NEW ECOLOGY
Community-Based Sustainable Development

# Energy Narrative / Simulation Modeling Report
# 1114 Beacon Street, Newton, MA

1114 Beacon Street, LLC

April 16th, 2021

## Summary

New Ecology, Inc. (NEI) created preliminary energy models for 1114 Beacon Street based on the Schematic Drawing set issued by Nunes Trabucco Architects dated October 29, 2019. These models were built to determine whether the design is on track to meet the energy performance requirements for LEED BD+C for Homes Multifamily v4 certifiability, per the City of Newton Zoning Amendment 5.12 Sustainable Development Design requirements as well as the Massachusetts Stretch Energy Code as required by the City of Newton, a Massachusetts Green Community.

The model results demonstrate that the building as currently designed achieve HERS index scores that meet both LEED requirements and Stretch Energy Code.

## Background

1114 Beacon Street schematic design is on the pathway to achieve the necessary energy-related credits for LEED certifiability through the LEED Homes Multifamily program. The building must demonstrate compliance with LEED energy efficiency requirements via modeling through the Residential Energy Services Network ("RESNET") Home Energy Rating System ("HERS") Index Target. To evaluate the building for this filing, conceptual energy models were developed in Ekotrope to estimate energy consumption. The conceptual models are based on early-stage conceptual design.

In the HERS rating process, individual housing units are modeled representing unique apartment types in the design. The models capture different geometries and envelope characteristics depending on the apartment position within the building. For the 1114 Beacon Street project, the team has modeled four "worst case" units.

Per Massachusetts Energy Code 9th Ed. (780 CMR Chapter 51, Section 11), low-rise residential projects must demonstrate a HERS index score of 55 or below, 60 or below with air source heat pump space heating or ENERGY STAR certification. At this early stage, the conceptual models show an average HERS score of 55. The worst case units are at Stretch Code requirements and exceed the Energy Star HERS Index Target score required by LEED. A score of 55 (the maximum per the code's performance path) will earn 16 points under LEED credit *Annual Energy Use* (before applying the Home Size Adjuster based on unit square footage). Throughout the design process, the team will update the models as new design decisions are made; these will result in updated HERS index scores.

NEW ECOLOGY
Community-Based Sustainable Development

HERS Modeling Assumptions Table

| **General Information** | | | | |
|---|---|---|---|---|
| Units modeled | TH-C | 205 | 302 | 402 |
| Conditioned floor area of units tested (SF) | 2,546 | 1,184 | 1,529 | 3,464 |
| Framing | 2x6 16" O.C Wood Frame | | | |
| **Envelope** | | | | |
| R-value of exterior wall insulation | R-28 (R-20 cavity insulation, R-8 continuous insulation) | | | |
| R-value of rim joist | R-25 Spray Foam | | | |
| R-value of ambient ceiling/floor insulation | R-30 Spray Foam | | | |
| R-value of garage ceiling/1$^{st}$ floor insulation | R-30 Spray Foam | | | |
| R-value of roof insulation | R-40 continuous, above roof deck | | | |
| Roof Color | High-albedo | | | |
| U-value of the windows | 0.27 | | | |
| S.H.G.C of the windows | 0.50 | | | |
| Size of windows | 25 sf each | | | |
| U-value of the corridor door | 0.67 (R-1.5) | | | |
| U-value of the exterior door | 0.2 (R-5) | | | |
| **Mechanical** | | | | |
| Heating system HSPF | 9.3 | | | |

NEW ECOLOGY
Community-Based Sustainable Development

| | | |
|---|---|---|
| Cooling SEER | 20.5 | |
| Blower fan motor | ECM | |
| Duct leakage | Leakage to outside: <4% @ CFM25<br>Total leakage: <8% @ CFM25 | |
| Electric Resistance DHW Energy Factor | 0.98 | |
| DHW Tank Size | 40 gal in Apts | 50 gal in Townhouse |
| Hot Water Pipe Length | Maximum based on plans (L x W of unit) | |
| Ventilation | Unit based ERV with air flow ranging from 66-134 CFM. | |
| | Energy Recovery = 80% | |
| | Efficacy = 0.45 watt/CFM | |
| Water Fixtures | Low Flow with at least R-3 pipe insulation | |
| Lighting and appliances | Energy Star Certified | |
| | 100% LED lighting | |
| | Dishwasher = 270 kWh annual usage | |
| | Refrigerator = 500 kWh annual usage | |
| | Washer = 2.92 IMEF | |
| | Dryer = 3.93 CEF | |
| Unit infiltration rate (compartmentalization) | 3 ACH at 50 Pa | |

NEW ECOLOGY
Community-Based Sustainable Development

HERS Modeling Results Report

## Home Energy Rating Certificate
Projected Report

Rating Date: 2020-02-13
Registry ID: Unregistered
Ekotrope ID: kLZb8N8L

**HERS® Index Score:**
**55**
Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

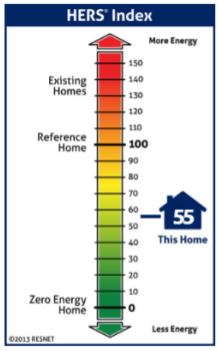
**Annual Savings**
**$5,191**
*Relative to an average U.S. home

**Home:**
1114 Beacon Street
Newton, MA 02461

**Builder:**
1114 Beacon Street, LLC

### Your Home's Estimated Energy Use:

| | Use [MBtu] | Annual Cost |
|---|---|---|
| Heating | 11.6 | $821 |
| Cooling | 1.3 | $93 |
| Hot Water | 8.3 | $590 |
| Lights/Appliances | 22.5 | $1,590 |
| Service Charges | | $66 |
| Generation (e.g. Solar) | 0.0 | $0 |
| **Total:** | **43.7** | **$3,159** |




### Home Feature Summary:

| | |
|---|---|
| Home Type: | Apartment, end unit |
| Model: | Unit 402 |
| Community: | N/A |
| Conditioned Floor Area: | 3,464 ft² |
| Number of Bedrooms: | 3 |
| Primary Heating System: | Air Source Heat Pump • Electric • 9.3 HSPF |
| Primary Cooling System: | Air Source Heat Pump • Electric • 20.5 SEER |
| Primary Water Heating: | Water Heater • Electric • 0.98 Energy Factor |
| House Tightness: | 3 ACH50 |
| Ventilation: | 134 CFM (unmeasured) • 60 Watts |
| Duct Leakage to Outside: | 5 CFM @ 25Pa (0.14 / 100 s.f.) |
| Above Grade Walls: | R-28 |
| Ceiling: | Vaulted Roof, R-40 |
| Window Type: | U-Value: 0.27, SHGC: 0.5 |
| Foundation Walls: | N/A |

### This home meets or exceeds the criteria of the following:

ENERGY STAR v3.1
2012 International Energy Conservation Code
2009 International Energy Conservation Code

### Rating Completed by:

**Energy Rater:**Kyle Lunetta
RESNET ID:5669693

**Rating Company:**New Ecology
15 Court Sq. Boston, MA 02108
617 557 1700

**Rating Provider:**Building Efficiency Resources
PO Box 1769 Brevard, NC 28712
800-399-9620

Kyle Lunetta
Kyle Lunetta, Certified Energy Rater
Digitally signed: 2/21/20 at 11:43 AM

ekotrope™

Ekotrope RATER - Version:3.2.3.2369
The Energy Rating Disclosure for this home is available from the Approved Rating Provider.
This report does not constitute any warranty or guarantee.

NEW ECOLOGY
Community-Based Sustainable Development

# Home Energy Rating Certificate

Projected Report

Rating Date: 2020-02-13
Registry ID: Unregistered
Ekotrope ID: YdxjbNb2

## HERS® Index Score:

**56** Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

## Annual Savings

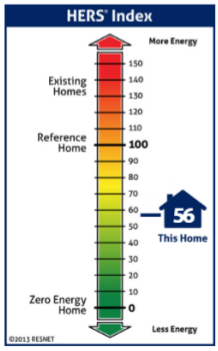
**$4,746**
*Relative to an average U.S. home

**Home:**
1114 Beacon Street
Newton, MA 02461

**Builder:**
1114 Beacon Street, LLC

## Your Home's Estimated Energy Use:

| | Use [MBtu] | Annual Cost |
|---|---|---|
| Heating | 16.5 | $1,165 |
| Cooling | 1.2 | $83 |
| Hot Water | 6.9 | $487 |
| Lights/Appliances | 17.8 | $1,262 |
| Service Charges | | $66 |
| Generation (e.g. Solar) | 0.0 | $0 |
| **Total:** | **42.4** | **$3,063** |




## Home Feature Summary:

| | |
|---|---|
| Home Type: | Townhouse, end unit |
| Model: | Townhouse C |
| Community: | N/A |
| Conditioned Floor Area: | 2,546 ft² |
| Number of Bedrooms: | 2 |
| Primary Heating System: | Air Source Heat Pump • Electric • 9.3 HSPF |
| Primary Cooling System: | Air Source Heat Pump • Electric • 20.5 SEER |
| Primary Water Heating: | Water Heater • Electric • 0.98 Energy Factor |
| House Tightness: | 3 ACH50 |
| Ventilation: | 99 CFM (unmeasured) • 44 Watts |
| Duct Leakage to Outside: | 60 CFM @ 25Pa (2.36 / 100 s.f.) |
| Above Grade Walls: | R-28 |
| Ceiling: | Vaulted Roof, R-40 |
| Window Type: | U-Value: 0.27, SHGC: 0.5 |
| Foundation Walls: | N/A |

## This home meets or exceeds the criteria of the following:

ENERGY STAR v3
ENERGY STAR v3.1
2012 International Energy Conservation Code
2009 International Energy Conservation Code

## Rating Completed by:

**Energy Rater:**Kyle Lunetta
RESNET ID:5669693

**Rating Company:**New Ecology
15 Court Sq. Boston, MA 02108
617 557 1700

**Rating Provider:**Building Efficiency Resources
PO Box 1769 Brevard, NC 28712
800-399-9620

Kyle Lunetta
Kyle Lunetta, Certified Energy Rater
Digitally signed: 2/21/20 at 11:43 AM

NEW ECOLOGY
Community-Based Sustainable Development

# Home Energy Rating Certificate

Projected Report

Rating Date: 2020-02-13
Registry ID: Unregistered
Ekotrope ID: ILXWIB82

## HERS® Index Score:

**54**

Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

## Annual Savings

**$2,364**

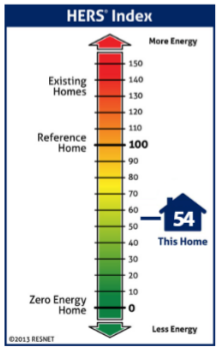
*Relative to an average U.S. home

**Home:**
1114 Beacon Street
Newton, MA 02461

**Builder:**
1114 Beacon Street, LLC

## Your Home's Estimated Energy Use:

| | Use [MBtu] | Annual Cost |
|---|---|---|
| Heating | 2.2 | $153 |
| Cooling | 0.5 | $34 |
| Hot Water | 8.3 | $589 |
| Lights/Appliances | 12.8 | $903 |
| Service Charges | | $66 |
| Generation (e.g. Solar) | 0.0 | $0 |
| **Total:** | **23.7** | **$1,745** |




## Home Feature Summary:

| | |
|---|---|
| Home Type: | Apartment, inside unit |
| Model: | Unit 205 |
| Community: | N/A |
| Conditioned Floor Area: | 1,184 ft² |
| Number of Bedrooms: | 3 |
| Primary Heating System: | Air Source Heat Pump • Electric • 9.3 HSPF |
| Primary Cooling System: | Air Source Heat Pump • Electric • 20.5 SEER |
| Primary Water Heating: | Water Heater • Electric • 0.98 Energy Factor |
| House Tightness: | 3 ACH50 |
| Ventilation: | 66 CFM (unmeasured) • 29 Watts |
| Duct Leakage to Outside: | 15 CFM @ 25Pa (1.27 / 100 s.f.) |
| Above Grade Walls: | R-28 |
| Ceiling: | Adiabatic, R-0 |
| Window Type: | U-Value: 0.27, SHGC: 0.5 |
| Foundation Walls: | N/A |

## This home meets or exceeds the criteria of the following:

ENERGY STAR v3.1
2012 International Energy Conservation Code
2009 International Energy Conservation Code

## Rating Completed by:

**Energy Rater:** Kyle Lunetta
RESNET ID:5669693

**Rating Company:** New Ecology
15 Court Sq. Boston, MA 02108
617 557 1700

**Rating Provider:** Building Efficiency Resources
PO Box 1769 Brevard, NC 28712
800-399-9620

Kyle Lunetta

Kyle Lunetta, Certified Energy Rater
Digitally signed: 2/21/20 at 11:43 AM

NEW ECOLOGY
Community-Based Sustainable Development

# Home Energy Rating Certificate

Projected Report

Rating Date: 2020-02-13
Registry ID: Unregistered
Ekotrope ID: 5dYWzm12

## HERS® Index Score:

**56**

Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

## Annual Savings

**$1,328**

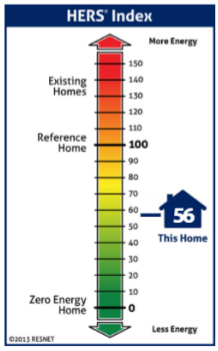
*Relative to an average U.S. home

**Home:**
1114 Beacon Street
Newton, MA 02461

**Builder:**
1114 Beacon Street, LLC

## Your Home's Estimated Energy Use:

| | Use [MBtu] | Annual Cost |
|---|---|---|
| Heating | 7.3 | $232 |
| Cooling | 0.6 | $19 |
| Hot Water | 6.3 | $201 |
| Lights/Appliances | 13.5 | $431 |
| Service Charges | | $84 |
| Generation (e.g. Solar) | 0.0 | $0 |
| **Total:** | **27.7** | **$968** |




## Home Feature Summary:

| | |
|---|---|
| Home Type: | Apartment, inside unit |
| Model: | Unit 302 |
| Community: | N/A |
| Conditioned Floor Area: | 1,529 ft² |
| Number of Bedrooms: | 2 |
| Primary Heating System: | Air Source Heat Pump • Electric • 9.3 HSPF |
| Primary Cooling System: | Air Source Heat Pump • Electric • 20.5 SEER |
| Primary Water Heating: | Water Heater • Electric • 0.98 Energy Factor |
| House Tightness: | 3 ACH50 |
| Ventilation: | 69 CFM (unmeasured) • 31 Watts |
| Duct Leakage to Outside: | 15 CFM @ 25Pa (0.98 / 100 s.f.) |
| Above Grade Walls: | R-28 |
| Ceiling: | Vaulted Roof, R-40 |
| Window Type: | U-Value: 0.27, SHGC: 0.5 |
| Foundation Walls: | N/A |

## This home meets or exceeds the criteria of the following:

ENERGY STAR v3.1
2012 International Energy Conservation Code
2009 International Energy Conservation Code

## Rating Completed by:

**Energy Rater:** Kyle Lunetta
RESNET ID:5669693

**Rating Company:** New Ecology
15 Court Sq. Boston, MA 02108
617 557 1700

**Rating Provider:** Building Efficiency Resources
PO Box 1769 Brevard, NC 28712
800-399-9620

Kyle Lunetta

Kyle Lunetta, Certified Energy Rater
Digitally signed: 2/21/20 at 11:43 AM

NEW ECOLOGY
Community-Based Sustainable Development

# NET ZERO SCENARIO TRANSITION

Below is a description of the technical framework by which the project can be transitioned to net zero greenhouse gas emissions in the future, acknowledging that such a transition might not be economically or technically feasible at first construction. This table explains the future condition and the process of transitioning from the proposed design to the future condition.

| | **Net Zero Condition** | **Transition Process** |
|---|---|---|
| Building Envelope | The building envelope will include continuous insulation on the exterior, and the project team is investigating methods to reduce air infiltration below the level required. | This system will be a zero (site) emissions system at installation. |
| HVAC Systems | The heating and cooling systems are planned to be electric. In addition, the project team is exploring the use of energy recovery ventilation to capture energy from the ventilation system. | This system will be a zero (site) emissions system at installation. |
| Domestic Hot Water | A central gas-fired hot water system will be included at construction. The project team is also exploring electric domestic hot water options. | At the end of the system lifetime, the project team expects the all-electric DHW system technology to have advanced sufficiently to allow for conversion of this system to all-electric. |
| Lighting | The project will use LED lighting throughout. The building energy model will factor in and measure Lighting Power Density as a calculation in overall building energy consumption. | The project team expects that the building management will update lighting systems at the end of their service life, and will continue to use efficient lighting systems. |
| Renewable Energy Systems | The project team intends to include on-site solar photovoltaics on the roof of the building. | In order to become fully carbon neutral, this project will likely have to purchase renewable energy credits given the building footprint and limited roof area. |

The building as proposed uses electricity for heating and cooling and will be designed to meet or exceed MA Stretch Energy Code. In addition, GHG emissions associated with electricity generation are expected to decrease over time as the mix of energy sources powering the grid moves away from fossil fuel-based sources, which may present future opportunities for decarbonization.