

Organize Your Data!

How Federal Energy Data Infrastructure Supports Organizational Behavior Change

BECC

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Overview

- Why organizations merit focus for sustained energy behavior change
- Data's essential role as the currency of energy performance in organizations
- Federal agencies' efforts to provide energy performance data tools
- How market players are leveraging federal tools
- Emerging trends and needs
- Summary and conclusions



Why Organizational Energy Behavior Matters

- Organizations use most of the energy: 63% of U.S. final consumption (from EIA AEO 2014 reference case)
- Organizations measure performance—financially and by other metrics—regularly
- Most organizations work to improve performance
- Most organizations collect, analyze and report data to measure and track performance
- Leading organizations provide employee engagement that can support behavior change in households



Best Practices in Energy Management Center on Data

5 HABITS OF ENERGY EFFICIENCY LEADERS

Better Buildings Challenge Partners have committed to improve the energy intensity of their building portfolios by at east 20% over 10 years and share their strategies and results with the market. By transparently sharing their successful approaches to overcome obstacles. Partners are reading by example and heiping others to achieve their energy-saving goals.

Here are file key habts from energy efficiency leaders in the Better Buildings Challenge.

1. Know the goal.

Betting a quantifable and ambitious goal, at the highest level of an organization, gives focus Nost organizations quickly move from the goal to an organization-wide plan for how to reach b This readmap provides definition and dailty for action at all levels. Organizations that have set portfolo-wide goals and have met them, or are well on their way, include University of California, Inine. Legrand and Best Buy



2 Data matters

If you can't measure it, you can't manage it. These Better Buildings Challenge Partners are prime examples of how to measure building performance and use this information to effectively manage operations to save money: Mac/s TIAA CREF, Schneider Bechric, the City of Columbia, Masouri, the State of Delaware and the City of Beaverton, Oregon:

3. Look beyond technology.

Bure advanced technologies drive great energy savings, but the most successful projects combine technology advances with organizational commitments and active engagement of staff and customers. 3M the City of Arington, Viginia, Delaware State University, the states of North Carolina and Minnesota, the Commonwealth of Massachusetts, Kohls and Acca al demonstrate the power of this 1-2-3 punch



4. It takes an (energy) champion - and a team.

One person can really make the difference in leading the way and inspling others. An onsteenergy "champion" makinizes the benefits of energy management by fully integrating energysaving practices into operations. Baint-Gobain, the City of Hisboro, Oregon, the Bate of Maryland, Geveland Clinic, the City of B Paso, Texas and Currming are just a few of the organizations with a successful champion. Energy champions also know how to build a team and tap the expertise and on-the-ground knowledge of on-site staff to discover even more ways to save energy and water-and ensure those savings continue. Neous Energy and Energi, two Financial Alles, teamed up to save a mutual customer more than \$1 million dollars a year on energy bils. Staples' successful 'Eco Treasure Hunt Program' and New York Presbyterian Hospital



are preat demonstrations of with beople power matters. 5. Learn, teach and evolve. Successful businesses and organizations are constantly evolving to succeed and meet their customers' needs. These leaders also recognize that how they use their buildings must evolve too





The Seven Habits of Highly Efficient Companies

1. Efficiency is a Core Strategy

 Efficiency is an integral part of corporate strategic
 Efficiency is an ongoing part of the organization's planning and risk assessment and not just another cost management issue or sustainability "hoop" to lump through.

aspirations and metrics for itself.

2. Leadership & Organizational Support is Real & Sustained

- At least one full-time staff person is accountable
 Energy efficiency is part of the company's culture. for energy performance.
- Corporate energy management leadership interacts
 Employees are empowered and rewarded for with teams in all business units.
- · Energy performance results affect individuals' performance reviews and career advancement paths.

3. The Company Has SMART²⁹ Energy Efficiency Goals

- · Goals are organization-wide.
- Goals are translated into operating/business unit goals.
- Goals have specific target dates.

and core operations.

energy innovation.

and externally.

continuous improvement.

· Goals are linked to action plans in all business units.

· Performance data is visible to senior management

Resources are sustained over a multi-year period.

in a form they can understand and act upon.

· Energy performance data is shared internally

. The system is linked to a commitment to

· Companies invest in human capital.

- · Goals are updated and strengthened over time.
- · Goals are specific enough to be measured.

4. The Strategy Relies on a Robust Tracking & Measurement System

- . The system collects data regularly from all business units.
- The data is normalized and baselined.
- Data collection and reporting is as granular.
- as possible.
- · The system bracks performance against goals In a regular reporting cycle.

5. The Organization Puts Substantial Resources Into Efficiency

- . The energy manager/team has adequate operating resources.
- · Business leaders find capital to fund projects.

6. The Energy Efficiency Strategy Shows Demonstrated Results

- . The company has met or beat its energy
- performance goal.
- · Successful energy innovators are rewarded
- and recognized.

7. The Company Effectively Communicates Efficiency Results

 An internal communications plan raises awareness
 Successes are communicated externally. and engages employees.





Measuring Data Helps Drive Performance

- First year results from DOE's Better Buildings Challenge program, which requires benchmarking and disclosure; partners showed average annual savings of 2.5%
- 35,000 buildings that benchmarked with Portfolio Manager continuously from 2008 to 2011 achieved an average savings of 7% (2.4% per year)

www.energystar.gov/datatrends



On average, partners have improved the energy intensity of their building space by more than 2.5 percent per year.

2 5%



Energy Savings in Portfolio Manager

How Data Helps Drive Performance

- Data Analytics at the portfolio level
 - Benchmarking, outlier analysis, load profiles, disaggregation, utility bill analysis
- Targeted Site Prioritization
 - Identification of best and worst in class performers
 - Prioritize underperforming buildings
- Targeted Site Analytics
 - Conduct remote data analytics, phone interviews, site visits
 - Obtaining sampled building characteristics data to support data analytics
- Targeted Site Data Supports Portfolio Opportunities
 - Generalizing building-level analytics helps identify scalable improvements
- On-going Data Analytics
 - Compare actuals to predicted, improve tools, drive better results



Understanding Portfolio Performance





Using Data Analytics to Drive Portfolio Improvement





Case Study – Portfolio Strategy for Wyndham

- Site visits conducted at three Wyndham Hotel properties
- Goal of identifying low cost measures to reduce energy use
- In just six months, achieved 14% energy savings
- Opportunities Identified
 - Reduce default "lit-on" lights in guest rooms
 - Guest room temperature management
 - Adjust chiller coil temperatures based on outside air temperature
 - Monitor carbon monoxide (CO) levels to optimize garage fan
 - Corrected building interior pressurization
 - Manage kitchen exhaust hoods
 - Clean coils and filters aggressively
 - Manage maximum hot water temperature
 - Careful control of equipment operating schedules
 - Guest Room Loading Strategy
 - Lighting replacement

Site visits conducted by ICF through the US-China Sustainable Buildings Partnership (SBP)







Case Study: Toyota

- 23% reduction over six years
- Achieved by:
 - Assigning KPIs to production shops
 - Making shop captains accountable
 - Providing very granular weekly and monthly KPI data
 - Forcing shop captains to ask
 Facilities for help
 - Maintaining "kaizen" database of EE improvement options
 - EE moved out of the boiler room and onto the shop floor
 - Creating friendly shop competitions

North America Energy Consumption Per Unit



Recreated based on image provided courtesy of Toyota (2009).



Case Study: IBM

- EE target set at 3.5% year
- Achieved by:
 - Triaging reporting: ~600 of 1100+ sites
 - Triaging management focus: manufacturing/data centers, major facilities, minor facilities
 - Dashboarding facility performance
 - Getting facilities staff involved in production unit operations
 - Driving greater innovation by asking people to look at technology solutions
 - Driving most energy performance improvements via behavior change and automation of change

	Clusters: Space Types								
Energy Drivers	Manufacturing	Data Centers	Office Spaces	Labs & Research	Total Spend				
HVAC	20%	10%	50%	30%	27%				
Data Center Equipment		65%	line.	25%	22%				
Central Utility Plant (CUP)	25%	20%	(20%	16%				
Manufacturing Processes and Tools	45%	-		2.8.4	14%				
Lighting	10%	5%	25%	10%	13%				
Plug Load			25%	15%	8%				
Total Spend	30%	28%	28%	13%					

Recreated from image provided courtesy of IBM (2009).

			As af Date	10/2009	10/2009	10/2009	10/2009	10/2005
			Previous Visar VTD Usage Total	NA.	NA	NA	NA	NĂ
			Current Year YTD Usage Total	164-	NA	144	NA	NA
			Vear to Year PCT Chg Total	-2.0%	-2.0%	2.01		2.0%
Rank	Locations	Geographies /	Countries	Previous Vear VTD Usage (MWb)	Current Year YTD Usage (MWh)	Year to Year PCT Change	Avg CY Rate (S/MWb)	YTD SK Impact
1	Location 1	North America 108	United States	438,612	406,926	1.25	\$80.13	\$2,631
2	Location 2	Notti America IOF	United States	376,767	343,814		\$45.25	-\$2,811
3	Location 2	North America 108	United States	212,868	193,991		381,24	-41,535
4	Location 4	North America IOT	United States	118,050	125,481		\$56,71	\$421
5	Laration 6	North America 101	United States	161,824	148,770		\$62.08	\$169
6	Location 6	North America IOE	United States	96,099	63,173		\$81,45	8564
7	Lication 7	North America IOT	Canada	117,449	104,042		\$41.28	-1708
8	Location B	Southwest Europe (Of	France	47,704	63,622	33.4%	\$71.35	\$1,135
ġ	Lucation 9	North America 107	United States	64,357	64,954		\$83.44	\$50
10	Location 10	North America 301	United States	94,664	87,572		\$73.70	461.6
u	Likelinin 11	North America IOT	United States	44,631	42,191		\$118.21	4218
12	Localise 12	North América IOF	United Slates	50,148	49,553		\$68.50	-\$41
13	Louis or 19	Northeast Europe	United Kingdom	45,023	42,971		\$119.66	-\$246
14	Deputies 14	North America 101	United States	38,308	\$7,830		\$114.23	466
16	Location 10	Latin America GMT	Brazil	46.062	62,163		\$154.74	\$1,099
16	Location 16	North America IOT	United States	44,714	47,107		\$123.49	\$295
17	Location 17	Northeast Europe	United Kingdom	42,061	43,410		\$113.91	\$150
18	Location 18	Northeast Europe	Instand	26,644	21,271		\$113.40	\$466



Energy Efficiency & Renewable Energy

U.S. Government Tools Make it Easier



Green Button Initiative

- Consumer access to energy data in electronic format
- Enables development of software applications
- Available to 42+ million customers now and 59+ million in the future
- Based on North American Energy Standards Board (NAESB) Energy Services Provider Interface (ESPI) standard







ENERGY STAR Portfolio Manager – U.S. and Canada

Operational rating tool: tracks energy and water usage data Provides weather-normalized EUI and a 1-100 score



Commercial Asset Score & Home Energy Score

Asset rating tools: provide a score and identifies opportunities for improvements, <u>based on buildings' physical characteristics.</u>





Government Agencies need to Combine and Share Data



Standard Energy Efficiency Data (SEED) platform

- Open source software includes database and user interface
- Initially designed to help cities manage building transparency programs, but has many other potential uses by public entities, utilities, etc. around the world.

ñ	Erik Larson		SEED PLATFORM Search						+	
b	Projects	o	🗒 1,601 Buildings							
Ħ	Buildings	1,601 2	Action - All Building Info Compliance Info							
*	Data		D ID		ADDRESS	NAME	FLOOR AREA FT		YEAR BUILT 👻	USE TYPE
				ID.	Address	Name	Min	Мах	Year Built	Use Type
1	нер		0	IMP78-6970045 1015 HALF ST 400,00		400,000		2011	COMMERCIAL	
A	Feedback		Ø	IMP78-1270055	0800 17TH ST		431,570		2010	COMMERCIAL
			Q	IMP78-12990325	1855 WISCONSIN AV		60,000		2010	COMMERCIAL
			Q	IMP78-6280901	0020 F ST		173,460		2010	COMMERCIAL
				IMP78-7110809	145 N ST		589,000		2010	COMMERCIAL
				IMP78-7740058	1005 3RD ST		140,908		2010	RESIDENTIAL-MULTI FAMILY
			0	IMP78-26780709	3460 14TH ST		353,792		2009	RESIDENTIAL-MULTI FAMILY
			O	IMP78-28680155	2305 14TH ST		276,542		2009	RESIDENTIAL-MULTI FAMILY
			Q	IMP78-29107002	4100 GEORGIA AV		75,240		2009	RESIDENTIAL-MULTI FAMILY
				IMP78-3200028	1155 F ST		380,222		2009	COMMERCIAL
			Disp	lay: 10 🛊 buildi	ngs	Showi	ng 291 to 300 of 1,	,601 buildings		« Previous Next »

Data in the BPD can be accessed by the public.



The Buildings Performance Database (BPD)

The BPD enables users to statistically analyze trends in the energy performance and physical & operational characteristics of real commercial and residential buildings.



A common format makes it easier to transfer data.





The Building Energy Data Exchange Specification



Residential, commercial and multifamily sectors



Activity areas, equipment and operational characteristics, energy consumption, energy conservation measures and costs



Project, building, campus or program-level information



BEDES establishes data fields, definitions, units of measure, and file formats

• States and Cities:

- Portfolio Manager for benchmarking and disclosure policies (Boston, Cambridge, New York, Philadelphia, DC, Montgomery County, Austin, Chicago, Minneapolis, Seattle, Washington State, San Francisco, California
- SEED for data management and reporting
- Building Performance Database
- Asset Rating Tools

• Utilities

- Portfolio Manager for data access, program baselines, tracking
- Asset rating tool for customer programs

• Third parties

App developers using open-source, API features to build commercial data offerings



Market Actors' Use of Federal Tools



Utility Automated Benchmarking Web Services





Home > Business > Business Type > Property Management > Automated Benchmarking Service

Welcome to Automated Benchmarking Service, your next step to optimizing energy usage in your building.

+ Smart Energy Savers Program

+ Residential

- Business

Business Type

Education

Government

Healthcare

Hospitality

Industrial

Nonprofit

Property Management

Retail

Other

Small Business Energy Solutions

the Energy Solutions for Business Combined Heat and Power

Retrocommissioning

Service Providers

Events Calendar

• Resources

Customer Spotlights

Partnering with EPA's ENERGY STAR Portfolio Manager (an online tool you can use to measure and track energy consumption) Automated Benchmarking Service will wizard you from identification of your building to validation of the number of accounts to aggregation of the building usage data into a single virtual meter number that can be used in Portfolio Manager to generate your benchmark score.

For buildings that have five or more tenants, energy usage data will be automatically aggregated. However, for buildings that have fewer than five tenants you will need you to download the consent form and get authorization from each of the tenants.

If you are a new user, and wish to proceed with registration,



Any time there are any changes in tenant occupancy or account information, you are required to update the building in order to generate the most accurate benchmarking score and to keep the consent form up to date.





What Lies Behind the ABS User Interface



Matching Buildings to Accounts via Virtual Metering





+ Smart Energy Savers Program

+ Residential

- Business

- Business Type
 - Education
 - Government
 - Healthcare
 - Hospitality

Industrial

- Nonprofit
- **Property Management**
- Retail
- Other
- Small Eusiness Energy Solutions
- + Energy Solutions for Business Combined Heat and Power
- + Retrocommissioning
- + Service Providers
- Events Calendar
- + Resources Customer Spotlights

26



0 SHARE 💽 💓 🖂 ...

Your Virtual Meter Number for Portfolio Manager

Congratulations! We have successfully aggregated the energy usage data on your building and created a Virtual Meter Number. Please visit ENERGY STAR Portfolio Manager web site in order to create your building profile. Upon creation of your building profile, the system will ask for meter numbers of the tenants. Please use the following Virtual Meter Number in place of Meter Number entry in order to automatically retrieve your energy usage from BGE.

Electric Virtual Meter Number: XXXYYY12345 Gas Virtual Meter Number: XXXYYY67890

Please check back into Automated Benchmarking Service page upon completion of the Portfolio Manager setup to see a dashboard view of how your building is performing! Dashboard view will provide you with benchmarking scores trend of your building from Portfolio Manager over time.

If you wish to add another building profile, please click here.





Emerging trends and needs

- Converging asset and operational ratings
 - Advanced data analytics enables synergistic learning
 - Calibration of asset rating tools<<>>improvement of analytics tools
- Converging low-cost sensors and building analytics
 - Reduces costs for key data acquisition
 - Enables more accurate analytics tools
 - Requires advanced pattern recognition/machine learning software
- Integrating advanced analytics into program evaluation
 - Developing baselines using convergence methods above
 - Measuring savings in semi-real time
 - Rolling up savings data to portfolio level



Summary

- Organizations can be powerful agents of behavior change
- Data is the currency of behavior change for energy performance
- Federal data tools and services help data exchange and reporting through:
 - Standard formats: BEDES, Green Button
 - Open source platforms with API: SEED
 - Building analytics tools: Asset Scoring Tool
 - Benchmarking tools: Portfolio Manager
- Benefits to organizations include:
 - Enhanced data access
 - Benchmarking services
 - Better bases for valuing energy performance
- Public sector benefits include:
 - Increased visibility of energy performance in the market
 - Platforms and tools that support policy and program goals
 - Reduced costs and increased consistency for EE programs and policies

