

---

**1,810** Buildings scored

**191M** Square feet

**49** States

**232M** Square feet in process

# BuildingSync XML

## Transmit

**HPMXL** Residential Audit

**BUILDINGSYNC** Commercial Audit

**GREEN BUTTON** Utility Energy Data

## Harmonize



Software that harmonize existing datasets into single platform designed for buildings



Dictionary of common terms to ensure interoperability between data tools

## Compare

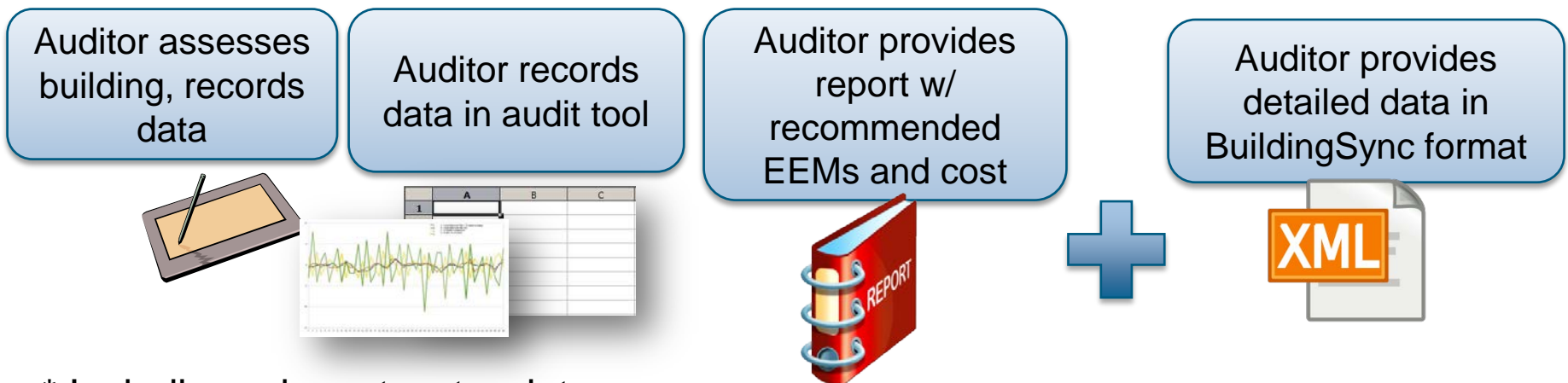


Public database of anonymized building energy performance



# What is BuildingSync?

- A common file format for energy audit data\* that can be utilized by different software and databases to streamline reporting
- Directed by DOE and developed by NREL with a large working group of industry-leading subject matter experts
- Referenced in draft ASHRAE energy audit standard



\* Including relevant water data

# Value Proposition: Building Owners

- **Reduce Long-Term Audit Costs**
  - Common data collection and reporting specification
  - Reuse previous audit data collection
- **Increase Audit Quality**
  - Standard terminology definitions using ASHRAE, DOE, and other references
  - Units are consistent across all audits
  - Input constraints reduce the risk of data entry errors
- **Expand Usefulness of Data**
  - Allows audit recommendations to be compared across a portfolio
  - Data can be easily imported to other BEDES-compliant platforms (Commercial Building Energy Asset Score, Building Performance Database, Compliance Tracking System, eProject Builder, SEED)

# Standard Energy Efficiency Data (SEED) Platform


## Transmit

**HPMXL** Residential Audit


**BUILDINGSYNC** Commercial Audit


**GREEN BUTTON** Utility Energy Data

## Harmonize

 **SEED** PLATFORM  
Software that harmonize existing datasets into single platform designed for buildings

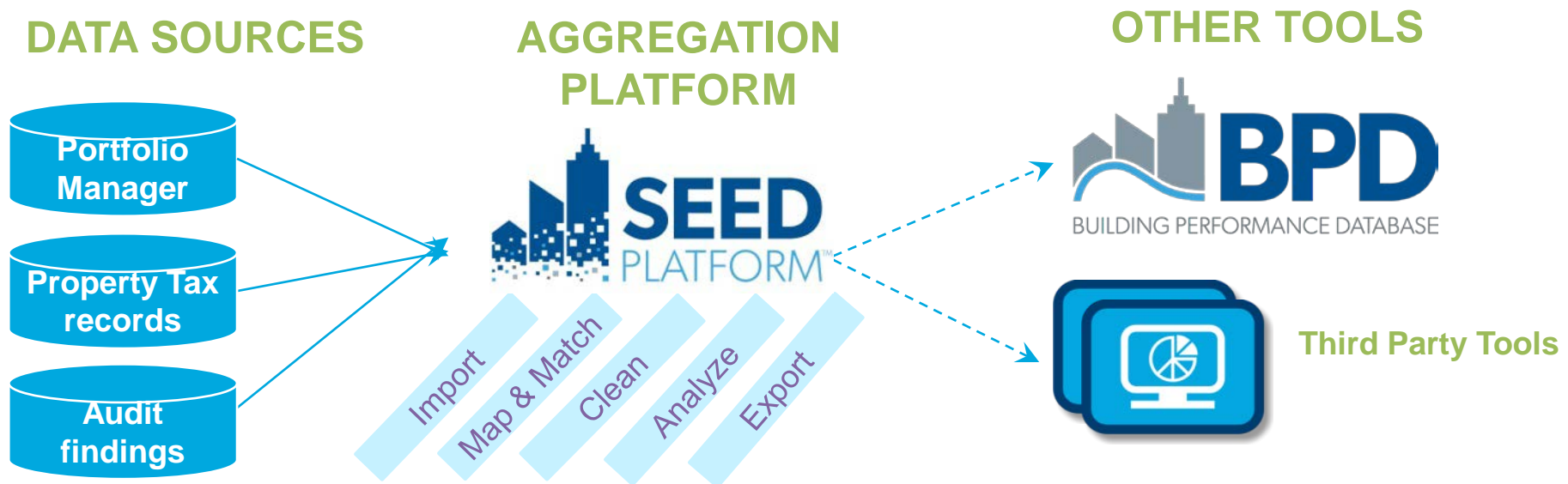
## Compare

 **BPD**  
BUILDING PERFORMANCE DATABASE  
Public database of anonymized building energy performance

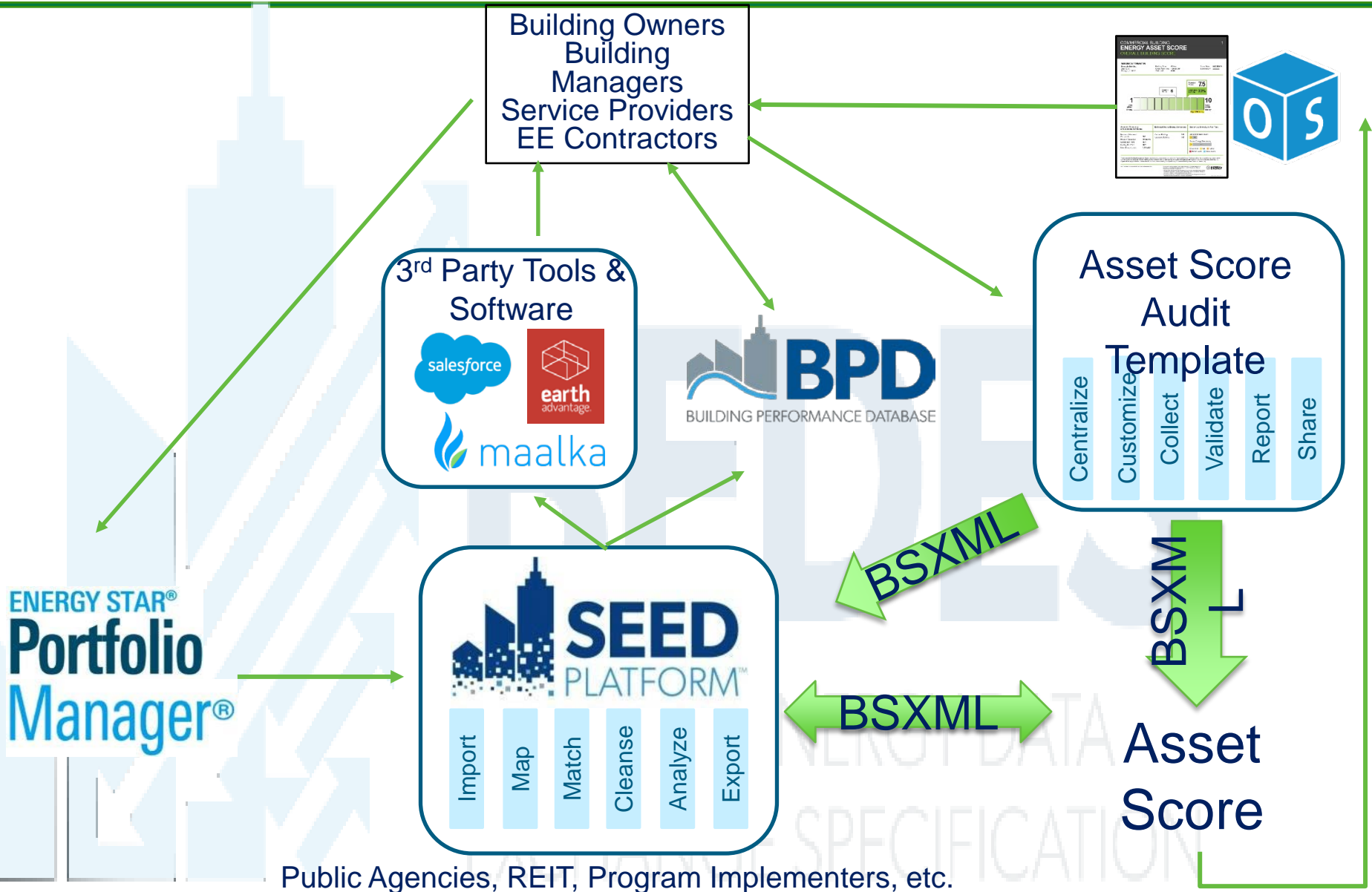
 **BEDES**  
BUILDING ENERGY DATA EXCHANGE SPECIFICATION  
Dictionary of common terms to ensure interoperability between data tools

# Data Tools Overview: SEED

- The SEED platform enables users to **import data from multiple sources** about a group of buildings, and **conduct cleansing, analysis and reporting** of the information
- SEED uses a standard data format – Building Energy Data Exchange Specification (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) enables third-parties to access the data, and offer add-on tools and services, in a replicable way



# Data Tools Foundational Network



# Thank You

---

**To learn more about DOE Data Tools visit us at:**  
<https://energy.gov/eere/buildings/analysis-tools>

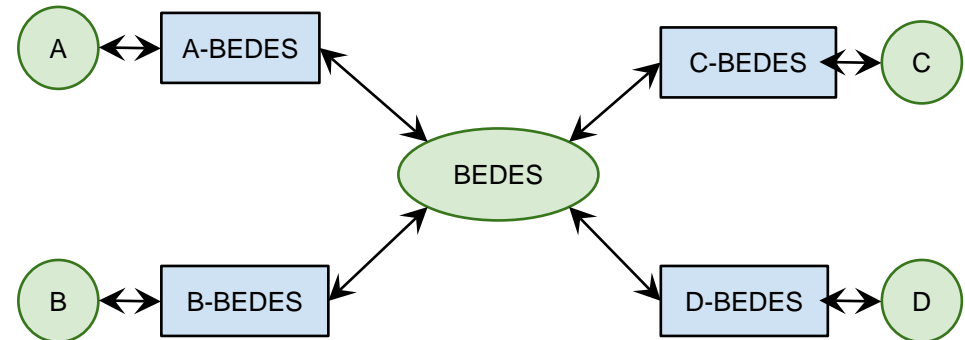
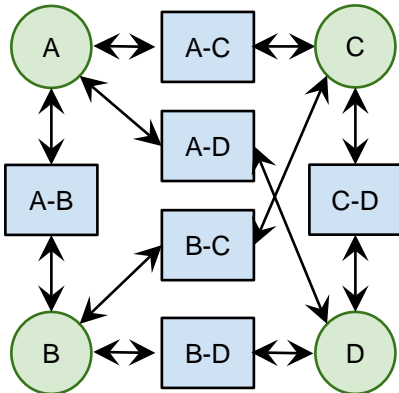
**Harry Bergmann**  
Data Tools Fellow  
U.S. Department of Energy  
[harry.bergmann@ee.doe.gov](mailto:harry.bergmann@ee.doe.gov)



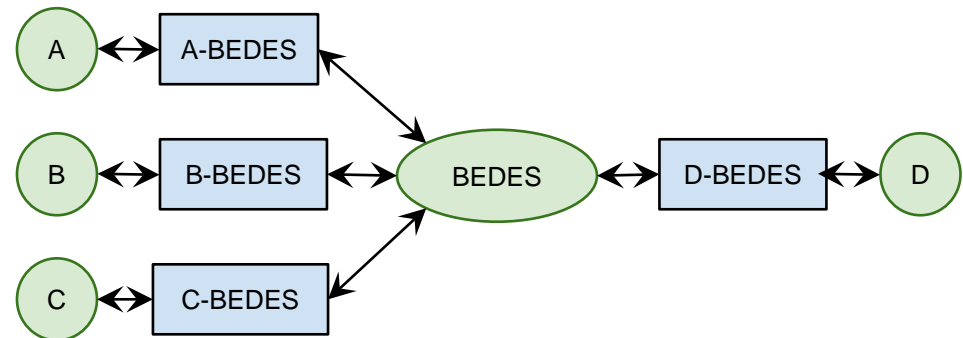
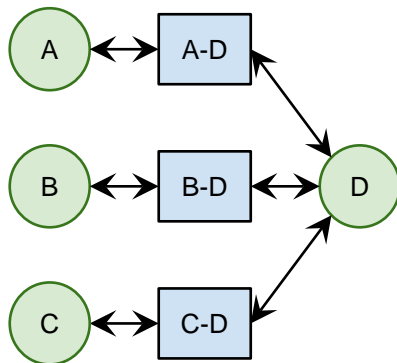
# Data Tools Overview: BEDES

○ = application data    □ = transformation

## Many to Many



## Many to One



# BEDES Adoption



## Organizations with BEDES applications completed or initiated



Alert Energy



**AIA** 2030 Design Data Exchange

# Data Tools Overview: SEED

- ***SEED makes data management easier.*** SEED helps increase data quality and save staff time.
- ***SEED is free.*** The core SEED software is free and can be used as-is. Users can also purchase add-on products or services from SEED Affiliates.
- ***SEED connects to other tools*** such as EPA Portfolio Manager™, Green Button, the DOE's Commercial Building Energy Asset Score and Home Energy Score.
- ***SEED is a national standard,*** providing a common, interoperable platform for the industry. It uses the BEDES data format.
- ***SEED is open source.*** Anyone can add onto or modify the software. Code enhancements can be contributed back to the project so that everyone benefits.

# Interoperability

## Transmit

**HPMXL** Residential Audit

**BUILDINGSYNC** Commercial Audit

**GREEN BUTTON** Utility Energy Data

## Harmonize



Software that harmonize existing datasets into single platform designed for buildings



Dictionary of common terms to ensure interoperability between data tools

## Compare



Public database of anonymized building energy performance



# Interoperability

