



Mail: 75 S. Main St., Unit 7 PMB 185, Concord, NH 03301 - tel: 603-369-4833
Email: kevin@horizon-res.com website: www.horizon-res.com

Preliminary "As Per Plans" ENERGY STAR® Report

Wednesday, July 29, 2015

To: Brad Hardie
From: Kevin Hanlon, Horizon Residential Energy Services NH LLC
Re: 11 Poplar St., Andover NH. 03216
Project ID: HRES-E5-2310

Name: Brad

Thank you for your interest in participating in the Version 3 EPA - ENERGY STAR® Homes Program. The goal of the federal EPA ENERGY STAR® Homes Program is to encourage the construction of homes that are roughly 20% more energy efficient than homes built to basic energy standards. My role as your third party EPA ENERGY STAR® Homes Rating Partner is to help you develop a package of energy features for your new home that will not only bring it up to the EPA-ENERGY STAR® Homes standards, but will also help you to maximize the energy performance, comfort and indoor air quality of your new home.

I have completed the initial modeling of this new home in the Home Energy Rating System (HERS) software. As you read through this, please keep in mind that these are preliminary "As Per Plans" numbers and that they will fluctuate in either direction as we fine tune the exact specifications of the energy features of this project.

Please note that the results shown are NOT a precise prediction of overall energy consumption or utility bills, but rather a guide to compare energy costs between a number of building configurations, similar to the "miles per gallon" guide for automobiles. The program includes "average" values for numerous factors that can affect energy usage such as weather patterns, number and living habits of the occupants, hot water usage, lights and appliance usage, thermostat settings, and certain details of a home's construction. In a particular dwelling, any of these factors can vary significantly from the assumptions made.

This project is required to certify under the guidelines of ENERGY STAR® Version 3.0.

This home CANNOT be labeled as an EPA ENERGY STAR® home until:

1. A mid-construction site visit has been performed to help identify potential energy performance problems. This includes all construction build type, including SIP panel, ICF wall and other stick built or non-stick built construction methods. **After wall insulation, prior to sheetrock install.**
2. The builder of record is listed on the ENERGY STAR® web site as an ENERGY STAR® builder partner in 2014.
3. The HVAC contractor of record is listed on the ACCA/Advanced Energy website as a credentialed QI contractor in 2014.
4. The home is completed and ready to occupy.
5. The ventilation requirement is satisfied.
6. All local and state mandatory energy codes are met.
7. All applicable items on all 4 ENERGY STAR® checklists have been verified as compliant with the language of the checklist item.
8. Final inspection and blower door testing, and duct pressure tests (if applicable) have been performed and met requirements.



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Other Points:

IS THE BUILDER OF RECORD AN ENERGY STAR VERSION 3 BUILDER PARTNER?

Horizon **HAS NOT** confirmed documentation of Brad Hardie as a V3 ENERGY STAR* builder partner.

IS THE HVAC CONTRACTOR OF RECORD ON THE ACCA / ADVANCED ENERGY WEBSITE AS A CREDENTIALLED QI CONTRACTOR?

Please remember that homes with heating / cooling systems that utilize ductwork for distribution **DO** require a QI credentialed contractor that is listed on the ACCA or Advanced ENERGY QA accredited website for Version 3 completions. It appears you **DO NOT** have a ducted, forced air furnace system. We have agreed that this project **DOES NOT** require an accredited contractor.

Note: There is no longer a fixed HERS index of 80. There is now a variable HERS index that the built home must meet or be below. Also larger homes are now subject to a size adjustment factor which will reduce the required HERS Index of larger homes, making compliance of larger homes more challenging.

Our services also include the New Hampshire Residential Energy Code Compliance Program.

1. IECC 2009 / 2012 Energy Code Compliance Reports
2. You or your builder do not need to complete the hand written or RES-check Energy Code Application
Horizon will provide this report to you, your local code officer, or the NH-PUC Energy Code Division upon request.

The following assumptions have been made for the "As Per Plans" modeling:

- Cook top / range: Electric
- Dryer: Electric
- 100% Energy Efficient lighting throughout
- ENERGY STAR appliances (refrig, dish, & clothes washer)



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The Energy Features of this New Home Project:

Please review the supplied ENERGY STAR®Version 3 Home Verification Summary. It aligns with the building information below.

BUILDING INFORMATION:

DESCRIPTION/ASSUMPTIONS:

ACTUAL "AS PER PLANS"

<p>CONDITIONED AREA</p>	<p>This is the FINISHED square footage of the project that is heated directly or indirectly. Insulated eaves and insulated basements that are not finished are NOT included in this calculation. Uninsulated spaces are not included in the square footage unless they are purposely heated. (Purposely heated, uninsulated spaced will fail) Crawl spaces and garages, whether heated or not, are not included as part of conditioned area.</p>	<p>This house appears to be a 2 story colonial home, over a full, insulated, purposely heated basement. I have included the entire above grade floors and basement, as conditioned, floor area. There is no attached garage.</p>
<p>CONDITIONED VOLUME</p>	<p>This is the total volume of conditioned space including ceiling volumes of slope and cathedral areas. This volume will be included in the blower door test(s). This does include basement volume when the basement walls are regarded as the pressure/thermal barrier.</p>	<p>I have included the entire insulated basement and entire above grade floors, as part of the conditioned volume. These sections of the house will be open to the blower door test. Attic is vented and will not be included in the blower door test.</p>
<p>INSULATED SHELL AREA</p>	<p>All foundation walls, slab floors and/or frame floors, rim/band perimeter joists, above grade exterior walls including kneewalls and basement walk-out walls, insulated slope roofs and/or flat ceilings, that define the pressure/thermal barrier of the home. Fenestration is not included as part of the insulated shell area, but included elsewhere.</p>	<p>Please review the supplied ENERGY STAR®Version 3 Home Verification Summary.</p>
<p>NUMBER OF BEDROOMS</p>	<p>This is the quantity of labeled bedrooms on the plans plus other rooms that meet RESNET definition of bedrooms. A bedroom is defined by RESNET as a room or space 70 sq ft or greater size, with egress window and closet, used or intended to be used for sleeping. A "den", "library", or "home office" with a closet, egress window and 70 sq ft or greater size or similar rooms shall count as a bedroom, but living rooms and foyers shall not.</p>	<p>4</p>
<p>HOUSING TYPE:</p>	<p>Self explanatory</p>	<p>Please review the supplied ENERGY STAR®Version 3 Home Verification Summary.</p>



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The Energy Features of this New Home Project (con't):

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BUILDING INFORMATION:

DESCRIPTION/ASSUMPTIONS:

ACTUAL "AS PER PLANS"

<p>FOUNDATION TYPE:</p>	<p>Describes how the house/basement is modeled in software. An unconditioned basement generally describes a building project where the basement ceiling (frame floor) has been chosen as the pressure/thermal boundary. A conditioned basement describes a basement where the basement walls, both framewalls and concrete, have been chosen as the pressure/thermal boundary. The basement may or may not be finished. The basement slab floor is not counted as conditioned floor area unless the basement is finished. (Sheetrock and wiring and/or deliberately heated). When the basement walls have been chosen as the pressure/thermal boundary (conditioned basement), it is not necessary to insulate the basement ceiling, ductwork located in basement, or hydronic space heating piping located in basement. However, mechanical contractor must consider the potential for condensation on pipes and ducts, and code requirements when determining insulation requirements.</p>	<p>I have modeled this home w/ a full basement, no walk-out to grade, basement, fully insulated, purposely heated / cooled, partially finished.</p>
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Building Shell Features of this New Home Project:

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(Note: Where feature level varies within the home, the dominant (most surface area) values are shown)

BUILDING INFORMATION:

DESCRIPTION/ASSUMPTIONS:

ACTUAL "AS PER PLANS"

<p>CEILING WITH ATTIC</p>	<p>This describes the upper pressure / thermal barrier ceilings that have vented attic above. (a typical attic assembly)</p>	<p>None, there is no typical, vented attic here.</p>
<p>VAULTED CEILING / SEALED ATTIC</p>	<p>This describes any upper pressure/thermal barrier ceilings that do not have a typical attic above. (Cathedral, vaulted, or sloped ceilings). It may include vented and unvented insulated rafter bays.</p>	<p>I've modeled your assembly as: 17.5" of R4 per inch EPS foamboard, on roof sheathing. Whole roof U value of .014, Whole roof R value of 70.</p>
<p>ABOVE GRADE WALLS</p>	<p>This describes the predominant above grade exterior wall assembly in the home.</p>	<p>I've modeled your assembly as: 2 x 4, 16" OC walls, 9.25" of EPS foam board as the outer insulation skin. The 2 x 4 wall cavities are filled w/ R15 rock wool material, properly installed, and detailed. Whole wall U value of .021, Whole wall R value of R47. This includes ALL wood frame walls between insulated space and ambient. This also includes the wall between heated basement and bulkhead.</p>
<p>FOUNDATION WALLS (COND SPACE)</p>	<p>This describes the predominant, foundation wall assembly between an insulated basement and ambient conditions.</p>	<p>I've modeled your insulated space foundation wall assembly as: Heated basement walls are: R24 ICF construction plus interior 3.25" layer of EPS foamboard. Whole wall R value of R37. This includes ALL foundation walls between heated basement and grade / above grade ambient.</p>
<p>FOUNDATION WALLS (UNCOND SPACE)</p>	<p>This describes the predominant foundation wall assembly between an unconditioned basement and outside.</p>	<p>I've modeled your unconditioned space foundation wall assembly as: None, there are no unconditioned basement spaces.</p>
<p>FRAME FLOORS</p>	<p>This describes the predominant floor assembly that defines the pressure/thermal boundry in your project. Ex: floor assembly above an unconditioned basement, the floor assembly between a conditioned bonus room and garage below, cantilevers and any other floors over outside or unconditioned space.</p>	<p>I've modeled your frame floor assembly as: None, there are no framed floors between conditioned space and unconditioned or ambient space.</p>



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<p>SLAB FLOOR</p>	<p>This describes the basement / living space slab floor only when the basement / living space (or portion thereof) is specified as conditioned.</p>	<p>I've modeled your below grade basement slab floor as: R22 insulated under entire slab. The slab edge is insulated to R22 and is adjacent to the R 24 ICF footing.</p>
<p>WINDOW TYPE</p>	<p>This figure states the projected U value/SHGC value of the windows used in the home. There are generally more than 1 set of values for most homes due to the various window types (dbl hung, casement, glass doors, transom, etc.). The value shown is the predominant value (most surface area). NFRC stickers must stay on windows until the 1st inspection. Otherwise a default will be use, penalizing the index.</p>	<p>I've modeled your window type as: Uvalue = .23 Uvalue and SHGC value as .22 for all windows Most windows are dbl hung, dbl glazed, Low E coating and Argon gas filled. NFRC stickers must stay on windows until the 1st inspection. Otherwise a default will be used, penalizing the index.</p>
<p>WINDOW WALL RATIO</p>	<p>This figure states the ratio of total window surface area to the total surface area of walls between conditioned space and non conditioned space. These walls define the pressure/thermal boundary of the home.</p>	<p>16%</p>
<p>INFILTRATION</p>	<p>There are several metrics to describe the projected infiltration / exfiltration (building tightness) of your project. Actual infiltration value will not be known until the final blower door test is run. I will display this projected value in CFM 50 (blower door number) and ACH50 (code compliance).</p>	<p>1.0 ACH50 / 659 CFM50</p>



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BUILDING INFORMATION:

DESCRIPTION/ASSUMPTIONS:

ACTUAL "AS PER PLANS"

<p>DUCT LEAKAGE TO OUTSIDE</p>	<p>This is the maximum tested amount of duct leakage to outside allowed for certification, based on projected square footage, per air handler. Actual duct leakage to outside value will not be known until the final duct pressure test is run. Advise your HVAC contractor that your duct system is required to be tested, regardless of duct location. All joints need to be sealed, preferably with mastic. Zip ties for flex to metal connections must be tool tightened with mechanical tensioner, not just by hand. Avoid panned returns.</p>	<p>Not Applicable</p>
<p>TOTAL DUCT LEAKAGE</p>	<p>This is the maximum amount of tested total duct leakage allowed for certification, based on project square footage. Actual total duct leakages value will not be know until the final duct pressure test is run. Advise your HVAC contractor that your duct system is required ro be tested, regardless of duct location. All joints need to be sealed, preferably with mastic. Zip ties for flex to metal connections must be tool tightened with mechanical tensioner, not just by hand. Avoid panned returns.</p>	<p>Not Applicable</p>



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Mechanical System Features of this New Home Project:

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(Note: Your HVAC / mechanical contractor is responsible for all equipment sizing and for signing and providing the HVAC contractor checklist)

BUILDING INFORMATION:

DESCRIPTION/ASSUMPTIONS:

ACTUAL "AS PER PLANS"

<p>HEATING</p>	<p>This describes the primary space heating system for your project. HVAC / Plumbing contractor is responsible for all mechanical equipment sizing.</p>	<p>I've modeled your project w/ 6 ductless mini - split airsource heatpumps, installed per manufacturer requirements. The units range in capacity from 6K BTU/ hr to 24K bTU / hr. Located in insulated space.</p>
<p>COOLING</p>	<p>This describes the cooling system for your project. HVAC / Plumbing contractor is responsible for all mechanical equipment sizing.</p>	<p>I've modeled your project w/ 6 ductless mini - split airsource heatpumps, installed per manufacturer requirements. The units range in capacity from 6K BTU/ hr to 24K bTU / hr. Located in insulated space.</p>
<p>WATER HEATING</p>	<p>This describes the Domestic Water Heating system for your project. HVAC / Plumbing contractor is responsible for all mechanical equipment sizing.</p>	<p>Electric fired Air Source Heat Pump hot water tank, .3.1 Energy Factor, located in insulated space.</p>
<p>PROGRAMMABLE THERMOSTATS</p>	<p>This describes the presence of programmable thermostats for primary heating and/or cooling. Programmable thermostats are not required for hydronic systems, but are required for ducted heating / air conditioning systems.</p>	<p>Programmable Thermostats</p>
<p>VENTILATION SYSTEM</p>	<p>This describes the projected Whole House ventilation strategy for your project. An ASHRAE 62.2 compliant ventilation strategy is required for certification.</p>	<p>I've modeled your project whole house ventilation strategy as: A heat recovery or energy recovery ventilator controlled to run @ 85 CFM, continuously, using proper controls. Flow rates as installed will be tested, and required to meet the ASHRAE minimum of 85 CFM, pulling 60 watts</p>
	<p>This describes the projected Spot ventilation strategy for your project. An ASHRAE 62.2 compliant ventilation strategy is required for certification.</p>	<p>I've modeled your project spot ventilation strategy as: an ENERGY STAR certified bathroom exhaust fan, w/ intermittent controls and at least 50 CFM field tested or continuous controls w/ at least 20 CFM field tested, for each showered bathroom.</p>



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HERS Report "As Per Plans" Performance:

Based on **4,842** sq ft of finished conditioned space.
1st and 2nd story, basement is included as finished space.

This home "as per plans" currently **DOES** meet EPA-ENERGY STAR® Version 3 Home standards.
 This home "as per plans" currently **DOES** meet EPACT 2005 builder tax credit standards.

As per plans HERS Index of Reference Design Home
As per plans HERS Index Target (SAF adjusted)
As per plans HERS Index

62
54
2

*The proposed As per plans HERS Index must be less than or equal to the HERS Index Target (SAF Adjusted)

All components, including infiltration rate, to be verified at mid inspection / final test.

- Annual Consumption - Heating/Cooling/DWH/Lights/Appliances: 62.9 MBTU/yr
- Design Load - Heating 20.6 kBTU/hr
- Design Load - Cooling 12.0 kBTU/hr

Estimated Annual Energy Costs

• Heating (fossil fuel)	\$0	0 Gal/yr. (70 deg F)
• Heating (electric)	\$1,208	6,727 KWH/yr. (70 deg F)
• Cooling	\$135	753 KWH/yr. (75 deg F)
• Water Heating	\$227	1,260 KWH/yr.
• Lights and Appliances (fossil fuel)	\$0	0 Gal/yr.
• Lights and Appliances (electric)	\$1,743	9,682 KWH/yr.
• Service Charges	\$102	
Photovoltaics	-\$3,112	-17,288 KWH/yr
• Total	\$303	1,134 KWH/yr

Note - the above figures are ESTIMATED, based on the data derived from the building plans, Electricity at .18 per Kwh & Propane at \$3.15 per gallon.



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PSNH ENERGY STAR® Home Rebate Program Requirements:

- Please remember that any incentive paid to the Rating Client (builder or homeowner) by NH utilities is dependent on the successful ENERGY STAR® certification of the home. Successful Version 3 ENERGY STAR® certification requires that all applicable line items of the 4 ENERGY STAR® checklists be verified as compliant.

- It is the builder's responsibility to review all 4 checklists required for certification by ENERGY STAR®. They have been emailed to you previously by Horizon Residential. Also, those checklists plus a lot more information are available at:

http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_v3_guidelines

http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_v3_training_req

- **VENTILATION REQUIREMENTS:** Ventilation must comply with ASHRAE 62.2 guidelines requiring whole house AND spot ventilation for kitchens and bathrooms. Typically, a whole house ERV/HRV strategy can satisfy this requirement. Alternatively, an ENERGY STAR® certified bath fan can be utilized to serve as both whole house and spot bathroom ventilation. Specific control strategies for the latter strategy are required. a.) The whole house rate based on sq footage and occupant count must be satisfied via testing by the rater. The actual rate is posted under "ventilation". b.) Spot exhaust ventilation requirements must also be met. Spot exhaust ventilation rates are based on whether the bathroom exhaust fans are designed to run continuously or intermittently.

- All penetrations through the shell to an unconditioned space must be tightly sealed to reduce exfiltration. This includes plumbing, electrical, and HVAC equipment. It also includes sealed chimney cases and weather-stripped attic hatches and/or attic access and uninsulated basement stairwell doors. This is a prescriptive state energy code provision.

- It is preferable to avoid recessed can lights through the building envelope. Recessed can lights that do go through the building envelope / thermal barrier must be rated for insulation contact and be rated as airtight (ICAT). They also must be sealed to the sheetrock. Recessed can lights in sloped/vaulted/cathedral ceiling assemblies are required to have R10 or better rigid foam or spray foam between the top of the fixture and roof deck sheathing.

- Any / all fossil fuel heating devices must be vented to outside, regardless of location. Fossil fuel heating devices in conditioned/insulated spaces must have dedicated combustion air, direct vented or sealed combustion. Unvented combustion devices, with the exception of gas stoves, are prohibited.

- All duct work (R6), hydronic heating pipe (R4) and DHW pipe (R3) that is in uninsulated space must be insulated. These insulation requirements can be waived wherever the distribution system is in insulated space. This is a prescriptive state energy code provision.

- Ductwork, regardless of its location must be sealed with mastic or other code approved method and be able to pass a duct leakage test. All duct systems will be pressure tested. The maximum leakage allowed has been reduced substantially.

- **Duct Leakage to outside must be equal to or less than 4 cfm to the outdoors per 100 sq ft of finished, conditioned space in order for the home to pass ENERGY STAR®. And Total duct leakage must be equal or less than 8 cfm per 100 sq ft of finished, conditioned space in order for the home to pass ENERGY STAR®.** Duct tape is not permitted for sealing ducts.

- All hatches need 4" of rigid foam adhered on the back of the hatch (R20) and a secure weatherstrip.



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State and/or local energy code provisions that are often overlooked:

- All hatches, passages and doors from insulated spaces to uninsulated spaces need weather-stripping and door sweeps.
- Batt insulation, duct insulation and foamboard insulation materials must be left with R-value prominently placed for ease of identification.

Indoor Air Quality:

- Install a dedicated combustion air supply kit to all fuel fired (oil, gas, propane, wood) combustion appliances.
- Install a kitchen stove exhaust fan vented to the outside of the house.
- Install one or more hard wired or plug-in Carbon Monoxide Alarms on each floor as per manufacturer's instructions.
- Install a high quality bathroom exhaust fan with a time delay switch. (this is mandatory in absence of a heat recovery ventilator)

Recommendations to Improve the Overall Energy Performance of any Home:

- It is suggested that you insulate the full height of the foundation walls to R10 or greater. The method and materials are optional. (Important - Check local codes)
- It is suggested R21 rigid or spray foam around the perimeter rim and band joist framing. (Fiberglass batt does not perform well. This is especially important with radiant floors).
- Install furnaces and boilers in insulated space or an insulated mechanical room, whenever possible.
- Install duct work, boiler pipe and DHW pipe in insulated space whenever possible.
- It is suggested that ENERGY STAR® rated appliances are installed.
- It is suggested that ENERGY STAR® rated lighting be installed, starting with the lights on the most hours per day.
- It is suggested that low flow aerators and shower heads be installed.

The New Hampshire / EPA - ENERGY STAR® Homes - Rebate Program Guidelines:

Below is an outline of the 2014 ENERGY STAR® homes rebate program:

- Step 1 - Horizon Residential performs the building plans evaluation
- Step 2 - Mid Construction site visit (when the home is insulated, BEFORE sheetrock)
- Step 3 - Final Inspection and blower door testing (when home is complete and ready to move in)
- Step 4 - Horizon Residential will then process and distribute all ENERGY STAR® and utilities Rebate Reports and documents.

- Utility will pay Horizon Residential for all of the above HERS/ENERGY STAR® rating services for the conventional and geothermal track programs.
- Additional site visits, whether requested by builder/homeowner or as deemed necessary by Horizon Residential, will incur additional charges and is payable by the builder/homeowner.



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Specific questions regarding the ENERGY STAR® Homes Rebate Program and your project should be addressed to:

Chris Johnson - NHEC 603-536-8672 johnsonc@nhec.com

This is just the start of the process. We are looking forward to helping you put together a package of energy features that will not only help your new home reach a specific mathematical HERS index, but will also help to ensure that it will actually "perform" as best as possible. We can do a number of "what if" scenarios with different combinations of energy features to assist in determining the best possible design.

Please let me know if you have any questions and/or when you are ready to take the next step.

Best Regards,

Kevin Hanlon
Horizon Residential Energy Services NH LLC
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Concord, NH 03301
Tel: 603-369-4833
Fax: 603-369-4835
E-mail: kevin@horizon-res.com
Website: www.horizon-res.com

Home Energy Ratings Systems (HERS) Report

In 1992, Congress instructed the US Department of Energy (DOE) to work with the US Department of Housing and Urban Development (HUD), and the lending industry to develop a nationally recognized uniform system to measure and rate the energy performance of new and existing dwellings. In 1995, DOE published these guidelines and they have been gradually taking hold around the country. Starting in 2006, the revised method rates a home on a scale of 0 to 100 with 0 being a highly efficient home and 100 being a house that is built to the energy code minimum. The system is based on comparing the house being rated, referred to as the design house, to a computer model of the exact same house if it were built to minimum current energy use standards, referred to as the reference house. An index of 100 would be a house which meets current energy consumption standards.

An index of 100 is a house built approximately to the IECC 2006 National Energy Code.