ENERGY STAR Qualified Homes, Version 3
HERS Index Target Procedure
For Hawaii and Puerto Rico

This document provides detailed instructions for determining the ENERGY STAR HERS Index Target, the highest HERS Index value that a home can achieve and qualify under the Performance Path of the program. The Performance Path provides flexibility to select a custom combination of measures through energy modeling that achieves the required ENERGY STAR HERS Index Target. Note, however, that regardless of the measures selected, the Mandatory Requirements for All Qualified Homes in Exhibit 2 of the ENERGY STAR Qualified Homes Version 3 Program Requirements for Hawaii and Puerto Rico shall be met.

Follow these steps using any RESNET-accredited software program to calculate the ENERGY STAR HERS Index Target:

1. Determine the HERS Index of the ENERGY STAR Reference Design Home. To accomplish this, use Exhibit 2 below, Expanded ENERGY STAR Reference Design Definition for Hawaii and Puerto Rico, to model the Reference Design Home and determine its associated HERS Index value. For Raters configuring the ENERGY STAR Reference Design manually, EPA provides the following guidance:
   a. The ENERGY STAR Reference Design Home is virtually identical to the home that would have been built using the minimum requirements of the Prescriptive Path. Therefore, EPA suggests that Raters complete a plan take-off of the home to be built, configure it with the minimum requirements of the Prescriptive Path, and then review Exhibit 2 of this document for any remaining items that need to be changed.
   b. Any item in Exhibit 2 that states “Same as Rated Home” means that the parameter should be identical to the rated home. Therefore, if the Rater follows the guidance in item a), these parameters don’t need to be further adjusted when calculating the ENERGY STAR HERS Index Target.
   c. RESNET requires that all accredited software automatically configure certain parameters when calculating a HERS index value (e.g., internal gains, thermostat setpoints, water heater temp.). Any item in Exhibit 2 that begins with a plus (+) and is shaded gray will be automatically configured by the software, indicating that the Rater need not do anything to comply with these items when calculating the HERS Index Target.
   d. In Exhibit 2, slab insulation R-values represent nominal insulation levels; U-factors and SHGC coefficients for windows and doors apply to the entire assembly; and assembly U-factors for foundations, floors, walls, and ceilings represent the overall U-value of the assembly, inclusive of exterior sheathing materials, cavity insulation and installation quality, framing, and interior finishes. To create an assembly that meets the required U-factor, Raters may wish to start with the nominal insulation R-values indicated in the Exhibit 1 of the ENERGY STAR Qualified Homes Version 3 Program Requirements for the State of Hawaii, and then modify the assembly details until the U-factor aligns.
2. For all single-family detached homes, townhomes, rowhomes, duplexes, triplexes, and quadplexes calculate the Size Adjustment Factor (SAF) using the following equation:

$$SAF = [CFA_{Benchmark\ Home} / CFA_{Home\ To\ Be\ Built}]^{0.25}, \text{ not to exceed } 1.0$$

   Where:

   $CFA_{Benchmark\ Home}$ = Conditioned Floor Area of the Benchmark Home, using Exhibit 1 below
   $CFA_{Home\ to\ be\ Built}$ = Conditioned Floor Area of the Home to be Built

   For the purposes of this step, calculate the number of bedrooms and the CFA of the home to be built using RESNET standards with the following exception: floor area in basements with at least half of the gross surface area of the basement’s exterior walls below grade shall not be counted.[1] If the CFA of the home to be built exceeds the CFA of the Benchmark Home, then the Performance Path shall be used. Because the SAF cannot exceed 1.0, it only modifies the HERS Index Target for homes with conditioned floor area greater than the Benchmark Home. For condos and apartments in multi-family buildings the SAF shall always equal 1.0.
3. Calculate the ENERGY STAR HERS Index Target, rounded to the nearest whole number:

   ENERGY STAR HERS Index Target = HERS Index of ENERGY STAR Reference Design Home x SAF
4. Next, proceed with Step 2 of the Performance Path as outlined in the ENERGY STAR Qualified Homes Version 3 Program Requirements for the State of Hawaii.

Exhibit 1: Benchmark Home Size [2,3]

Bedrooms in Home to be Built	1	2	3	4	5	6	7	8
Conditioned Floor Area $_{Benchmark\ Home}$	1,000	1,600	2,200	2,800	3,400	4,000	4,600	5,200

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Exhibit 2: Expanded ENERGY STAR Reference Design Definition for Hawaii and Puerto Rico

Building Component	Expanded ENERGY STAR Reference Design Definition[5]			
Foundations:	Construction Type & Structural Mass: Same as Rated Home, except: • For masonry floor slabs, modeled with 80% of floor area covered by carpet and 20% of floor directly exposed to room air			
	Conditioning Type: Same as Rated Home, except: • Crawlspaces shall be modeled as vented with net free vent aperture = 1sq. ft. per 150 sq. ft. of crawlspace floor area			
	Gross Area: Same as Rated Home			
	Insulation:[6] Choose appropriate insulation level below; • Basement Wall Assembly U-factor only applies to conditioned basements; if applicable, insulation shall be located on interior side of walls • Floor assemblies above crawlspace foundations shall be configured to meet the applicable floor assembly U-factor listed in the building component section for Floors Over Unconditioned Spaces • Slab floors with a floor surface less than 12" below grade shall be insulated to the Slab Insulation R-value. The insulation shall extend downward from the top of the slab on the outside of the foundation wall and then vertically below-grade to the Slab Insulation Depth			
	Climate Zone:	**Hawaii**	**Puerto Rico**	
	Slab Insulation R-Value:	0	0	
	Slab Insulation Depth (ft):	0	0	
	Basement Wall Assembly U-Factor:	0.360	0.360	
Floors Over Unconditioned Spaces:	Construction Type: Wood frame			
	Gross Area: Same as Rated Home			
	Insulation:[6]			
	Climate Zone:	**Hawaii**	**Puerto Rico**	
	Floor Assembly U-Factor:	0.257	0.257	
Above-Grade Walls:	Interior and Exterior Construction Type: Wood frame			
	Gross Area: Same as Rated Home			
	Solar Absorptance = 0.75			
	Emittance = 0.90			
	Insulation:[6]			
	Climate Zone:	**Hawaii**	**Puerto Rico**	
	Wall Assembly U-Factor:	0.082	0.401	
Thermally Isolated Sunrooms:	None			
Doors:	Area: Same as Rated Home			
	Orientation: Same as Rated Home			
	U-Values and SHGCs, based on ENERGY STAR doors:[7]			
	Door Type:	**Opaque**	**≤ 1/2-Lite**	**> 1/2-Lite**
	U-Value:	0.21	0.27	0.32
	SHGC:	N/A	0.30	0.30
Glazing:	Total Area: (except in homes with conditioned basements and attached homes[8]) • Same as Rated Home, where Rated Home glazing area is less than 15% of conditioned floor area; OR • 15% of the conditioned floor area, where the Rated Home glazing area is 15% or more of the conditioned floor area			
	Orientation: Equally distributed to North, East, South, and West			
	+ Interior Shade Coefficient: Same as HERS Reference Home, as defined by RESNET's standard [9]			
	External Shading: None			
	U-Values and SHGCs:[7]			
	Climate Zone:	**Hawaii**	**Puerto Rico**	
	U-Value:	0.60	0.60	
	SHGC:	0.27	0.27	
Skylights:	None			
Ceilings:	Construction Type: Wood frame			
	Gross Area: Same as Rated Home			
	Insulation:[6]			
	Climate Zone:	**Hawaii**	**Puerto Rico**	
	Ceiling Assembly U-Factor:	0.035	0.035	
Attics:	Construction Type: Vented with aperture = 1sq. ft. per 300 sq. ft. ceiling area			
	Radiant Barrier: Included if > 10 linear ft. of ductwork are located in unconditioned attic in Haiwaii; Included in all homes in Puerto Rico			
Roofs:	Construction Type: Composition shingle on wood sheathing			
	Gross Area: Same as Rated Home			
	Solar Absorptance = 0.92			
	Emittance = 0.90			

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Exhibit 2: Expanded Hawaii and Puerto Rico ENERGY STAR Reference Design Definition (Continued)

Heating Systems:	Heating loads may be calculated and equipment capacity selected according to the latest edition of ACCA Manual J, ASHRAE 2009 Handbook of Fundamentals, or a substantively equivalent procedure; otherwise, same as Rated Home.			
	Fuel Type: Same as Rated Home [10]			
	System Type: Same as Rated Home, except Reference Design shall be configured with air-source heat pump where Rated Home is modeled with ground-source heat pump, electric strip or baseboard heat; applicable efficiency selected from below.			
	Climate Zone:	**Hawaii**	**Puerto Rico**	
	Gas Furn. AFUE:	80	80	
	Oil Furn. AFUE:	80	80	
	Gas/ Oil Boiler AFUE:	80	80	
	Air-Source Heat Pump HSPF:	8.2	8.2	
	Air-Source Heat Pump Backup:	Electric	Electric	
Cooling Systems:	Cooling loads may be calculated and equipment capacity selected according to the latest edition of ACCA Manual J, ASHRAE 2009 Handbook of Fundamentals, or a substantively equivalent procedure; otherwise, same as Rated Home.			
	Fuel Type: Same as Rated Home [10]			
	System Type: Same as Rated Home, except Reference Design shall be configured with air-source heat pump where Rated Home is modeled with ground-source heat pump;applicable efficiency selected from below.			
	Climate Zone:	**Hawaii**	**Puerto Rico**	
	AC SEER:	14.5	14.5	
	Air-Source Heat Pump SEER:	14.5	14.5	
	Ground-Source Heat Pump EER:	n/a	n/a	
Service Water Heating Systems:	+ Use (Gallons per Day): Same as HERS Reference Home, as defined by RESNET's standard [9].			
	+ Tank Temperature: Same as HERS Reference Home, as defined by RESNET's standard [9].			
	Fuel Type: Solar with electric backup, if Rated Home fuel type is electric and/or solar; otherwise, natural gas.			
	System Type: If solar with electric backup, then use the parameters below for Solar Water Heater System Type. If natural gas, then use the parameters below for Gas Condensing Water Heater system type.			
	Solar Water Heater			
	Collector Type and Area:	Liquid Direct; 12+8 ft^2 per bedroom	**Pipe Insulation:**	None
	Orientation/Azimuth	180° of true North	**Solar Fraction:**	90%
	Storage Tank Size:	50 gal	**Tilt:**	25°
	Water Heater Efficiency (EF):	0.90		
	Gas Condensing Water Heater			
	Gas Storage Tank Capacity:	**All Capacities**		
	Gas DHW EF:	0.80		
Thermal Distribution Systems:	Duct Leakage to Outside: 4 CFM25 per 100 sq. ft. of conditioned floor area			
	Duct Insulation: • R-8 on supply ducts located in unconditioned attic • R-6 on all other ducts located in unconditioned spaces			
	Duct Surface Area: Same as Rated Home			
	Supply and Return Duct Locations:			
	Foundation Type:	**Slab**	**Crawlspace**	**Basement**
	One Story:	100% Attic	100% Crawlspace	100% Basement
	Two Story:	75% Attic / 25% Conditioned	50% Attic / 50% Crawlspace	50% Attic / 50% Basement
Thermostat:	Type: Programmable			
	+ Temperature Setpoints: Same as HERS Reference Home, with offsets defined by RESNET's standard [9], section 303.5.1.2			
Infiltration & Mechanical Ventilation:	Infiltration Rates:			
	Climate Zone:	**Hawaii**	**Puerto Rico**	
	ACH50:	6	6	
	If no mechanical ventilation system is installed in Rated Home: None; Otherwise mechancial ventilation without heat recovery using the following:			
	Rate: CFM = 0.01 * CFA + 7.5 * (Nbr + 1), where CFA = Conditioned Floor Area and Nbr = Number of Bedrooms			
	Hours per Day: 24			
	Fan Watts: Watts = CFM Rate / 2.2 CFM per Watt, where CFM Rate is determined above			
	Climate Zone:	**Hawaii**	**Puerto Rico**	
	Ventilation Type:	Supply	Supply	
Lighting, Appliances, & Internal Gains:	Fluorescent Lighting: 80%			
	Refrigerator: 423 kWh per year			
	Dishwasher: 0.66 EF			
	Ceiling Fan: 122 CFM per Watt			
	+ Internal Gains: Defined by Section 303.5.1.1 of RESNET's standard [9] and adjusted for internal gains from the high-efficiency lighting and appliances listed above, as provided by Section 303.4.1.7.			
Internal Mass:	+ Same as HERS Reference Home, as defined by RESNET's standard [9].			
	Additional mass specifically designed as a Thermal Storage Element for the Rated Home shall be excluded.			

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Notes:

1. To determine whether at least half of the basement wall area is below grade, use the gross surface area of the walls that are in contact with either the ground or ambient outdoor air, measured from the basement floor to the bottom of the basement ceiling framing (e.g., the bottom of the joists for the floor above). Note that the exception regarding the floor area in basements is only for the purpose of determining a home's Benchmark Home Size, Size Adjustment Factor, and eligibility to use the Prescriptive Path. The full conditioned floor area, per RESNET's standards, should be used when rating the home (e.g., determining compliance with duct leakage requirements). If a home has zero bedrooms with regard to the Benchmark Home Size determination, then the Benchmark Home Size for one bedroom shall be used.

2. The average-size home with a specific number of bedrooms is termed "Benchmark Home". 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 other similar rooms shall count as a bedroom, but living rooms and foyers shall not.

   An egress window, as defined in 2009 IRC section R310, shall refer to any operable window that provides for a means of escape and access for rescue in the event of an emergency. The egress window definition has been summarized for convenience. The egress window shall:

   - have a sill height of not more than 44 inches above the floor; AND
   - have a minimum net clear opening of 5.7 sq. ft.; AND
   - have a minimum net clear opening height of 24 in.; AND
   - have a minimum net clear opening width of 20 in.; AND
   - be operational from the inside of the room without the use of keys, tools or special knowledge.

3. The conditioned floor area of a Benchmark Home (CFA Benchmark Home) is determined by selecting the appropriate value from Exhibit 1. For homes with more than 8 bedrooms, the CFA Benchmark Home shall be determined by multiplying 600 sq. ft. times the total number of bedrooms and adding 400 sq. ft.

   Example: CFA Benchmark Home for a 10 bedroom home = (600 sq. ft. x 10) + 400 sq. ft. = 6,400 sq. ft.

4. The Rater may define the 'permit date' as either the date that the permit was issued or the date of the contract on the home. In cases were permit or contract dates are not available, Providers have discretion to estimate permit dates based on other construction schedule factors. These assumptions should be both defensible and documented.

5. Any parameter not specified in this exhibit shall be set to "Same as Rated Home".

6. For informative purposes, assembly U-factors are meant to correlate to typical assemblies containing the nominal R-values as listed in 2009 IECC Table 402.1.1.

7. Note that the U-factor requirement applies to all fenestration while the SHGC only applies to the glazed portion.

8. When determining the ENERGY STAR HERS Index Target for homes with conditioned basements and for attached homes under the Performance Path, the following formula shall be used to determine total window area of the ENERGY STAR Reference Design:

$$AF = 0.15 \times AFL \times FA \times F$$

   Where:
   - AF = Total fenestration area
   - AFL = Total floor area of directly conditioned space
   - FA = (Above-grade thermal boundary gross wall area) / (Above-grade boundary wall area + 0.5 x Below-grade boundary wall area)
   - F = 1- 0.44 x (Common wall area) / (Above-grade thermal boundary wall area + Common wall area)

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And where:

- Thermal boundary wall is any wall that separates directly or indirectly conditioned space from unconditioned space or ambient conditions;
- Above-grade thermal boundary wall is any portion of a thermal boundary wall not in contact with soil;
- Below-grade boundary wall is any portion of a thermal boundary wall in soil contact; and
- Common wall is the total wall area of walls adjacent to another conditioned living unit, not including foundation walls.

9. RESNET's 2006 Mortgage Industry National Home Energy Rating Systems Standard.

10. In the ENERGY STAR Reference Design, fuel type(s) shall be same as Rated Home, including any dual-fuel equipment where applicable. For a Rated Home with multiple heating, cooling, or water heating systems using different fuel types, the applicable system capacities and fuel types shall be weighted in accordance with the loads distribution (as calculated by accepted engineering practice for that equipment and fuel type) of the multiple systems.

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