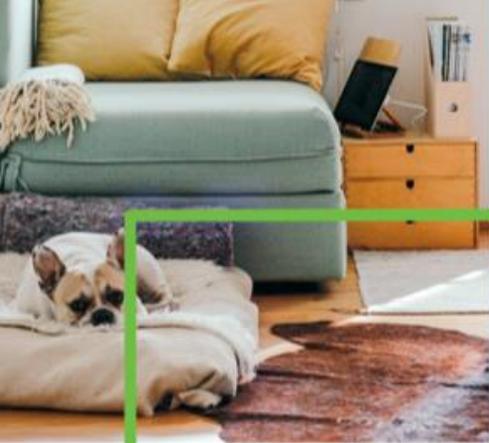




PERFORMANCE
SYSTEMS
DEVELOPMENT

| We Speak Building





Navigating the Rapids

Steering New Homes Programs
Through Energy Code Changes





- **Kathy Greely**
SVP Program Services, PSD
- **Mike Turns**
Director of Codes & New Construction, PSD
- **Dan Wildenhaus**
Building Science Manager, TRC
- **Ben Adams (in absentia)**
VP, Strategic Development, MaGrann
- **Matt Christie**
Associate Director, TRC





2019

nbi new buildings
institute

is the year of

ENERGY CODES

..the growing pressure to address climate change has put a spotlight on **codes as a critical lever for states and cities when trying to cut carbon emissions** that are fueling climate change. Buildings account for roughly 40% of the energy used in the U.S. and over one-third of carbon emissions. **Without addressing the building stock, climate action and energy policy goals are simply not achievable.** The good news is that substantive improvements in building energy codes are attainable in the near term.

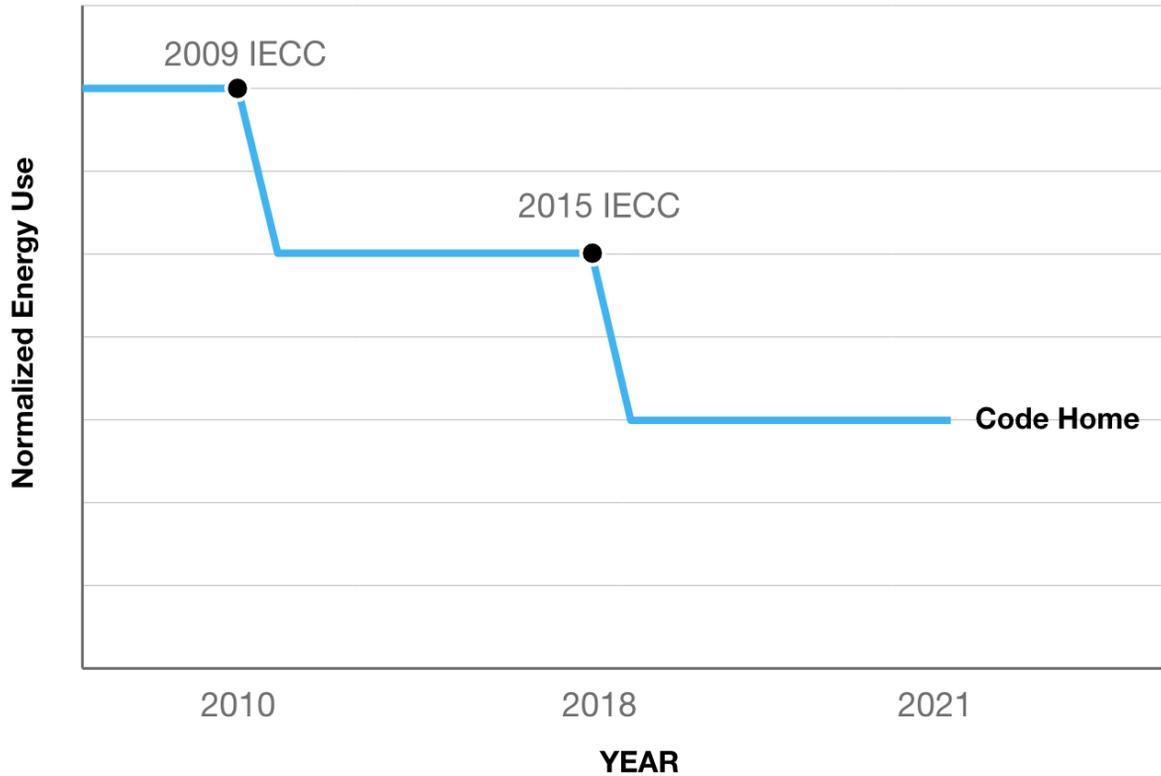


Good for the planet....

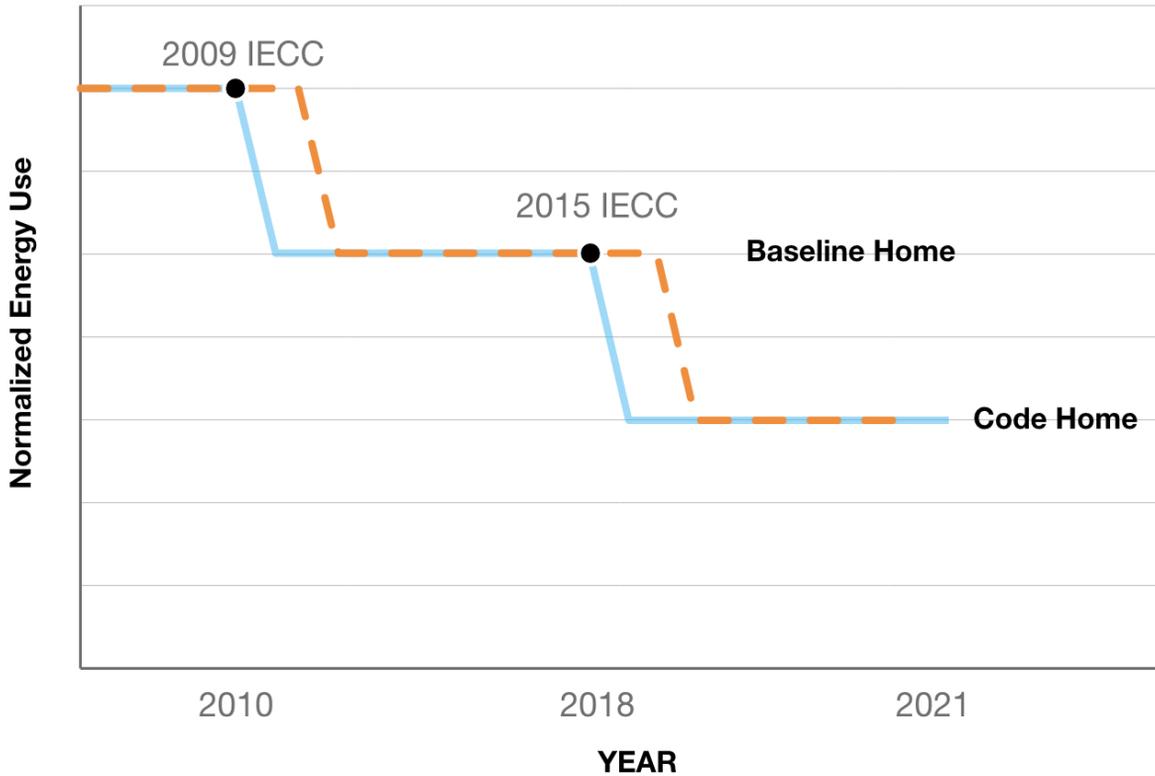


...bad for New Homes
Program savings

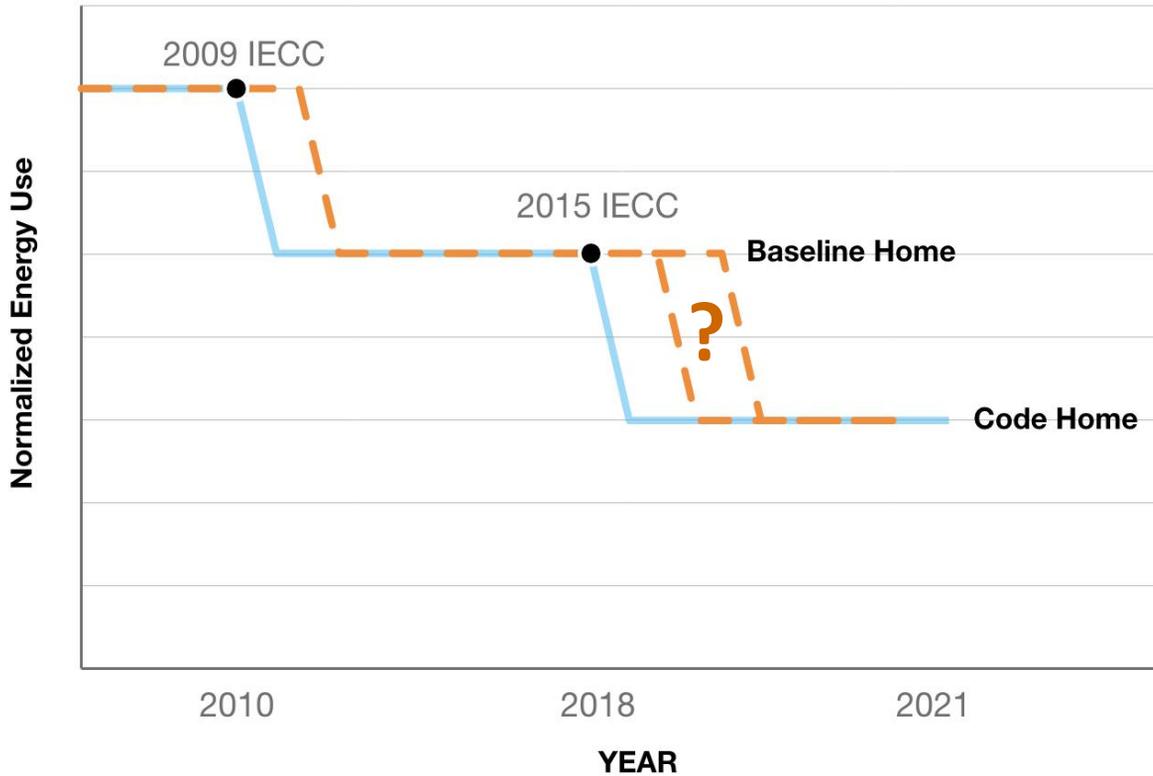
Code Change Impacts In Pennsylvania



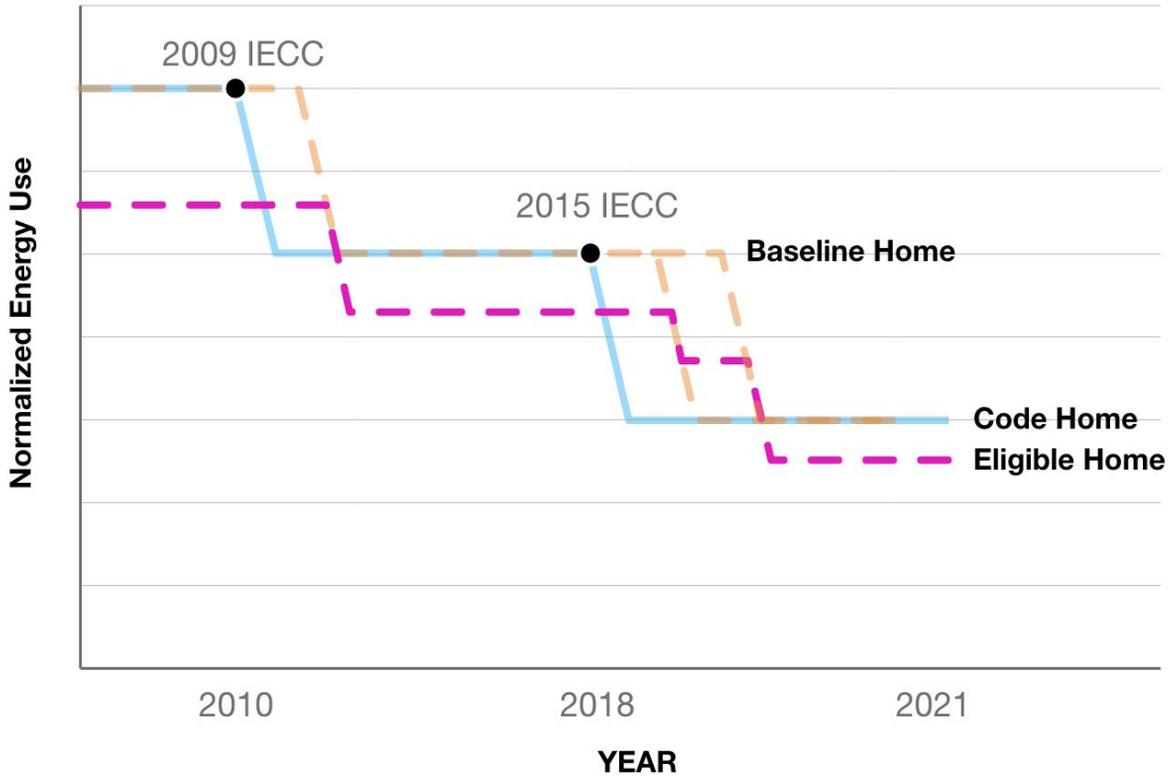
Code Change Impacts In Pennsylvania



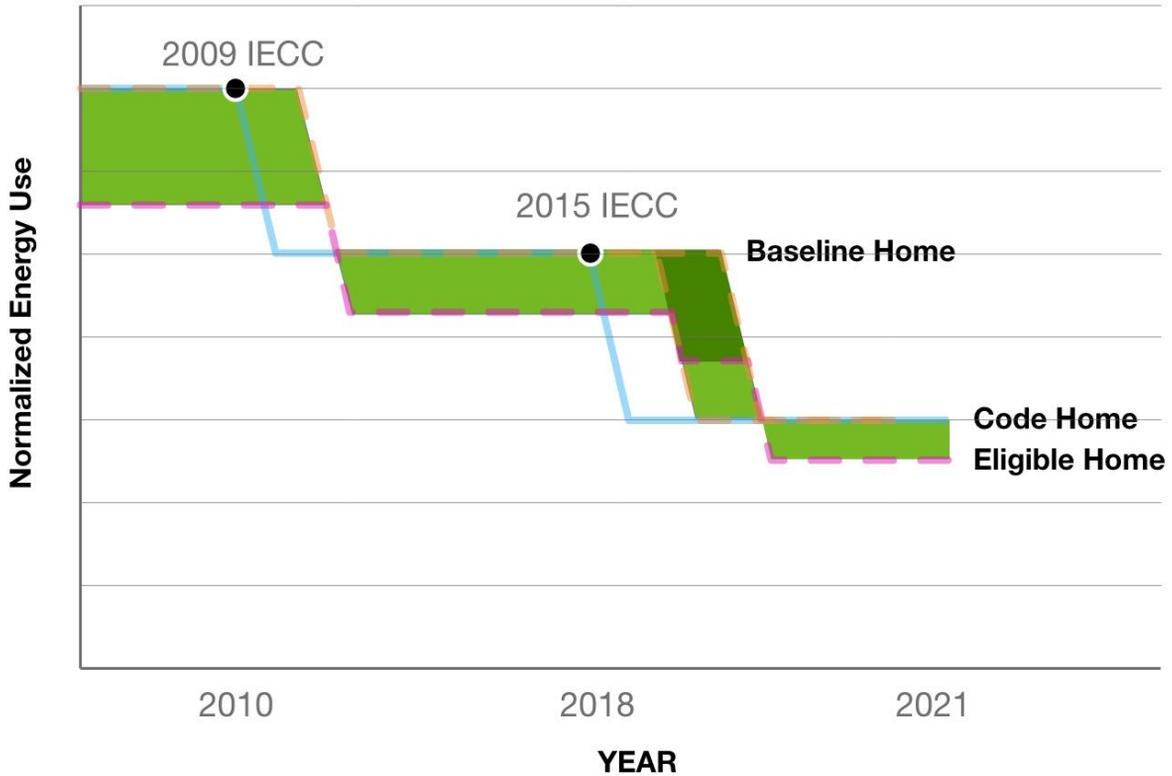
Code Change Impacts In Pennsylvania



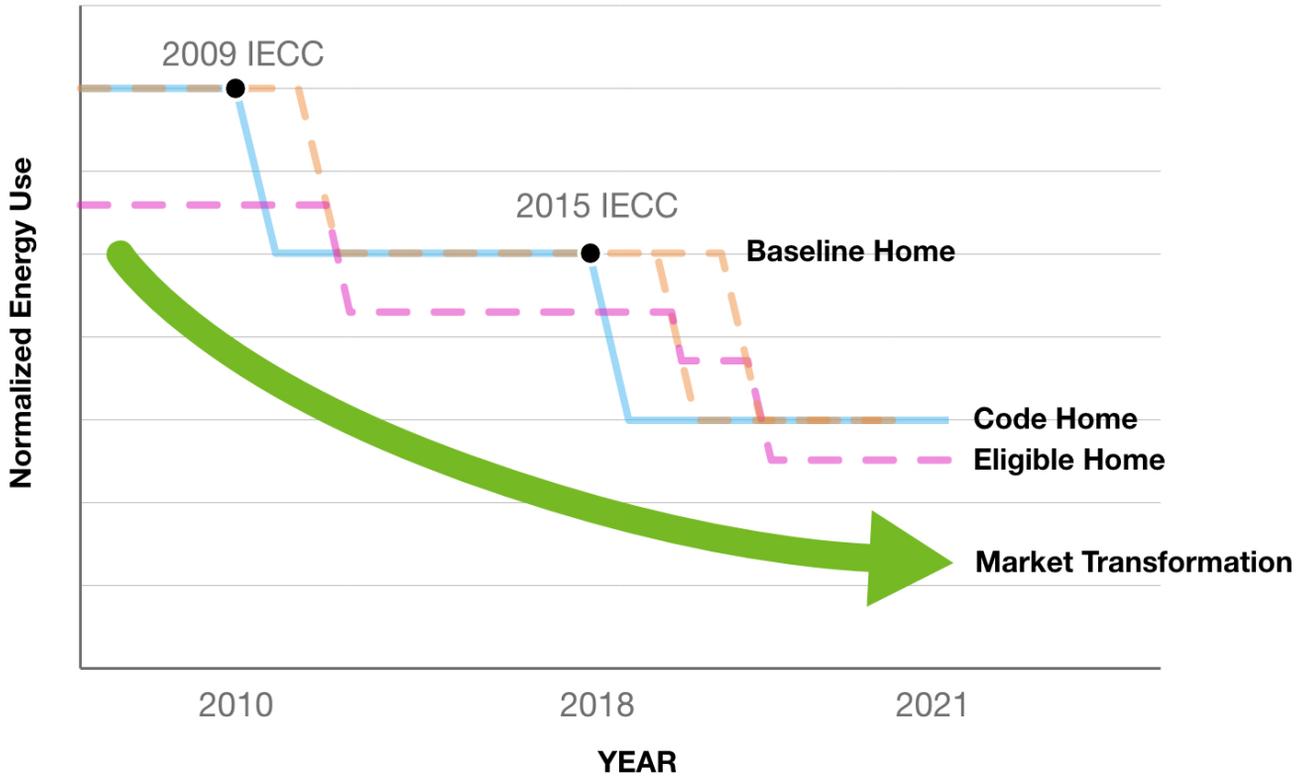
Code Change Impacts In Pennsylvania



Code Change Impacts In Pennsylvania



Code Change Impacts In Pennsylvania



IMPACTS OF CODE CHANGES



- Reduce savings per home
- Change qualification criteria (% Savings over Code, ES Version)
- Decrease the “lift” for program participation



- Effect on Participation
- Effect on Savings



Less Participation
& Savings



More Participation
& Savings

CRITICAL DECISIONS FOR IMPLEMENTERS

- *How* to change qualification criteria and savings baseline
- *When* to change qualification criteria and savings baseline
- Incremental change vs. cliff



VS





Changing Times in PA

Mike Turns

The Importance of Data



2009 Avg kWh Sv 2009 Total kWh Sv 2015 SOC

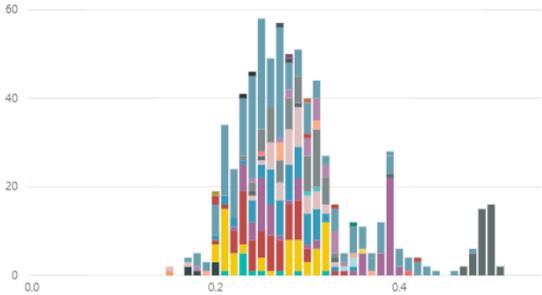
3.15K 2,208,170.71



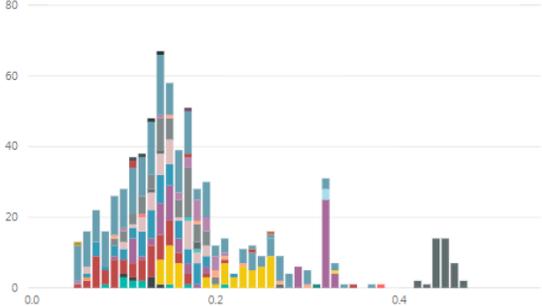
Unit Type Builder

All All

SPIBUILDER Home... Homes Const... n Builders



SPIBUILDER Home... Homes Const... n Builders

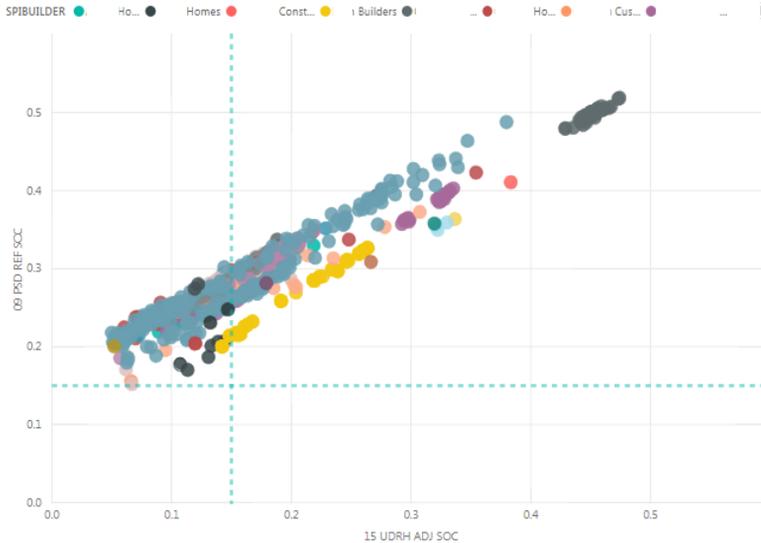


Homes

702

2015 Avg kWh Sv 2015 Total kWh Sv

2.36K 1,654,973.23





- What is the date of the code change?
- When do regulators require an updated savings baseline?
- Update eligibility requirements (e.g. 15% savings over code) at the same time?
 - Gradual phase-in? 5%, 10%, 15% over code?
 - By permit date or submittal date?



- Reference home approval
- Rollout dates
- Software versions

| Climate Zone 5 | | |
|------------------------------------|---|---|
| | 2009 IECC | 2015 IECC with PA Amendments |
| Insulation and Fenestration | | |
| Window U-factor | 0.35 | 0.32 |
| Skylight U-factor | 0.60 | 0.55 |
| Ceiling R-value | 38 | 49 |
| Basement wall R-value | 10/13 | 15/19 |
| Unvented crawl space R-value | 10/13 | 15/19 |
| Air Infiltration | | |
| ACH50 | 7.0 | 5.0 (PA amendment) |
| Ducts | | |
| Insulation | R-8 <i>supplies</i> in attics R-6 everywhere else | R-8 in attics (supplies & returns) R-6 everywhere else |
| Leakage (cfm/100 sqft) | Post construction total: 12 Post construction LTO: 8 Rough-in w/air handler total: 6 Rough-in w/o air handler total: 4 | Post construction total: 4 Post construction LTO: Not allowed Rough-in w/air handler total: 4 Rough-in w/o air handler total: 3 |
| Lighting | | |
| High-efficacy | 50% | 75% |



- Communicate with software companies to incorporate changes in program-specific requirements/baselines
- Consider state-specific code amendments
- Equipment efficiencies:
 - RESNET defaults \neq current federal minimums
- Will take time and maybe money



- More like turning a ship than a dinghy
 - Start communicating change ~1 year in advance
 - e-newsletters
 - Conversations with major participants
- Staged phase-ins can reduce participation drop-offs



- Provide information on items that impact gas or electricity, depending on the utility
- Utilize data to identify lowest-hanging fruit, e.g.
 - Heat pump water heaters
 - Envelope air leakage
 - Mechanical ventilation

Northwest Home Certification Programs

What we do with data

Dan Wildenhaus

Programs

NATIONAL



National

REGIONAL



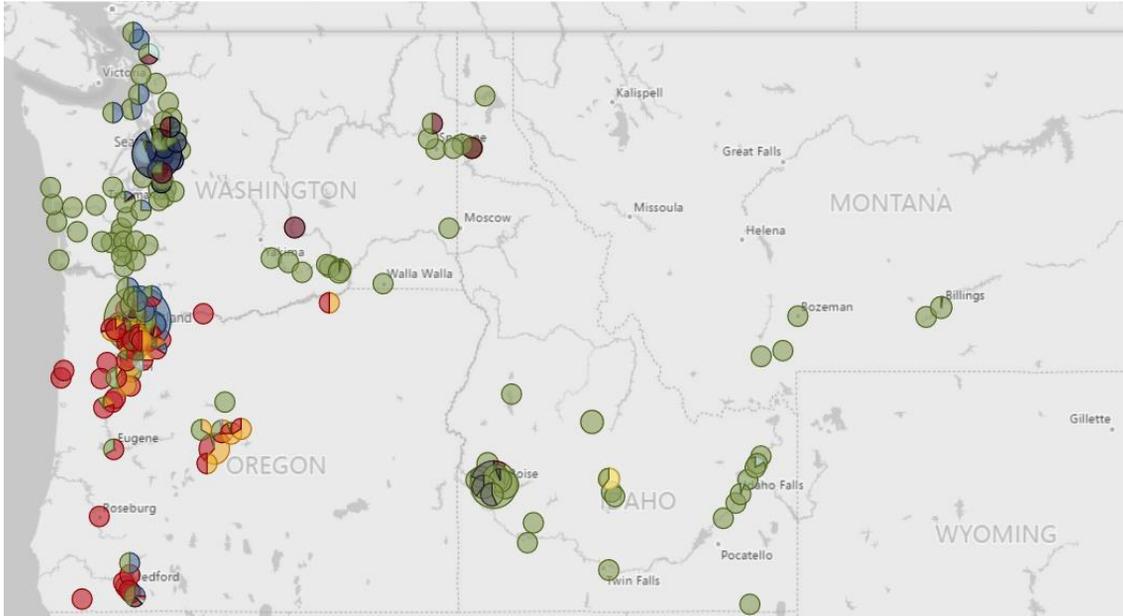
Northwest

Next
Step
Homes

Utility
Incentive

Regional Activity

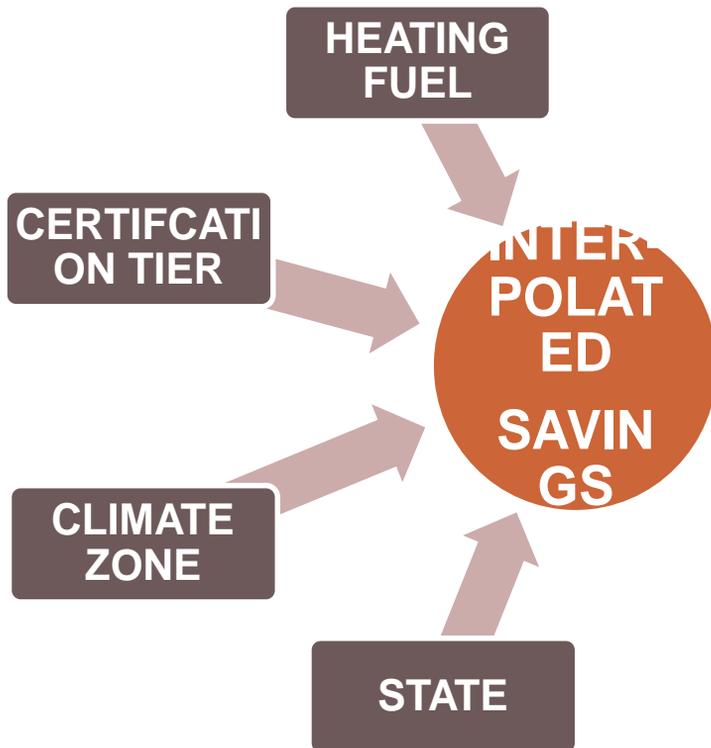
Homes Certified in 2017 by Program



Savings Estimate Methodology



Savings Estimate Methodology



| ORHZ1Gas | State: | OR |
|----------|-----------------|-----|
| | Climate Zone: | HZ1 |
| | Heating System: | Gas |
| Tier | Therms | kWH |
| Tier 5 | 132 | 334 |
| Tier 4 | 108 | 334 |
| Tier 3 | 85 | 261 |
| Tier 2 | 61 | 188 |
| Tier 1 | 37 | 115 |

| WAHZ2Electric | State: | WA |
|---------------|-----------------|----------|
| | Climate Zone: | HZ2 |
| | Heating System: | Electric |
| Tier | Therms | kWH |
| Tier 5 | 0 | 5944 |
| Tier 4 | 0 | 4630 |
| Tier 3 | 0 | 3317 |
| Tier 2 | 0 | 2003 |
| Tier 1 | 0 | 689 |

NW New Homes By the Numbers...

7,873

net homes
received



9,866

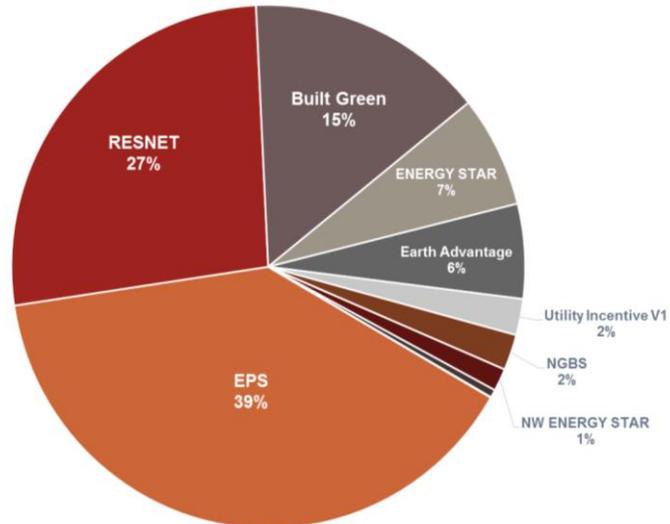
certifications

13.2 million
kWh savings



825,000
therms savings

2017 Homes Certifications by Program*



**Total homes certified before netting out due to program overlaps.*

Home level data from EPS

| | BV | BW | BX | BY | BZ | CA | CB | CC |
|----|--|---|---|---|--|---|---|---|
| | ETO-640S 3.33 | | | | | | | |
| | ETO-640S 3.30 Primary Heating Equipment SEER | ETO-640S 3.31 Primary Heating Equipment COP | ETO-640S 3.32 Primary Heating Equipment Brand | ETO-640S 3.33 Primary Heating Equipment Model Number | ETO-640S 3.35 Primary Heating Equipment Location | ETO-640S 3.36 Primary Heating Equipment ECM | ETO-640S 3.37 Heat Pump Outdoor Unit Model Number | ETO-640S 3.38 Primary Heating Equipment |
| 23 | - | - | American Standard | S9V2B040D3PSAAA | Conditioned Area | Yes | - | Gas |
| 24 | 18.90 | - | MTSUBISHI | MXZ-8C48NAHZ | Conditioned Area | No | - | Electric |
| 25 | 18.00 | - | Fujitsu | ARU9RLF | Conditioned Area | No | AOU24RLXFZ | Electric |
| 26 | - | - | RHEEM | R95PA0701317MSA | Garage or open crawl sp | No | - | Gas |
| 27 | - | - | Rheem | R95PA0401317MSA | Conditioned Area | No | - | Gas |
| 28 | - | - | Bryant | 912SC48060S17 | Garage or open crawl sp | No | - | Gas |
| | CE | CF | CG | CH | CI | CJ | CK | CL |

| ETO-640S 3.39 Water Heater Fuel | ETO-640S 3.40 Water Heater Type | ETO-640S 3.41 Water Heater Gallons | ETO-640S 3.42 Water Heater EF | ETO-640S 3.43 Water Heater Location | ETO-640S 3.44 Water Heater Brand | ETO-640S 3.45 Water Heater Model Number | ETO-640S 3.46 Local |
|------------------------------------|------------------------------------|---------------------------------------|----------------------------------|--|-------------------------------------|--|------------------------|
| Gas | Tankless | 0.00 | 0.97 | Garage or open crawl sp | Navian | NPE 210A | Conditioned |
| Electric | Storage | 50.00 | 2.70 | Garage or open crawl sp | BRADFORD WHITE | RE2H50R10B-1NCWT | Conditioned |
| Gas | Tankless | 0.00 | 0.95 | Conditioned Area | Rinnai | REU KBD32237FFUD | Conditioned |
| Gas | Tankless | 0.00 | 0.96 | Garage or open crawl sp | RINNAI | REU-KB2934WD | Unconditioned |
| Gas | Tankless | 0.00 | 0.82 | Garage or open crawl sp | Noritz NR98DVC | GQ-2857WX-FFA US | Conditioned |
| Gas | Tankless | 0.00 | 0.96 | Garage or open crawl sp | Rinnai | REU-KBD2530FFUD | Unconditioned |
| Gas | Tankless | 0.00 | 0.99 | Garage or open crawl sp | Navien | NPE-210S | Partial |
| Gas | Storage | 75.00 | 0.68 | Garage or open crawl sp | BRADFORD WHITE | RG275H6N | Partial |
| Electric | Heat Pump | 50.00 | 3.20 | Garage or open crawl sp | Rheem | PRO 50 T2RH350D | Unconditioned |
| Electric | Storage | 50.00 | 2.80 | Garage or open crawl sp | GE | GEH50DEEJSC1 | Unconditioned |
| Electric | Storage | 50.00 | 0.95 | Conditioned Area | Bradford White | RE350S6 | Conditioned |
| Electric | Storage | 50.00 | 0.95 | Conditioned Area | Bradford White | RE350S6 | Conditioned |
| Electric | Storage | 50.00 | 0.95 | Conditioned Area | Bradford White | RE350S6 | Conditioned |
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| Electric | Storage | 50.00 | 0.95 | Conditioned Area | Bradford White | RE350S6 | Conditioned |
| Electric | Storage | 50.00 | 0.95 | Conditioned Area | Bradford White | RE350S6 | Conditioned |

The background of the image shows several stacks of light-colored wooden planks, likely pine or spruce, arranged in a workshop or lumber yard. The planks are stacked in neat piles, with some showing the grain and knots. The lighting is bright, highlighting the texture of the wood. An orange L-shaped graphic element is positioned on the left side of the image, partially overlapping the text box.

Local Gov't Work

What is BetterBuilt^{NW}?



Non-profit representing over 140 utilities and energy efficiency organizations

The acceleration and adoption of energy-efficient products, services and practices

BetterBuilt^{NW}

A suite of resources that supports key energy efficiency measures and residential New Construction

Website, staff, marketing, and the Home Efficiency Forum

Where this started?



Support Us

ENERGY EFFICIENCY PORTALS

ABOUT US

NEWS & BLOG

PUBLICATIONS

CONFERENCES & EVENTS

[Home](#) | [Energy Efficiency by Sector](#) | [Local Energy Policy](#) | [Technical Assistance Toolkit](#) | [Local Technical Assistance Toolkit](#)

Local Technical Assistance Toolkit

ACEEE acts as a technical assistance advisor to numerous local governments and authorities by providing analyses on the potential for energy efficiency and presenting policy opportunities. This toolkit was developed as a result of our experience working with local policymakers, program managers, and community stakeholders. The tools are designed to respond to needs of local governments and others engaged in advancing energy efficiency at the local level. Many of these tools are aimed at enabling action on low-cost, high-impact policies that will allow communities to achieve lasting energy savings.

The resources below summarize several of the programs and policies being implemented in local communities around the country. They include links to introductory information and technical assistance resources for each topic area. These resources are continually evolving as we identify additional local needs, develop new strategies, and improve upon existing ones. If you do not find the tool you need, please let us know. Need more help? Fill out this [form](#) and send it to us. For resources related to state policy please see the [State Technical Assistance Toolkit](#).

[Local Energy Planning](#)

[Local Government Lead by Example](#)

[Local Government-Utility Partnership Strategies](#)

[Community Resilience Planning](#)

[Local Energy Efficiency Policy Calculator \(LEEP-C\)](#)

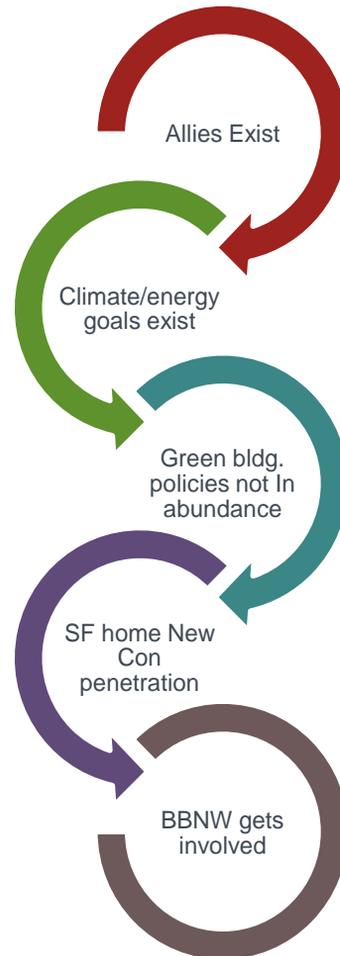
Local Policy Toolkit

- [Local Energy Planning](#)
- [Improving Access to Energy Usage Data](#)
- [Strategies for Energy Savings In Buildings](#)
- [Local Government Lead by Example](#)
- [Water and Wastewater Treatment](#)
- [Public Buildings](#)
- [Local Government-Utility Partnership Strategies](#)
- [Overview: Local Government-Utility Partnerships](#)
- [Increasing Participation In Utility Energy Efficiency Programs](#)

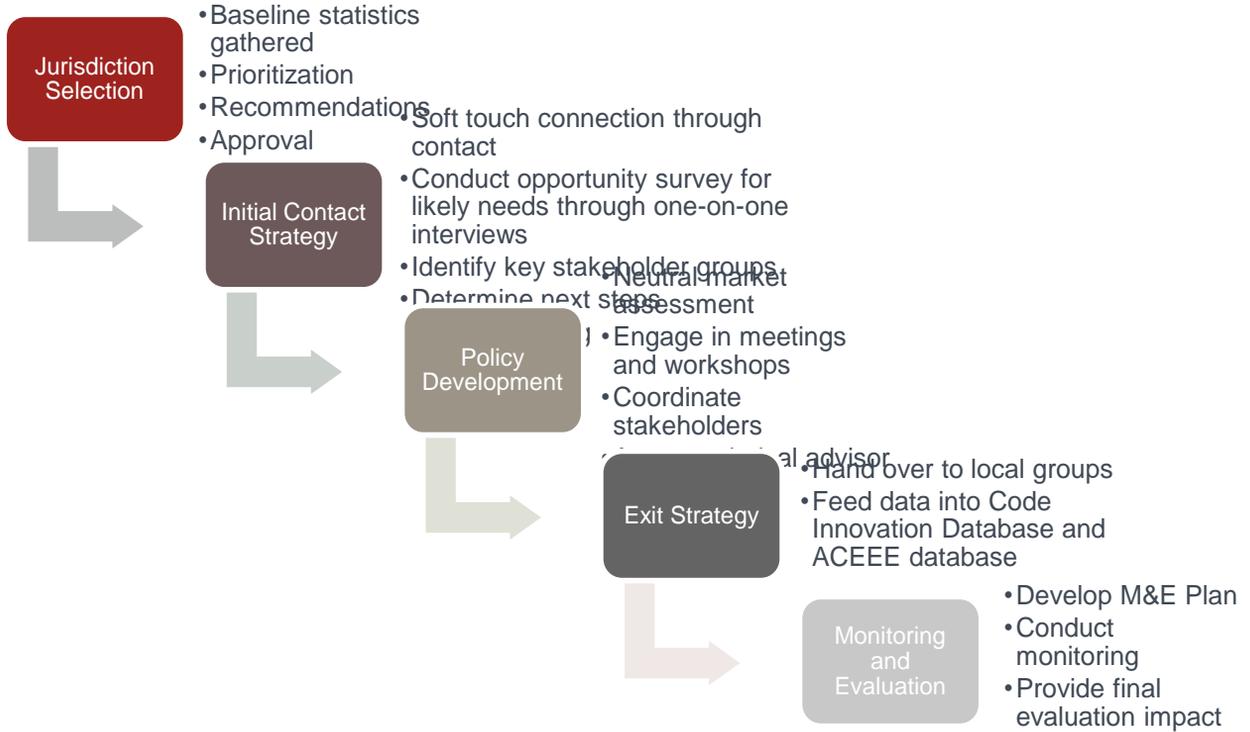
Where we work

Data Resources

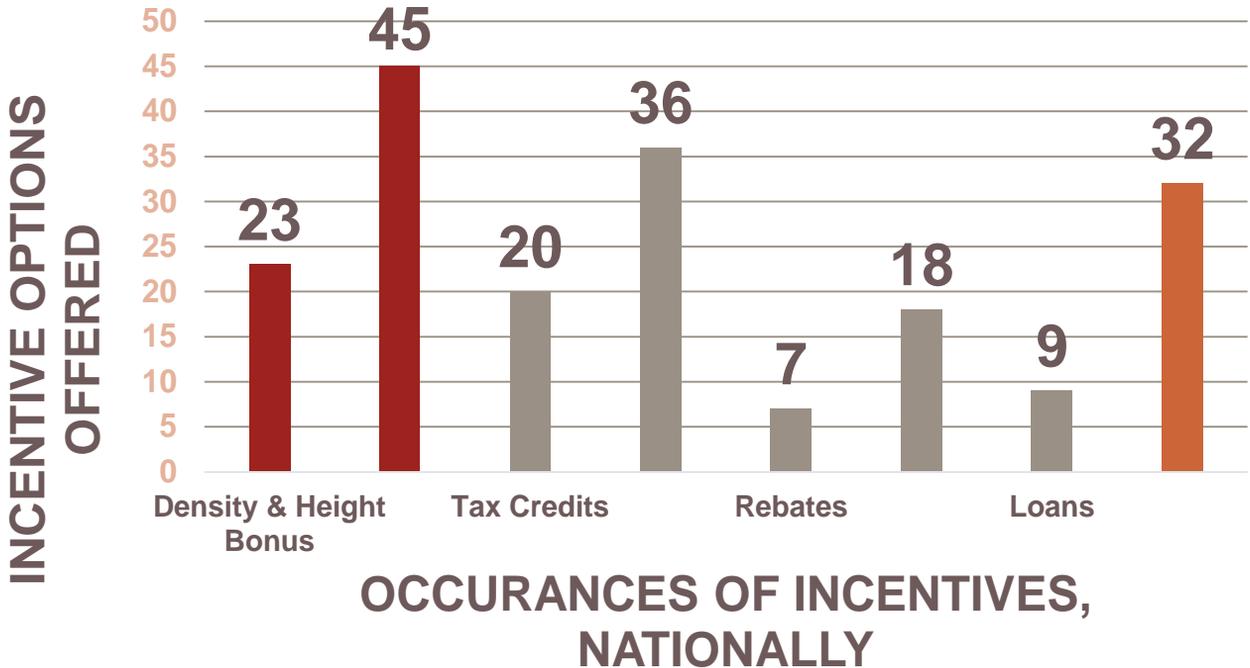
- Construction monitor
- ACEEE roll-up/stakeholder database
- Statewide e-permitting websites
- Dodge data county level forecasts
- NAHB dataset
- Oregon Office Economic Forecasts



Example Methodology



Effective Incentives



Outputs

Builder Survey Questions

Kickoff Meeting Agenda



BetterBuilt^{NW}

NORTHWEST ENERGY EFFICIENCY ALLIANCE

Guide to Certification Program and Local Government Partnerships

Prepared by TRC Energy Services, on behalf of the Northwest Energy Efficiency Alliance (NEEA)
February 9, 2019

Partnership Guide



BetterBuilt^{NW}

Local Government Policy Examples: Fee Reductions and Waivers

SUMMARY

The Northwest Energy Efficiency Alliance (NEEA) and the Northwest Building Code Council (NWBC) have developed a series of local government policy examples that can be used to inform local government decision-making on energy efficiency incentives and programs. These examples are intended to provide a starting point for local government decision-makers and are not intended to be a one-size-fits-all solution. Local governments should tailor these examples to their own needs and circumstances.

Key Takeaways:

- Local governments should consider the impact of energy efficiency incentives on their revenue and budget.
- Local governments should consider the impact of energy efficiency incentives on their building code and enforcement.
- Local governments should consider the impact of energy efficiency incentives on their community and economic development.

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Policy Examples



BetterBuilt^{NW}



Pennsylvania Housing Finance Agency Financial Incentives and Passive House Partnership

In 2015, the Pennsylvania Housing Finance Agency (PHFA) entered into a partnership with the Pennsylvania Department of Community and Economic Development (PDECD) to provide financial incentives for the construction of Passive House (PH) buildings. This partnership has resulted in the construction of several PH buildings in Pennsylvania, including the first PH building in the state.

Key Takeaways:

- PHFA and PDECD have established a partnership to promote the construction of PH buildings in Pennsylvania.
- PHFA provides financial incentives for the construction of PH buildings, including grants and low-interest loans.
- PDECD provides technical assistance and support for the construction of PH buildings, including training and certification.

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Case Studies

Outputs



Energy Performance
Comparison: *DOE-Zero
Energy Ready Home &
OR State Energy Code
Home*

January 29, 2019



NEEA New Homes

Passive House
Analysis

Prepared by TRC
May 25, 2018

Codes Innovation Database

SANDEN CO2 REFRIGERANT HEAT PUMP WATER HEATER AT FUTUREFIT HOME

Case Study by Tad Everhart, Tad Everhart Energy Advisor LLC

Abstract

Residential heat pump domestic water heating systems (HPDHW) use synthetic refrigerants with high global warming potential (GWP). In the 1990s, Japanese engineers developed an alternative HPDHW technology known as "Eco-Cute" that uses CO2 for refrigerant, a naturally occurring gas with global warming potential (GWP) 2,000 times less than synthetic. Oregon's plumbing code requires hot water heating systems to be listed and tested by an approved agency (such as Underwriters Laboratories UL). Although it is not yet UL listed, the City of Portland allowed us to install the CO2 HPDHW system as an alternate material through its Alternative Technology Advisory Committee process.

Permitting Process

There were two steps in the process. First, the ATAC heard our testimony and reviewed our evidence and recommended our technology. Second, the building official granted our appeal and permitted us to install a Sanden Eco-Cute. The entire approval process took just over two months. We submitted our written application and the required \$150 fee to the ATAC. Within one month ATAC held a hearing on our application and allowed our in-person testimony. Within two weeks, ATAC informed us that it would recommend we be allowed to install our system, and it gave us a written recommendation and posted it on its website. We then submitted our written building code appeal and the required \$100 fee, and within one week, the City of Portland informed us that our appeal was granted and posted the appeal summary on its website.

| Code Requirement | Compliance Path |
|--|--|
| 2011 ORSC section M1302.1 Requires appliances to be listed and labeled by an approved agency (e.g. UL) | City of Portland building code appeal based on ATAC's recommendation (see below); administrative ruling by City staff, followed by written, online approval. |
| 2011 ORSC section R104.11 allows alternative materials, design and methods of construction and equipment when the material or work offered is equivalent | Written application to City's ATAC, ATAC in-person hearing, and ATAC's written recommendation to approve... |

Project Description

Even after futurefitting our home (remodeling for the future) to the super-efficient Passive House Standard in 2009, we still needed a small amount of space heating. And futurefitting did not change our need for domestic hot water. An "active" heating system like HPDHW fit well with our plan: efficient, affordable, and electric to make use of renewable energy and avoid combustion of fossil fuels. When installed, it will satisfy both our space heating and hot water needs.

The specific Eco-Cute equipment we want to install is not UL listed but it is environmentally superior, so we made an application to the City of Portland Alternative Technology Advisory Committee (ATAC). ATAC heard remote and in-person oral testimony and reviewed written materials we submitted. ATAC recommended approval, and the Bureau of Development Services approved our code appeal based on the ATAC's recommendation.

Resources:

[Oregon Residential Specialty Code](#)

[Oregon Plumbing Specialty Code](#)

[Laboratory Assessment of Sanden GAU Heat Pump Water Heater Lab](#)

[Oregon Mechanical Specialty Code](#)

[Oregon Reach Code](#)

[WSU Case Study on CO2 Refrigerant HPDHWs](#)

SEARCH CODE INNOVATIONS

Enter a keyword to search for code innovations.

[Browse all case studies](#)



| | |
|---------------------|---|
| Category | Energy Heating, Ventilation & AC Plumbing Systems |
| Subcategory | Water Heating |
| Specific Innovation | Heat Pump Water Heater - CO2 Refrigerant |
| Jurisdiction | City of Portland |
| Parcel Number | 10447 |
| Approving Official | Terry Whitehill, Bureau of Development Services |
| Owner | Tad Everhart |
| Building type | Residential |
| Square Feet | 2100 |
| Architect | Barry N. Smith & Chris Neelander |
| Subcontractor | Gresham Electric and Imagine Energy |
| Rating / Awards | None |

Applicable Codes and Standards

2011 ORSC M1302
2011 ORSC M2005
2011 ORSC 104.11, page 3

Related documents

ATAC recommends approval
City of Portland appeal decision & supporting docs



ADVANCING A 200-YEAR PERSPECTIVE FOR THE BUILT ENVIRONMENT

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THE CODE INNOVATIONS
DATABASE

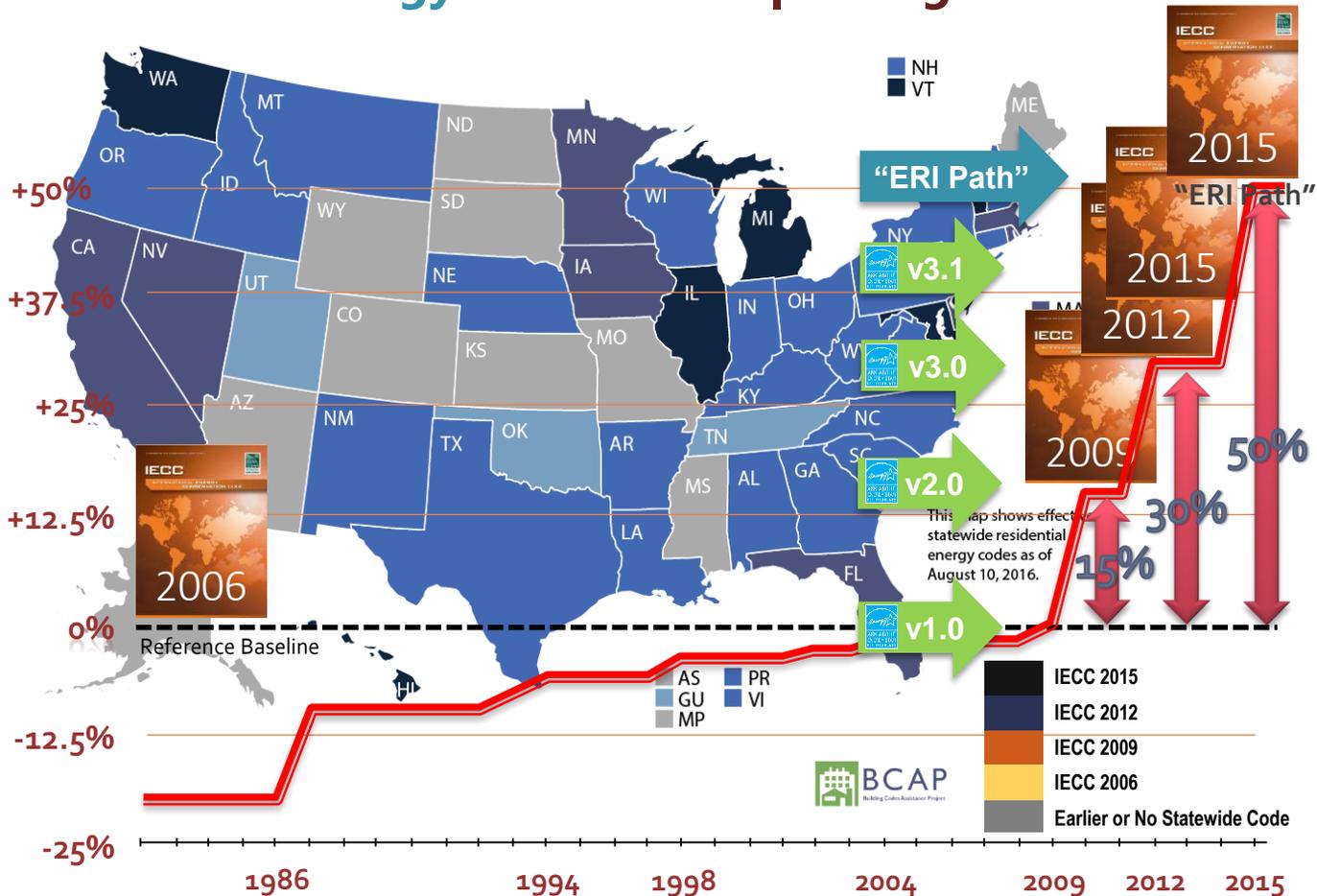
THESE ARE THE BUILDING CODES THAT SHAPE OUR WORLD. WE'VE COLLECTED THEM INTO ONE PLACE TO HELP YOU UNDERSTAND THEM BETTER.

Ratings, Programs and Code

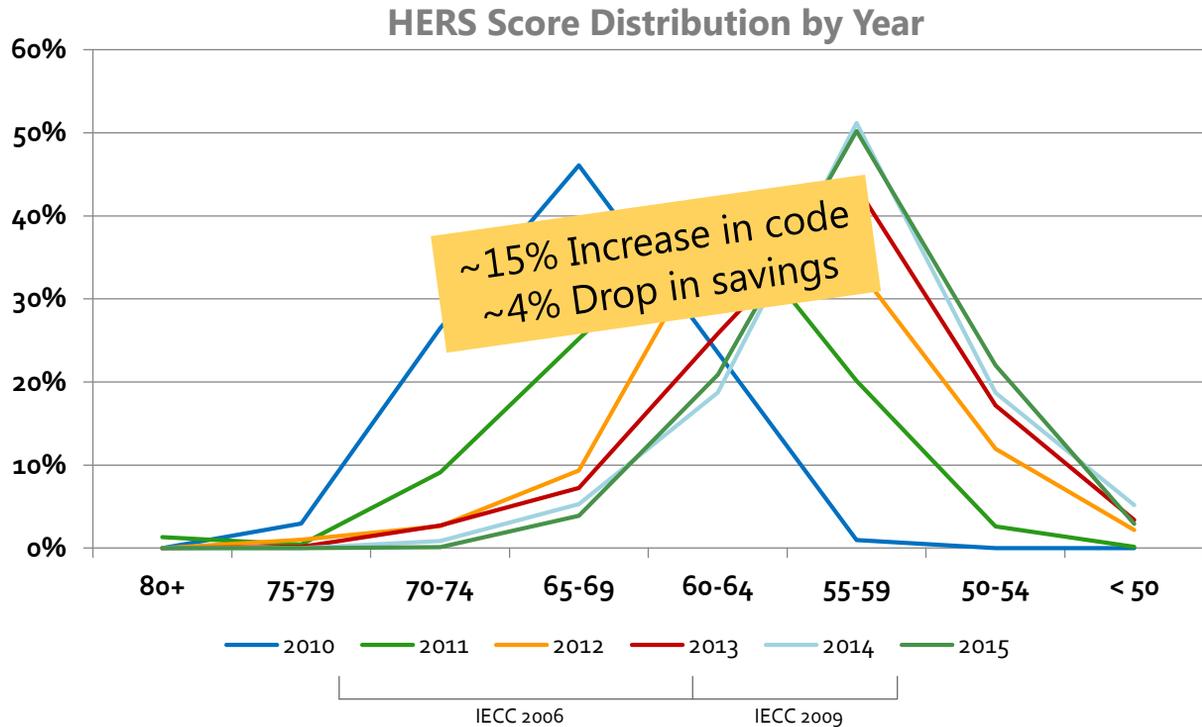
Ben Adams



Residential Energy Codes are Improving Faster!



HERS Based Incentives and Code Change



Savings Based Incentives and Code Change

AEP Ohio EfficiencyCrafted New Homes 2018 Program Summary



Incentive Levels

Single Family a

EfficiencyCra

ENERGY STAR Certified

~10% Increase in savings
Next code change in 2019

\$300.00 + \$0.12/kWh

\$300.00 + \$0.12/kWh

Homes must be new construction, complete per the local building code, and include central space heating, air conditioning or water heating supplied by AEP Ohio residential electric service.

Building Type Definitions

Single Family – A structure containing one or two single-family dwelling units with a separate external entrance for each unit.

Multi-Single Family – A structure containing three or more dwelling units with separate external entrances and no more than one dwelling unit located above another unit.

Multifamily – All other structures up to five floors above grade or above garage regardless of entrance configuration. In all cases, the structure must meet the criteria for "ENERGY STAR Certified Homes" according to the EPA ENERGY STAR Multifamily New Construction Decision Tree available at energystar.gov.



An AEP Company

For more information call (877) 771-5506 or email info@EfficiencyCraftedHomes.com

Rater Feedback



Preparedness

Training

Consulting

New Business

Appreciation

Understanding

Permit Grab

Enforcement

ENERGY STAR

Skepticism

Trades

Cost

Blame

Watering Down



Q & A

