



**Better Buildings Residential Network  
Peer Exchange Call Series:  
*Data Overload: Best Practices for Collecting and  
Using Information***

September 28, 2017

*Call Slides and Discussion Summary*



# Agenda and Ground Rules

- Agenda Review and Ground Rules
- Opening Polls
- Residential Network Overview and Upcoming Call Schedule
- Featured Speakers
  - **Harry Bergmann**, Data Tools Fellow, Building Technologies Office, U.S. Department of Energy
  - **Chad Curry**, Managing Director, National Association of REALTORS
- Discussion
- Closing Poll and Announcements



# Better Buildings Residential Network

## Join the Network

### Member Benefits:

- Recognition in media and publications
- Speaking opportunities
- Updates on latest trends
- Voluntary member initiatives
- Solution Center guided tours

### Commitment:

- Members only need to provide *one number*: their organization's number of residential energy upgrades per year

### Upcoming calls:

- October 5: [Here Comes the Sun: New Advances in Solar and its Connection to Energy Efficiency](#)
- October 12: [The Power of IR Diagnostics to Drive Home Upgrades without Incentives](#)
- October 19: [Powered Up: Batteries and the Future of Residential Energy Storage](#)

*Peer Exchange Call summaries are posted on the Better Buildings [website](#) a few weeks after the call*

*For more information or to join, for no cost, email*

*[bbresidentialnetwork@ee.doe.gov](mailto:bbresidentialnetwork@ee.doe.gov), or go to [energy.gov/eere/bbrn](http://energy.gov/eere/bbrn) & click Join*



# **Best Practices: Building Technologies Office, U.S. Department of Energy**

**Harry Bergmann, Data Tools Fellow**



# Data Overload: Making your building data manageable

September 28, 2017





# Motivation for BEDES

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## Problem

- Ambiguity of data definitions (e.g. gross floor area).
- High transaction costs of sharing and aggregating data.

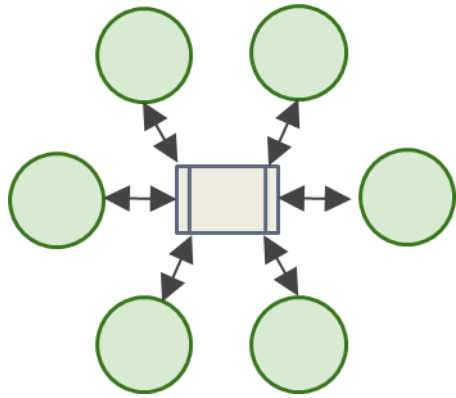
## Solution

- Provide common terms and definitions to enable exchange, comparison, and combination of data.
- Reduce costs in the building efficiency sector.
- Facilitate software development and interoperability.



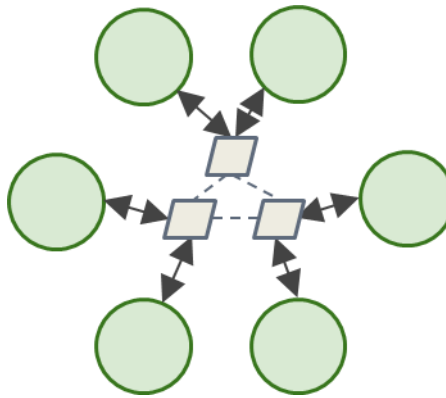
# Think Big, Start Small...

Perfect world...



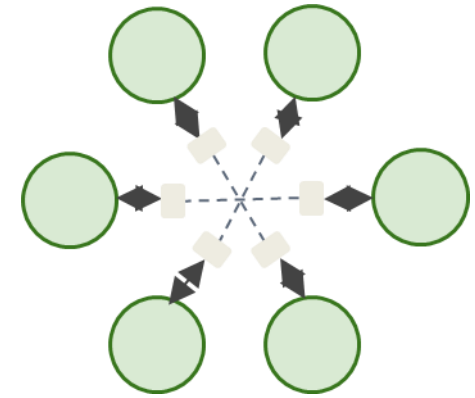
*A single universal exchange schema*

Almost perfect world...



*A set of standard exchange schemas for different use cases*

Somewhat less perfect world....



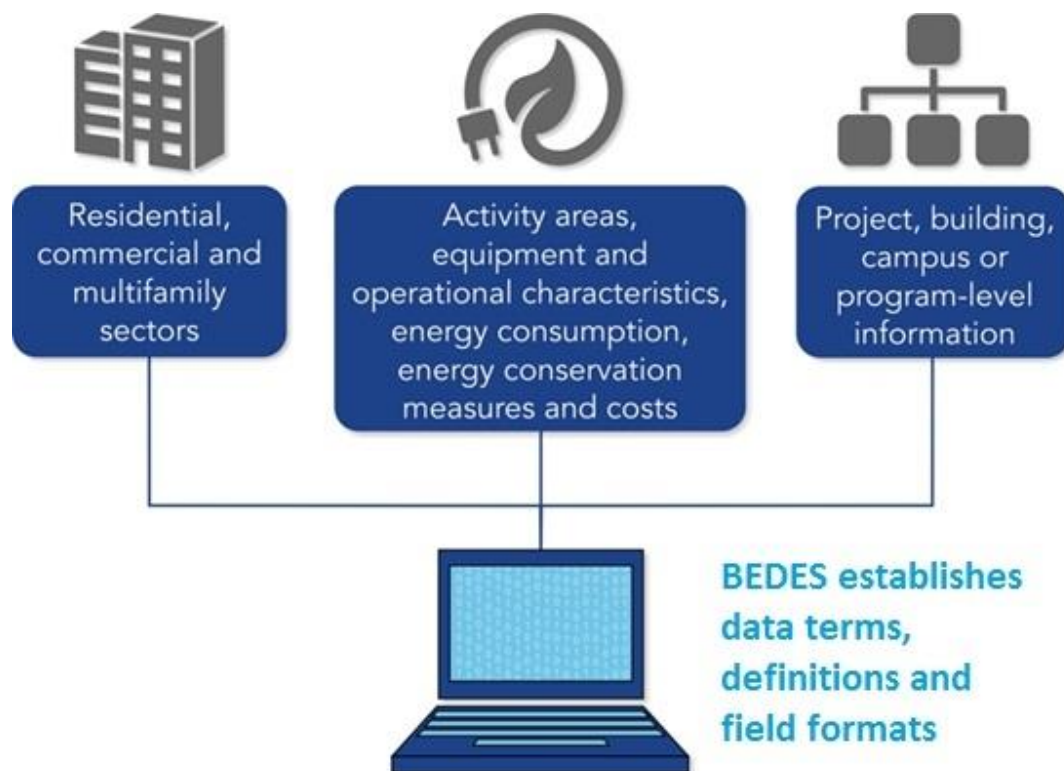
*Standard terms and definitions*

utopia ← → reality



# What is BEDES?

*BEDES is a collection of terms and definitions to facilitate the sharing of building characteristics and energy data among data collection and analysis applications more easily, consistently, and at lower cost.*





# Rapid Increase in Building Data

Tax Assessor Data

Utility Data

Contact Information

Building Use Information

Audit Data

Benchmarking Results

Retrocommissioning



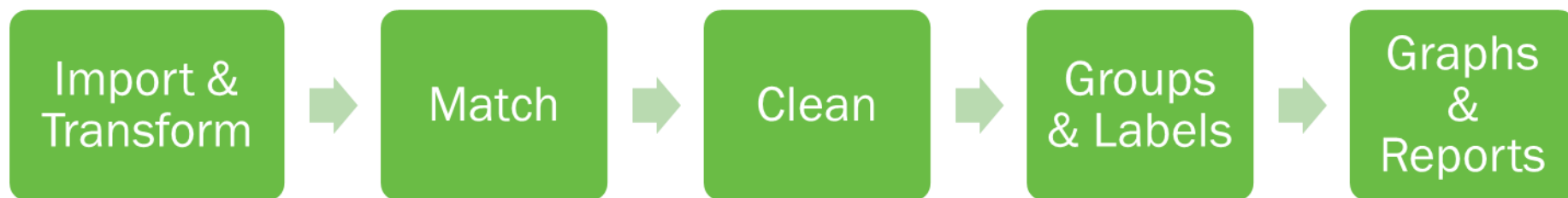
Calendar Year 2012 Disclosure | Sheet 1: Whole Building Data  
Page 1 of 12  
District Department of the Environment Energy Performance Benchmarking for Privately:

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 (Mn)
00000006	2500 VIRGINIA AV NW	WATERGATE EAST INC	2	Watergate East, Inc.	2500 Virginia Avenue, N.W.	Washington	DC	20007	Multifamily Housing	1966	400,000	
00000008	2600 VIRGINIA AV NW	GREENFENZ 2600 VIRGINIA AVENUE LLC	2	Watergate Building	2600 Virginia Avenue	Washington	DC	20007	Office	1963	217,716	
00000011	0600 NEW HAMPSHIRE AV NW	WATERGATE HOLDINGS I LLC	2	0600 New Hampshire Avenue NW (Watergate)	600 New Hampshire Ave NW	Washington	DC	20007	Office	1972	280,211	
00940068	2550 M ST NW	CARR CORP DCVA PROPERTIES LLC	2	Westbridge Office Building	2550 M Street NW	Washington	DC	20007	Office	1978	208,325	
00760093 00760093	0950 25TH ST NW	CLARIDGE H COOPERATIVE	2	950 25th Street NW	950 25th Street NW	Washington	DC	20007	Multifamily Housing	1960	373,216	
0024-0024												
00240112	1250 24TH ST NW	WORLD WILDLIFE FUND INC		1250 24th Street NW	1250 24th Street NW	Washington	DC	20007	Office	1968	150,305	
00240113	2400 N ST NW	AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION		2400 N Street NW	2400 N Street NW	Washington	DC	20007	Office	1965	251,707	
00240070	2401M ST NW	LHCW HOTEL HOLDING (2002) LLC		2401M Street, NW	2401M Street, NW	Washington	DC	20007	Hotel	1965	386,390	
00240071	2445 M ST NW	WMT 2445 M LLC		2445 M Street NW	2445 M Street NW	Washington	DC	20007	Office	1966	321,603	
00250008	2400 M ST NW	EQH-485 2400		2400 M Street NW	2400 M Street NW	Washington	DC	20007	Multifamily Housing	2006	267,760	
00250648	1111 25TH ST NW	ATLAS CONDORING		1111 25th Street NW	1111 25th Street NW	Washington	DC	20007	Multifamily Housing	2004	237,911	
00251792	2425 L ST NW	THE COLUMBIA RESIDENCES CON		2425 L Street NW	2425 L Street NW	Washington	DC	20007	Multifamily Housing	2006	549,021	Not Avail
00280000	950 24TH STREET NW	COMMERCIAL CO		950 24th Street NW	950 24th Street NW	Washington	DC	20007	Residence Hall/Dormitory	1969	157,672	
00308037	2475 VIRGINIA AV NW	POTOMAC PLAZA APARTMENTS INC	2	Potomac Plaza	2475 Virginia Avenue, N.W.	Washington	DC	20007	Multifamily Housing	1957	376,550	
00330007	2400 VIRGINIA AV NW	COLUMBIA PLAZA	2	Columbia Plaza All Bldg	2400 Virginia Avenue, N.W.	Washington	DC	20007	Multifamily Housing	1960	368,878	
00360048	2300 N ST NW	TR 2300 N STREET	2	2300 N Street	2300 N Street NW	Washington	DC	20007	Office	1966	304,484	
00360053	1201 24TH ST	HYATT EQUITIES	2	Park Hyatt Washington	1201 24th Street NW	Washington	DC	20007	Hotel	1966	361,400	
00370853	2300 - 2330 M ST NW	MEDICAL FACULTY ASSOCIATES INC	2	2300-2330 M St	2300 - 2330 M Street NW	Washington	DC	20007	Office	1984	161,222	
00400038	300 23RD ST	GEORGE WASHINGTON UNIVERSITY	2	George Washington University	300 23rd Street NW	Washington	DC	20007	Hospital (General Medical)	2002	465,000	
00410040	23001 ST NW	GEORGE WASHINGTON UNIVERSITY		Rees Hall	23001 St, NW	Washington	DC	20052	College/University (Campus-Level)	1973	420,653	
00420055	2301 G ST	GEORGE WASHINGTON UNIVERSITY		Health and Wellness Center	2301 G St, NW	Washington	DC	20052	Recreation	2001	167,964	
00430026	616 23RD ST	GEORGE WASHINGTON UNIVERSITY		616 23rd St NW	616 23rd St NW	Washington	DC	20052	Residence Hall/Dormitory	2004	283,531	
00500095	1250 22ND ST NW	EMBASSY/SHAW D/C		1250 22nd Street NW	1250 22nd Street NW	Washington	DC	20007	Hotel	1967	306,123	
00500096	1255 23RD ST	CARITOL 50 ASSOCIATES		1255 23rd Street NW	1255 23rd Street NW	Washington	DC	20007	Office	1963	353,362	
00510073												
00540041	2200 PENNSYLVANIA AV	GEORGE WASHINGTON UNIVERSITY	2	2200 Pennsylvania Avenue	2200 Pennsylvania Avenue NW	Washington	DC	20052	Office	2011	541,360	
00660030	2201 G ST NW	GEORGE WASHINGTON UNIVERSITY	2	Funger, Duques, & Temple Hall	2201 G St and 725 23rd St, NW	Washington	DC	20052	College/University (Campus-Level)	1970	344,663	
00670055	2100 MASSACHUSETTS	NORD SOUTH LLC	2	Fallax at Embassy Row	2100 Massachusetts Ave NW	Washington	DC	20008	Hotel	1927	217,504	
00660008	1421 21ST ST NW	2100 P STREET	2	WestPark Apartments	2100 P Street NW	Washington	DC	20006	Multifamily Housing	1975	194,255	
00700195	1200 NEW HAMPSHIRE AV NW	NH STREET PARTNERS HOLDINGS LLC	2	1200 New Hampshire Avenue	1200 New Hampshire Avenue	Washington	DC	20006	Office	1975	386,378	
00700887				33770 Washington West END Marriott	1211 22nd St NW	Washington	DC	20007	Hotel	1981	304,053	
00731919	1177 22ND ST NW	22 WEST CONDO	2	22 West A Condominium	1177 22nd St, NW	Washington	DC	20007	Multifamily Housing	2008	225,414	



# SEED Platform

Users can easily compile **all information on the building stock in one place.**



The open source and extensible platform can **support apps and exchange data** with websites and other software, such as communications management programs and public real estate listings.



# SEED for Home Energy Information

- **Import HES data (CSV format).** This can already be done now. So no new development expected.
- **Export data to MLS.** budget will depend heavily on how exactly MLS can accept data. CSV is easy, web services connection is more work.
- **Matching of multiple HES files** - potentially across multiple years
- **Data cleansing methods** specific to HEScore data types.
- **Combining with utility data.** This is covered in the existing SEED development and we assume that no additional development is needed to support this use case.
- **Associate data source with each field.**



# SEED for Home Energy Information

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## User Interface

- User friendly display of HEScore data
- Store pdf files
- Ability to support other data source effectively (e.g. FHA). Will depend on the format of the data (XML, CSV, etc.)
- Simple analytics, including aggregation.

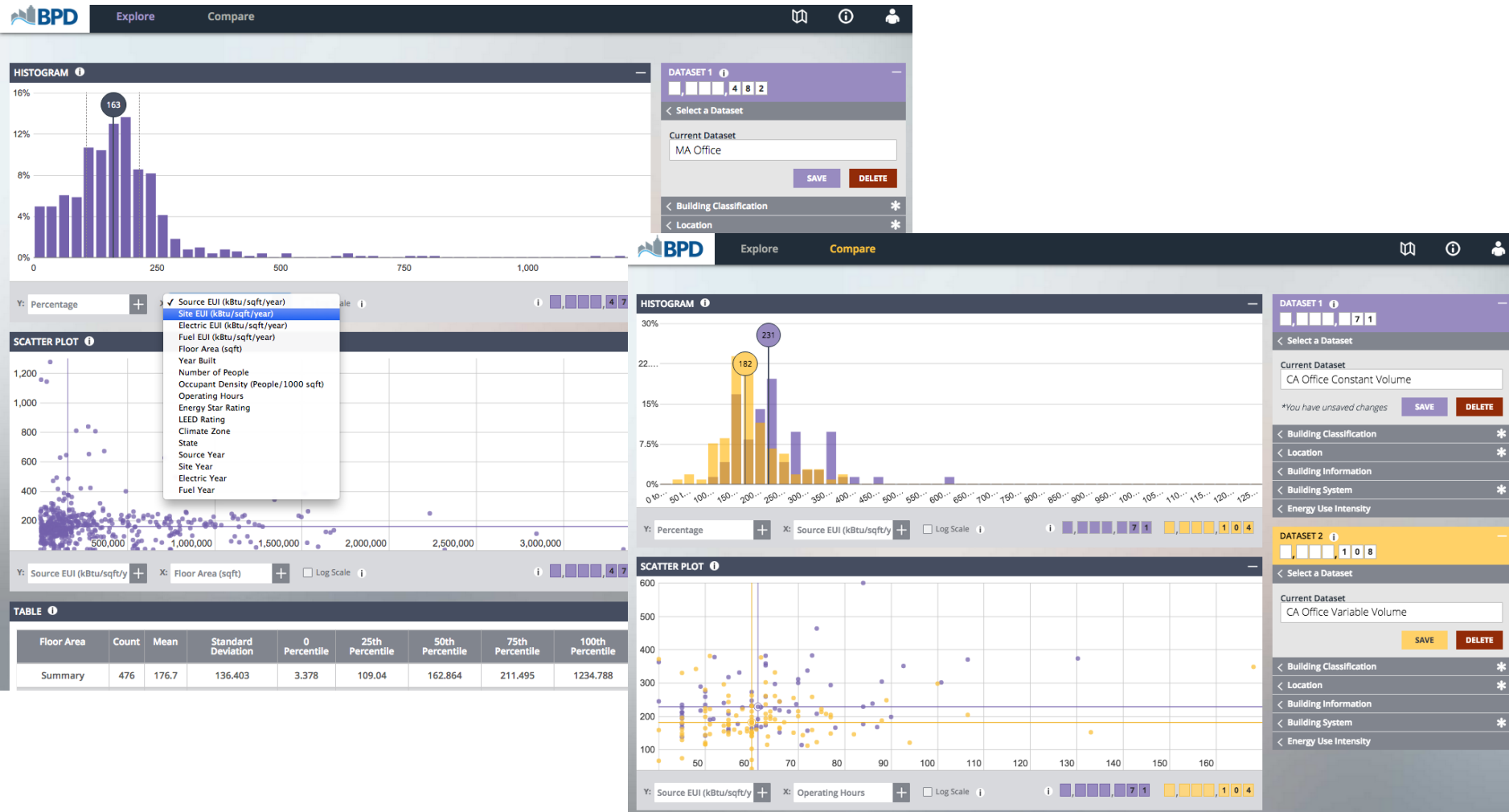
## Nice-to-Have's

- Import HPXML data
- API connection to HEScore
- Water data



# Building Performance Database

- Contains over 1 MILLION residential and commercial buildings
- Features two main analysis tools: Explore and Compare





# BPD Design Principles

## By design, the BPD:

- Provides access to *actual data* on existing buildings - not modeled data or anecdotal evidence.
- Enables analysis of data without revealing information about individual buildings.
- Cleanses and validates data from many sources and translates it into a standard format.
- Allows users to create third party applications using the database through an API.

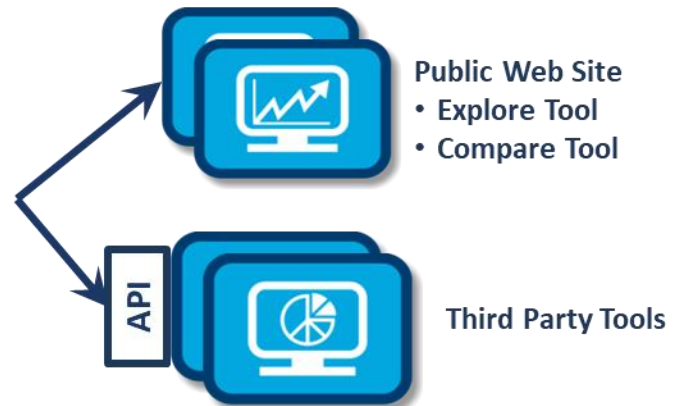
### DATA SOURCES



### AGGREGATION PLATFORM



### ANALYTICAL TOOLS





# About the Data

## REQUIRED: Basic Building Characteristics

- City, State, Zip Code
- Usage type (office, retail, home)
- Building floor area
- Year completed
- Electricity/fuel use for at least one year

\*All datasets must contain a minimum of 50 building records

## OPTIONAL: Detailed Building Characteristics

*Operational information (Portfolio Manager data), such as:*

- Types of activities and associated floor area
- Operating hours
- Number of occupants

*Equipment & Asset information, such as:*

- Lighting type and controls
- Air distribution configuration, controls, etc
- Heating and cooling equipment types & efficiencies
- Hot water equipment type & efficiency
- Wall, roof and window characteristics



# Thank You

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To learn more about our tools visit us at:  
[www.energy.gov/eere/buildings/analysis-tools](http://www.energy.gov/eere/buildings/analysis-tools)

Harry Bergmann  
Data Tools Fellow  
U.S. Department of Energy



# Presentation highlights: Building Technologies Office, U.S. Department of Energy

- **Standardization keeps transaction costs low:** the huge increase in building data has prompted the need for standardization, which enables large scale analyses.
- **Towards a Rosetta stone – speaking the same language:** BEDES aims to improve the cost-effectiveness of sharing and aggregating data by providing standardized definitions and data.
- **Finding order in the chaos:** Managing large data sets can provide a clearer picture on a building's energy performance and enable benchmarking against other buildings. SEED helps cities in their data aggregation and other data management efforts.
- **Personally identifiable information (PII) is top secret:** data is anonymized before being entered into the Building Performance Database (BDT).
- **Databases are only as valuable as the data included in them:** DOE welcomes even more contributions to the BDT.



# Best Practices: National Association of REALTORS

**Chad Curry**, Managing Director



# Homeostasis for a Healthy Home

**Chad Curry**

Managing Director

Center for REALTOR® Technology

CRT Labs



# WHAT WE DO

EDUCATE

ADVOCATE

INNOVATE





**CRT LABS**

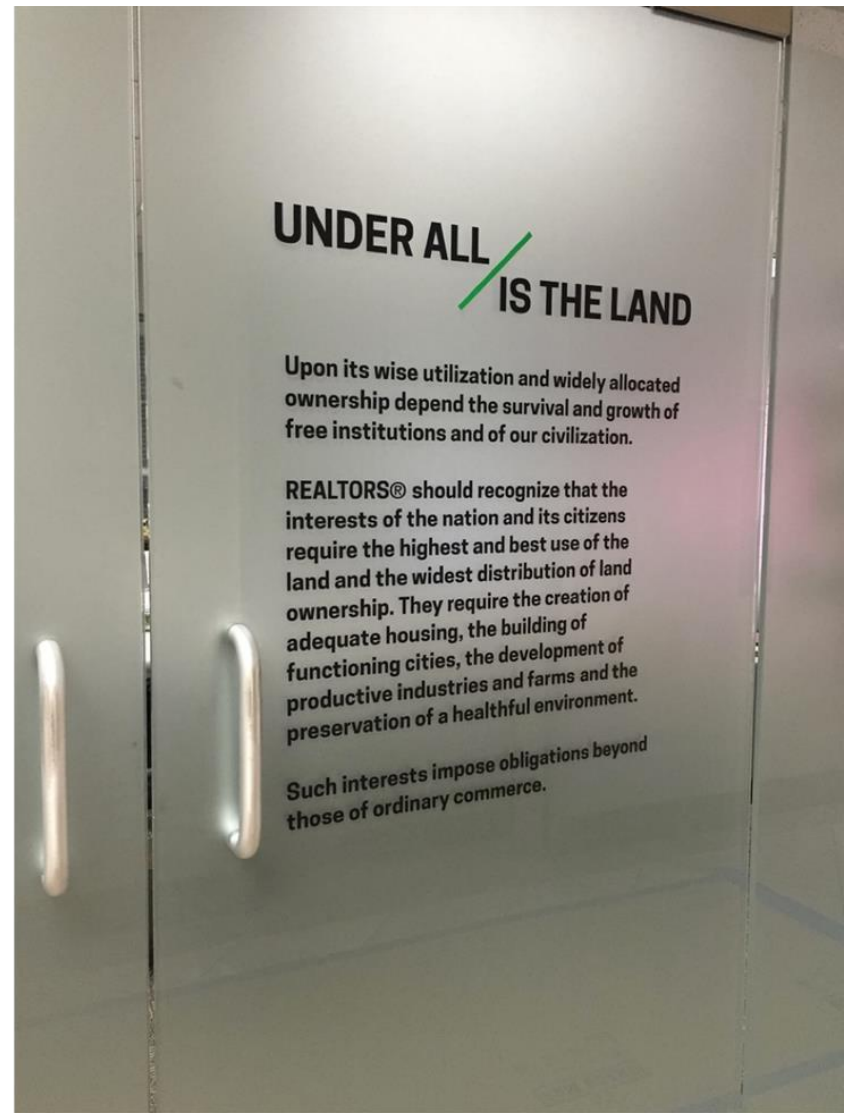
**4<sup>th</sup> Floor  
Across from  
Elevators**

**430 N. Michigan Avenue  
Chicago, IL 60611**



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ASSOCIATION of  
REALTORS®**





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REALTORS®







# What is a Healthy Home?

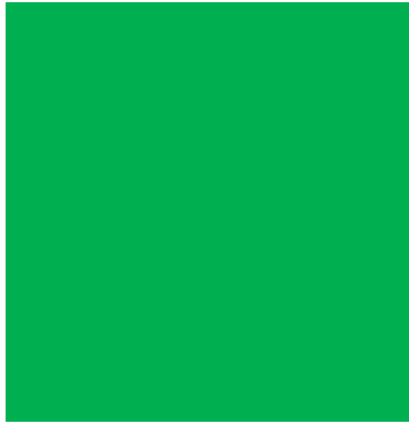
How do we measure and report the home's health?







# HUMANS HAVE 3 COLOR RECEPTOR CONES





# MANTIS SHRIMP HAVE 16 COLOR RECEPTOR CONES



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REALTORS®





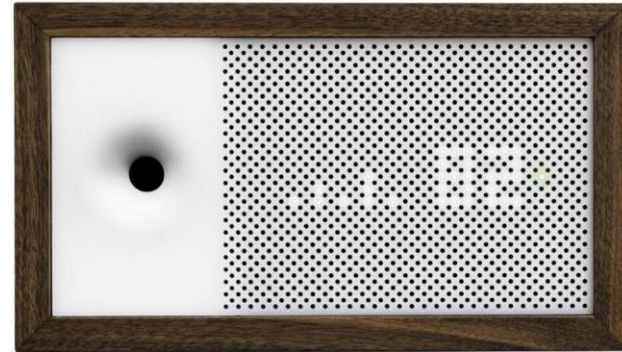
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# IAQ Monitors



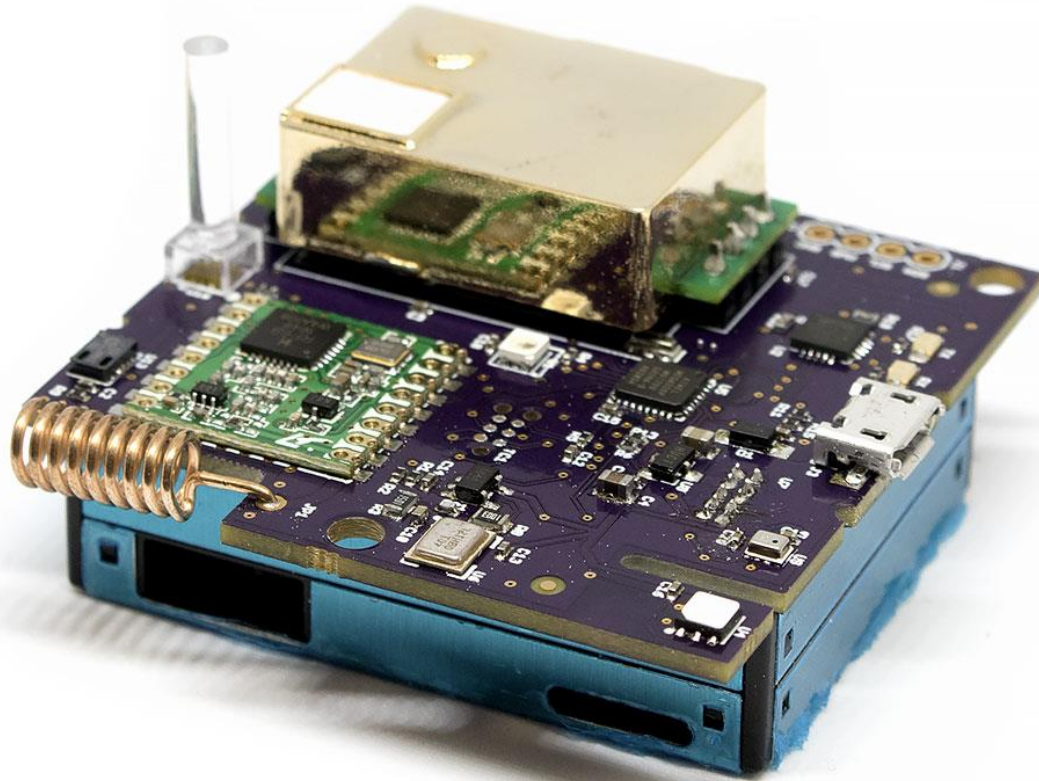


# IAQ Monitors

- Measure about 5 different air quality metrics
  - Carbon Dioxide (CO<sub>2</sub>)
  - Particulate Matter
  - Volatile Organic Compounds
  - Temperature
  - Humidity
- \$200 per device
- External data from EPA sensors



# TOUCHSTONE



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# TOUCHSTONE





# WHAT DOES IT MEASURE?

- Carbon Dioxide (CO<sub>2</sub>)
- Volatile Organic Compounds (VOCs)
- Particulate Matter (PM<sub>2.5</sub>)
- Temperature
- Humidity
- Light
- Noise
- Pressure
- Interact with other devices for regulation of environmental quality
- Can connect with electrical panel monitors and smart meters
- Smart city data

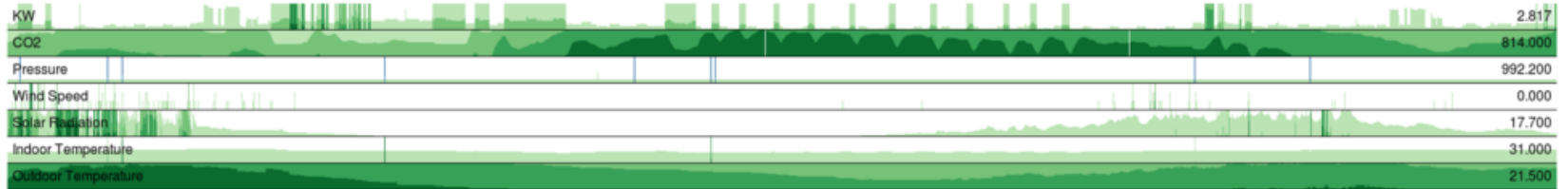




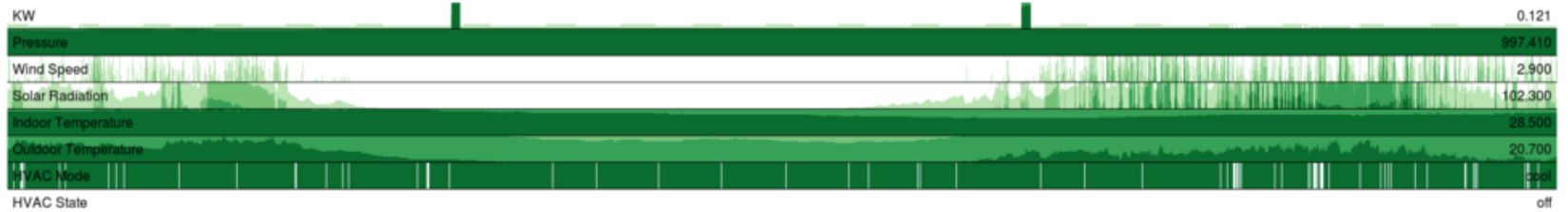


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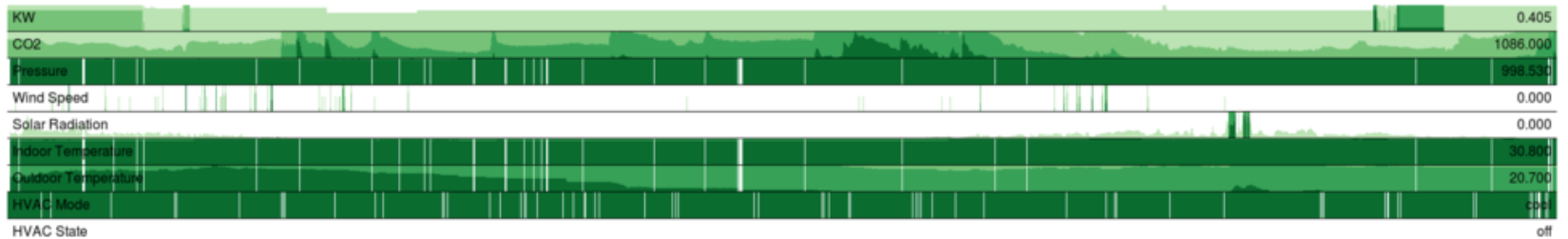
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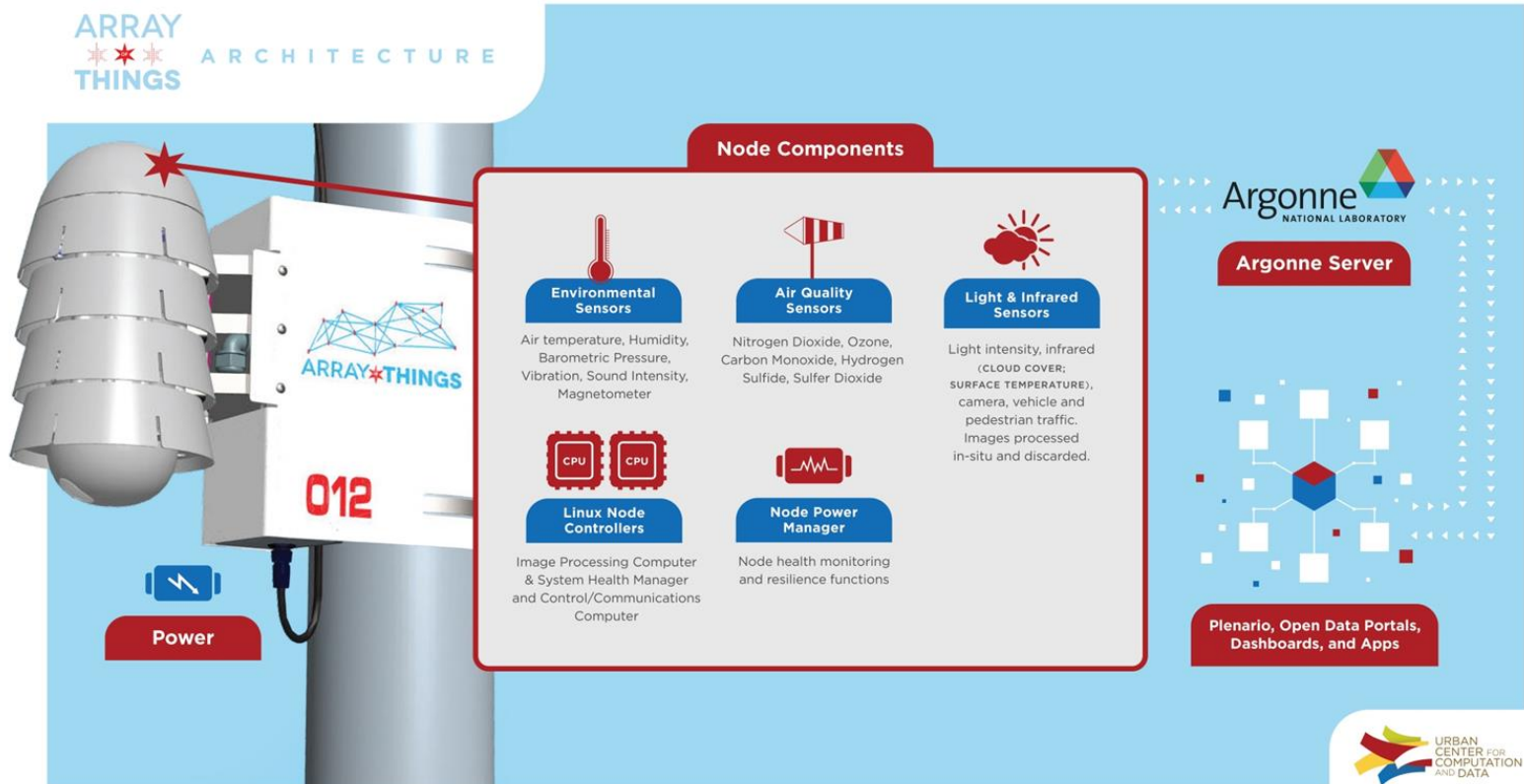


# ENERGY MONITORING





# MICROCLIMATE DATA





# HOMEOSTASIS FOR A HEALTHY HOME

- Mitigate CO<sub>2</sub>
- Humidity mitigation
- Light control
- Energy monitoring and control
- Report outdoor environmental quality & inform home performance



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<https://crtlabs.org>

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<https://facebook.com/crtlabs>



# INTERACT WITH US

Fridays @ 3p Eastern

Office Hours

<https://facebook.com/crtlabs>



# THANK YOU

Chad Curry

@crtlabs



# Presentation Highlights: National Association of REALTORS

- **New technologies have the ability to create visual indicators for home energy features** such as indoor air quality or humidity that are not visible to the naked eye.
- **REALTORS designed “Touchstone”**, a tool that measures various home performance metrics, that is given as closing gift to new homeowners. The tool functions on a radio frequency, provides both localized and remote data, and it’s open source on GitHub. The goal is to have homeostatic homes where connecting devices can improve home energy.
- **The Array of Things (AoT):** REALTORS contributes to this urban project, which is a network of sensors similar to the Touchstone that will be installed in Chicago to collect real-time data on the city’s environment and infrastructure to identify opportunities for improvement and cost savings.



## Discussion Highlights: What are the gaps in knowledge for this topic that, if filled, would help improve work in this area?

- **A database for databases:** a one stop shop where people in this sector can find all the databases existing both from DOE and individually developed would help enable more synergies and connect similar ongoing efforts.
- **A unique building identifier:** a “VIN” number for buildings will be needed to facilitate analyses. DOE is currently looking at this. Energy information from multifamily buildings can be challenging to read oftentimes.
- **Collecting and using qualitative data:** Satori and ISTT conduct this type of analyses.



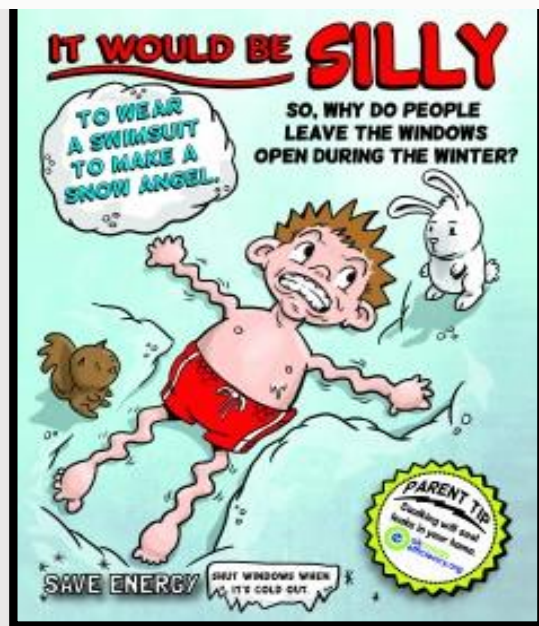
# Upcoming Seasonal Messaging Opportunities

Now is the time to start planning energy efficiency messaging!

Dec 21 – March 19  
Winter season



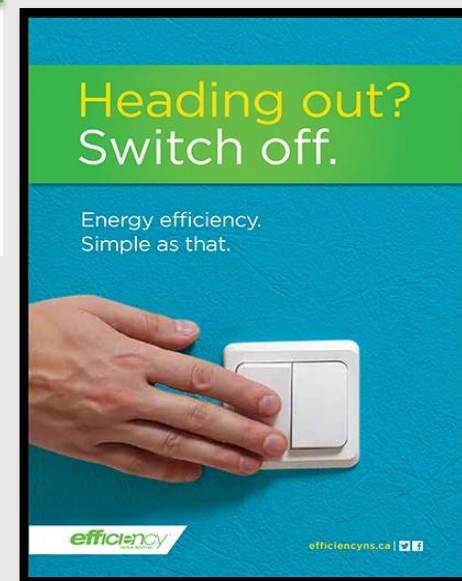
December  
Winter Holidays



Alaska Energy Efficiency  
Poster



Fuel Fund of Maryland  
Poster



Efficiency Nova  
Scotia

Facebook Post: You deserve a break. So does your power bill.

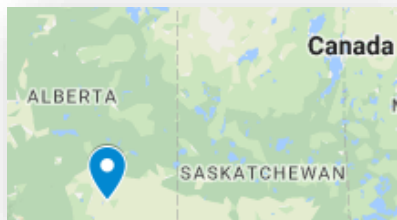
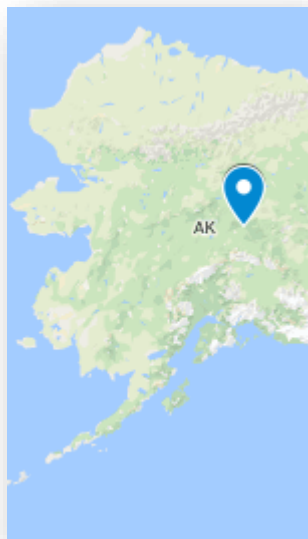
Remember to do this before you go on [#holiday!](#)



# Addenda: Attendee Information and Poll Results



# Call Attendee Locations





# Network members

- Advanced Energy
- Center for Energy and Environment
- Center for Sustainable Energy
- Civic Works
- CLEAResult
- Cold Climate Housing Research Center
- County of San Luis Obispo
- Efficiency Maine
- Efficiency Vermont
- Energy Efficiency Specialists
- Focus on Energy
- Home Star Iowa
- International Center for Appropriate and Sustainable Technology (ICAST)
- New York State Energy Research & Development Authority (NYSERDA)
- Resispeak
- Seventhwave
- Wisconsin Energy Conservation Corporation (WECC)



# Non-members (1 of 2)

- Alliant Energy
- AtSite
- BAE Systems
- California Public Utilities Commission
- CenterPoint Energy
- Clallam County
- Community Housing Partners
- E4TheFuture Inc.
- EA Dynamics
- Edison Electric Institute
- Emerson
- Florida Department of Agriculture & Consumer Services (Office of Energy)
- Focus: HOPE
- Frontier Energy, Inc
- Green Compass Sustainability
- HDR Consulting
- Home Office Training & Technology
- ICF
- Local Government Commission
- Louisville Gas & Electric (LG&E)
- Massachusetts Department of Public Utilities
- Metro Nashville Government



# Non-members (2 of 2)

- Metropolitan Washington Council of Governments
- NANA Regional Corporation
- National Association of REALTORS
- National Fuel
- National Renewable Energy Laboratory (NREL)
- Nest Labs
- New Ecology, Inc.
- New York City Mayor's Office of Sustainability
- NORESKO, LLC
- Oakland Livingston Human Service Agency
- Power Integrations
- Proctor Engineering
- Quadlogic
- StopWaste
- Studio Jack Rees
- Texas A&M Energy Institute
- The Benningfield Group
- The Benningfield Group, Inc.
- Therma-Stor LLC
- TRC Solutions
- Utah Governor's Office of Energy Development



# Opening Poll #1

- Which best describes your organization's experience with collecting and using information?
  - Some experience/familiarity – **51%**
  - Very experienced/familiar – **32%**
  - Limited experience/familiarity – **15%**
  - Not applicable – **2%**
  - No experience/familiarity – **0%**



# Closing Poll

- After today's call, what will you do?
  - Seek out additional information on one or more of the ideas – **77%**
  - Consider implementing one or more of the ideas discussed – **12%**
  - Make no changes to your current approach – **11%**
  - Other (please explain) – **0%**