Navigating Key DOE Tools for your State and Community Energy Decarbonization Projects

Tuesday, April 11, 2023
3:30 – 5:30pm ET
Shannon Zaret
DOE
Today’s Presenters

• Katie Richardson, Group Manager at Innovation and Entrepreneurship Center
  • National Renewable Energy Laboratory

• Sydney Applegate, ORISE Science Technology and Policy Fellow
  • DOE: Building Technologies Office

• Jeff Wanner, Technical Project Engineer
  • DOE: Building Technologies Office

• Shannon Zaret, Management and Program Analyst
  • DOE: Office of State and Community Energy Programs
Katie Richardson
National Renewable Energy Laboratory: Innovation and Entrepreneurship Center
C2C's Expert Match Program connects clean energy experts with local governments, electric utilities and community-based organizations to provide technical support for renewable energy projects in low-income communities.

Expert Match offers:

- **Access to experts from the U.S. Department of Energy’s national lab system.**
- **40–60 hours of support over 2–3 months from first kickoff call.**
- **Focus on community-driven challenges or goals—from clean electricity, buildings, mobility, and grid to financing, environmental justice, and more.**

For more information, visit: [www.nrel.gov/c2c/expertmatch](http://www.nrel.gov/c2c/expertmatch)
Cohoes, New York, is a small working-class community in upstate New York with limited resources and energy-related expertise. The city wanted to reduce its climate impact, but its municipal buildings were old and many had slate roofs that weren't suitable for solar panels.

Expert Match helped Cohoes reduce its climate impact and increase its renewable energy capacity by providing guidance on:

Retrofitting historic buildings for energy efficiency, including reviewing proposals for reducing emissions and evaluating technology options.

Developing a 3.2-MW floating solar project on the water reservoir, which will generate electricity for municipal buildings and share with other organizations.

For more information, visit: www.nrel.gov/c2c/expertmatch
Sydney Applegate
Jeff Wanner
DOE: Building Technologies Office
BTO Building Energy Data Software Tools

Better Buildings Summit 2023
**Building Energy Data Tools**

**UBID** – unique building identifier based on geospatial location supporting data use

**SEED** – central database for building related information

**Audit Template** – standard format for building data collection & persistency

**BETTER** – identifies targeted energy efficiency upgrades from a building’s annual energy usage
UBID (Unique Building Identifier)

- The need for a consistent and verifiable mechanism for identifying buildings and tracking related data led to the creation of UBID.
- **UBID**: Geospatial unique identifier for buildings that is more precise & validated
  - Preserves parent-child relationships between buildings (i.e., campus)
  - Via a map interface this tool generates an alpha-numeric string that corresponds to specific locations and can be decoded as needed.
- UBID is a methodology with some limited supportive tooling to enable users to generate identifiers.

Methodology is published, copyrighted, patented, with 2D approach open-source.
In the same way that ENERGY STAR Portfolio Manager has a reporting template for public agencies with benchmarking programs, we created the parallel path for audit/asset-based programs.

- Audit Template is designed to be customizable for program administrators, agencies and portfolio owners to include the characteristics and details they deem valuable.
Audit Template

• **Free, web-based tool** to collect, store, and report building energy and water asset data

• The generated asset data report may be submitted to jurisdictions or agencies to **demonstrate audit completion or any asset-based alternative compliance pathway**
Audit Template Workflow

Total of 1800+ audits per year are required to go through Audit Template.

Building Owners/ Auditors/Energy Managers
Submit to Agency

Enter asset data requested by jurisdiction or agency

Audit Template report submitted to program admin and/or downloaded by user

Program Admins/ Agency
View, Review, and Manage Reported Data

BuildingSync XML
Audit Template At-a-glance

- Built in QA/QC ensures high quality data submissions
- Capability to collect professional credentials
- Reports available to download for owner and service provider

Custom Inputs
• City administrators have access to a **‘City Dashboard’** which is a support tool to review, approve, and track submitted buildings.

• Older versions of submissions are saved and available for review.

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**Audit Template**

**San Francisco, CA**

<table>
<thead>
<tr>
<th>Submission ID</th>
<th>San Francisco Assessor Parcel Number</th>
<th>Building Name</th>
<th>Address</th>
<th>Submitted UTC Time</th>
<th>Submitter</th>
<th>Comment</th>
<th>Status</th>
<th>Options</th>
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<td>Received</td>
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<td></td>
<td></td>
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</table>
SEED (Standard Energy Efficiency Data)

A central database for jurisdictional building energy policy/program data. It merges information from Portfolio Manager, Audit Template, and other city datasets in one place, behind one intuitive interface.

- Simplify data management.
- Improve data quality while reducing staff time.
- Automate spreadsheet-based workflows.
- Centralize all data in one place behind an easy-to-use dashboard.
- Convert data into actionable insights.
- Share Data to CRM & dashboards
- Track BPS compliance & progress
- Use geospatial data to visualize an entire building portfolio.
- Keep data secure and private

Get started by requesting a free test account and one-on-one demonstration or contact BTODataTools@ee.doe.gov

25% Reduction in time spent managing programs
Map Analysis & Justice40 Tracking
Program Tracking: Reports

SEED PLATFORM™

Inventory Reports

From first date of: BETTER 2021
Until last date of: BETTER 2021
X Axis: Gross Floor Area (ft²) ➔ Y Axis: Year Built ➔ Update Charts

Gross Floor Area (ft²) vs. Year Built

Gross Floor Area (ft²) vs. Year Built (Aggregated)

Year Ending Properties with Data Total Properties
--- --- -------
2021 174 175
2020 174 175
2019 1 322
2021 174 175

Year Ending Properties with Data Total Properties
--- --- -------
2021 174 175
2020 174 175
2019 1 322
2021 174 175
Program-wide Dashboard

Program Overview

Need to configure your Program Metrics? Program Metric Configuration page.

Chart Legend
- Compliant
- Not Compliant
- Unknown

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<tr>
<th>CYCLES</th>
<th>2019 CALENDAR YEAR</th>
<th>2020 CALENDAR YEAR</th>
<th>2021 CALENDAR YEAR</th>
<th>2022 CALENDAR YEAR</th>
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<tr>
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<td>5</td>
<td>29</td>
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<td>0</td>
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<tr>
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BETTER Results in SEED

<table>
<thead>
<tr>
<th>PM Property ID</th>
<th>Property Name</th>
<th>Address Line 1</th>
<th>City</th>
<th>BETTER Potential Cost</th>
<th>BETTER Potential Energy</th>
<th>BETTER Potential GHG</th>
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<td>Allison-Webb</td>
<td>894 Mills Fork</td>
<td>Manteca</td>
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<td>12254.92</td>
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<tr>
<td>53122797</td>
<td>Anthony, Cabrera and ...</td>
<td>24632 Gregory Vista</td>
<td>Susanville</td>
<td>67027.96</td>
<td>92318.68</td>
<td>18158.84</td>
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<td>66670865</td>
<td>Bender-Johnson</td>
<td>945 Lynch Ramp Suite ...</td>
<td>Crescent City</td>
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<td>El Monte</td>
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<td>82965112</td>
<td>Campos, Flynn and Do...</td>
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<td>Yuba City</td>
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<td>4277132</td>
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<td>Martinez</td>
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<td>84613073</td>
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<td>806 Brad Junction</td>
<td>Riverside</td>
<td>2330726</td>
<td>263000.09</td>
<td>53159.17</td>
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</table>

There are 40 properties in the table.
BETTER Results in SEED
BETTER - Building Efficiency Targeting Tool for Energy Retrofits

- With utility billing data and basic building information BETTER conducts an inverse modeling analysis effort to identify energy savings opportunities.
- Uncovers no-/low-cost operational energy efficiency measures to cut energy use 5-10% portfolio-wide.
- Identifies buildings ready to achieve net zero energy.

1. Simple Data Inputs
   - Building Type
   - Building Address
   - Gross Floor Area
   - Fossil
   - Electricity

2. Fast Analysis
   - Electricity Change-point Model
   - Electricity Consumption Benchmarking

3. Actionable Outputs
   - Cost Savings (USD / $):
     - Reduce Equipment Schedules
     - Reduce Lighting Load
     - Reduce Plug Loads
     - Decrease Heating Setpoints
     - Increase Cooling System Efficiency
   - Building Portfolio Savings Comparison
Since release in June 2021, ~7000 buildings and 550M ft² across 16 sectors entered

"BETTER has helped our school division identify substantial energy cost savings, which can be redirected into the classroom. With its simple data inputs and powerful analytics, we believe BETTER is poised to help hundreds of school districts across the country to improve their energy, financial, and environmental performance." — Bryan Conrad, Energy Education Coordinator for Prince William County Public Schools

“BETTER offers a possibility of delivering efficiency retrofits in underserved markets faster and cheaper by orders of magnitude.” — Tom Strumolo, Founder, Energy General LLC
Better V1.0 Building Summary Report
Campus, Flynn and Douglas
Generated at

Overview
Building Type: Gross Floor Area (ft²):
Office 229,512.7

Building Location: Closest Weather Station:
3827 West Chapman Avenue, Orange, California
Station: 722977-93184 : J. Wayne Apt-Orange Co Apt

Potential Cost Savings: Potential Energy Savings:
$1,109,555 30,195,347 kBTU
80.9% 83.1%

Electricity Energy/Cost Savings: Fossil Fuel Energy/Cost Savings:
80.2% 92.8%

GHG Emissions Reduction: GHG Emissions Intensity Reduction (MTCO₂e/ft²):
1,899.8 0.008
82.7 %

Electricity Model: Your consistent baseload is 0.07 kBTU/(ft²)*day, or 25.6 kBTU/(ft²)*yr, [Baseline]. The building's energy consumption start to increase as the outside air temperature goes above 57.1 °F [Cooling Change-Point]. Beyond the cooling change-point, the daily energy consumption increases by 115 (kBTU) when outdoor air temperature increases by 1 °F [Cooling Sensitivity].

Electricity Change-point Model (R² = 0.83)

Electricity Consumption Benchmarking
Baseline (Typical)
Cooling Slope (Typical)
Cooling Change-point (Good)

Note: % indicates the percentage of buildings your building is superior to.

Fossil Fuel Model: Your consistent baseload is 0.007 kBTU/(ft²)*day, or 2.6 kBTU/(ft²)*yr, [Baseline]. The building's energy consumption start to increase as the outside air temperature goes below 73.2 °F [Heating Change-Point]. Below the heating change-point, the daily energy consumption increases by 84.5 (kBTU) when outdoor air temperature decreases by 1 °F [Heating Sensitivity].

Fossil Fuel Change-point Model (R² = 0.82)

Fossil Fuel Consumption Benchmarking
Baseline (Typical)
Heating Slope (Poor)
Heating Change-point (Poor)

Note: % indicates the percentage of buildings your building is superior to.
Shannon Zaret
DOE: Office of State and Community Energy Programs
Low-income Energy Affordability Data (LEAD) Tool

April 2023
Shannon Zaret
The LEAD Tool is the only publicly available analytical tool for household energy burden. The tool helps stakeholders create better energy strategies and programs by improving their understanding of housing and energy characteristics for low- and moderate-income households.

By the Numbers

- Nearly **30,000** Unique Visitors in 2022
- In 2022, States, local governments, and organizations have used the LEAD Tool to inform policy, programming, and research.

Use Case 3
Carrboro, NC (2017)

City Energy Goal: reduce GHGs by 50% by 2025

Objective: Achieve goal without passing costs to low-income residents; target building energy actions and policies to benefit low-income households.

- Renters were more likely to live in multifamily buildings, use electric heating, and be low-income than homeowners.
- In Carrboro, programs that targeted energy efficiency upgrades in multifamily buildings could have larger impact on low-income residents.

Conclusion: converting rental properties from propane to variable-speed heat pumps could target units with occupants experiencing a higher energy burden.

1. Includes all 50 states, plus Puerto Rico and the District of Columbia
2. Including, but not limited to: National Grid, the State of Kentucky, Rochester, NY, New Haven, CT, and Carrboro, NC
4. Most renter-occupied units are in buildings of 3 units or more.
What is the LEAD Tool?

Accessible Energy Burden Analysis

- The LEAD Tool was created in response to stakeholder requests for greater accessibility to energy burden analysis to provide data to drive policy and program-making decisions.

- DOE gathered substantial stakeholder feedback through the Clean Energy for Low-Income Communities Accelerator (CELICA) – an initiative to lower energy bills for low-income communities - for improvements to the LEAD Tool’s interface and analytical capabilities.

Use the LEAD Tool to:

1. CELICA Toolkit: Clean Energy Solutions for Low-Income Communities | Better Buildings Initiative
What Information is in the LEAD Tool?

**Geographic Boundaries**
- National, state, county, tribal, city, and census tract boundaries.
- Includes 50 states, DC, Puerto Rico, and federally recognized tribes.

**Household Characteristics**
Households can be broken down by:
- Area Median Income (AMI)¹
- State Median Income (SMI)
- Federal Poverty Level (FPL)²
- NEW: demographics³

**Housing Unit Characteristics**
Users can analyze energy expenditures by:
- Occupant type (owner, renter)
- Building age
- Building type
- Number of units in building
- Primary heating fuel type

**Energy**
- Average annual energy cost
- Average energy burden (% income)

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1. AMI and SMI categories: 0-30%, 30-50%, 50-80%, 80-100%, 100+%  
2. FPL categories: 0-100%, 100-138%, 138%-200%, 200-400%, 400%+  
3. Demographics include race and education attainment
Who Uses the LEAD Tool?

The LEAD Tool is used by federal, state, and local government agencies, utilities, nonprofit organizations, and universities.

**Federal Government**
- **Congress** – cited LEAD data in a memorandum\(^1\) from the House Committee on Energy and Commerce.
- **EPA** – Energy savings and Impacts Scenario Tool relies on LEAD energy burden data.
- **USDA** – Rural Business-Cooperative Service cited the LEAD Tool as priority consideration for competitive awards.\(^2\)
- **DOE** – the State and Local Planning for Energy (SLOPE) platform uses energy burden metrics from the LEAD Tool.

**State Government**
- **Kentucky** – Office of Energy Policy used LEAD to identify participants for a pilot project to provide energy efficiency upgrades to low-income households.\(^3\)
- **Wisconsin** – Public Service Commission of WI, Focus on Energy, and the WI Office of Energy used LEAD to target policies toward low-income renters facing barriers to energy efficiency upgrades.\(^4\)
- **Washington** – Department of Commerce used LEAD to prioritize energy assistance toward low-income, high energy burden households.\(^5\)

**Energy Utilities**
- **PacifiCorp** – used LEAD to estimate customers’ energy burden in support of their Clean Energy Implementation Plan.
- **Xcel Energy** – includes LEAD in their “Reaching Underserved Populations Toolkit.”
- **Portland General Electric (PGE)** – used LEAD to quantify equity metrics as part of their Distribution System Planning Process.

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\(^1\) Hearing on “Generating Equity: Deploying a Just and Clean Energy Future” (2021): [HHRG-117-IF03-2021-0420-SD-02.pdf](http://house.gov)
\(^3\) KY Case Study (2021): [https://lead.openei.org/assets/docs/LEAD-Kentucky-Case-Study.pdf](https://lead.openei.org/assets/docs/LEAD-Kentucky-Case-Study.pdf)
## Responding to Partner Needs

<table>
<thead>
<tr>
<th>Stakeholder Challenge</th>
<th>LEAD Tool Response</th>
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</thead>
<tbody>
<tr>
<td>• Lack of easily-accessible data on low- to moderate-income household energy characteristics</td>
<td>• The LEAD Tool launched in 2016 to help stakeholders make data-driven decisions on energy goals and program planning by improving their understanding of low-income and moderate-income household energy characteristics.</td>
</tr>
<tr>
<td>• Easy ways to compare/visualize data</td>
<td>• Filter groupings added, users are now able to compare different geographic locations simultaneously (2019)</td>
</tr>
<tr>
<td>• Tribal lands not outlined in the tool</td>
<td>• Federally recognized tribal areas added to LEAD tool dataset and maps - 2021</td>
</tr>
</tbody>
</table>
| • Stakeholder need for additional equity layers and functionality                    | • Demographic data - educational attainment and race - added to the LEAD Tool.  
• DOE made improvements to the tool’s speed and usability (2023)  
• **Planned work**: an analysis of historic zoning (e.g., redlining) and modern energy burden; incorporation of disadvantaged community boundaries from White House tool. |
| • Weatherization Assistance Program (WAP) stakeholders have difficulty identifying local service territories, finding resources related to energy burden | • **Planned work**: solicit feedback from WAP stakeholders at the 2023 Home Performance Conference on how the LEAD Tool can better support their work to reduce energy burden in low income households. |
| • Inflation Reduction Act (IRA) Home Energy Rebates Program                          | • **Planned work**: US Map showing AMI by HUD-defined areas; Datasets linking US area to 80% AMI and 150% AMI threshold varied by household size; Search bar that allows a user to enter a zip code and household size to produce resultant 80% AMI and 150% AMI values. |
Kentucky Office of Energy Policy (OEP)

Objectives

• Identify building types most commonly occupied by low-income households in counties where energy burden is high.
• Better understand building types occupied by low-income households in these counties means OEP can assess how well the services offered by HDA address high energy burden in these communities and whether additional services may be needed.

Results

OEP used LEAD to target support to high energy burden households through:

• Funding for four affordable housing organizations to conduct home repair, weatherization, and other low-income programs
• HDA’s Hope Building program: people recovering from substance abuse receive paid job training in construction while they build new energy-efficient homes for low-income county residents
• Kentucky Home Uplift: provided energy efficiency upgrades to 25 low-income households.
Table 1: Number of households earning 0–60% AMI in single-family and “other” building types and energy burden in five Kentucky counties served by HDA. (Source: LEAD tool)

<table>
<thead>
<tr>
<th>Name</th>
<th>Building Type</th>
<th>Housing Counts</th>
<th>Energy Burden (%)</th>
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<tr>
<td>Breathitt County</td>
<td>1 unit detached</td>
<td>1,032</td>
<td>16</td>
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<tr>
<td>Breathitt County</td>
<td>Other</td>
<td>1,151</td>
<td>16</td>
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<tr>
<td>Floyd County</td>
<td>1 unit detached</td>
<td>2,896</td>
<td>16</td>
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<tr>
<td>Floyd County</td>
<td>Other</td>
<td>1,924</td>
<td>17</td>
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<tr>
<td>Knott County</td>
<td>1 unit detached</td>
<td>1,217</td>
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<td>Other</td>
<td>1,134</td>
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<td>Leslie County</td>
<td>1 unit detached</td>
<td>790</td>
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<td>Leslie County</td>
<td>Other</td>
<td>998</td>
<td>17</td>
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<tr>
<td>Perry County</td>
<td>1 unit detached</td>
<td>1,806</td>
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<tr>
<td>Perry County</td>
<td>Other</td>
<td>1,725</td>
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</table>

Figure 2: Housing counts by building type and average energy burden for households earning up to 60% AMI in five Kentucky counties served by HDA. (Source: LEAD tool)

Figure 3: Annual energy cost and housing counts by fuel type for households earning 0–60% of AMI in Perry County, Kentucky. (Source: LEAD tool)
**State Energy Goal:** Washington's 100% clean electricity law, the Clean Energy Transformation Act (CETA 2019), requires Washington electric utilities make energy assistance programs and funding available to low-income customers under section 120.

**Objective:** Washington Department of Commerce assembled a Data Technical Advisory Group (TAG) in 2019 to assist in the data collection work directed under Sec. 120. This law "requires Commerce submit a biennial report to the Legislature that:

1. Aggregates information into a statewide summary of energy assistance programs, energy burden, and energy, assistance need;
2. Identifies and quantifies current expenditures on low-income energy assistance; and
3. Evaluates the effectiveness of additional optimal mechanisms for energy assistance including, but not limited to, customer rates, a low-income specific discount, system benefits charges, and public and private funds
4. Assess mechanisms to prioritize energy assistance toward low-income households with a higher energy burden."¹

The Washington Department of Commerce opted to use the LEAD Tool in combination with utility data to meet these requirements.

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Findings:

• Over 250,000 (25%) low-income households are energy burdened
• Rural counties have a greater percentage energy burdened low-income households than urban counties
• These households spend an average of "$844 in excess of 6% of their household income on home energy bills annually, which amounts to an annual statewide energy burden of $234 million dollars after taking bill reductions from energy assistance programs into account"

Conclusion: Using LEAD data, commerce generated a report that addresses the goals of Sec. 20 and provides two policy approaches to strengthen energy assistance in the state.

2 Washington State Department of Commerce. (2023), Low-Income Energy Assistance 2023 Legislative Report: Per the Clean Energy Transformation Act (RCW 19.405.120). 2023 Legislative Repo
3 Ibid.
Thank You!
Q & A
Thank You!

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