



MADISON ROAD HIEE ASSESSMENT

Prepared: March 3, 2023



PROJECT SUMMARY

Viridiant assessed 4 floor plans - 1 Bedroom Lower Floor, 1 Bedroom Top Floor, 2 Bedroom Lower Floor, and 2 Bedroom Top Floor - at Madison Road for their potential to meet the energy efficiency requirements outlined in the Affordable and Special Needs Housing Consolidated Application Program Guidelines 2021-2022 for HIEE funding.

Assessment Summary

No units with the currently proposed scope would meet the energy efficiency requirements required for HIEE. For new construction, that requirement is to meet the target HERS index of the Zero Energy Ready Home (ZERH) program.

A variety of potential scope changes were assessed to determine which will help the units meet the requirements. Individual measures and packages of those measures were evaluated.

It's important to note that the results from individual measures can't simply be added in the table below. Due to interactions between measures, results for multiple measures are only valid when assessed as a package.

HIEE Modeling Summary

The required energy efficiency levels will be met for all unit types with the following scope changes.

Other options were evaluated and the team may wish to review them and identify measures that will work better with the specifics of the project.

The tables show the As-Is results first, which are the results with the currently proposed scope. The HERS index achieved and the target HERS index are shown, as well as utility costs. Utility costs are included to help the team evaluate the impact on utility allowances. The utility costs should not be considered accurate enough to use for utility allowances and are meant as a rough guide. Costs are projected based on assumed operating conditions for the units. Current rates were utilized in the projections. Actual costs will vary based on how the units are operated, the final testing results of each unit, the orientation and actual size of each unit, and other factors.

It should be noted that items may improve either the percent improvement, HERS, or savings, but will not necessarily improve all 3 due to the way each is assessed by the software.

Note that, for the HERS, a lower number is better.

Assessment Results

The following tables summarize the results of the analysis. Each row represents an independent analysis.

1BD Lower Floor Units

Target ZERH HERS: 60

	HERS	Annual Energy Costs	Annual savings	ZERH
As Proposed (Baseline)	77	\$908	-	n
With AirCycler Controller and Inline Fan 80 watts for mechanical Ventilation	66	\$788	\$120	n
With RenewAire BR130/EV130 - 72% recovery efficiency, 99 watts	63	\$804	\$104	n
ENERGY STAR washers in unit or common area	73	\$863	\$45	n
ENERGY STAR washers in unit or common area + With RenewAire BR130/EV130 - 72% recovery efficiency, 99 watts	60	\$758	\$150	y
Heat pump water heater, 3.5 UEF	71	\$819	\$89	n
Heat pump water heater, 3.5 UEF + With AirCycler Controller and Inline Fan 80 watts for mechanical Ventilation	59	\$698	\$210	y
18k, 18.2 SEER2, 10.4 HSPF2, Heat Pump	74	\$883	\$25	n
18k, 18.2 SEER2, 10.4 HSPF2, Heat Pump + AirCycler Controller and Inline Fan 80 watts + ENERGY STAR washers in unit or common area	59	\$716	\$192	y

1 BR Top Floor Units

Target ZERH HERS: 61

	HERS	Annual Energy Costs	Annual savings	ZERH
As Proposed (Baseline)	76	\$919	-	n
With AirCycler Controller and Inline Fan 80 watts for mechanical Ventilation	65	\$799	\$120	n
With RenewAire BR130/EV130 - 72% recovery efficiency, 99 watts	64	\$811	\$108	n
ENERGY STAR washers in unit or common area	72	\$874	\$45	n
ENERGY STAR washers in unit or common area + With RenewAire BR130/EV130 - 72% recovery efficiency, 99 watts	60	\$766	\$153	y
Heat pump water heater, 3.5 UEF	70	\$830	\$89	n
Heat pump water heater, 3.5 UEF + With AirCycler Controller and Inline Fan 80 watts for mechanical Ventilation	59	\$709	\$210	y
18k, 18.2 SEER2, 10.4 HSPF2, Heat Pump	73	\$892	\$27	n
18k, 18.2 SEER2, 10.4 HSPF2, Heat Pump + AirCycler Controller and Inline Fan 80 watts + ENERGY STAR washers in unit or common area	59	\$726	\$193	y

2 BR Lower Floor Units

Target ZERH HERS: 60

	HERS	Annual Energy Costs	Annual savings	ZERH
As Proposed (Baseline)	73	\$1,029	-	n
With AirCycler Controller and Inline Fan 80 watts for mechanical Ventilation	63	\$910	\$119	n
With RenewAire BR130/EV130 - 72% recovery efficiency, 99 watts	61	\$935	\$94	n
ENERGY STAR washers in unit or common area	69	\$973	\$56	n
ENERGY STAR washers in unit or common area + With RenewAire BR130/EV130 - 72% recovery efficiency, 99 watts			\$1,029	y
Heat pump water heater, 3.5 UEF	64	\$897	\$132	n
Heat pump water heater, 3.5 UEF + With AirCycler Controller and Inline Fan 80 watts for mechanical Ventilation	54	\$777	\$252	y
18k, 18.2 SEER2, 10.4 HSPF2, Heat Pump	71	\$1,007	\$22	n
18k, 18.2 SEER2, 10.4 HSPF2, Heat Pump + AirCycler Controller and Inline Fan 80 watts + ENERGY STAR washers in unit or common area	57	\$832	\$197	y

2 BR Top Floor Units

Target ZERH HERS: 61

	HERS	Annual Energy Costs	Annual savings	ZERH
As Proposed (Baseline)	72	\$1,047	-	n
With AirCycler Controller and Inline Fan 80 watts for mechanical Ventilation	62	\$928	\$119	n
With RenewAire BR130/EV130 - 72% recovery efficiency, 99 watts	61	\$950	\$97	n
ENERGY STAR washers in unit or common area	68	\$992	\$55	n
ENERGY STAR washers in unit or common area + With RenewAire BR130/EV130 - 72% recovery efficiency, 99 watts	57	\$894	\$153	y
Heat pump water heater, 3.5 UEF	64	\$915	\$132	n
Heat pump water heater, 3.5 UEF + With AirCycler Controller and Inline Fan 80 watts for mechanical Ventilation	54	\$96	\$951	y
18k, 18.2 SEER2, 10.4 HSPF2, Heat Pump	69	\$1,022	\$25	n
18k, 18.2 SEER2, 10.4 HSPF2, Heat Pump + AirCycler Controller and Inline Fan 80 watts + ENERGY STAR washers in unit or common area	56	\$847	\$200	y

2023 Pre-Review Comments

Madison Road



Project Address

454 North Madison Road, Orange, VA 22906

Funding Type

9% LIHTC

The following represents the "Baseline Scenario"

Modeling Summary

Enclosure:

- R-10 slab edge insulation, 2' depth
- R-21 Grade I cavity insulation, 2x6 16 O.C.
in exterior above grade walls and rim & band exterior insulation
- R-15 Grade II cavity insulation in party walls and adiabatic ceilings/floors
- R-49 Continuous roof deck insulation
- 0.21 U-Value for opaque doors
- 0.29 U-Value/0.27 SHGC windows

Mechanicals:

- SEER2 15.2, HSPF2 7.8, 18k air source heat pump, programmable thermostat
- 0.93 UEF storage electric water heaters, 40 gallon
- 5 ACH50 for infiltration threshold/blower door test
- 4% duct leakage to the outside, 6% total duct leakage
- Ducts within conditioned space and insulated to R-6
- Air Cyclor mechanical ventilation (250 watts assumed , 24 hours a day)

Lights & Appliances:

- ENERGY STAR rated kitchen appliances
 - 616 kWh/yr refrigerator
 - 270 kWh/yr dishwasher
- Advanced lighting 100% CFL or LED



ZERH Requirements

Specs meet requirements

Meet the Required ZERH HERS threshold Score	N
Meet ENERGY STAR Multifamily New Construction V1 Requirements	Y
Fenestration shall meet or exceed ENERGY STAR requirements	Y
<p>Duct Systems are either:</p> <ul style="list-style-type: none"> -located within the home's thermal boundary <p>or</p> <ul style="list-style-type: none"> -Ducts located in a vented attic have: <ul style="list-style-type: none"> i. a minimum R-8 duct insulation with an additional minimum 1.5" of closed-cell spray foam insulation encapsulating the ducts; and ii. duct leakage to outdoors ≤ 3 CFM25 per 100 ft² of conditioned floor area (in addition to meeting total duct leakage requirements from Section 4.1 of the ENERGY STAR HVAC Rater checklist); and iii. ductwork is buried under at least 2" of blown-in insulation. 	N
HVAC system is located within the home's thermal boundary	Y
<p>Hot Water delivery systems will store no more than 0.5 gallons (1.9 liters) of water in any piping/manifold between the hot water source and any hot water fixture and the Project Team has completed calculations to demonstrate this. If a recirculation system will be used to meet this, an on-demand system must be used.</p> <p>OR</p> <ul style="list-style-type: none"> a. Gas water heaters have an Energy Factor ≥ 0.90 or a Uniform Energy Factor ≥ 0.87; and b. Electric water heaters have an Energy Factor ≥ 2.2 or a Uniform Energy Factor ≥ 2.2; and c. All showerheads and bathroom sink faucets are WaterSense labeled; and d. The hot water distribution system shall store no more than 1.2 gallons between the hot water source and the furthest fixture. This shall be verified by either 1) a calculation using the piping or tubing interior diameter and the system length based on plans, or 2) by a field verification test, using the protocol described in Endnote 15, which demonstrates a minimum temperature rise of 10 °F by the time 1.4 gallons of water is delivered to the furthest hot water fixture. 	N
All installed refrigerators, dishwashers, and clothes washers are ENERGY STAR certified	Y
80% of lighting fixtures are ENERGY STAR qualified or ENERGY STAR lamps (bulbs) in minimum 80% of sockets	Y
All installed bathroom ventilation and ceiling fans are ENERGY STAR qualified	Y
Provisions of the DOE Zero Energy Ready Home PV-Ready Checklist are Completed	N

EPA Indoor airPLUS Requirements	Specs meet requirements
ENERGY STAR Version 3 (or 3.1, 3.2) Program Requirements must be followed and the home shall be ENERGY STAR certified in conjunction with Indoor airPLUS qualification.	Y
Drain or sump pump installed in basements and crawlspaces. In EPA Radon Zone 1, check valve also installed.	NA
Layer of aggregate or sand (4 in.) with geotextile matting installed below slabs AND radon techniques used in EPA Radon Zone 1.	N
Basements/crawlspaces insulated, sealed and conditioned	NA
Protection from water splash damage if no gutters	Y
Supply piping in exterior walls insulated with pipe wrap.	N
Hard-surface flooring in kitchens, baths, entry, laundry, and utility rooms.	Y
Radon-resistant features installed in Radon Zone 1 homes in accordance with Construction Specification 2.1.	N
Corrosion-proof rodent/bird screens installed at all openings that cannot be fully sealed. (Not required for clothes dryer vents.)	Y
Equipment selected to keep relative humidity < 60% in "Warm-Humid" climates - Exception for climate zone 4	NA
Duct systems protected from construction debris AND no building cavities used as air supplies or returns	N
No air-handling equipment or ductwork installed in garage	NA
Clothes dryers vented to the outdoors or plumbed to a drain according to manufacturer's instructions.	N
Central forced-air HVAC system(s) have minimum MERV 8 filter AND no ozone generators in home. Temporary filter installed to protect unit from construction dust.	N
Emissions standards met for fuel-burning and space-heating appliances.	NA
CO alarms installed in each sleeping zone (e.g., common hallway) according to NFPA 720.	Y
Multifamily buildings: Smoking restrictions implemented AND ETS transfer pathways minimized.	Y
Attached garages: Door closer installed on all connecting doors.	NA
Attached garages: In homes with exhaust-only whole-house ventilation EITHER 70 cfm exhaust fan installed in garage OR Pressure test conducted to verify the effectiveness of the garage-to-house air barrier	NA
All composite wood products certified low-emission. See spec.	N
Interior paints and finishes certified low-emission. See spec	N
Carpet, carpet adhesives, and carpet cushion certified low-emission. See spec.	N
HVAC system and ductwork verified to be dry and clean AND new filter installed	Y
Home ventilated before occupancy.	N
Equipment manuals, Indoor airPLUS label, and certificate provided for owner/occupant	N

DOE Zero Energy Ready Home PV-Ready Checklist	Specs meet requirements
Designate a proposed array location and square footage on architectural diagram	NA
Identify orientation (Azimuth) of proposed array location	NA
Identify Inclination of proposed array location	NA
Provide code-compliant documentation of the maximum allowable dead load and live load ratings of the roof; (recommended: allowable dead load rating can support an additional 6 lbs/sq. ft. for future solar system)	NA
Provide architectural drawing of solar PV system components. <i>Alternative:</i> Provide home buyer with the following information: <ul style="list-style-type: none"> - List of renewable-ready features ☐ Available free roof area within +/- 45° of true south - Location of panel or blocking for future mounting of PV system components - Location of Breaker or slot for future breaker in electrical service panel - Copy of the PV-Ready Checklist - A copy of the RERH Solar PV Specification G 	NA
Install a 1" metal conduit for the DC wire run from the designated array location to the designated inverter location (cap and label both ends)	NA
Install a 1" metal conduit from designated inverter location to electrical service panel (cap and label both ends)	NA
Install and label a 4' x 4' plywood panel area for mounting an inverter and balance of system components. <i>Alternative:</i> Blocking is permitted to be used as an alternative to the 4' x 4' panel. The area designated for the future panel to mount PV components shall be clearly noted in the system documentation.	NA
Install a 70-amp dual pole circuit breaker in the electrical service panel for use by the PV system (label the service panel) <i>Alternative:</i> Provide a labeled slot for a double-pole breaker in the electrical service.	NA