Rhode Island 2017 Code vs. UDRH Study

Executive Summary

The focus of this study was to compare savings of new homes in Rhode Island using IECC 2012 code vs. the latest RI UDRH. The same methodology has been exercised for Rhode Island in the past, as well as for programs in Massachusetts.

The first step was to determine the home configurations to be modeled, as well as any other variable characteristics (HVAC system type, primary heating fuel type, and location). There were 8 basic home configurations, summarized in Table 1 below.

Table 1 – Home Configurations

Description	CFA (sq. ft.)	Volume (cu. ft.)	Foundation Type
Mid-level Apartment	1,406	11,248	Apartment above conditioned space
Lower-level Apartment	1,689	13,416	Slab
Top-level Apartment	1,689	13,416	Apartment above conditioned space
Average-size single family detached	2,304	17,408	Unconditioned basement
Large single family detached	4,596	58,219	Conditioned basement
Small single family detached	1,495	11,960	Slab
Townhome - end unit	2,281	17,588	Slab
Townhome - interior unit	2,413	21,183	Conditioned basement

Five different HVAC system types were to be modeled per client direction:

- Furnace with Central AC
- Hydro-Air Boiler with Central AC
- Boiler with no AC
- Boiler with Central AC
- Air-Source Heat Pump

It's worth noting that the first and second systems listed above are modeled the same way in REM/Rate and ICF's proprietary Beacon® Predictive Savings Tool (PST) – the two software tools used for this analysis – so the same home was used to model each and then their weighting factors were combined (see below).

Four different Primary Heating Fuel Types were modeled (Electric – obviously only applicable to homes with Air-Source Heat Pumps – Natural Gas, Oil, and Propane), and two locations were modeled, based on availability of weather data in each software tool (Providence, RI and New Bedford, MA).

A single REMRate file was created to model each combination of the above variables, resulting in 160 unique homes:

- 8 different home configurations
- 10 different HVAC/fuel combinations

- o Furnace or Hydro-Air Boiler with AC, with Gas, Oil, or Propane (3 different combinations)
- o Boiler with no AC, with Gas, Oil, or Propane (3 different combinations)
- o Boiler with AC, with Gas, Oil, or Propane (3 different combinations)
- o Air-Source Heat Pump with Electricity (1 combination)
- 2 different locations
- 8 x 10 x 2 = 160 unique combinations

Each of these homes were modeled using IECC 2012 code minimums and federal minimum standards for HVAC equipment efficiency. Where no code or federal minimum was specified, reasonable assumptions were made.

These 160 REM/Rate files were run through both REM/Rate and the Beacon PST, using the RI 2017 UDRH as the baseline. Savings therefore represent the difference between 2012 IECC code and the RI UDRH – positive savings indicate that the 2012 IECC code home outperforms a home built according to the UDRH, while negative savings indicate a UDRH-built home outperforms an equivalent code-built home.

Each characteristic was assigned a weight according to its relative prevalence among new homes in Rhode Island. These weights are summarized in Table 2.

Table 2 – Weighting Factors

Characteristic	Value	Weighting Percentage
Weather Location	Providence	57.0%
	New Bedford	43.0%
Home Type[1]	Apartments	20.0%
	Townhomes	13.0%
	Detached	67.0%
Primary HVAC System Type	Furnace w/CAC (70%)	78.0%[2]
	Hydro-Air Boiler w/CAC (8%)	
	Boiler, no CAC	8.0%
	Boiler, CAC	7.0%
	Other (ASHP)	7.0%
Primary Heating Fuel Type	Electric	28.5%
	Natural Gas	64.8%
	Oil	0.6%
	Propane	6.1%

The final step was to weight the savings results from each home according to the weighting factors above. Results from both REM/Rate and Beacon PST were provided, organized by end use and by primary heating fuel type (with total average savings also provided).

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[1] The three different apartment configurations, three different single-family-detached configurations, and two different townhome configurations shown in Table 1 are all evenly weighted within their category.
[2] As noted above, Furnaces and Hydro-Air Boilers are modeled the same way in REM/Rate and Beacon PST, so their weighting factors were added for purposes of weighting those system types.