



Better, Faster, Cheaper

Better Buildings Home
Upgrade Program
Accelerator

Dale Hoffmeyer
DOE

What is a Better Buildings Accelerator?

- Collaborative peer-to-peer networks designed to facilitate learning and leadership opportunities that result in new strategies and practices in clean energy development.
- focus on partner identified areas that aim to overcome persistent barriers.



ISSUE SPECIFIC



TIME BOUND



RESULTS-DRIVEN

Better Buildings Accelerators



Home Upgrade Program

Minimize program costs while improving and expanding program savings through the use of information technology and adoption of common data standards to streamline data exchange.



Home Energy Information

Expand the availability of energy information in residential real estate transactions to make energy-related information available to home buyers and sellers through multiple listings.



Clean Energy for Low Income Communities

Develop plans to identify funding that will lead to the implementation of expanded installation of energy efficiency and distributed renewables in low income communities.



Energy Savings Performance Contracting

Catalyze public-sector energy efficiency investments of \$2 billion from January 2013 to December 2016 through the use of innovative and best-practice approaches to ESPC.



Data Centers

Reduce the infrastructure energy intensity of one or more data centers by 25 percent over a period of five years.



Combined Heat and Power Resiliency

Develop plans for communities to capitalize on CHP's strengths as a reliable, high efficiency, lower emissions electricity and heating/cooling source for critical infrastructure.

Better Buildings Accelerators



Smart Labs

Universities, federal agencies, national laboratories, hospitals, and corporations commit to advancing strategies that rapidly improve energy efficiency in laboratory buildings.



Zero Energy Districts

Districts demonstrate the practicality of taking action to cost effectively meet zero energy goals by completing a detailed energy master plan, business case, model, and development.



Industrial Superior Energy Performance

Utilities and administrators are deploying SEP programs across their service territories and manufacturers are implementing SEP across a corporation or multiple plants.



Outdoor Lighting

Accelerate the adoption of high-efficiency outdoor lighting and improve system-wide replacement processes.



Wastewater Infrastructure

State, regional, and local agencies will work to improve the energy efficiency of water resource recovery facilities by at least 30 percent on their path to more sustainable infrastructure.



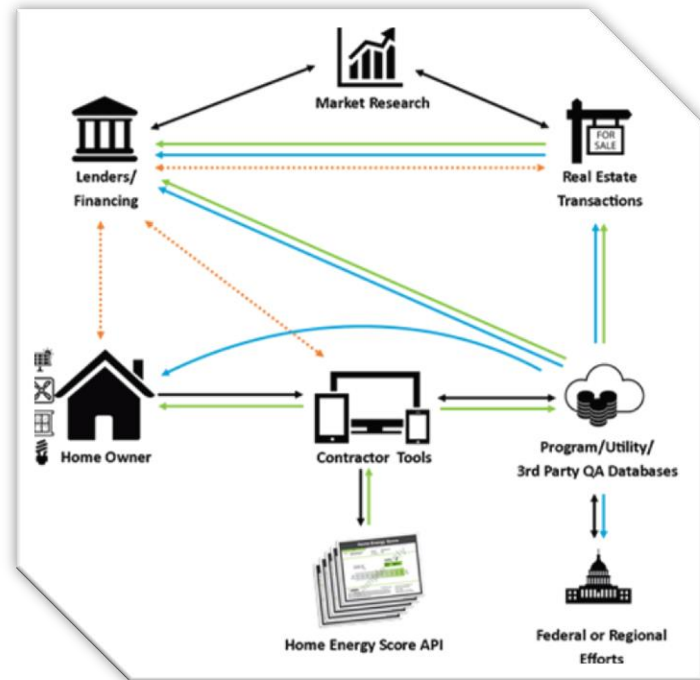
Combined Heat and Power Resiliency

Develop plans for communities to capitalize on CHP's strengths as a reliable, high efficiency, lower emissions electricity and heating/cooling source for critical infrastructure.

Home Upgrade Program Accelerator

Objective: Reduce the administrative burden and cost of programs by improving processes to:

- ✓ Manage and track home energy upgrades
- ✓ Review the quality of work
- ✓ Streamline data collection, management, & transfer (e.g., BEDES, HPXML)



Accelerator Partners

- APS
- NYSERDA
- Build It Green
- Enhabit
- Pearl Home Certification
- Building Performance Institute
- Midwest Energy Efficiency Alliance (MEEA)
- Neighborworks of Western Vermont HEAT Squad

Benefits

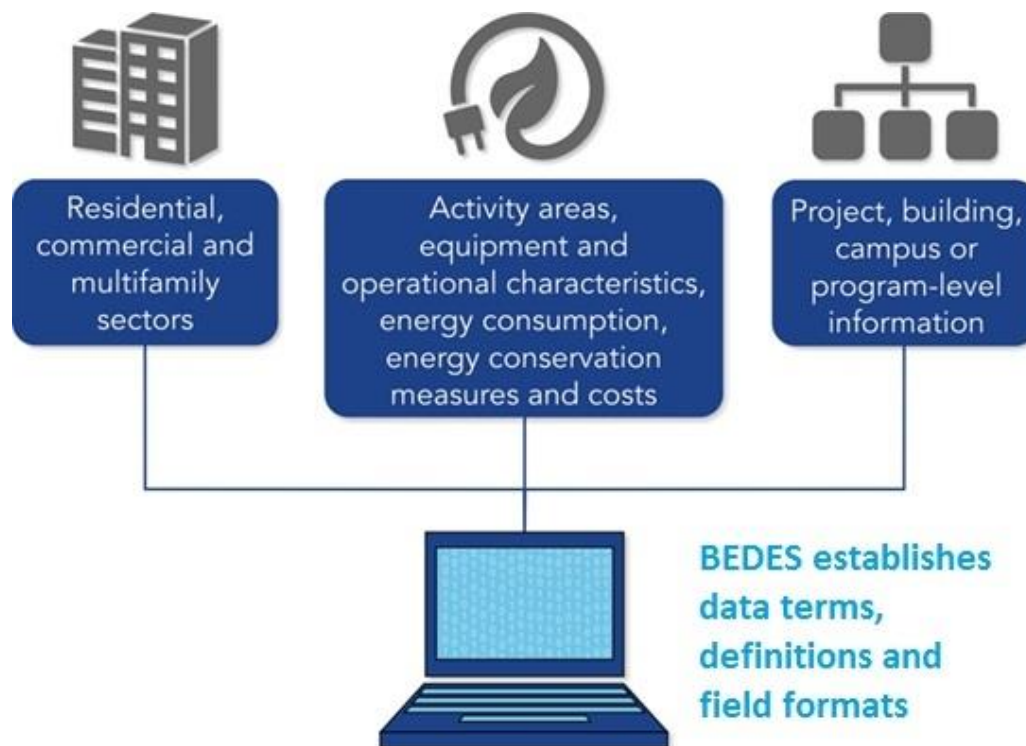
- ✓ Peer exchange of knowledge and experience
- ✓ Strategies to reduce program cost and enhance effectiveness, improve participating contractor satisfaction
- ✓ Receive public recognition as leader

Standardize Collection of Building Data

- Increase data interoperability between industry software system.
- Facilitate implementation consistency across jurisdictions to drive economies of scale.
- Create consistent, high quality, and large scale data sets to inform market research and valuation of EE resources.

Building Energy Data Exchange Specification (BEDES)

BEDES provides a common set of data terms, definitions and field formats that can be used by public and private software tools, data schemas and databases working within the building energy performance sector.



Home Performance XML

Building Performance Institute (BPI) standards for collecting and transferring home energy upgrade information.

- Dictionary of terms for home upgrades aligned with BEDES
 - Home Performance-Related Data Collection (BPI-2200)
- Schema for data transfer using extensible mark-up language (XML)
 - Home Performance-Related Data Transfer (BPI-2100)
 - **Key for machine to machine communication and automation**

EXAMPLE HPXML

```
<WaterHeatingSystem>  
  <SystemIdentifier id="dhw1"/>  
  <FuelType>natural gas</FuelType>  
  <WaterHeaterType>storage water heater</WaterHeaterType>  
  <Location>conditioned space</Location>  
  <CombustionVentingSystem idref="combvent1"/>  
</WaterHeatingSystem>
```

Standardize Specifications for Home Energy Upgrades

- Reflect a whole-house approach to installing energy-efficiency measures (e.g. ventilation, insulation, and air sealing).
- Establishes common expectations of quality work against which consumers, financiers, and policymakers can measure performance of home energy-efficiency professionals.
- Supports the development of a skilled residential energy upgrade workforce.

Specification Example

4.1006.1 Pull-Down Stairs

Topic: Attics

Subtopic: Attic Openings

4.1006.1 Detail Name: Pull-Down Stairs

Desired Outcome: Pull-down attic stair properly sealed and insulated

ROW	TITLE	SPECIFICATION(S)	OBJECTIVE(S)
4.1006.1a	Installation	<p>Hatches will be insulated with non-compressible insulation and the measure will include a protective barrier or baffle</p> <p>Pull down stair assembly will be insulated to the same R-value as the adjoining insulated assembly</p> <p>Pull down stair rough opening will be surrounded with a durable dam that is higher than the level of the attic floor insulation</p>	<p>Achieve uniform R-value</p> <p>Prevent loose insulation from entering the living area</p>

↑

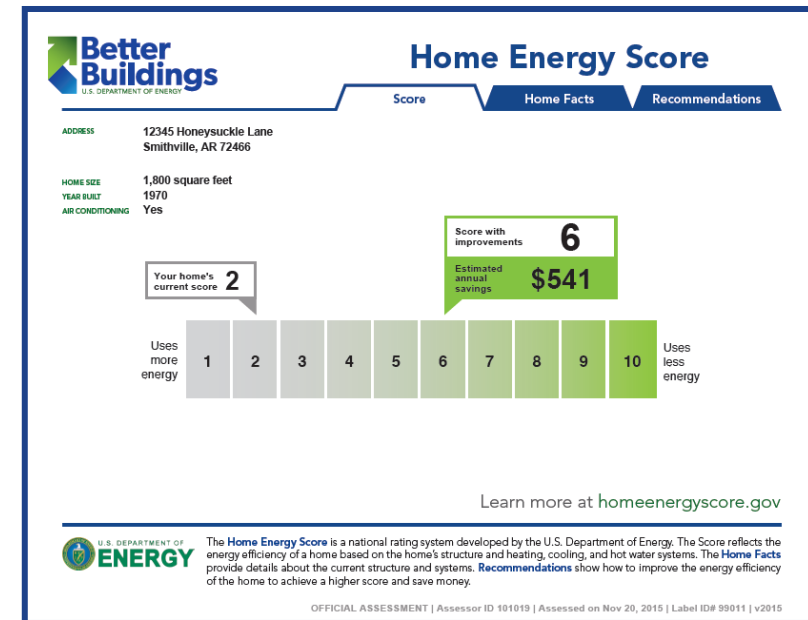
The **Specification** defines the minimum level of action required to meet the **Objective**.

↑

The **Objective** defines the required outcomes of the work.

Home Energy Score HPXML Translator

- A translator automatically simplifies complex, HPXML-formatted home data into inputs to generate a Home Energy Score
- Minimizes need to customize assessment software



HPwES Certificate of Completion

Auto-populate certificate of completion using HPXML

Home Performance with ENERGY STAR® Certificate of Energy Improvements

Home Address:

Work Performed By:

Work Verified By:

Work Completed On:

Signature:

Home Performance Improvements:

Additional Information:

X. Insert Logo Here.
First, right click the 'X'
and select delete to
remove this red box.
Then, to upload a logo,
click in the white space
and choose a file to
upload.

X. Insert Logo Here.
First, right click the 'X'
and select delete to
remove this red box.
Then, to upload a logo,
click in the white
space and choose a
file to upload.

ENERGY STAR® is the simple choice for energy efficiency. Home Performance with ENERGY STAR is a systematic approach to improving energy efficiency and comfort in homes, while reducing the greenhouse gas emissions that contribute to climate change. Join the millions across America already making a difference at energystar.gov.



ENERGY STAR Home Advisor

- Auto populate using HPXML
- Developing HPXML export to facilitate interactions with other systems.

ENERGY STAR HOME ADVISOR

Are you ready to increase your home's energy efficiency and all-around comfort? With the ENERGY STAR® Home Advisor, you can create an accurate profile of your home's energy usage and get a prioritized list of energy-saving recommendations customized to your home.

Welcome Rebecca H.
account settings | logout

My ENERGY STAR highlights

RECENT ACTIVITY

1 item on your to do list
2 completed items

READY FOR YOU

70 items available

SAVE YOUR PROGRESS

Profile

Recommendations

Review and Edit Your Home Profile



The ENERGY STAR Home Advisor is designed to help you complete a basic review of the energy efficient features of your home, build an ENERGY STAR Home Profile, and get customized and prioritized recommendations for improvements to increase efficiency and comfort. If you want help, consider hiring a home energy auditor. [See how the Home Advisor works.](#)



My Home Basics

Basic information about your home, including house size and type, year built, and fuels used for heating and cooling.

☒ Partially Complete

[View/Edit Profile](#)



Utility Bills (Home Energy Yardstick)

Assess the energy efficiency of your home based on your utility bills and see how it measures up.

☐ Not Started

www.energystar.gov/homeadvisor

Questions? Email: Hudson.Rebecca@epa.gov for more information

Home Performance Community Tools

- www.hpxmlonline.com provides information on the data standard, the value for the building performance industry, and tools to help programs and software developers.
- Online standard workforce specification tool (sws.nrel.gov) can be leveraged in energy audits, scopes of work, quality control, training and field guides.



Visit the Residential Program Solution Center: energy.gov/rpsc



Suggestions? Email BBRPSolutionCenter@ee.doe.gov

Process Innovations to Accelerate Home Upgrade Programs

Dec 15th, 2016

Chris Baker
Program Manager,
Home Performance with ENERGY STAR
Arizona Public Service



Context

Started 2010

BPI BA process for the assessment.

Mandatory software for modeling and project submission

Between 2,000- 4,000 projects a year



Worked on the SWS committee in 2010 with NREL.

The Draft version of that document became the work quality requirements for HPwES.

All contractors had to sign a document acknowledging all policies and procedures.

3.1003.6 Dropped Soffits

Topic: Attics
Subtopic: Dropped Ceilings and Soffits
Desired Outcome: Dropped soffits seal movement between the attic and conditi

Single-Family Homes

	TITLE	SPECIFICATION(S)
<input type="checkbox"/>	Select All	
<input type="checkbox"/>	3.1003.6a Pre-inspection	An inspection will be conducted for mold, water leaks, damage before sealing ceiling or soffit Repairs will be completed before work begins
<input type="checkbox"/>	3.1003.6b Soffit general	Air flow will be blocked at locations where access is required
<input type="checkbox"/>	3.1003.6c Option 1: bring soffit inside (seal at	Entire opening will be sealed with <u>rigid material</u> in line with ceiling level Material will be cut to fit and fastened as required

Old Program Management Software.

Buggy, Slow, frequent crashes and issues.

Integrated program software and modeling tool.

Had to create several “work-a-round's” for our stock / climate



Improvements Software 2012/13

Shifted to flexible software for
program management

Receives and aggregates HPXML
files, invoices, rebate forms for
easy access

Allowed contractors to choose
their own modeling software.

Web based. Fast. Easy.



Improvements Software program management

Improved visibility into program operations.

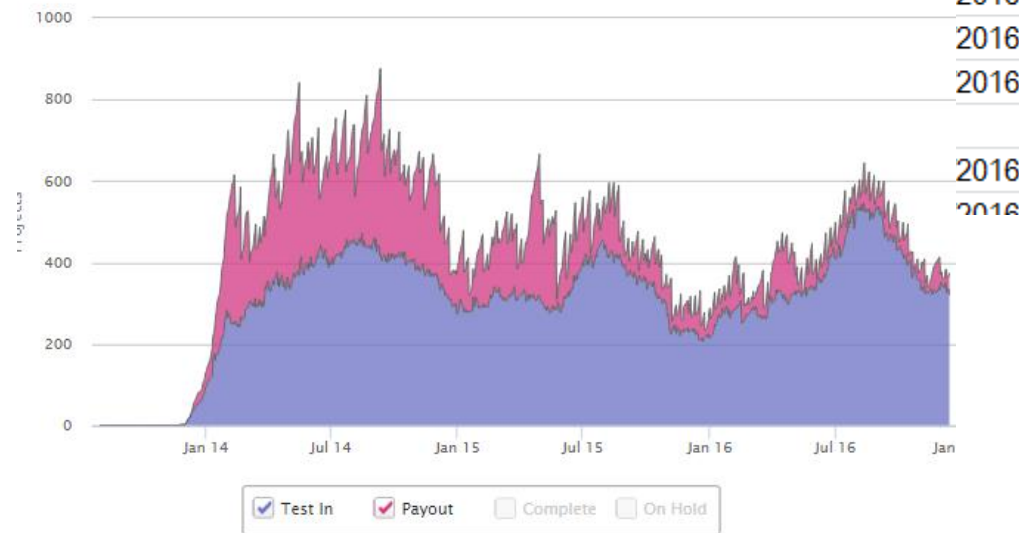
All necessary information in one place for Program managers & M&V

Insights into marketing effectiveness

Insights into contractor performance

ali	Duct Te	Duct Te	Insulatio	Insulatio	Date paid
0	1	400	0	0	12/2/2016
0	1	0	0	0	
0	1	400	1	250	11/23/2016
0	1	400	0	0	11/23/2016
0	1	400	1	250	11/23/2016

Program Pipeline



Marketing	Operations	Results	Partners
op applicant sources within time period	Project numbers within time period	Upgrades performed within time period	Most open tasks over SLA on 12/13/16

Improvements Software

This reduced QA admin labor
by 50%

Increased contractor
satisfaction 50%

31% Decrease in contractor
admin labor reporting

Contractor reports became
customizable and sales rates
increased



Improvements Measures

Quality of work varied among contractors.

Training for new hires or crew turnover especially problematic.

Contractors were getting a lot of callbacks to fix simple problems.

Contractor profits impacted.



Improvements Measures

FSL Partnered with Advanced Energy and created the “Critical Details”

Initially developed for WAP, adapted to HPWES.

Training for all contractors on how to use the critical details for in house training, and QC.

Critical details became standard on all corrective action reports following a failed inspection.

CRITICAL DETAIL: SWS 3.1003.6

CAPPING SOFFITS

Install support material (e.g., 2X) for spans wider than 24 inches.

NOTICE: If air sealant is plastic, it must be covered with an approved thermal barrier (e.g., rockwool, slag wool).



d seams

Seal all gaps, holes and seams in adjacent framing.

Notes: Be cautious

excessive hammering

(e.g., drywall)



Improvements Measures

Contractors now receive
quarterly scorecards

Top 5 Contractor of the year
awarded in January

Special marketing benefits to
winners

Has created some friendly
competition

2016 Q3 HPwES Scorecard

Performance contractor

Your company is currently
Ranked
5th/35

Measure	Scope	Survey	Overall
2.97	3.00	9.63	9.77
2.99	3.00	9.94	9.96
2.50	3.00	9.00	8.83

Current Annual numbers

Approximately 3200 Audits.

40% conversion rates.

All contractors are rated 1-10

#1 – 9.96

#35 – 8.83

Takeaways

Whole house programs cannot exist without good contractors.

Good contractors need to be profitable.

Good contractors need consistent training

Designing and evolving programs should be done with contractor input, and with their perspective in mind.





Case Study: Improving Arizona Home Performance Program Acceleration



Keys to Home Performance Program Improvements

► **Simplicity:** A whole-home upgrade is a complicated endeavor, but that does not mean that whole home programs need to be equally complicated. Exploring every avenue to streamline and automate program steps can lower implementation costs.

► **Standardization:** Streamlining a program requires transparent and well-defined program standards. The Arizona HPwES program looked to industry efforts, including the Standard Work Specifications for Home Energy Upgrades (SWS) and Home Performance Extensible Markup Language (HPXML), as the cornerstone for program improvements.

► **Flexibility:** HPXML enabled the program to open its market to a wide range of energy assessment tools. Access to these tools gave contractors more choice and control of how they delivered home performance.

► **Quality:** Delivering consistent and reliable upgrades not only requires a definition of quality, but also a means to manage that quality over time and across all personnel, both program and contractor.

Home Performance with ENERGY STAR® (HPwES) encourages a whole-home assessment approach to provide the most comfortable, efficient living space, looking at all systems for improvement. Since launching the Arizona HPwES program in March 2010, electric utility Arizona Public Service (APS) and Arizona's HPwES Sponsor, FSL Home Energy Solutions (FSL), have focused on continuous improvements designed to elevate customer and contractor experience while boosting program cost-effectiveness.

The program saw success in its early years of implementation, quickly growing to serve more than 2,300 homes in its second program year and more than 4,000 in its sixth year. During this program expansion, three areas for improvement emerged:

► **Contractor satisfaction:** Participating contractors were frustrated that the program's mandatory energy assessment software was difficult and time-consuming to use. Contractors also complained that the program's home energy reports were

Thanks

Chris.C.Baker@aps.com

Example APS Scorecard

HOME PERFORMANCE WITH ENERGY STAR



Your 2016 Q4 HPwES Scorecard

Jon Doe Home Performance:

Your company is currently
Ranked

6th/39

	Measure	Scope	Survey	Overall	Total
Your Company	3.00	3.00	9.50	9.75	9.76
Top Company	2.98	3.00	9.93	9.94	9.98
Bottom company	1.92	3.00	5.00	6.06	NA

Achievement rate - 148%

HOME PERFORMANCE WITH ENERGY STAR



Q4 Scorecards:

This is the final scorecard for 2016. These scores are considered in the awarding of the Top 5 Contractors of the year for 2017.

1. These scores are based on the FSL scores for the last 4 quarters only. (Jan 1st - Dec. 16th 2016).
2. In order to qualify for Contractor Of the Year, you must have had a minimum of 10 retrofits, and 5 inspections in the last 4 quarters. For every 10 retrofits completed in the last 4 quarters, an additional 0.01 points is added to your overall score. Once the adjusted scores were tabulated ties were broken by adding 0.01 points to the company with more retrofits.

The Total Score column is your FSL overall score with the above factors added in.

If you had less than 10 retrofits, or 5 inspections recorded in the last 4 Quarters, you will see an NA for your ranking.

Achievement Rates

As stated with the Q2 Scorecards, achievement rates do not affect your scores for 2016. I am including them when available for informative reasons. These will become more important in 2017. 100% is right on target, over 100% is exceeding expectations, and less than 100% is not producing the savings expected.

Chris Baker,
Manager, HPwES
APS

Residential Home Upgrades in California

Torsten Glidden

Sr. Technical Manager

Energy Upgrade California® Home Upgrade

Build It Green

tglidden@builditgreen.org

AESP Webinar

Dec 2016

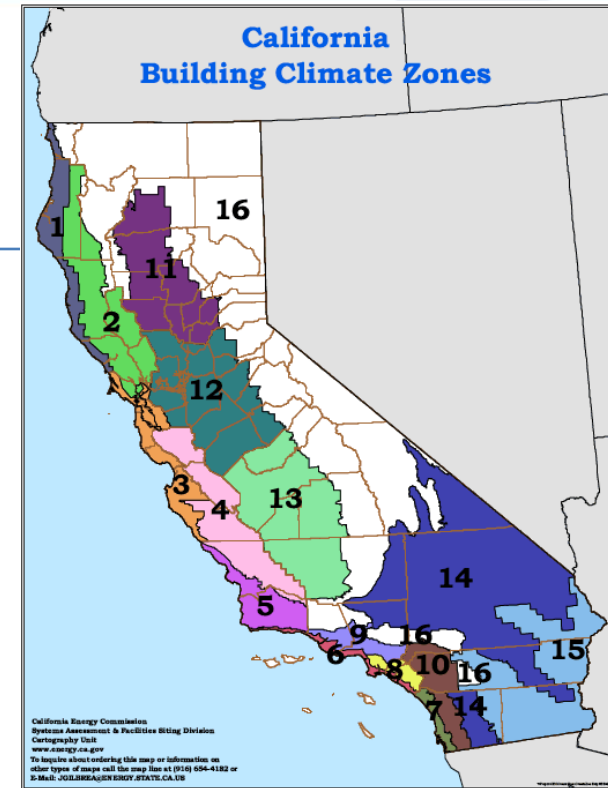


Home Upgrade

Energy Upgrade California®

Presentation Outline

- Introduction
- Home Upgrade Program Issues, Process & Solutions
- Home Upgrade Program Accelerator Metrics & Results
- Timeline
- Goals



Introduction



is a non-profit green building standards development, training and program implementation services organization.



Home Upgrade
Energy Upgrade California®

Introduction



is implementer for the Home Upgrade program, under the statewide Energy Upgrade California 'programs umbrella', in the Pacific Gas and Electric (PG&E) service territory, as well as the service territory that PG&E shares with the Southern California Gas Company (SoCal Gas).



Home Upgrade
Energy Upgrade California®

Introduction

The Home Upgrade Program (HUP) participation consists of:

- **150 Participating Contractors**
- **3,000 – 5,000 Upgrade Project Rebates Issued Annually**
- **2 Program pathways**
 - Home Upgrade pathway is prescriptive measures based
 - Advanced Home Upgrade pathway requires energy modeling (Pre- and Post-Installation)



Home Upgrade Program Issues



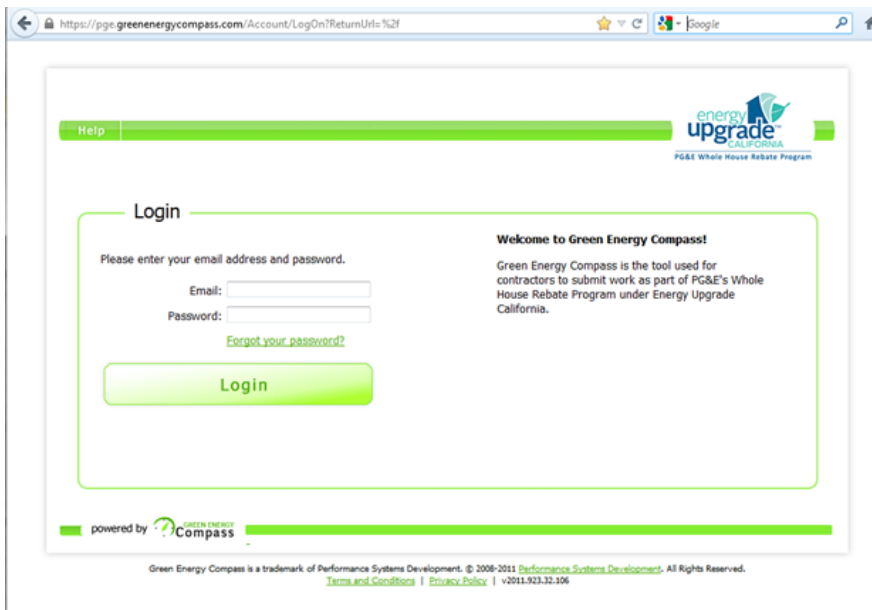
- Program is **complicated** and requires ongoing training and mentoring
- Initially, the Advanced program had **only one approved energy modeling software tool**
- Program requires a significant amount of **time-consuming data collection and document submission**
- **Rebate application process** is lengthy and (initially) **unnecessarily complex**
- Job-submission **staff turnover can cause delays** during 'learning-curve'
- Modeled energy **savings is not as accurate as desired**



Home Upgrade Program Issues

Biggest initial pain-point:

- Rebate application process is lengthy and (initially) unnecessarily complex



The screenshot shows a web browser window with the URL <https://pge.greenenergycompass.com/Account/LogOn?ReturnUrl=%2f>. The page features a green header with a "Help" link and the "energy upgrade CALIFORNIA" logo, which includes the text "PG&E Whole House Rebate Program". Below the header is a "Login" section with a green border. Inside this section, there is a prompt "Please enter your email address and password." followed by input fields for "Email:" and "Password:". A green link "Forgot your password?" is positioned below the password field. A large green "Login" button is at the bottom of the login section. To the right of the login fields, a "Welcome to Green Energy Compass!" message states: "Green Energy Compass is the tool used for contractors to submit work as part of PG&E's Whole House Rebate Program under Energy Upgrade California." At the bottom of the page, there is a footer that reads "powered by" followed by the "GREEN ENERGY Compass" logo. Below this, small text states: "Green Energy Compass is a trademark of Performance Systems Development. © 2008-2011 Performance Systems Development. All Rights Reserved. [Terms and Conditions](#) | [Privacy Policy](#) | v2011.923.32.106".

Focus on:

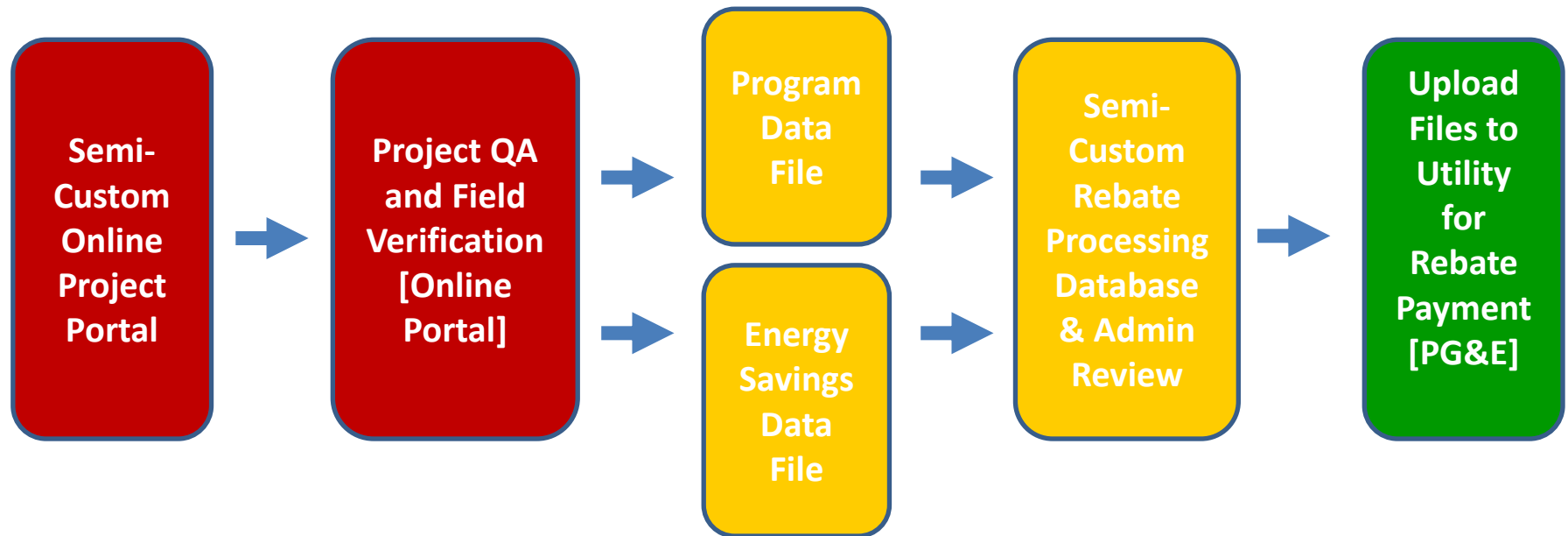
Information Systems
(i.e., the thing we had the most control of)



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Home Upgrade Program Process

2011-2014



Home Upgrade
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Home Upgrade Program Issues



Process advantages for ‘Semi-Custom’ portal/database solutions:

- Off-the-shelf solution to launch Program

Process drawbacks for ‘Semi-Custom’ portal/database solutions:

- Difficult to update features without significant impacts on users
- Difficult to track application documentation updates (good notes required!)
- Design included significant amount of manual aggregation of data in order to move to next step in process
- Reporting capabilities were not as flexible as needed
- More steps = More potential for data errors in transfer



Home Upgrade Program Process

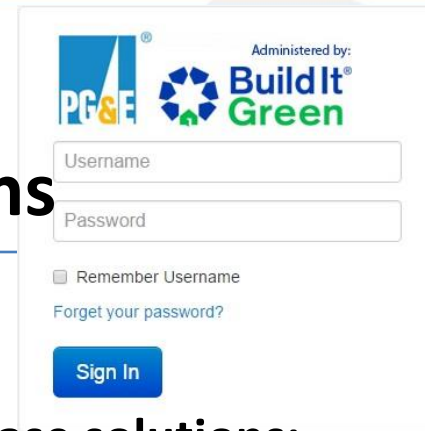
2015-Current



Home Upgrade
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Home Upgrade Program Issues & Solutions

salesforce



Process advantages for fully 'Custom' integrated portal/database solutions:

- Regular, flexible feature updates built on stable, standardized platform (Salesforce) minimize impacts on users and increases efficiency
- Iterative application documentation tracking (good notes still recommended!)
- Automated data aggregation speeds move to next step in process significantly
- Reporting capabilities are as flexible as needed (design for standardization of data where possible)
- Fewer steps = Limited potential for data errors in transfer

Process drawbacks for fully 'Custom' portal/database solutions:

- Initial Cost



Home Upgrade
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Home Upgrade Program Solutions



Addressing other Pain-Points:

- **Reduce unnecessary and/or manual data entry and documentation**
 - Parse data and ‘auto-populate’ from transparent, standardized energy modeling output (HPXML)
 - Online, dynamic, database-integrated ‘test-measurements’ form to minimize manual data transfer and user-error
 - Choice of ‘less-detailed’ software options

These solutions can increase efficiency and save time/money, but might they help reduce staff turnover as well?



HPXML Standard/Structure Maintained by DOE (NREL)

Complex Type BuildingDetailsType

Namespace http://hpxml.org/hpxml/2011/1

Diagram



Showing:

- ☒ Annotations
- ☒ Attributes
- ☒ Diagrams
- ☒ Facets
- ☒ Instances
- ☒ Model
- ☒ Properties
- ☒ Source
- ☒ Used by

Close

Used by	Element	Building/BuildingDetails
Model	BuildingSummary{0,1} , ClimateandRiskZones{0,1} , Zones{0,1} , Enclosure{0,1} , Systems{0,1} , Appliances{0,1} , Lighting{0,1} , Pools{0,1} , MiscLoads{0,1} , HealthAndSafety{0,1} , extension{0,1}	
Children	Appliances, BuildingSummary, ClimateandRiskZones, Enclosure, HealthAndSafety, Lighting, MiscLoads, Pools, Systems, Zones, extension	
Source	<pre><xs:complexType name="BuildingDetailsType"> <xs:sequence> <xs:element name="BuildingSummary" minOccurs="0"> <xs:annotation> <xs:documentation>Overall characterization of building for descriptive, rather than modeling purposes</xs:documentation> </xs:annotation> </xs:element> <xs:complexType> <xs:sequence> <xs:element minOccurs="0" name="Site"> <xs:complexType> <xs:sequence></pre>	

HPXML Structure Based on BPI & DOE Standards



Building Performance Institute, Inc.
BPI Standards



ANSI/BPI-2400-S-2012
Standard Practice for Standardized Qualification of Whole-House Energy Savings Predictions by Calibration to Energy Use History



Building Performance Institute, Inc.
BPI Standard

BPI-2100-S-2013
Standard for Home Performance-Related Data Transfer v2.1.0



Building Performance Institute, Inc.
BPI Standard

BPI-2200-S-2013
Standard for Home Performance-Related Data Collection v2.1.0

<https://bedes.lbl.gov>

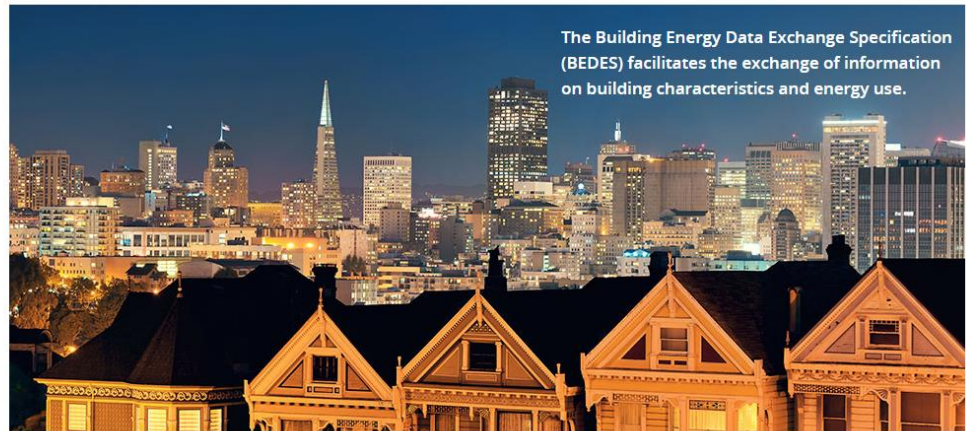


SEARCH



HOME BEDES ONLINE RESOURCES COLLABORATION EVENTS ABOUT CONTACT US

The Building Energy Data Exchange Specification (BEDES) facilitates the exchange of information on building characteristics and energy use.



The Building Energy Data Exchange Specification (BEDES, pronounced "beads") is a dictionary of terms and definitions commonly used in tools and activities that help stakeholders make energy investment decisions.

BEDES Online

Test Measurements Form

Energy Upgrade California® Home Upgrade - Test Measurements V2.0

Job Site, Occupant and BPI Analyst Information		Occupant Email	
Occupant Name		Primary Phone	
Job Address		City	Zipcode
BPI Analyst	BPI ID#	Test-In/Test-Out	Test Date

Building Infiltration		Diagnostic Inspection & Testing	
CFM50	Condition Area (sq ft)	Stories (above grade)	Avg Ceiling (ft)
Duct Systems and Leakage		LBL N Factor	ASHRAE (p/r)
CFM25	Number of Systems	Systems Avg CFM25 (y/h)	CFM25 Test Method
Asbestos (y/n)	System Fan Flow Type (for leakage % calc)	Actual System Fan Flow - if measured (cfm)	

Whole House Combustion Gas Testing		CAS/CAZ Inspection & Testing	
CO Monitor(s) Installed	Stove	Oven	Broiler
Gas Line Testing (p/r)	As Measured CO (ppm)		
Whole House CO (ppm)	Ambient CO (ppm)		

Combustion Appliance Zone (CAZ) Identification, Combustion Ventilation Air (CVA) and CAZ Pressure Testing			
Appliance/Equipment Location (visual)			
Baseline Pressure (pa) Worst Case (pa)			
Net Pressure Difference (pa) CVA (p/r)			

Appliance/Equipment Information, Gas Line in CAZ and Venting			
Appliance/Equipment Type (visual)			
Heating In or Out (kBtu) Cooling (tons)			
Combustion Gas Flue Type (visual)			
CAZ Gas Line Test (p/r) Flue Config (p/r)			

Worst Case CAS Testing			
Spillage (at worst case)			
AirFree Flue CO (ppm) CAZ Ambient CO (ppm)			

NGAT 'CAS Fail' and/or unsafe Natural Gas conditions? Contact the local Gas Utility Service Provider (PG&E or SoCalGas) For PG&E's GSR: 800-813-1975 (bus. hrs.), 800-743-5000 (after 5:30/weekends) | For SoCalGas®: 800-427-2200

GSR Call Required (NGAT Fail) ☐ Date/Time Gas Utility Contacted GSR Field Order Number



Energy Upgrade California® Home Upgrade - Test Measurements Form

Combustion appliance safety failure or other unsafe natural gas conditions? Contact the local gas utility service provider.

PG&E Gas Service Representatives (GSR): 800-813-1975 (business hours)
800-743-5000 (after 5:30pm/weekends)

SoCalGas®: 800-427-2200

Test date =

Test type = ☐ Test In
☐ Test Out

GSR call required ☐ Yes
(NGAT fail) ☐ No

Outcomes = ☐ All tests completed
☐ Some tests not completed due to presumed asbestos-containing material (PACM)

Diagnostic Inspection & Testing

Building Infiltration

CFM50 =

Conditioned area ft²

Avg. ceiling height ft

Stories

above grade

Occupants

#

Ventilation

ASHRAE Standard = ☐ ASHRAE 62.2-2010
☐ ASHRAE 62.2-2013
☐ ASHRAE 62.2-2016
☐ Other

Total Required Ventilation Rate (acq CFM)
[\(see table\)](#)

Installed Ventilation = CFM

Space Conditioning Systems

Please enter test information for each space conditioning system separately.

Ducted system? ☐ Yes ☐ No

Area served ft²
* % of total

Space = ☐ Normal Heating
☐ Normal Cooling
system type = ☐ Actual System Fan Flow (Measured Return)

[+ Add another space conditioning system](#)

Combustion Appliance Safety (CAS) Inspection & Testing

Whole House gas lines test =

☐ Pass
☐ Fail

Whole House CO =

ppm

Carbon monoxide monitors =

☐ Installed new ☐ Existing, < 5 yrs. old
☐ Expired, > 5 yrs. old ☐ None

Results for all accessible gas lines

Kitchen

Ambient CO = ppm

Stove type = ☐ Electric
☐ Gas

Oven type = ☐ Electric
☐ Gas

Broiler type = ☐ Electric
☐ Gas

Other Kitchen Appliance

Appliance Name =

As measured CO ppm

[+ Add another kitchen appliance](#)

Heating/Cooling (Combustion Appliance) Zone

Zone name/location =

☒ Electric only

Ambient CO = ppm

Appliance

Type =

[+ Add another appliance in this zone](#)

[+ Add another combustion appliance zone](#)

At-a-Glance Software Comparison Guide

PTIMISER®		Snugg Pro	
power simplicity accuracy		Home Upgrade Energy Upgrade California®	
Pricing Options License is per user. Per project and monthly license types available. • OptiMiser Silver – \$25.00 per project; No Monthly Fee; \$300 One Time Setup Fee • OptiMiser Gold – \$3.50 per use over 40 uses per month; \$150 Monthly Fee (includes 40 uses per month); No Setup Fees www.consulta.com		Advanced Home Upgrade Software Modeling Options	
CAKESYSTEMS™ for touch-enabled Windows tablets. Provides full offline access to: led utility calibration - customizable report generation its are available at http://optimiserenergy.com/getting-started now. Mobile data collection app available soon. by buildings and single units in multi-unit buildings. OptiMiser also unit buildings. brated modelling. OptiMiser combines: real-time hybrid (degree-day/hourly) as system for residential buildings tes available information—including anything from zero to 26 utility re available to select from, or use a pre-selected report. Add:		included. \$200/project after that eluded. \$150/project after that eluded. \$10/project after that at fee -No setup fee -No annual and phone support • Easy and inst	
Pricing Options License is per user login, with three options available: • Pay Per Use – For low volume, \$25.00 per site/audit • Basic Plan – Unlimited audits, no tech support or mobile app use, \$69.99/month • Premium Plan – Unlimited audits, tech support and mobile app use, \$99.99/month		saved in the cloud. y interface that dynamically adapts to oss multiple devices. This means a con imputer at the office to prepare the rep (Windows), tablets (iOS, Android, Windows Detailed results for single family units. C ally metered for both gas and electric ed and uncalibrated modelling.	
HPXML Generation Yes		les report designed to quickly convert y simple inputs that can be gathered ar more specific information gathering an devices. Works great on tablet compu	
User Interface Online application. Can be used offline for data collection only with mobile app.		emely easy to use. s, free training and support. Our extern cludes dedicated full-time tech support and email. eeso to ensures users are always acces of custom trainings either via the Web lisher • Searchable knowledge base	
Select Features Single Family		de great flexibility to allow for complex overments and renewable energy.	
Calibrated or Uncalibrated models Uncalibrated models only		SI/BPI-2400-S-2012 • BPI-2101 Partner (pending) • Green Button Pa by Colorado's Audit Program • Ener tema: nvest Energy Alliance • Efficiency M argy Upgrade California® Home Upgrade	
Customizable Report User can upload a logo or photo to customize the header of the report. Report content is standardized; for larger organizations the report can be customized for an additional fee with an Enterprise Account.		company • Set user roles for individu ls • See all projects across all users single Snugg Pro account (useful if you	
Inputs Core inputs for CAKESYSTEMS to generate an energy model are very streamlined and simple. More detailed inputs are available to be entered in the Proposal Generator features.		in a process • Sort and search project pool • Export projects to CSV and H r custom financing with built-in loan ca specific project templates flexible and optimized for conversion	
Mobile Application Data collection app works with Android and iOS operating systems. Tablet and smartphone compatible. Data collection only in offline mode. Synchronize and use the software directly when connected to the Internet.		or the Home Upgrade program only. Si ne without a credit card. Each account one filled out with sample data the re card and activate billings to create a n	
Technical Support Included with Premium Accounts		Find out which is right for your business!	
Training A 2- to 4-hour, self-paced online training and 2-hour live webinar are available for \$199/user. 6 BPI CEUs for software training awarded.		Home Upgrade Energy Upgrade California®	
Scenario Management Proposal Generator feature provides the ability to create an unlimited number of project reports. Auditors can use the project reports to offer the homeowner different scenarios for improving their home which include both savings and estimated cost numbers.		Home Upgrade Energy Upgrade California®	
Accreditation • HPXML 2.1 compliant Approved for the following programs: • Mass Save EPS • Washington Community Energy Efficiency Program • AEP Ohio-In-Home Energy Program • Missouri Home Energy Certificate • Seattle City Light/Community Power Works • Clean Energy Works Oregon • NYSERDA (pilot phase) • Energy Upgrade California® Home Upgrade		Home Upgrade Energy Upgrade California®	
Quality Management and Business Features CAKESYSTEMS Simple inputs are optimized to speed up your workflow, so you can spend more time selling work and doing jobs, and less time filling in forms. Report templates feature allows users to quickly insert commonly used text when creating the homeowner reports, saving time and standardizing the language auditors use across your organization. Enterprise Accounts include additional configurable options including: dashboard for tracking audit pipeline, system alerts, customized homeowner reports and a QA module. Data extracts can be created as a spreadsheet, HPXML, or optionally connected to databases and CRMs like Salesforce.		Home Upgrade Energy Upgrade California®	
Initial Launch Pricing Promotion CAKESYSTEMS introductory offer for Home Upgrade Participating Contractors and Rates: • 6 month Basic Plan for \$399 with free training (save \$200 total) • 6 month Premium Plan for \$499 with free training (save \$300 total)		Home Upgrade Energy Upgrade California®	



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Home Upgrade Program Solutions



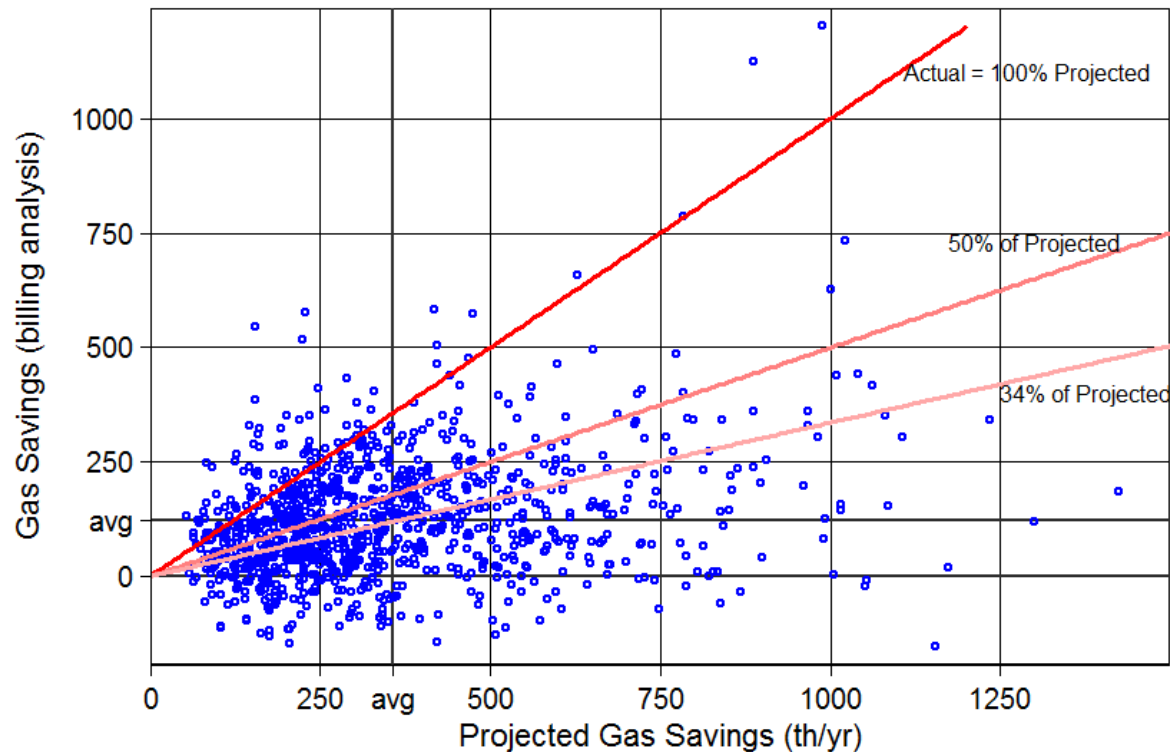
Addressing other Pain-Points:

- **Increase energy-modeling accuracy for better Program energy savings and satisfaction**
 - Launch mechanism for comparison of energy-modeled predictive savings results with pre- and post-installation customer bill data (CalTRACK)
 - Provide realization-rate feedback to energy modeling software vendors to improve tools
 - Provide realization-rate feedback to contractors to target areas that need improvement with more specific training and mentoring (potentially introduce 'contractor scores')



Is the Program Delivering Savings?

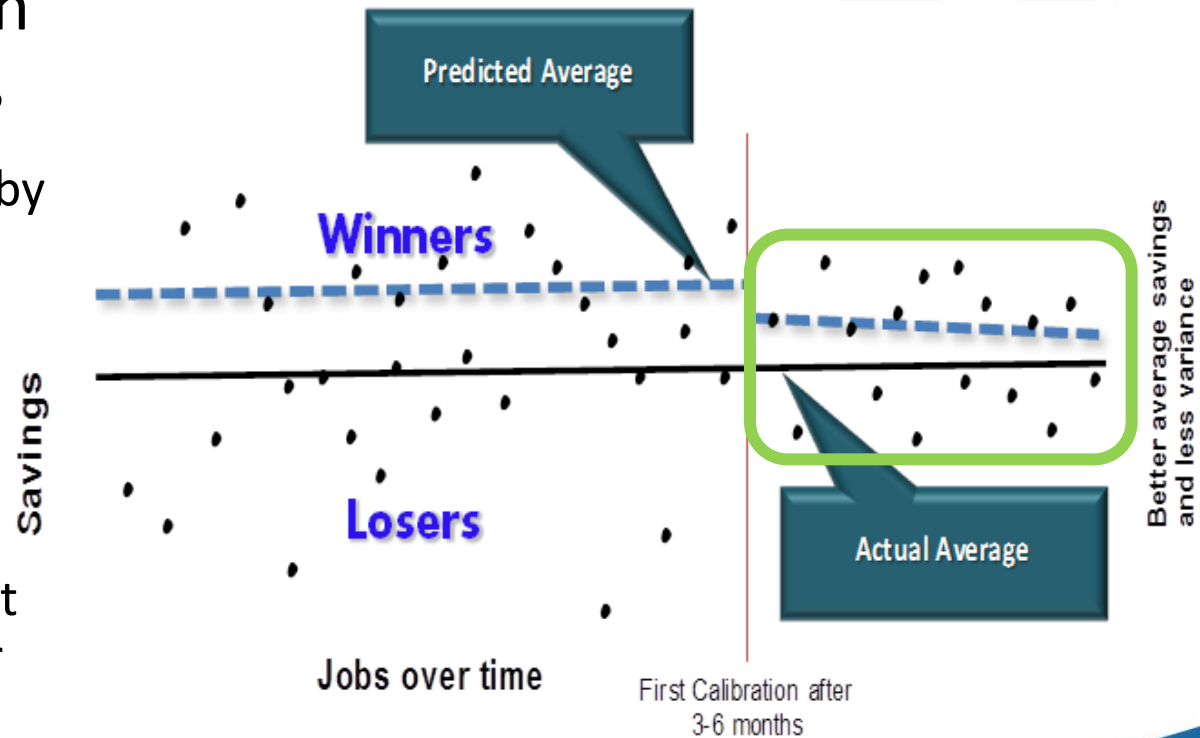
Actual (billing analysis) vs. Projected Gas Savings



CalTRACK: Delivery of Predicted Savings

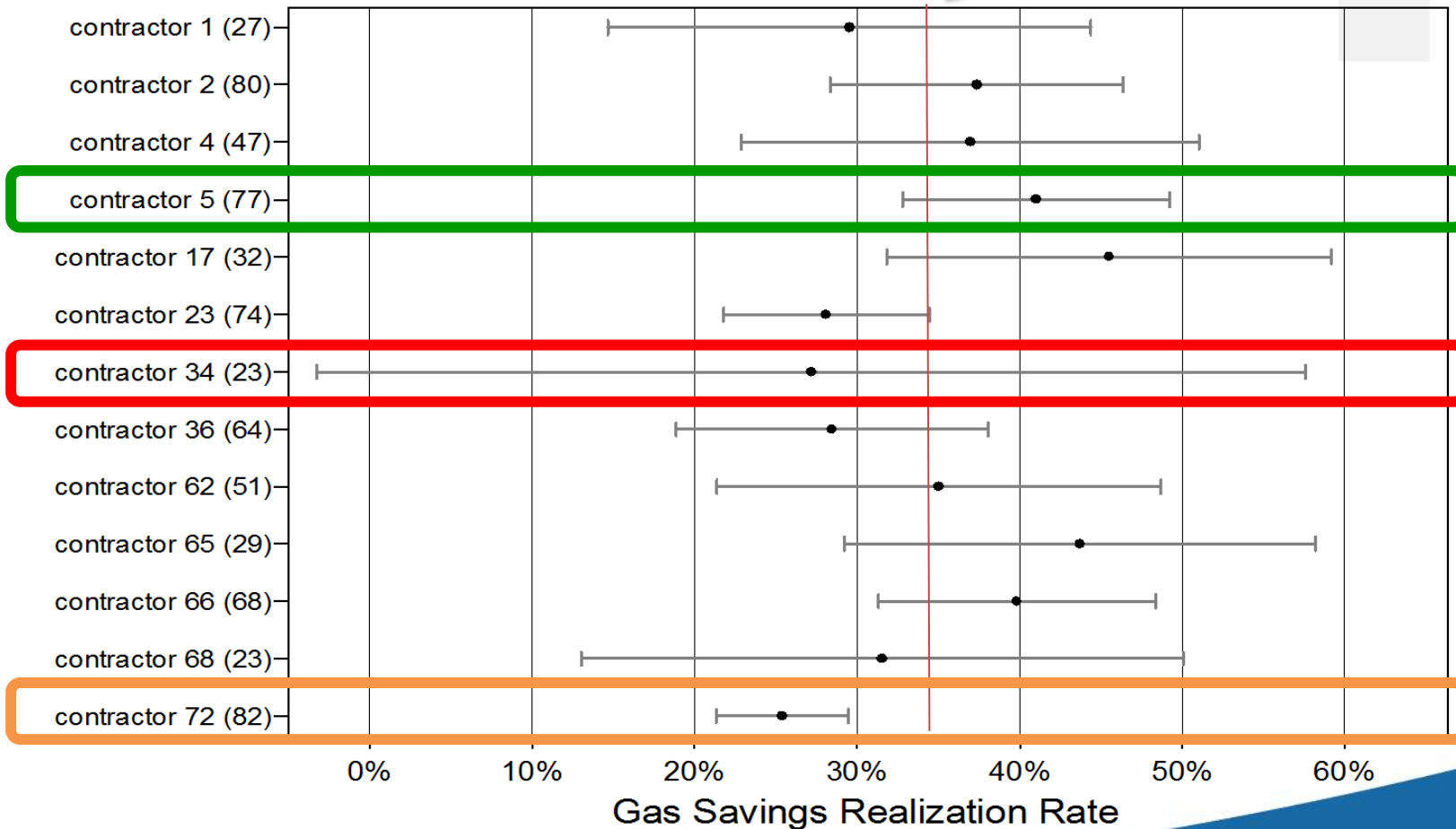
California Data-Driven Tracking and Analysis

- Upgrade projects tracked by software version used
- Savings predictions compared to weather normalized post retrofit billing data
- If inaccuracies identified at the software level, vendor can revise software or an adjustment factor can be applied to reconcile future model predictions



CalTRACK: Contractor Feedback

Avg. Gas Realization Rate (2010-2012 Data): 34%



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Home Upgrade Program Accelerator Metrics

1. Reduce administrative time to review rebate applications by 25% (per project)
2. Expand contractor choice of energy modeling software tools
3. Reduce the reporting burden on contractors by 25% (per project)
4. Improve contractors' satisfaction in the program by 20% (based on surveys)
5. Benchmark predictive accuracy of modeled energy savings and reduce average difference between predicted and actual savings by 10%

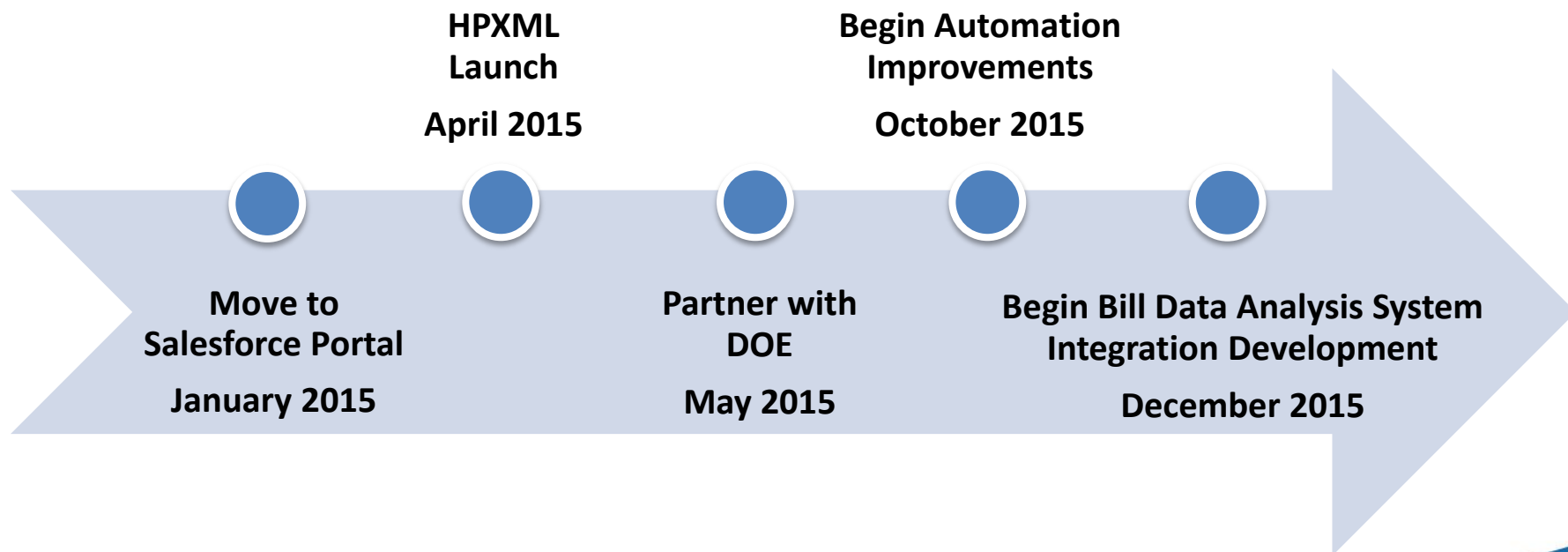


Home Upgrade Program Accelerator Results

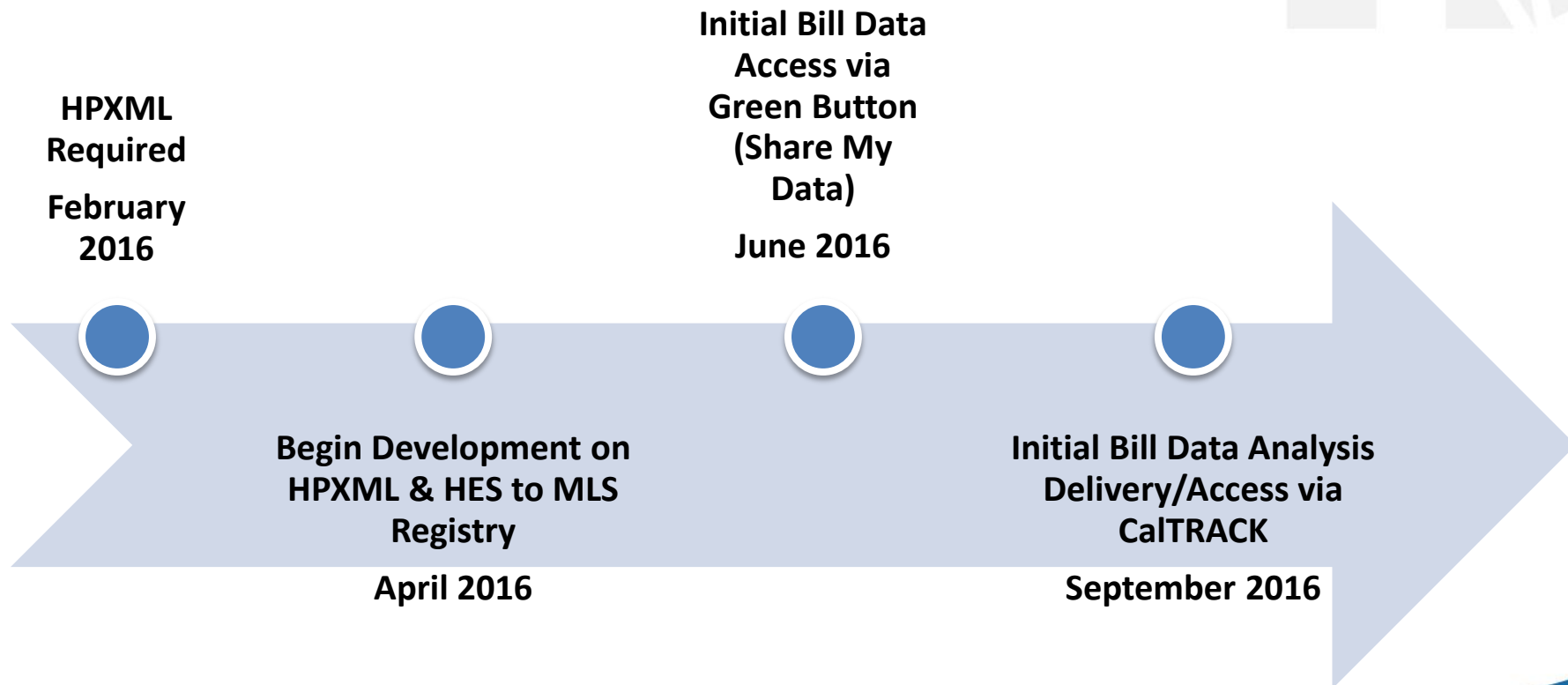
1. Reduced administrative time to review rebate applications by 48%
2. Expanded contractor choice of energy modeling software tools to 3
3. Reduced the reporting burden on contractors by 27% in avg. application submission time and 20% in avg. energy modeling time
4. Improved contractors' satisfaction in the program by 28%
5. Benchmarking of predictive accuracy of modeled energy savings is **in progress**; reducing average difference between predicted and actual savings by 10% is next (upon completion of benchmarking)



HUP Improvements Timeline - 2015



HUP Improvements Timeline - 2016



Long-Term Goal: Market Transformation

Indirect benefits that HUP improvements can facilitate:

- Driving demand/quantifying value of energy efficiency work
 - ✓ Home Energy Score via HPXML
 - ✓ Bringing green building data to the MLS via HPXML
- Designing better, more cost-effective programs
 - ✓ Less risk (greater predictability) for investors
 - ✓ Better environment for private capital and industry investment
 - ✓ Standardized (HPXML) data sharing and comparative analysis between other states, organizations and industries



Questions and Comments

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Thank You



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