Building Energy Asset Score

2016 Building Technologies Office Peer Review

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Project Summary

Timeline:
Start date: 04/01/2011
Planned end date: Ongoing program

Key Milestones
Asset Score 2.0 with Preview (01/27/2016)
Building Data Reporting Platform Beta (06/30/2016)

Budget:
Total Project $ to Date:
• DOE: $7.263M
• Cost Share: $0

Total Project $:
• DOE: $TBD
• Cost Share: $0

Key Partners:
None

Project Outcome:
• A credible scoring system for commercial and multi-family buildings that can be used to inform retrofits and real estate transactions.
• A streamlined process and tool to collect, manage, and report building asset data.
Purpose and Objectives

**Problem Statement:** There was no low-cost, standardized tool for consistently evaluating a building’s structure and energy-related systems independent of operations/tenant behavior. A national energy Asset Score for commercial and multifamily buildings is essential to encourage effective valuation of energy efficiency in real estate transactions and spur investment in capital improvements.

**Target Market and Audience:**
**Market:** Commercial and Multi-family Buildings. Commercial sector accounts for 19% of total energy consumption in the U.S., totaling 18,021 TBtu.*
**Audience:** Building owners/operators, state & local governments, federal agencies, service providers, utilities.

**Impact of Project:**
- Provide a standard, free evaluation tool to help commercial building owners and operators gain insight into the efficiency of building systems and their potentials, motivate investment in improvements, and improve valuation of efficiency.
- By 2020, use Asset Score to evaluate 1% of total commercial space** (870 million ft²) and identify 36 TBtu primary energy use savings (assuming 20% on average) and $356 million cost savings*.
- In the long term, use Asset Score to inform real estate transactions.

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*According to EIA Annual Energy Review 2011. The total energy consumption in the commercial sector estimates fro18,021 TBtu in 2011 (p.40). The total consumer expenditure estimates for energy in the commercial sector is $178,128 million in 2010 (p.79).

**According to CBEC 2012, the total commercial floor space is 87,043 million sq.ft.
Approach

Approach:
• Create a **free** Asset Scoring Tool application with **simplified data requirements** using the EnergyPlus building modeling engine (via OpenStudio).
• Develop a **quick and easy** way help unsophisticated users to initiate an energy efficiency analysis.
• Provide a **standardized report** documenting the building’s Asset Score to inform owners, operators and others who have limited knowledge of building energy efficiency.
• Help building owners and managers **disaggregate building energy information** and include a mechanism for **identifying energy improvement opportunities**.

Key Issues:
• Determine the **appropriate level of data inputs** for an accurate assessment while minimizing data collection burden.
• Provide **useful information and actionable strategies** to help building owners make informed decision on building upgrades.
• Create a **streamlined process** for building screening, energy audit, data management and report, and building valuation.
**Approach**

**Distinctive Characteristics:**
Position the tool upstream the real estate owners by working with architects, professional service providers.

**Strategic Objectives:**
- Create **self-sustaining deployment channels** by building user base in EE services, engineering, design, and program administration sectors.
- Improve **core technical quality** before expanding use types.
- Invest in **lateral “capabilities”** with potential to vastly expand market penetration.

- Asset Score Preview
- Asset Score Full Analysis
- Report Platform
- Third-Party Energy Audit and Analysis Tools
- Open Studio Parametric Analysis Tool
- USGBC LEED Energy Credit (alternative path)
- ASHRAE Commercial Building Energy Audit Standards
- Standard Energy Efficiency Data Platform
How Asset Score Works

Asset Score evaluates the as-built physical characteristics (envelope, HVAC, lighting, service hot water) of a building and its overall energy efficiency, independent of occupancy and operational choices.

ENERGY STAR benchmarks the overall building performance against peers.

Asset Score runs an energy simulation using EnergyPlus.

The simulation normalizes for building operations, occupancy and tenant behavior.
Types of Buildings

Asset Score assesses the following *new and existing* building types:

- Multifamily (low/high-rise, 3+ units)
- Office
- Retail
- Assisted living
- City hall
- Community center
- Courthouse
- Educational (including K-12 schools)
- House of Worship
- Library
- Lodging
- Medical office
- Parking garage
- Police station
- Post office
- Senior center
- Warehouse (unrefrigerated)
- Mixed-Use (of the above types)
1. Create a new building and enter basic building information

2. Identify building use type(s) and create an inventory of your building features (HVAC, windows, etc.)

3. Create 3-D block(s) of your building and apply use type(s) and features to your building block(s)

4. Score your building and receive your Asset Score Report
Asset Score Report

Four sections

- Score
- Upgrade Opportunities
- Structure and Systems
- Building Assets
Asset Score Preview

Example Building 7

Asset Score Input Mode

**PREVIEW**
Select this mode to obtain an estimated score range and an Asset Score report preview based on a limited amount of inputs.

Learn More

Full Report
Select this mode to obtain a full Asset Score report with current and potential scores, total energy use, building upgrade opportunities, and system energy.

Learn More

Building Information
123 Street
Chicago, IL 60001

Number of Floors: 6
Orientation: North-South
Heating Retrofit: 2012
Cooling Retrofit: 2012
Water Heating Retrofit: 2012
Lighting Retrofit: 2012

Confirm all of the building inputs below before submitting for an estimated score by selecting one of the following inputs for each component, or by selecting "N/A as written" or "Mark all as I don't know."

1. Edit the default value entered by the Tool
2. Verify the default value entered by the Tool
3. Select if the value for this component is unknown

Office - 100,000.00 ft²

**CONSTRUCTION**
- Roof: Built-up w/ metal deck
- Floor: Slab-on-Grade
- Wall: Brick/Stone on masonry

**LIGHTING**
- Fixture 1: Recessed Fluorescent T8
  - 50.0% served
- Fixture 2: Recessed Fluorescent T12
  - 50.0% served

**HEATING/Cooling**
- System: Packaged Rooftop VAV w/ Hot-Water Reheat

**Service Water Heating**
- Equipment Type: Air Handler

Full Report

ASSET SCORE Preview
OVERALL BUILDING SCORE

Building Information
- Preview Test: 1211 Envy St.
- Pasco, WA 99301
- Building Type: Office
- Office: 5,000 ft²
- Score Data: 08/18/2015
- Building ID #: 1

1. Uses MORE Energy
   - Current Estimate
   - Potential Improvement

Score range note:
Current score: Your building is likely to receive an Asset Score between 1.5 and 3.5 in Full Input Mode.
Potential score: On average, similar buildings may improve 2.0 points with cost-effective upgrades.

Switch to Full Input Mode to add additional building data and generate an Asset Score report with cost-effective upgrades.
How Preview Works

Only 7 data points are required from users:
- Building Address,
- Year of Construction,
- Use Type,
- Gross Floor Area,
- No of Floors,
- Orientation,
- Retrofit Years (if applicable)

Match the user inputs to the corresponding prototype buildings and display defaults.

Allow users to modify the defaults if more information is known.

Run the data model (regression analysis) and calculate the mean, minimum, and maximum EUIs.

Post-process and Display the score range.
**Reporting Platform**

**Benefits:**
- Standardized output format
- Automated error checking
- Seamless connection with SEED
- Additional Asset Score report

**Chart Diagram:**
- Auditors submit data via Asset Score.
- Owners receive a standard data report (i.e., ASHRAE Level 2) in PDF + Asset Score report (if interested).
- Send a subset of ASHRAE Level 2 in BS XML format via API.
- View and manage submitted data.
- Submit Data via Asset Score.
- Submit Data via other tools.
- Third party tools.
- SEED.
- Cities.
Progress and Accomplishments

Accomplishments:

• Developed Asset Score Preview including batch analysis capability.

• Allow Open Studio (.osm) model download.

• Added new capability to model plenums, parking garage, skylights, cool roofs, energy recovery ventilation (ERV), dedicated outdoor air system (DOAS), minimum air flow fraction, elevators, variable frequency drive for constant volume supply fan, and multiple fuel type for reheat.

• Added new energy efficiency measures of cool roofs, occupancy sensors, top-lighting controls, ERV, fan control and minimum air flow fraction for multiple zone distribution air handling units.

• Revised to 10-point scales and fine-tuned the scales.

• Updated baseline ranges for envelope, heating, and cooling systems in the ‘Structures and Systems’ section.

• Added input data validations in API.

• Updated user support materials, including Asset Score Building Upgrade Guide, Help page, and Technical Protocol, Data Collection Forms, and Asset Score report.
Progress and Accomplishments

Market Impact and Recognition:
21 organizations committed to use the Asset Score on 10 buildings in 2016 and work with DOE to produce a case studies to highlight best practices and lessons learned:

- AECOM
- Arup
- Association of Energy Engineers
- CH2M Hill
- City of Milwaukee, WI
- 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

825 Buildings scored
83M Square feet
30 States
155M Square feet in process

Asset Score was recognized in the White House event on Jan 28, 2016.
Project Integration and Collaboration

Project Integration:
- Reached out to 200+ entities
- Maintain communications with 50+ key stakeholders
- A national network of DOE, leading companies, federal agencies, and state and local governments has been formed to expand the tool’s use and guide its future development

Subcontractors and Collaborators:
- NREL provide Open Studio technical support
- PSD provide Help Desk user support
- CBEI provide regional user outreach and develop training curriculum

Communications:
- GreenBuild 2015
- ACEEE Summer Study 2016
- Public webinar to release Preview
- Numerous 1:1 webinars with interested stakeholder groups
- Invited presentations and trainings
Next Steps and Future Plans

Next Steps and Future Plans:

- Develop mobile-friendly user interface to support onsite data collection.
- Expand building use types to include food service, food sales, hospitals, data centers, laboratories.
- Integrate onsite renewables.
- Enhance API and link to DOE’s Standard Energy Efficiency Data (SEED) Platform, Buildings Performance Database (BPD), and other third-party tools.
- Support more advanced heating and cooling systems and controls.
- Pilot test Reporting Platform with cities.
- Develop assessor qualifications and associated quality assurance protocols.
- Develop sustainable user support and training model.
REFERENCE SLIDES
## Project Budget

**Cost to Date:** $7,263,000  
**Additional Funding:** none

### Budget History

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<th>FY 2016 (current)</th>
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## Project Plan and Schedule

### Project Schedule

**Project Start:** 04/01/2011  
**Projected End:** TBD (ongoing program)

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### Past Work

- Milestone: Pilot Test 1
- Milestone: Pilot Test 2
- Milestone: Revise to 10-point scale
- Milestone: Enhance user experience and add building management features
- Milestone: Develop API
- Milestone: Add additional HVAC, controls, EEMs and use types
- Q2 Milestone: Deploy Asset Score 2.0 with Preview function

### Current/Future Work

- Q3 Milestone: Deploy Reporting Platform Beta with new user interface
- Q4 Milestone: Deploy Mobile Friendly AS Tool with additional functions
# Value Propositions

## Building owners:
- Communicate the underlying energy efficiency of your buildings to tenants and investors
- Demonstrate national sustainability leadership and corporate social responsibility
- Ensure the market recognizes your energy efficiency investments
- Guide energy-related investments and reduce operating expenses in a building or across a building portfolio

## Real estate managers:
- Strengthen your sustainability service offerings for building ownership clients
- Provide added value to clients by understanding their asset portfolios and opportunities for energy efficiency improvement
- Support building owners in communicating their sustainability leadership to the marketplace
- Demonstrate national sustainability leadership and corporate social responsibility

## Architects
- Guide energy-efficient design considerations with a no-cost, standardized tool
- Strengthen your sustainability-related platform for clients
- Demonstrate national sustainability leadership and corporate social responsibility
- Collect energy-related metrics across projects and report metrics to national programs

## Energy services companies, engineers and consultants:
- Strengthen your energy/sustainability service offerings for clients
- Enhance business development activities and create opportunities
- Help building owners communicate their sustainability leadership to the marketplace
- Integrate your data seamlessly with the Asset Score through our API

## State and local governments:
- Strengthen government transparency by reporting building energy information to citizens
- Collect building energy-related metrics that inform the creation of local energy goals and milestones
- Demonstrate local clean energy and sustainability leadership and communicate progress
- Guide energy-related investments and reduce operating expenses across your building portfolio

## Utilities and utility program administrators:
- Quickly and cost-effectively identify new customers for rebate and incentive programs
- Enhance customer service by providing Asset Score evaluations for customers
- Demonstrate commitment to clean energy and corporate social responsibility
- Quantify energy efficiency results to regulators and other parties