Building Technologies Office

National Energy Efficiency Starts Here

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

EIA Energy Conference – June 17, 2013

Roland Risser, Director
Building Technologies Office

Buildings are a "key" component of a growing National Energy Challenge

AGENDA for today…

- Language is not consistent
- Data is rarely comparable
- Grid to Load transactions work – but are not scalable today
- What else is BTO doing to support this Challenge

Building Technologies Office

Our Integrated Approach to Improve Building Performance

Research & Development

Developing High Impact Technologies

Standards & Codes

Locking in the Savings

Market Stimulation

Accelerating Tech-to-Market

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

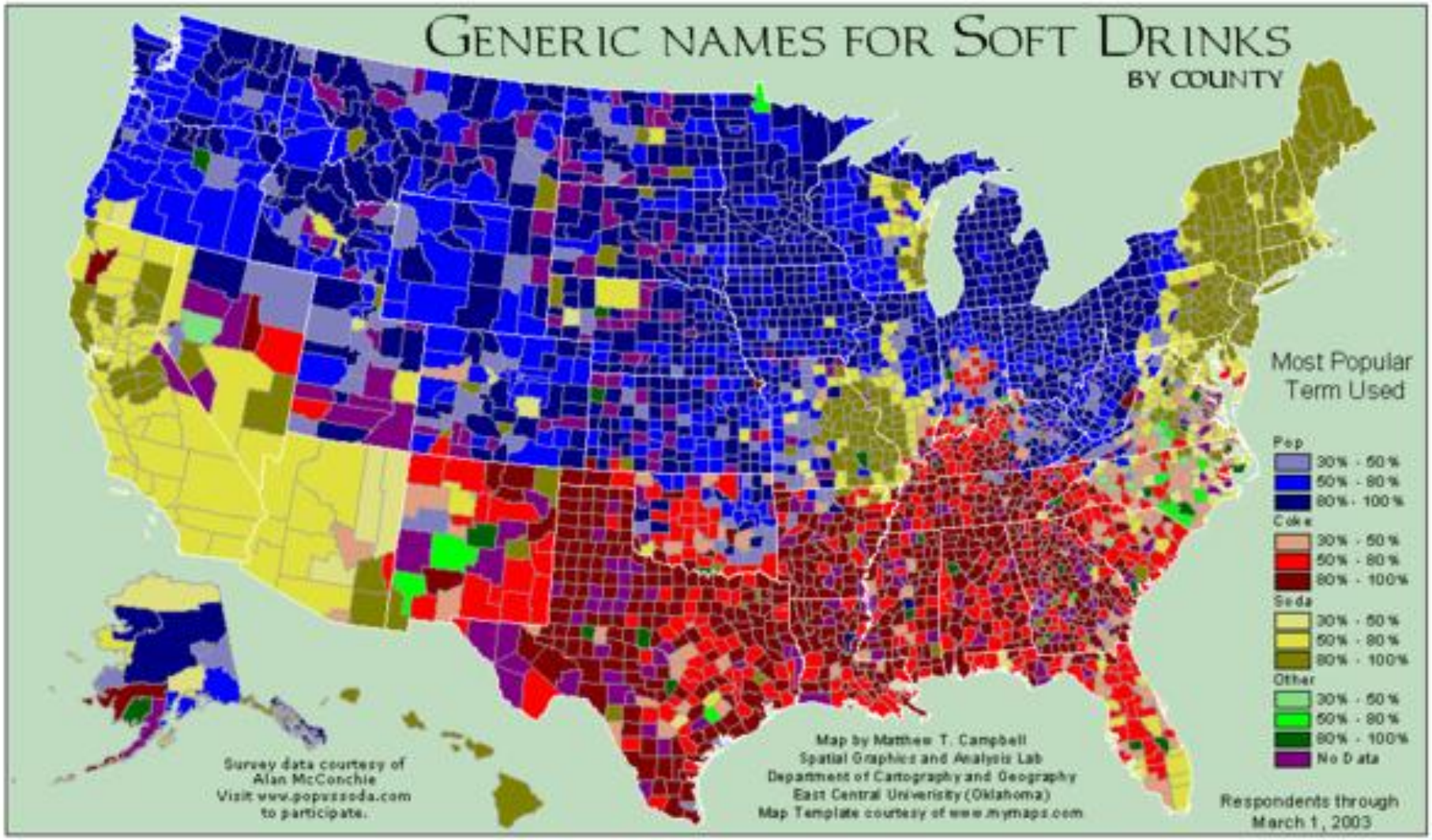
A Future Grid has New Challenges

- **Language is not consistent**
- Data is rarely comparable
- Grid to Load transactions work – but are not scalable today
- What else is BTO doing to support this Challenge

What do you call this?

- Atlanta — Coke Machine
- California — Soda Machine
- Minneapolis — Pop Machine
- Alaska — ?

What is this? Same thing but in different terms



A Future Grid has New Challenges

- Language is not consistent
- **Data is rarely comparable**
- Grid to Load transactions work – but are not scalable today
- What else is BTO doing to support this Challenge

What is the size (sf) of this building?

1101 K Street, Washington DC

The answer depends on who you are and what value you place on the answer…

What is the size (sf) of this building?

1101 K Street, Washington DC

- Architect 300,000 square foot (gross)
- Owner 291,480 square foot (net)
- Manager 243,512 square foot (leasable)
- Engineer 450,000 square foot (reported to energy star)
- Others… Tax assessors, service contractors, etc.

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

A Future Grid has New Challenges

- Language is not consistent
- Data is rarely comparable
- **Grid to Load transactions work – but are not scalable today**
  - **US has more than 40 Demonstration Projects**
  - **Range in size from small to large; EVs to PV**
  - **None can interoperate "out of the box" - so not directly scalable**
  - **Scalable solutions require some standardization**
- What else is BTO doing to support this Challenge

Vision for the Future Grid

Key Goal: Appropriate balance of key attributes while recognizing situational differences

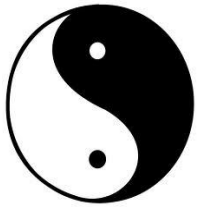
A seamless, cost-effective electricity system, from generation to end-use, capable of meeting all clean energy demands and capacity requirements:

- Significant scale-up of clean energy (renewables, natural gas, nuclear, clean coal)
- Universal access to consumer participation and choice (including distributed generation, demand-side management, electrification of transportation, and energy efficiency)
- Holistically designed solutions (including regional diversity, AC-DC transmission and distribution solutions, microgrids, energy storage, and centralized-decentralized control)
- Two-way flows of energy and information
- Reliability, security (cyber and physical), and resiliency

Our Grid Vision Highlights an Opportunity for Buildings

Buildings are limited in response to grid needs due to the existing controls systems (i.e. part of the problem)

HOWEVER,

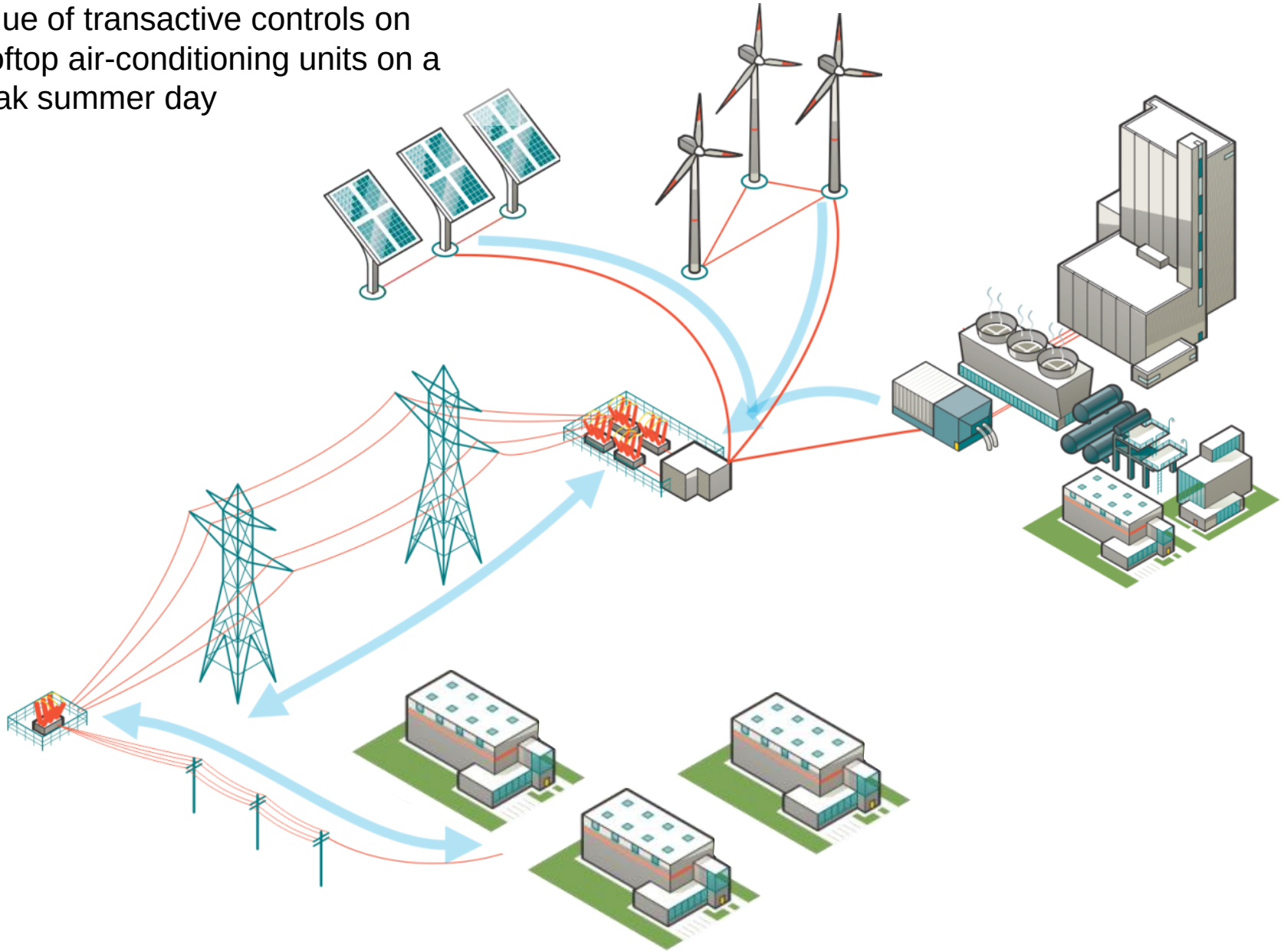


Buildings are also one solution in optimizing cost effective grid interactions
(i.e. part of the solution)

ALL SOLUTIONS REQUIRE STANDARD DATA!

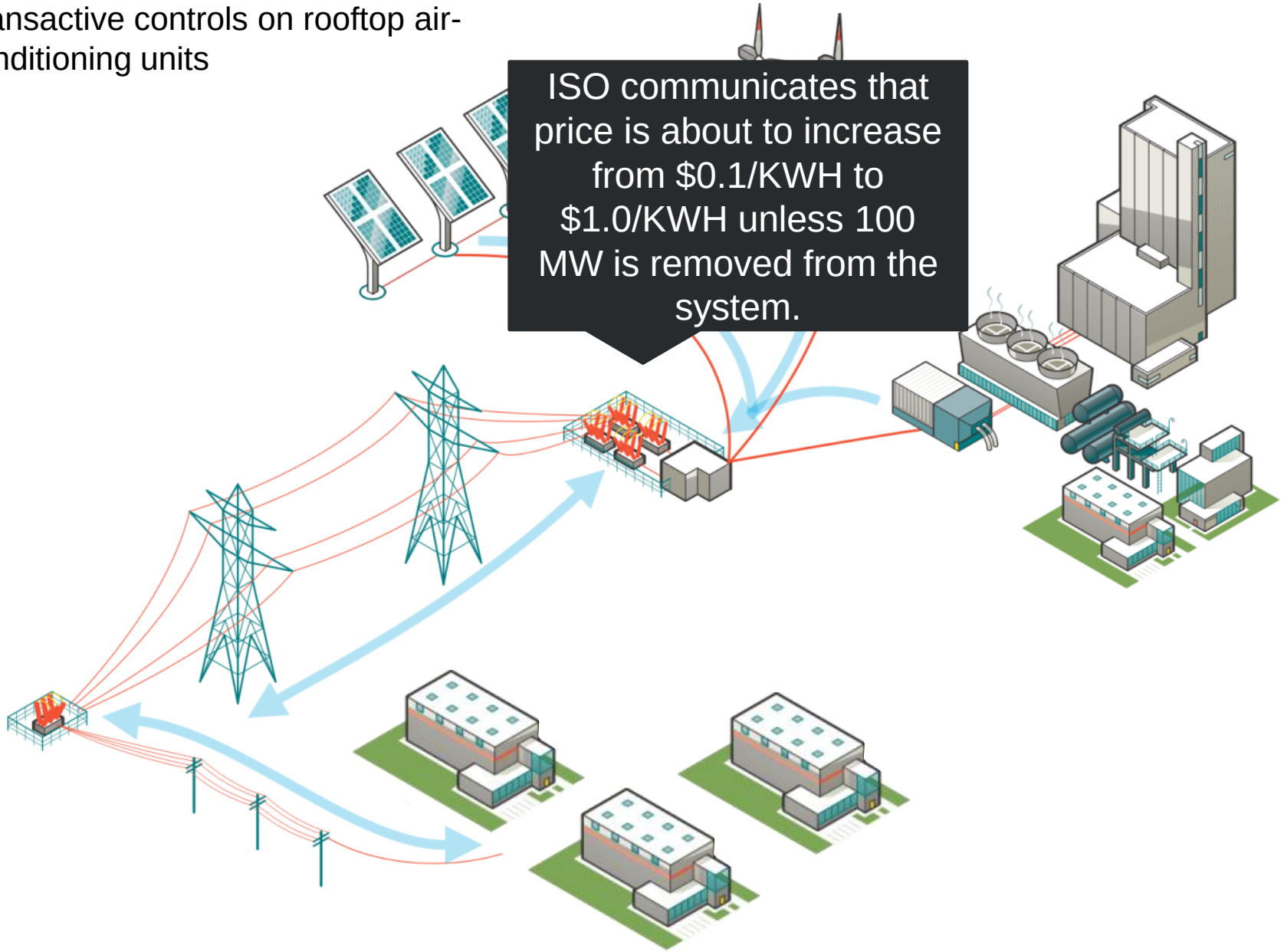
Example Opportunity:

- Value of transactive controls on rooftop air-conditioning units on a peak summer day



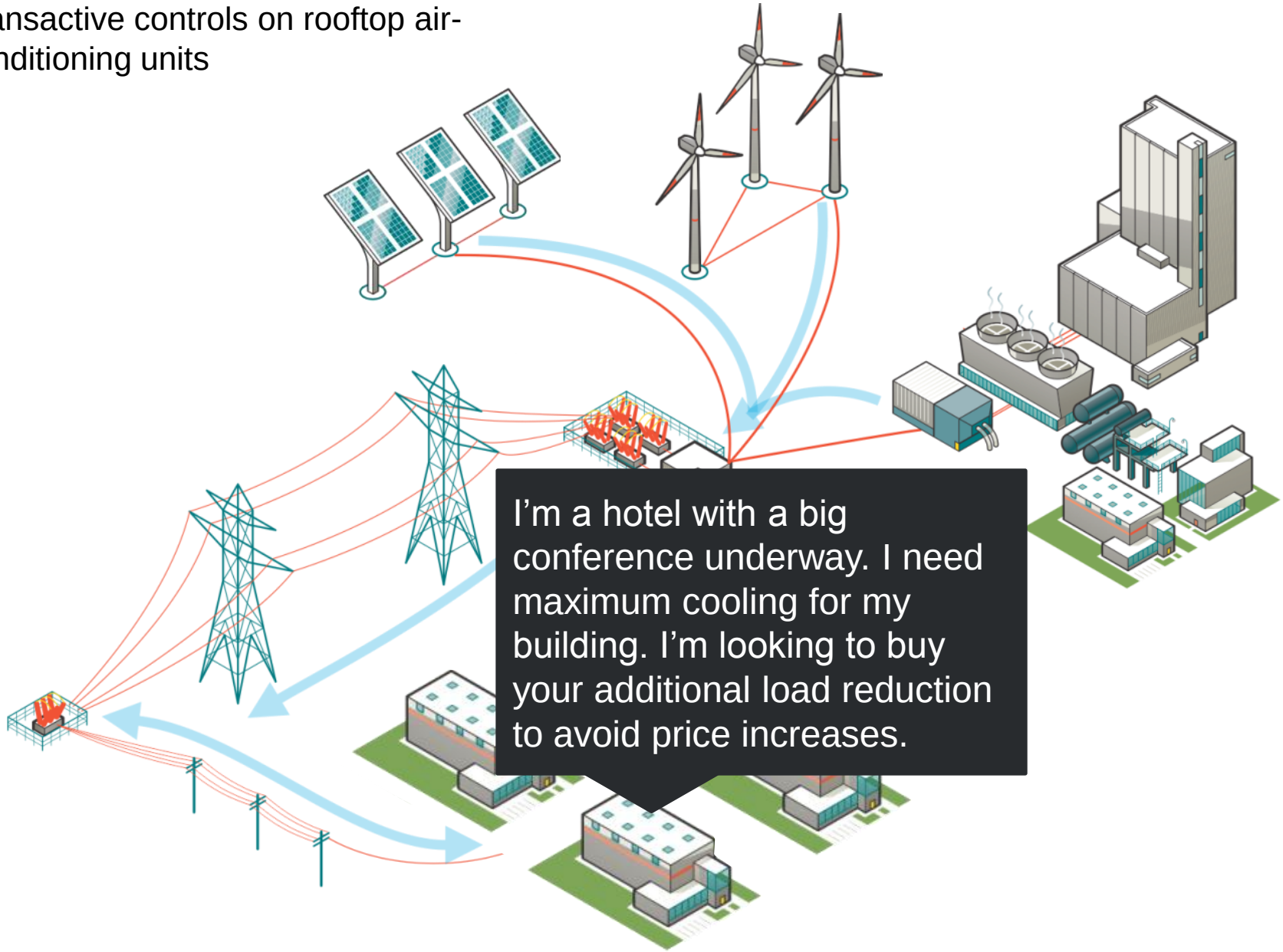
Example Opportunity:

- Transactive controls on rooftop air-conditioning units



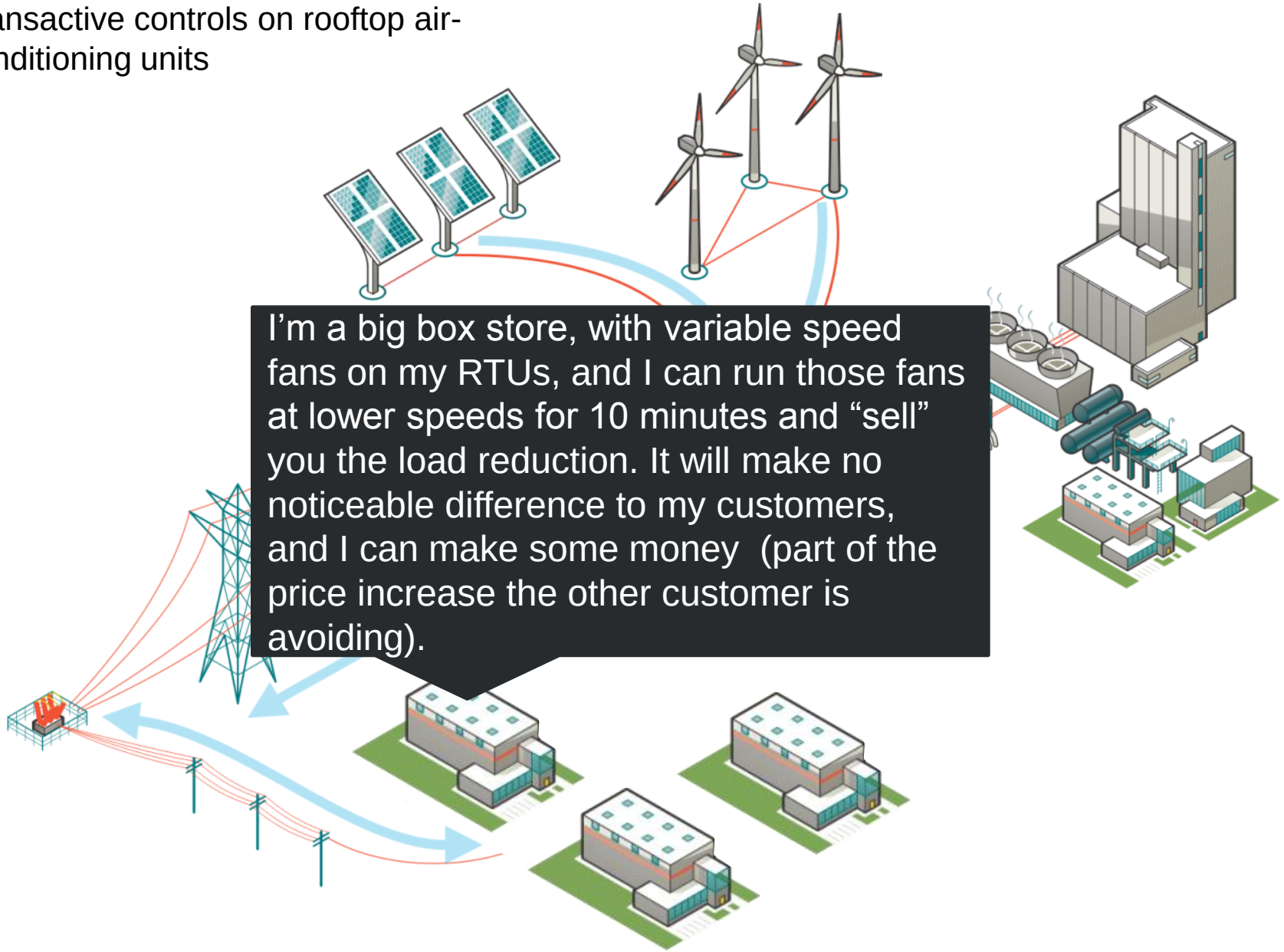
Example Opportunity:

- Transactive controls on rooftop air-conditioning units



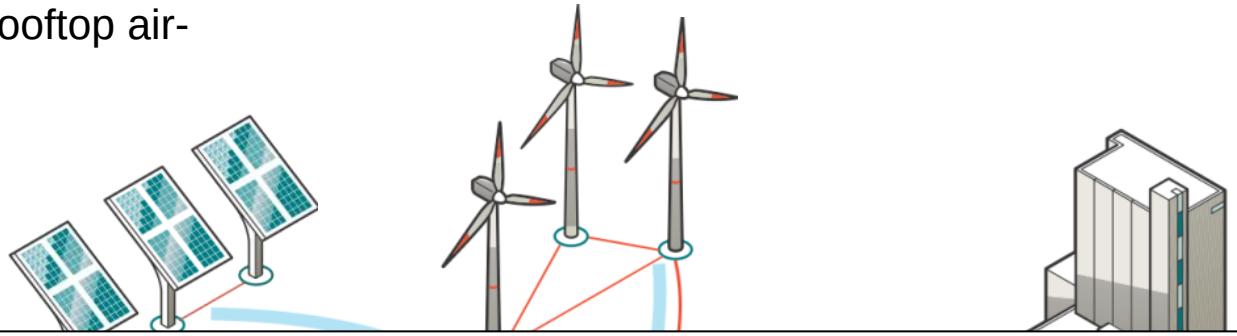
Example Opportunity:

- Transactive controls on rooftop air-conditioning units



Example Opportunity:

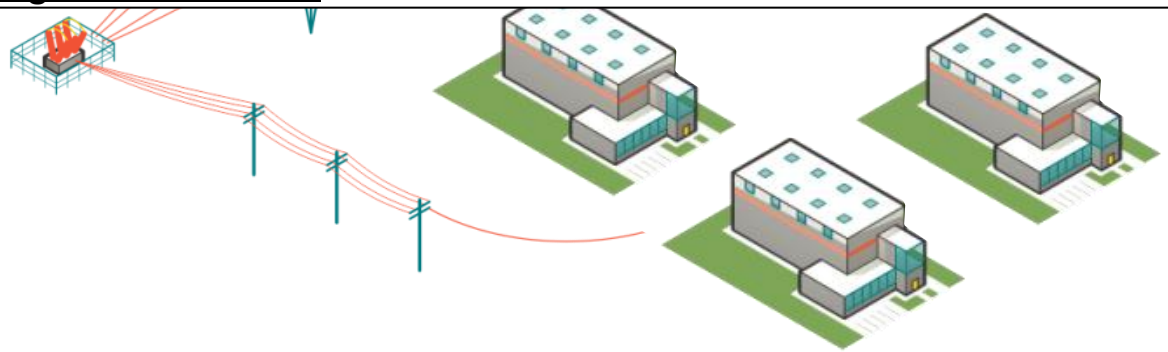
- Transactive controls on rooftop air-conditioning units



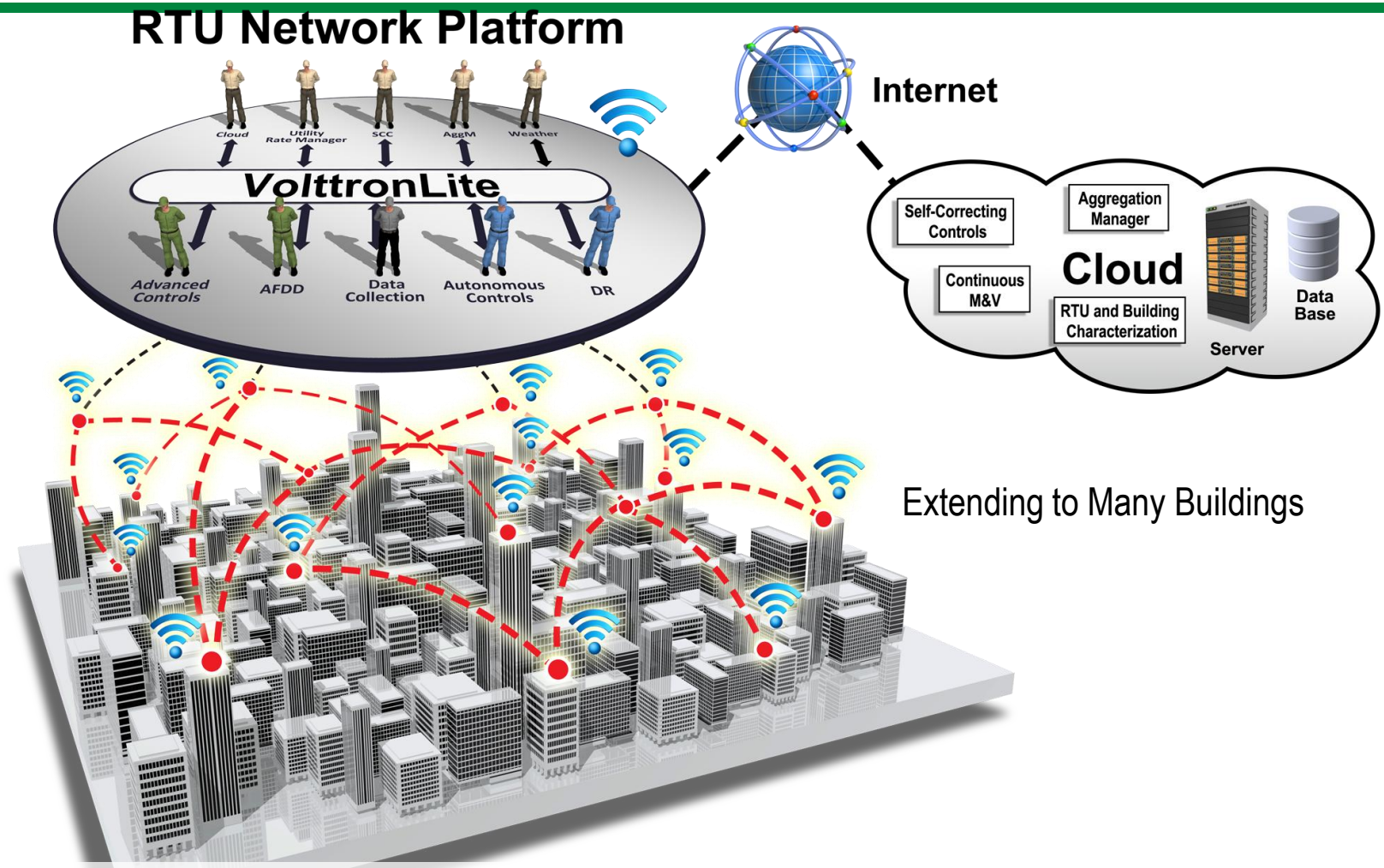
But to reach 100MW, negotiating and controlling across a few RTUs in a few buildings won't realize an impact.

However, if all the RTUs in a service territory -- across the national accounts AND the independents -- could autonomously and automatically aggregate to deliver a solution for the utility, the system would be optimized and building owners/operators would realize energy savings.

This will work if the equipment can systematically communicate, transact, and "settle" amongst themselves.



FY13 BTO Project: Open Source Controls



Opportunity: RTU Network Platform – Infrastructure + Controller to unlock opportunity for transactive control in RTUs.

A Future Grid has New Challenges

- Language is not consistent
- Data is rarely comparable
- Grid to Load transactions work – but are not scalable today
- **What else is BTO doing to support this Challenge**

Helping the buildings market use its data effectively

Two of the key market needs and BTO's contribution to meeting them by *using data as a resource*

Market Need:

- State and local governments are Increasing their role in efficiency programs and policies.
- They need tools to merge, match, and report information on building performance in standard formats.

Develop a low-cost analytical platform for public sector use based on common terms, definitions, and data exchange specification
Standard Energy Efficiency Data Platform (SEED)

Market Need:

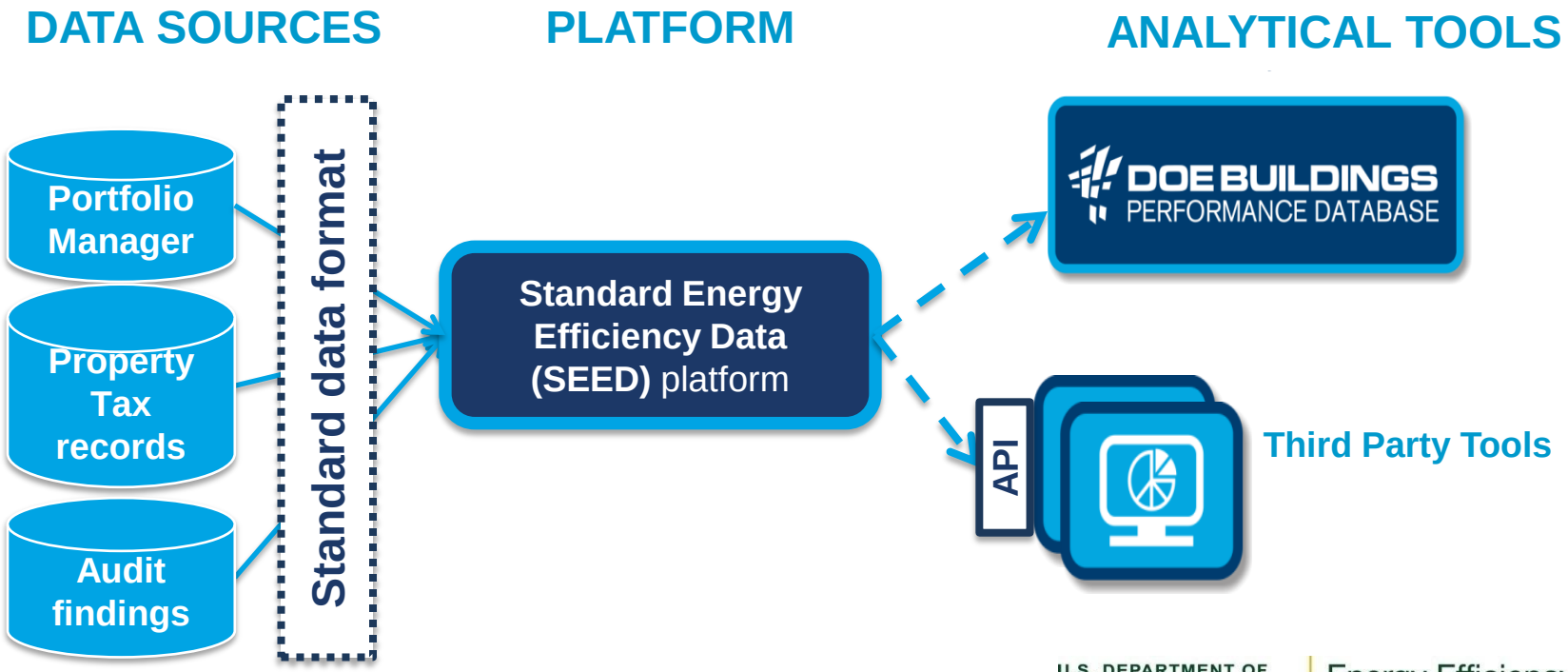
- Building owners and service providers need ways to use data to compare building performance against peers, and accurately predict performance of buildings and retrofit projects

Develop a large database of empirical building data to predict likely outcomes
Buildings Performance Database (BPD)

Thinking About Resources in New Ways: Standard Energy Efficiency Data (SEED) Platform

- The SEED platform utilizes a standard format.

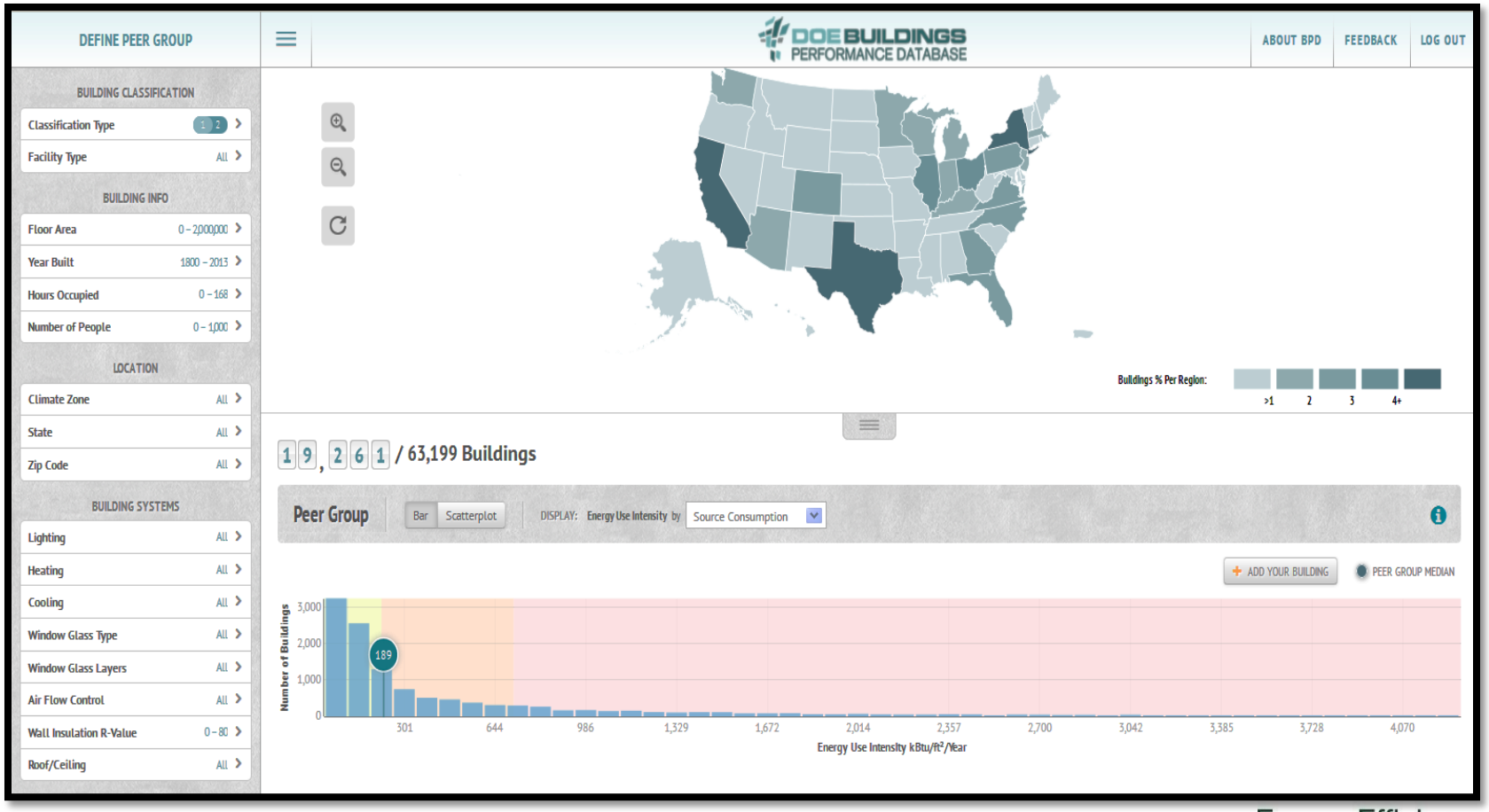
- SEED platform enables users to import data from multiple sources about the same group of buildings, and conduct cleaning, analysis and reporting of the information.



U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Thinking About Resources in New Ways: Buildings Performance Database (BPD)

- The BPD currently contains ***actual data*** on >60,000 existing commercial and residential buildings.



ENERGY | Energy Efficiency & Renewable Energy

Buildings-Grid Interface: Outstanding Data Challenges

Grid Integration is possible today, so what is the problem?

Scalable Interoperability:

- Equipment, systems, EVs, PV and buildings do not have a common data taxonomy or communications protocols.
- Many companies make “smart” products, most use their own proprietary protocols.
- Some quasi communication standards are in place, but they are either not specific enough or only cover a limited number of situations.

Today every interconnection requires a patchwork of different systems

What is DOE planning:

- Common data vocabulary and data exchange specifications (formats, etc)
- Support open communication protocols