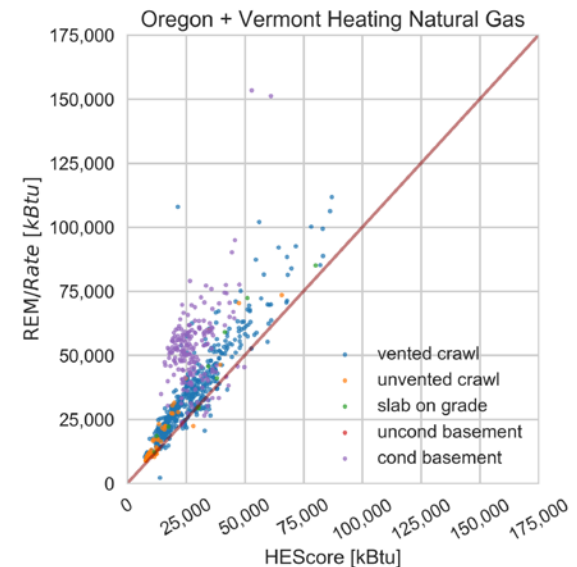
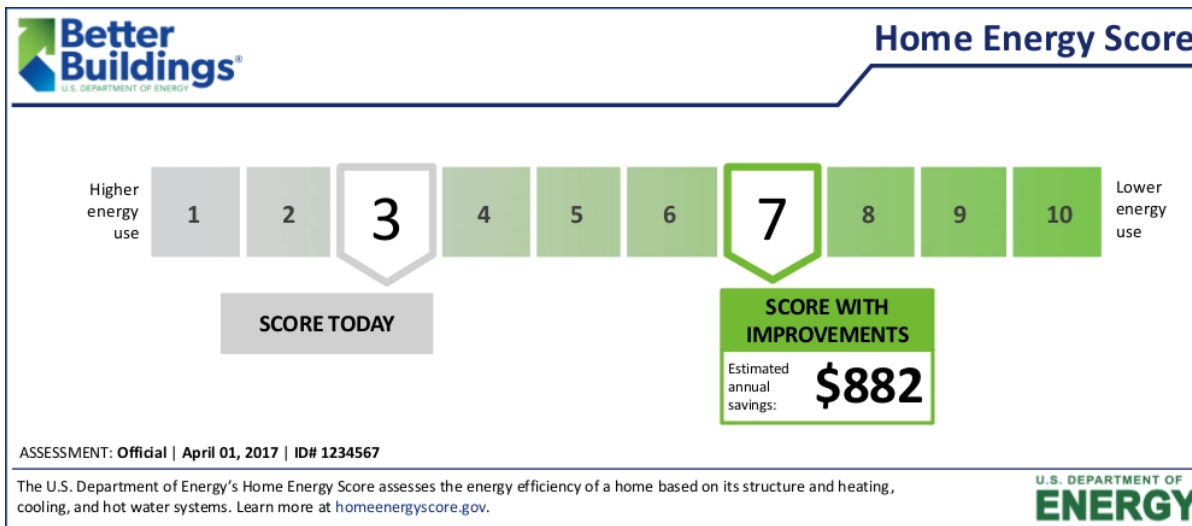


Computer Modeling for Residential Energy Assessments



National Renewable Energy Laboratory
Noel Merket – Research Engineer
303-275-3156 | noel.merket@nrel.gov

Project Summary

Timeline:

Start date: 10/1/2016

Planned end date: 9/30/2020

Key Milestones

1. HPXML API v3.x: 1/2017, 5/2017, 6/2017, 8/2017, 3/2018
2. Energy Metrics Analysis Report: 4/2018 (pending)
3. Home Energy Score release using EnergyPlus/OpenStudio

Budget:

Total Project \$ to Date:

- DOE: \$100k
- Cost Share: \$0

Total Project \$:

- DOE: \$300k
- Cost Share: \$0

Key Partners:

National Association of State Energy Officials	Southface Energy Institute
Energy Trust of Oregon	Oregon Department of Energy
Earth Advantage	PNNL
Vermont Energy Investment Corporation	LBNL

Project Outcomes:

Analysis of the Home Energy Score and HERS energy calculation methodology to find a pathway to a common metric.

Updates to the Home Energy Score HPXML API in response to users.

Team



Noel Merket, Research Engineer, NREL
Expertise: Software development, HPXML, Home Energy Score, data analysis



Scott Horowitz, Senior Engineer, NREL
Expertise: Software development, energy modeling, optimization



Leslie Badger, Senior Analyst, Vermont Energy Investment Corporation
Expertise: data analysis, data system administration, program and project management



David Heslam, Executive Director, Earth Advantage
Expertise: Leader in energy labeling, energy auditing researcher, high performance home builder

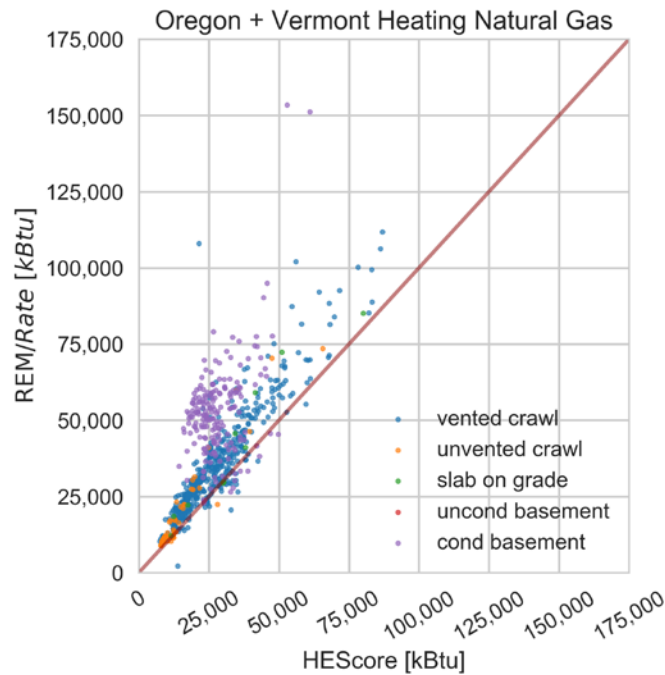
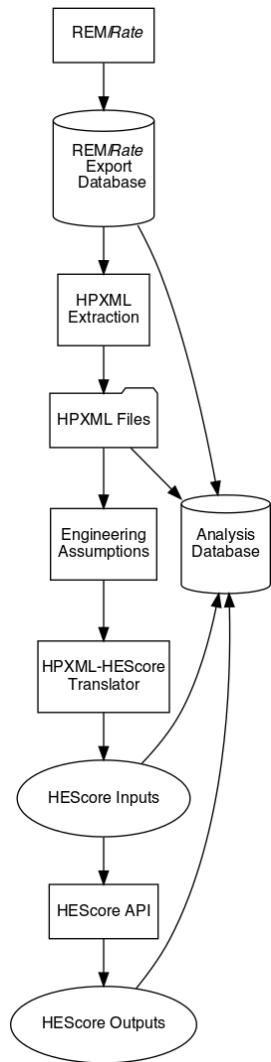
With additional support from:



Challenge

1. Differences in rating/scoring systems' results causes homeowner confusion and less confidence.
2. Connecting existing software to the Home Energy Score API requires software developer effort to convert building modeling inputs into the required format.

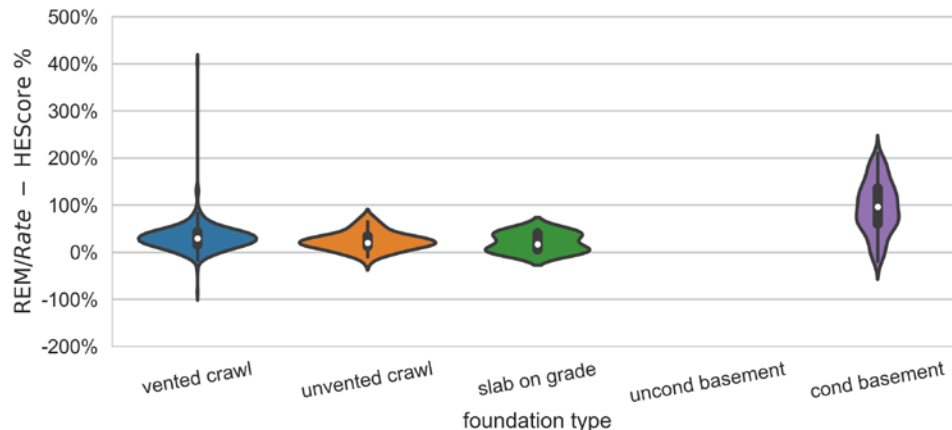
Approach: Comparative Analysis



Discover **why** models are giving differing energy predictions.

1. Simulate a sample of homes through Home Energy Score and REM/Rate (a popular HERS rating tool).
2. Compare results by end use, fuel type
3. Use machine learning to **identify characteristics associated with differences in modeling approaches**

Output: Technical Report with information on focus areas



Approach: HPXML API



- **HPXML is a file format (like docx) that facilitates describing home energy audit data.**
- **Software vendors are already making the investment to export to HPXML.**
- **The Home Energy Score HPXML API allows developers to leverage their investment in HPXML to access the scoring tool.**

Impact

Comparative Analysis

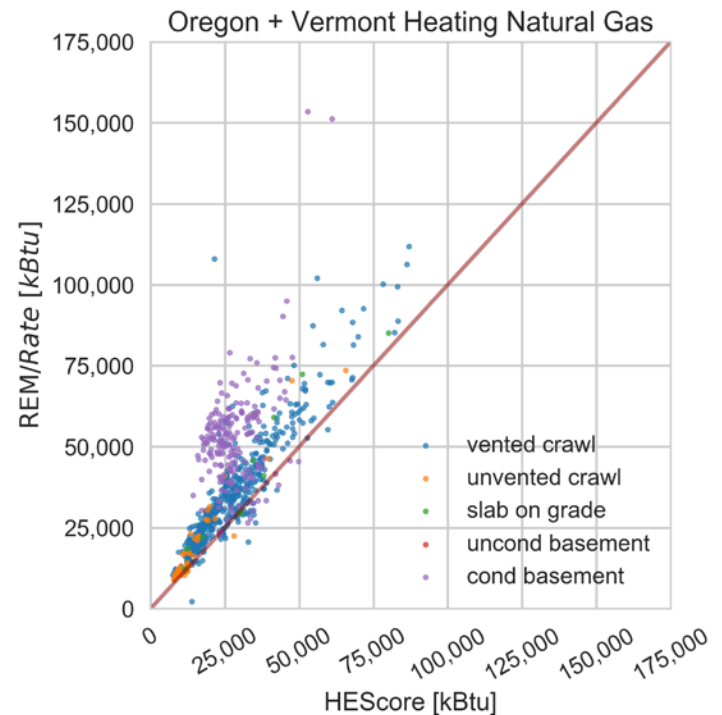
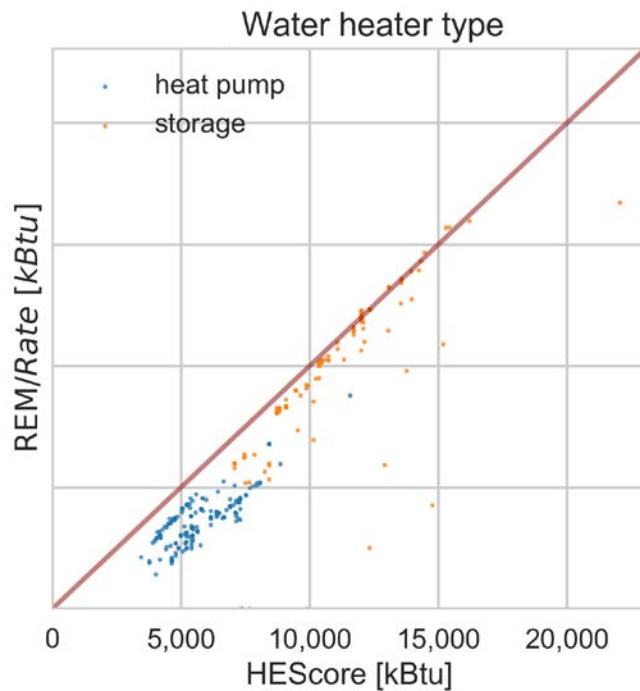
- The analysis and report provided actionable information to decision makers to move towards a **single simulation engine solution for residential energy audits.**

HPXML API

- **3 of 6** software vendors using the Home Energy Score API to generate scores **use HPXML.**
- **~15%** of scores are calculated through the HPXML API.

Progress: Comparative Analysis

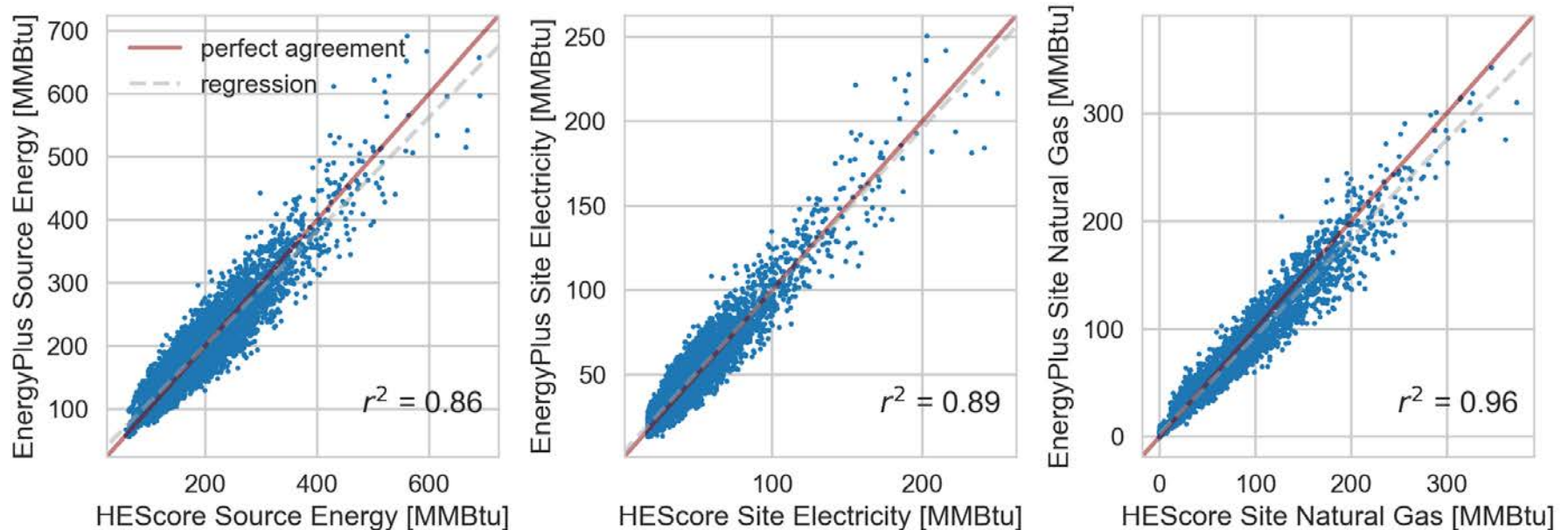
- **Technical Report published.** Areas of interest include:
 - Natural gas heating in basements
 - Cooling in homes with high window area
 - Lighting and appliance assumptions
 - Heat pump water heaters



Progress: Comparative Analysis

Will migrating HEScore to EnergyPlus change the results?

Energy Plus feasibility study using ResStock sample:



...not much.

Progress: HPXML API

- **Released v3.0 to utilize newest version of HPXML and Home Energy Score**
 - Includes PV and evaporative coolers.
 - Better installer and continuous integration testing
- **Multiple bug fix releases in response to user requests:**
 - v3.1: 6/2017
 - v3.1.1: 8/2017
 - v3.1.3: 3/2018

Stakeholder Engagement

The comparative analysis was stakeholder driven from the beginning:

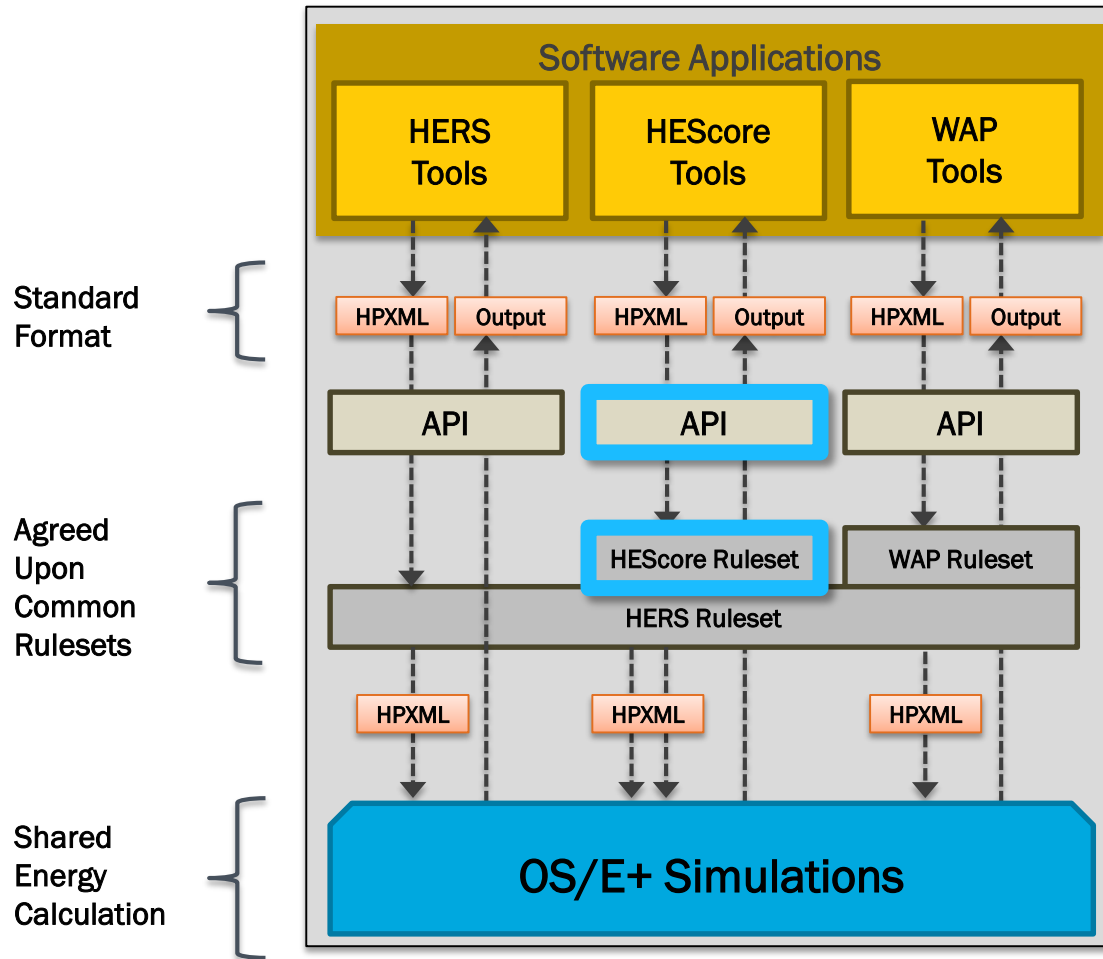


HPXML API Software Partners:



Remaining Project Work

Home Energy Score component of OpenStudio/EnergyPlus residential modeling platform



Benefits

- ✓ Accelerates new technologies into software tools
- ✓ Increases consistency across DOE/industry programs
- ✓ Reduces developer effort to use EnergyPlus
- ✓ Lowers industry-wide costs of maintaining multiple engines
- ✓ Allows private-sector competition around innovations for user interface, business support, etc.

Thank You

National Renewable Energy Laboratory
Noel Merket – Research Engineer
303-275-3156 / noel.merket@nrel.gov

REFERENCE SLIDES

Project Budget

Project Budget: Through FY18, a lower-level analysis and maintenance budget. In FY19 and forward, a larger budget to implement HEScore in OS/E+

Variances: N/A

Cost to Date: 80% of FY18 budget spent as planned

Additional Funding: N/A

Budget History

FY 2017 (past)		FY 2018 (current)		FY 2019 – TBD (planned)	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
\$50k	\$0	\$50k	\$0	\$200k	\$0k

Project Plan and Schedule

Project Schedule												
Project Start: 10/1/2016	Completed Work											
Projected End: TBD	Active Task (in progress work)											
	◆ Milestone/Deliverable (Actual)											
	FY2017				FY2018				FY2019			
Task	Q1 (Oct-Dec)	Q2 (Jan-Mar)	Q3 (Apr-Jun)	Q4 (Jul-Sep)	Q1 (Oct-Dec)	Q2 (Jan-Mar)	Q3 (Apr-Jun)	Q4 (Jul-Sep)	Q1 (Oct-Dec)	Q2 (Jan-Mar)	Q3 (Apr-Jun)	Q4 (Jul-Sep)
Past Work												
HPXML API v3	◆											
Comparative Analysis Report							◆					
Current/Future Work												
HEScore Modeling in OS/E+												