

# Lessons Learned from the HERS<sub>H2O</sub> Pilot

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RESNET

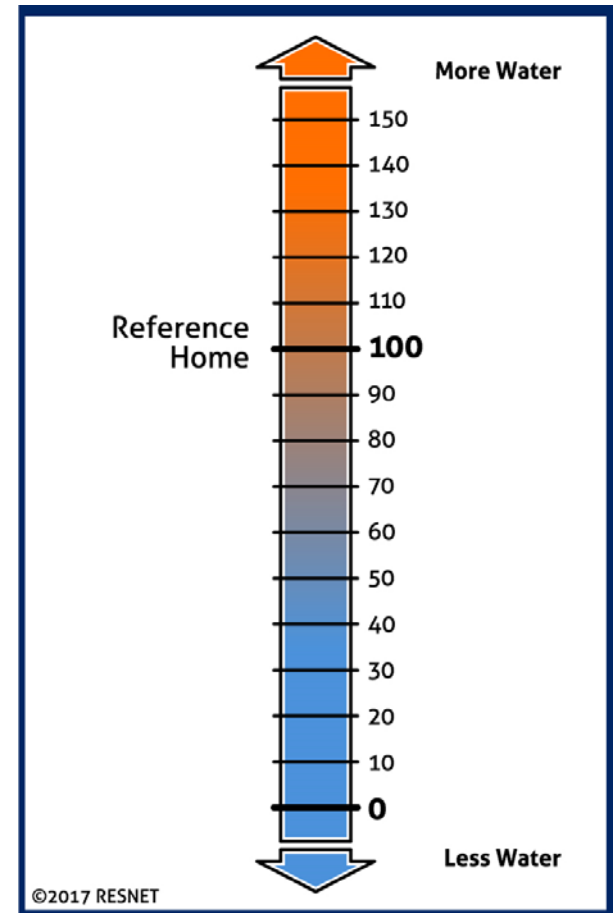


# Agenda

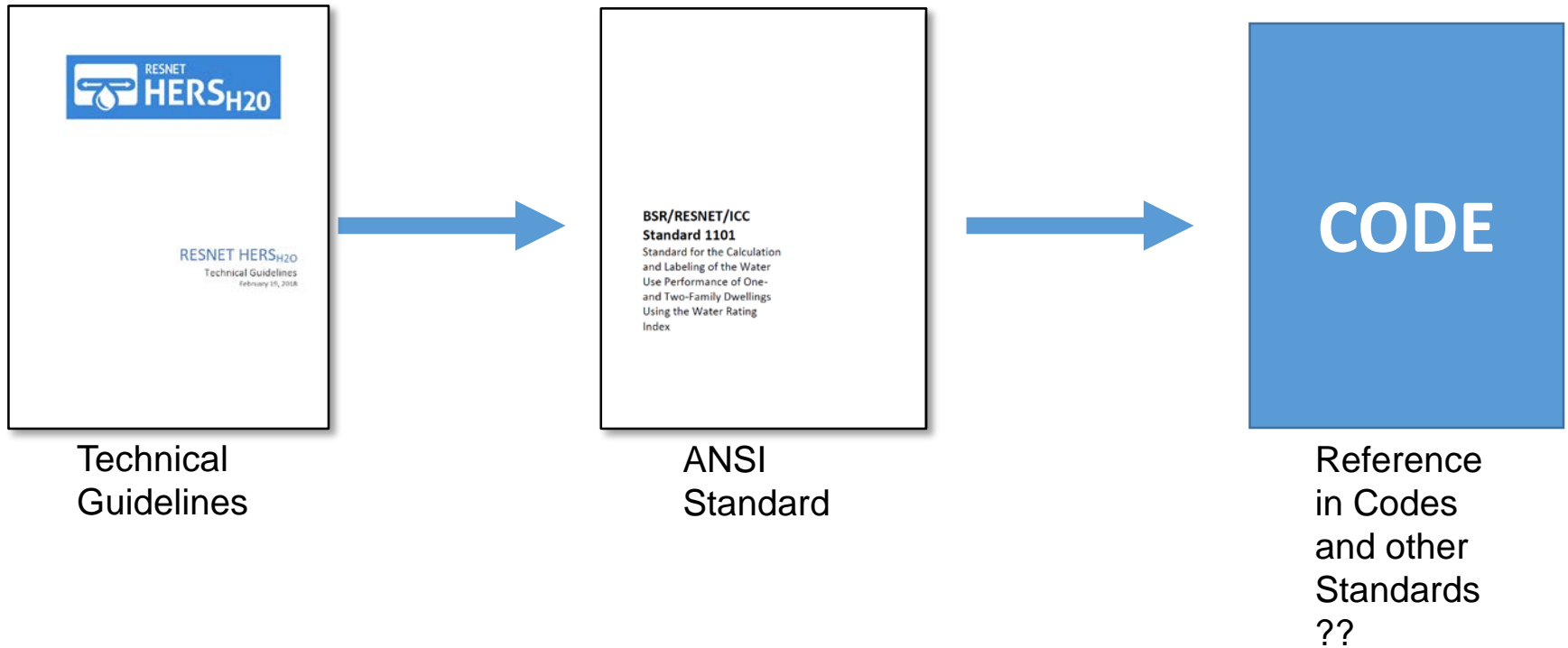
- Background on HERS<sub>H2O</sub>
- Overview and Update on BSR/RESNE/ICC 1101-20xx
- Overview of Pilot Phase
- Key Feedback and Takeaways
- Resources
- CRESNET Pilot
- Moving Forward

# Key Objectives for HERS<sub>H2O</sub>

- Nationwide applicability
- Suitable for both new and existing homes
- Encompasses both indoor and outdoor water efficiency
- Practical and affordable to administer
- Scores usable for quantitative comparison



# Development Process



Technical Guidelines serve as the basis for the Water Rating Index Standard (BSR/RESNET/ICC 1101-201x).

# Timeline of Guidelines Development

2015

- RESNET Board Approves Program
- Advisory Council Formed

2016

- HERS<sub>H2O</sub> Working Group Formed
- HERS<sub>H2O</sub> Working Group Technical Subcommittees formed
- Initial work begins

2017

- Technical Guidelines Drafted and Underwent Public Review and Comment Process
- Inspection Checklist completed
- Inspection guidance doc drafted
- RESNET/ICC ANSI SDC Formed
- Planning for Field Testing of Technical Guidelines
- Working draft of ANSI Standard started

# 2018 and 2019 Activities

**2018**

- **Guidelines approved by RESNET Board**
- **Development of WRI Standard**
  - Review of draft Standard by SDC
  - Public Comment Period
  - Review/respond to Public Comments
- **Development of HERS<sub>H2O</sub> Implementation Standards**
  - Quality Assurance
  - Registry
  - Training
- **6 month pilot phase**

**2019**

- **Second round of public comments on Standard 1101**
- **Revisions to Inspection checklist and guidance doc**
- **Development of HERS<sub>H2O</sub> training**
- **Finalize HERS<sub>H2O</sub> implementation standards**
- **HERS<sub>H2O</sub> data in RESNET Registry**
- **Publication of Standard 1101**

# Introduction to the Water Rating Index Preliminary Draft Standard

# Scope of the Standard

This Standard will provide a uniform methodology for evaluating, rating and labeling the indoor and outdoor water use performance of one- and two-family dwellings.





# Rating Calculation Methodology

- Grounded in water use data as much as possible
- Indoor reference home based primarily on HERS
  - Original analysis for Addendum A (Domestic Hot Water)
    - Residential Energy Consumption Survey (RECS)
    - DOE Engineering Analysis for Rulemakings
  - Some additional data from REUWS I & II
- Outdoor reference home based on REUWS II
  - Detailed landscape and outdoor use analysis for 838 homes

# Components of a Water Rating



Shower  
Heads



Kitchen  
Faucet



Lavatory  
Faucets



Toilet Flush  
Volume



Irrigation



Pool or Spa

# Components of a Water Rating



Clothes  
Washer



Water  
Softener



Leaks/Other  
Water Use



Excess  
Pressure



Dishwasher

# Other Factors Included in the Rating



House Size



Geographic Location



Number of Bedrooms



Lot & Landscape Size



Hot Water Distribution Layout



Hot Water Pipe Insulation

# Rated Home Credits

## **Indoor model will respond to:**

- More efficient plumbing products
- Efficient Appliances
- More efficient plumbing distribution

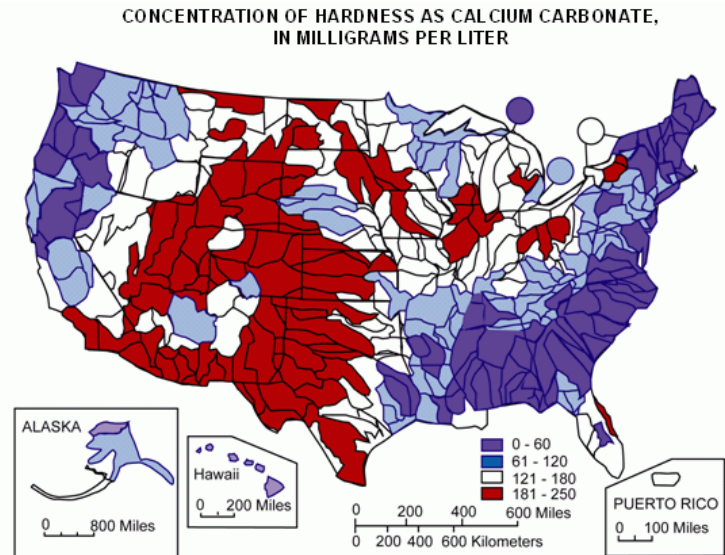
## **Outdoor model will respond to:**

- Smaller landscapes (the reference landscape is fixed based on lot size)
- More efficient irrigation technology
  - Smart/weather-based controllers
  - More efficient emitters, as expressed by the Residential Irrigation Capacity Index (RICI)

# Calculation Spreadsheet-Local Climate

## Local Data Used for the Following:

- Evapotranspiration (ET) for landscape irrigation
  - Based on Water and Climate Atlas dataset
  - Processed at the zip code level
- Hardness of water (Water softener water use)
  - USGS hardness map
  - Processed at the zip code level
- Mains water temperature (impacts hot water use wasted)



# Rainwater and Gray Water

- Not addressed in PDS-01
- Explanation included in the Forward
- Committee decision:
  - Insufficient reliable data to quantify the impact of alternative water sources on a home's potable water use
- Goal to include in future revisions



# Innovative Design Requests

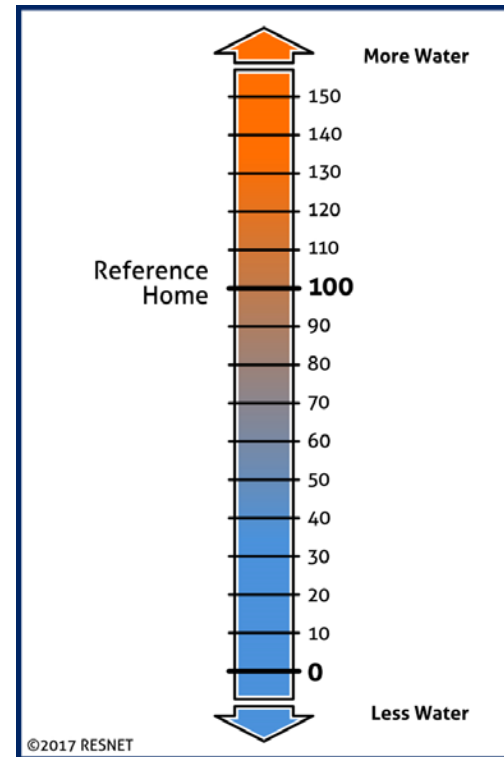
Water Rating providers can petition for adjustment to the Water Rating Index for a Rated Home with features or technologies not addressed by Approved Software Rating Tools or the Standard.





# Other Provisions

- Default values
- Certification and Labeling
- Cost Savings Estimates (water and sewer)
- Rating types
  - Projected
  - Confirmed
  - Sampled



# Update on Standard 1101

- Public comment on PDS-01 ended Sept. 27<sup>th</sup>.
- Committee actions and responses approved
- PDS-02 will be out for public comment soon
- Engagement with software vendors after standard is near approval

# Overview of Pilot

- Kick-off webinar in June, 2018
- Participating homes must be getting a HERS rating
- Open to active and Certified HERS Raters in good standing
- Asked for feedback from raters and builders
- Asked for calculation spreadsheets to be submitted to RESNET

# Overview of Pilot

- To date: ratings completed in 3 states
  - CO, NV and UT
- Calculation spreadsheets submitted
- Average HERS<sub>H2O</sub> score = 55
- Added cost \$50-\$150

# Inspection Tools

- Stop watch/ cell phone timer
- Digital thermometer such as a digital food thermometer
- Pressure gauge
- Bucket or flow bag with volume measures marked
- Dye tablets for toilets
- Tape measure



# Inspection Checklist-Leaks

Item	Section	Home Criteria	Value?	Yes	No	NA
<b>Indoor Water Efficiency Criteria</b>						
Leaks	1	Leaks detected from pressure-loss test on all water supplies? (Not required for new construction)				
		Visible leaks from hot water delivery system?				
		Visible leaks from tank type toilets from dye test?				
		Visible leaks from bathroom faucets?				
		Visible leaks from kitchen faucets?				
		Visible leaks from showerheads?				
		Visible leaks from other fixtures or appliances?				
		Checked meter with all systems off for system leak?				

# Inspection Checklist-Service Pressure

Service Pressure	2	Pressure tank installed and set $\leq$ 90 psi OR				
		Pressure Regulating Valve installed upstream of fixtures and pressure test $\leq$ 90 psi OR				
		Written documentation from water supplier that pressure $\leq$ 90 psi OR				
		On-site static pressure test: _____ psi				

# Inspection Checklist-Hot Water

Hot Water	3	Is there a hot water recirculation system present? If so, what type:				
		Hot water pipe insulation present? If so, list the R-value: _____				
		Standard system pipe length? _____ ft.				
		Recirculation pump watts? _____ watts				
		Recirculation system loop length? _____ ft.				
		Recirculation system branch length? _____ ft.				
		Drain water heat recovery (DWHR) system installed?				
		Does DWHR system have more than one shower connected?				



# Inspection Checklist-Fixtures/Appliances

Toilet	4.1	Flush volume Marker*				
	4.1.1	Single Flush	Flush Rate**	gpf		
	4.1.2	Dual Flush	Flush Rate**	gpf		
		Non-water-consuming toilet				
Bathroom sink faucet	4.2	Flow Rate Marker*		gpm		
Kitchen sink faucet	4.3	Flow Rate Marker*		gpm		
Showerhead	4.4	Flow Rate Marker*		gpm		
Dishwasher	4.5	Capacity of dishwasher in place settings?				
		Gallons per cycle of the dishwasher?				
		Make:				
		Model #:				
Clothes washer	4.6	Capacity of clothes washer in cubic feet?				
		Integrated Water Factor (IWF)?				
		Make:				
		Model #:				
Water softener	4.7	Verify whether or not all of the water uses in the home are being softened?				
	4.7.1	Verify water hardness of area or conduct test				

# Lessons Learned- Indoor

- Less feedback
- Fairly simple process
- Documentation easy to obtain
- Ask builder for documentation in advance
  - Faucets
  - Shower heads
  - Toilets
  - Dishwasher and Clothes washer
  - Water softener
  - Water pressure

# Lessons Learned- Indoor

## Inspection Process:

1. Put dye tablets in toilets
2. Verify flow rates of fixtures
3. Record make/model of dishwasher (if installed)
4. Record make/model of clothes washer (if installed)
5. Record make/model of water softener system (if installed)
6. Go back and check toilets for leaks (flush toilets to clear dye)
7. Verify flush rates stamped on toilets
8. Check house water pressure (or obtain documentation from builder)

# Calculation Spreadsheet

## Indoor Calculation Fields

Example Water Use Calculations										
User input fields are yellow		Water Use	Cold Wtr	Hot Wtr	Total Wtr	Home characteristics:		Drain Water Heat Recovery:		
Location (pull down)	Castle Rock, CO	Shower_gpd	7.0	17.1	24.1	CFA	2400	Showers connected	all	
Distribution system	std	KitchF_gpd	4.1	10.1	14.2	Nbr	3	Equal flow?	yes	
HW pipe Insulation	none	LavF_gpd	1.8	4.5	6.4	Nfl	2	CSA 55.1 DWHR <sub>eff</sub>	54.0%	
Shower (gpm)	2.5	Waste_gpd	4.5	11.2	15.7	Bsmt	0	Tmains =	55.9	
Kitch Faucet (gpm)	2.2	CW_gpd	20.6	3.9	24.5	Appliances:		WHinTadj =	0.00	
Lav Faucet efficiency	std	DW_gpd		4.3	4.3	Dishwasher	std	WHinT =	55.9	
Std sys pipe length	89	Toilets_gpd	21.9		21.9	Clothes washer	std			
Recirc sys loop length	159	Soft_gpd	0.0		0.0	Water heater	9.5			
Recirc sys branch length	10	Other_gpd	15.7	2.1	17.8	Toilets:				
Recirc pumpWatts	50	EP_gpd	0.0	0.0	0.0	gpf	1.6			
DW heat recovery?	no	Indoor_gpd	75.7	53.2	128.9	Water Softener:				
Lot Area (ft2)	5,000	Outdoor_gpd	67.8	0.0	67.8	Softener	no			
Landscaped Area (ft2)	2,348	Total_gpd	143.5	53.2	196.6	gal/removed	5.0	gallons/1,000 grains removed		
% Outdoor H2O =	34%	Ref_In =	75.7	53.2	128.9	Outdoors:				
Ref_Irr_Area =	2,348	Ref_Out =	67.8	0.0	67.8	Inground Pool?	no			
Tot_Ref_Irr_ratio =	47.0%	Ref_Tot =	143.5	53.2	196.6	Irrigation?	no			
Net_Lscape_ratio =	61.8%	Save_Tot =	0.0	0.0	0.0	Smart controller?	no			
Lot size (acres) =	0.115	H2O_in =	100	100	100	Use RIC1?	no			
		H2O_Out =	100	100	100	Zone flow rates	25.2	Sum of irrigation zone flow rates		
		H2O_Tot =	100	100	100	Prof Audit?	no			
		HERS <sub>H2O</sub> =	100	H2Osave* =	0	Static Pressure	90			
Ref std sys pipe length =	89.3	* Gallons per year		\$save** =	\$0	H2O Price	\$3.90	\$/CCF (1 CCF = 748.05 gallons)		
Ref recirc sys loop length =	158.6	** \$ per year								

# Inspection Checklist: Outdoor

Item		Home or Unit Criteria	Value?	Yes	No	NA
<b>Outdoor Water Efficiency Criteria</b>						
Landscape design	5.0	Front yard landscaped?				
		Temporary landscape installed?				
		Will builder be installing all landscaping?				
		Measure area of hardscaping (driveways, sidewalks, patios) (ft <sup>2</sup> )				
	5.0	Measure Irrigated area (ft <sup>2</sup> )				
	5.0	Determine future irrigated area to be completed by the homeowner? (ft <sup>2</sup> )				
Total lot area (ft <sup>2</sup> )						
Pools/spas	5.0	Is there a swimming pool?				
	5.0	Is there a spa/hot tub?				
Irrigation system	5.1	Automatic irrigation system?				
	5.2	Weather-based Controller (i.e. weather-based irrigation controllers or approved soil moisture sensor-based controller)				
	5.3	Inspection by Certified Professional?				
	5.4	Optional- Sum of total irrigation system flow rates for those wanting RICl credits				

# Lessons Learned- Outdoor

- Irrigation systems- most significant learning curve for raters
- Make clear that RICl is optional
- RICl intended to be verified by other professionals (but raters can do it)
- How to handle homes where builder only installs the front yard landscaping
- Calculating irrigated area and “future irrigated area”

# What is RIC1?

- An index within an index
- Estimate irrigation use without knowledge of plantings
- Baseline RIC1 is set to 5 based on data
- Each 1-point reduction from baseline = 10% reduction in outdoor water use

$$RIC1_{rat} = \frac{\text{sum of flow (gpm) of all irrigation valves}}{\text{square feet irrigated area}} * 1,000$$

# Testing for RIC1

## Determine the irrigated area.

- Start with lot area
- Subtract the footprint of the home and any hardscaping
- Subtract any other areas that will not receive irrigation (artificial turf)



## Determine Irrigation Flow Rates

- Turn off all fixtures and appliances
- Set irrigation controller to run each zone for a few minutes (equalize system)
- Measure flow rates by noting start reading of the meter
- Watch for 30 seconds and multiply water used by 2
- Sum together flow rates in gpm.
- Enter this number into the HERS<sub>H2O</sub> calculation spreadsheet





# Calculation Spreadsheet

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- Estimating Irrigation Impact. Only need: Lot area, landscaped area and “yes” for irrigation
- Smart controller and Professional Audit are optional
- Only enter zone flow rates when “yes” is selected for RIC (documentation provided)

# Next Steps for HERS<sub>H2O</sub>

- Completion of ANSI Standard 1101
- Implementation of Standard in Software
- Rater training module
- QA Standards
- Certification/Testing?
- Canadian Pilot

# Canadian Pilot for HERS<sub>H2O</sub>

- MOU with CRESNET
- 120 homes to receive HERS<sub>H2O</sub> scores
- 8-10 homes with grey water systems will be monitored to better understand how much potable water use is offset by the system
- Potential to incorporate grey water systems into the standard



# Thank you!

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Setting the **Standards** for  
**Home Energy Efficiency**