Got Gas?

Low-load Home Solutions with Combustion Equipment

with Bruce Manclark OR Dan Wildenhaus

Your presenters…

- Dan Wildenhaus
- 20 something years in industry
- Recovering Auditor and Contractor
- Building Science Manager
- CLEAResult

- Bruce Manclark
- 30 something years in industry
- Director of Training
- Director of Special Projects
- Self appointed historian
- CLEAResult

Agenda

What we HOPE to cover today

- Why we care
- What's the cool stuff NOW?
- What's coming down the pike (or pipe if you prefer)?
- What are YOU into?
- Wrap up and resources

Does Gas Equipment fit into low load homes?

- NOT a call to use gas
- Recognition of prevalence and preference for gas

Yeah, but…

What's happening now?

Current and immediate solutions

REM/Rate
v 15.3
Usage Guestimates

Let's imagine a house to start with…

- New Townhome, what range of gas space and water heating should we expect?
  - Space = $125 to $300 per year
  - Water = $80 to $200 per year
- Existing two story home built in the 60's, what might we expect?
  - Space = $200 to $750 per year
  - Water = $135 to $250 per year

It's a frame of reference. We are talking about annual savings that range from 5 to 150 bucks per year per measure.

GTI researched and proposed and the market is adopting

Through wall packaged heating, cooling systems

Combined Space and Water Systems

Low capacity 'right-sized' furnace

Hearth products with enhanced distribution

Micro gas furnaces

Image courtesy of IBACOS

Energy savings from equipment:

- All models are 95–97 percent AFUE
- Limited study shows ~7 % lower energy use, due to decreased number of cycles and slightly higher efficiency of unit from industry standard

Micro gas furnaces

Energy savings from duct and equipment location:

- 15–20 percent savings associated with "ducts inside"
- Much easier and cost effective to run ducts inside the envelope

Guestimates

- 3 Story Townhome
- Above code
- End unit
- Eugene, OR
- **96 AFUE Dettson**
- 14 SEER AC
- 0.57 EF 50 gal tank
- **All ducts inside**

- What impact do we think this will have on the estimated heating consumption?
- What do we attribute the estimated savings to?

Can a fireplace heat a whole home?

864 TRV & CF	864 HO	864 ST	4237 CF
38-1/4" (TRV), 44-3/4" (CF)	47-3/4"	38-1/4"	53-3/4"
41" (TRV), 42-3/4" (CF)	41"	44"	59-1/4"
20-3/4", 22" (CF)	22-1/4"	27"	29-1/4"
8" Rear or 8" Top (Top can be reduced to 6 5/8")	8" Rear or 8" Top (Top can be reduced to 6")	8" (Top vent can be reduced to 6")	8"
205 lbs. (TRV) 205 lbs. (CF)	225 lbs.	310 lbs.	555 lbs.
Dancing-Fyre™	Ember-Fyre™	Dancing-Fyre™	Dancing-Fyre™
34-1/2" W x 22-1/4" H	34-1/2" W x 22-1/4" H	Each side 34-1/2" W x 22-1/4" H	Each side 42" W x 37" H
YES - 180 CFM (Optional on TRV; Standard on CF)	YES - 260 CFM (Standard)	YES - 130 CFM (Optional)	YES - Twin 130 CFM (Standard)
YES (One)	YES (Two)	YES (One)	YES (Two)
vary depending on ve… …nd atmospheric conditions. Contact local building or fire officials about restrictions and installation requirements in your area.			
Up to 1,400 Sq. Ft.	Up to 2,500 Sq. Ft.	Up to 1,500 Sq. Ft.	Up to 3,000 Sq. Ft.
31,000 - 10,000 (68%	46,700 - 12,500 (73% Turn Down)	37,500 - 14,700 (61% Turndown)	60,000 - 32,089 (% Turndown)
31,000 - 8,000 (75% Turndown)	46,700 - 9,000 (81% Turn Down)	37,500 - 10,000 (73% Turndown)	60,000 - 30,887 (% Turndown)
68.36% (NG) 67.79% (LP)	71.57% (NG) 72.2% (LP)	70.77% (NG) 70.71%(LP)	62.76% NG, 63.87% LP
80.38% (NG) 81.21% (LP)	82.13% (NG) 83.25% (LP)	83.07% (NG) 85.92% (LP)	67.93% NG, 69.44% LP
73.8% (NG) 73.5% (LP)	75.6% (NG) 75.7% (LP)	75.4% (NG) 72.9% (LP)	63.79% NG, 65.15% LP
information is available at your local FireplaceX® dealer or on our website at www.fireplacex.com			
A = 40-3/4" to 48-3/4"TRV* 44-3/4" CF* (measured from base of fireplace)	A = 47-3/4" to 52-3/4"* (measured from base of fireplace)	A = 37-1/4"* (measured from base of fireplace)	A = 54 "* (measured from base of fireplace)
B = 0"	B = 7 3/4"	B = 0"	B = 0"
C = 1"	C = 5"	C = 3-1/4" from glass frame	C = 0"
D = 0"	D = 0"	D = 2-1/8"	D = 5/8"
E = None Required	E = None Required	E = None Required	E = None Required
F = None Required	F = None Required	F = None Required	F = None Required
*Will vary depending mantel depth. 0" to 12" maximum mantel depth. See Owner's manual for details Note: Each face plate design varies in dim. MINIMUM FRAMING HEIGHT Height 38-1/2" TRV 44-3/4" CF Width 41-1/4" TRV 42-3/4" CF Depth 20-3/4" TRV 22" CF	*Will vary depending mantel depth. 0" to 12" maximum mantel depth. See Owner's manual for details Note: Each face plate design varies in dim. MINIMUM FRAMING HEIGHT Height 48" Width 41-1/4" Depth 22-3/4" TV 21-3/4" RV	*Will vary depending mantel depth. 0" to 12" maximum mantel depth. See Owner's manual for details Note: Each face plate design varies in dim. MINIMUM FRAMING HEIGHT Height 38-1/2" Width 44" Depth 26"	*Will vary depending mantel depth. 0" to 12" maximum mantel depth. See Owner's manual for details Note: Each face plate design varies in dim. MINIMUM FRAMING HEIGHT Height 53-3/4" Width 59-1/4" Depth 29-1/4" Flush, 28-3/4" Standard

NOTE: Improper installation of your gas appliance or failure to operate it in accordance to the guidelines detailed in the Owner's Manual may negate your warranty and endanger your home and family. Installation information is available on our website at www.fireplacex.com. We recommend all FireplaceX® appliances be installed, and maintained on an annual basis by your Specialty Hearth Retailer.

HEAT&GLO

POWERFLOW™ HEAT MANAGEMENT TECHNOLOGY

Yeah, but…

Romance vs Heating

What's the primary reason for having a gas fire place?

More guestimates

- 3 Story Townhome
- Above code
- End unit
- Located in Eugene, OR
- 92 AFUE gas furnace
- 14 SEER AC
- 0.57 EF 50 gal tank
- **Gas FP as back up**

- If we assume that the Gas FP works on 20% of the heating load or less, do we expect much of an impact to estimated consumption?
- Would we expect much of a change in annual heating cost?

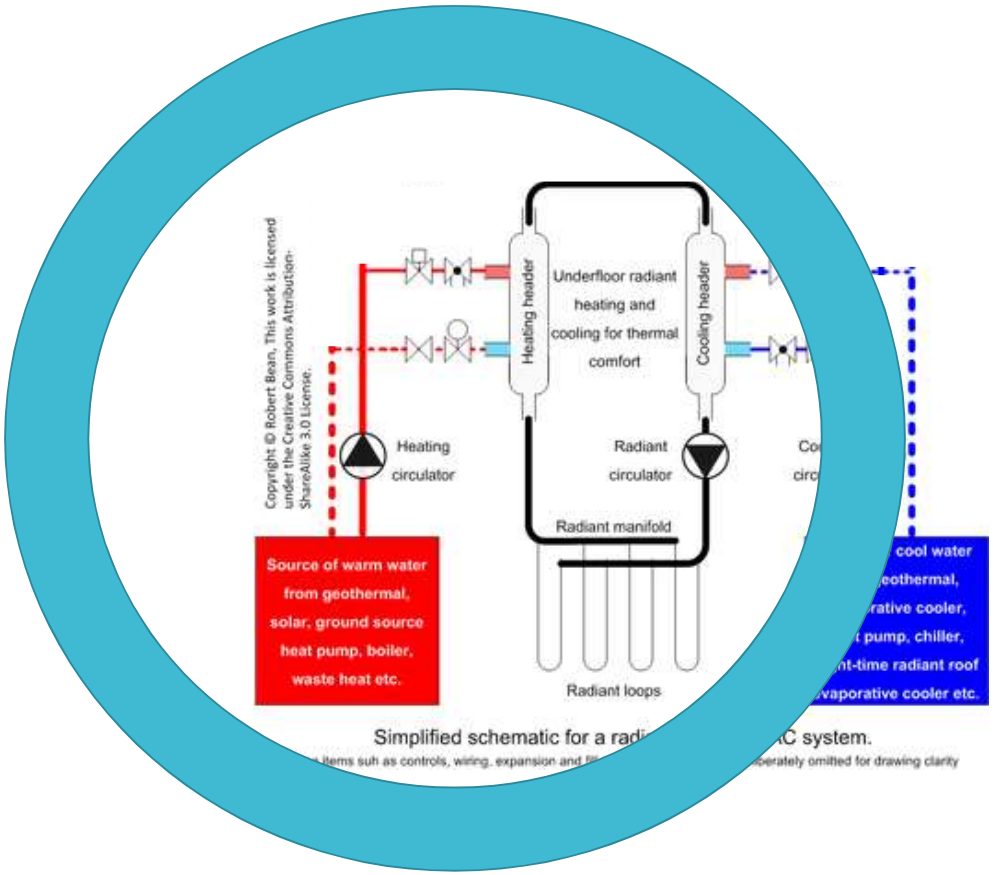
More guestimates

- 3 Story Townhome
- Above code
- End unit
- Located in Eugene, OR
- 92 AFUE gas furnace
- 14 SEER AC
- 0.57 EF 50 gal tank
- **Condensing gas FP as back up**

- Let's assume we put in a fancy condensing gas FP, at 20% of load or less, much consumption impact?
- Much annual cost impact?
- How much of load would need to be addressed in order to see big changes in consumption?

Urban development craze

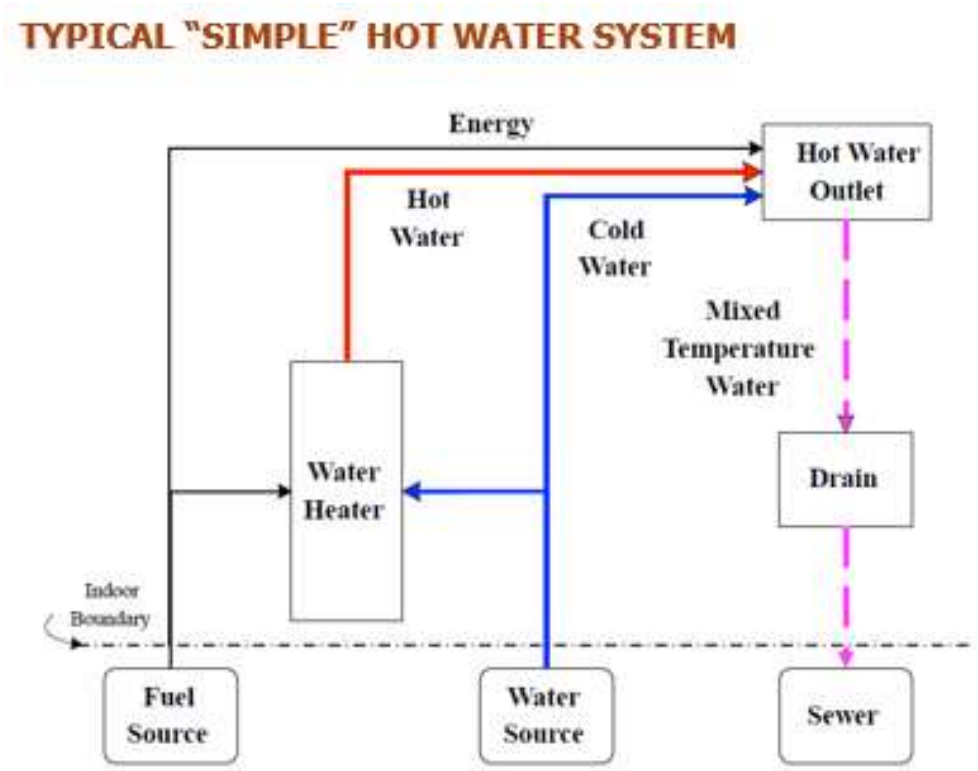
Combi-boiler radiant systems



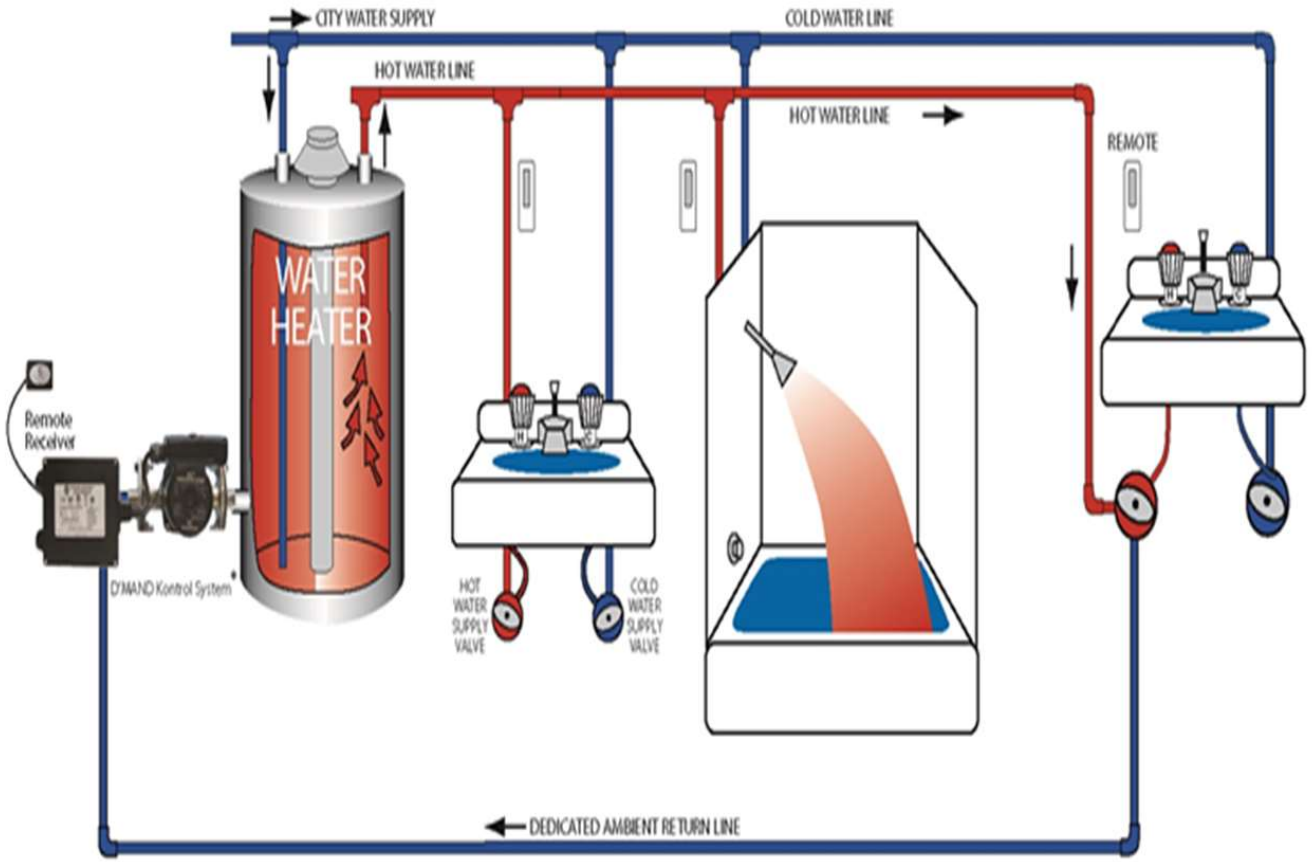
Will it save energy and dollars?

- If we changed from a standard furnace to a radiant system, we've now removed ducts outside…what type of impact is that?
- BUT, we went from a 90+ furnace to an 80% boiler…what type of impact is that?
- BUT, we improved the water heater from .62 to .80…what type of impact is that?

Boosting existing equipment performance and savings



Boosting existing equipment performance and savings



On Demand recirculation

Table 2. *Relative Costs of Operating Standard and Alternative Distribution Systems*

Standard Distribution System	Water and Wastewater	Natural Gas	Electricity
Total Annual Cost for Hot Water Including Waste	$116	$250	$465
Annual Cost Associated with the Wasted Water	($36)	($84)	($156)
Annual Cost Associated with Intended Water Use	$80	$166	$309
Additional Energy Costs to Operate Recirculation System			
Thermosyphon (24 hours per day, gravity, 5F temperature drop)		$336	$619
Continuous Pump (24 hours per day, 5F temperature drop)		$366	$649
Timer-Controlled Pump (16 hours per day, 5F temperature drop)		$244	$433
Temperature-Controlled Pump (12 hours per day, 5F temperature drop)		$183	$325
Timer and Temperature-Controlled Pump (8 hours per day, 5F temperature drop)		$122	$216
Demand-Controlled Pump (10 minutes per day)		$15	$27
Additional Costs Associated with Residual Wasted Water			
Manifold Systems (approximately 25% reduction)	$27	$63	$117
Heat Trace (approximately 90% reduction)	$4	$284	$284
All 6 Recirculation alternatives (approximately 80% reduction)	$7	$17	$31
Notes: Water and wastewater costs are $0.05 per gallon combined. Natural gas costs are $0.92 per therm. Electricity costs are $0.087 per kWh. Heat trace is only operated with electricity. The costs are the same whether the water heating fuel is natural gas or electricity.			

Source: Gary Klein

We already know about most of this stuff…what else?

Pilots and Research

“Try me” category

SmartPlug®

Instant Hot Water Control

The patented SmartPlug lets you upgrade any hot water recirculation pump with a power cord to "Smart" operation.

Using a sensor that mounts to the hot water supply pipe, the SmartPlug will record the daily hot water usage pattern in a home and adjust the circulator run time automatically. Hot water will always be available when needed.

http://www.taco-hvac.com/press.html?action=d&art_id=44

Smart thermostats in gas programs

Potential energy savings:

- Basic operational savings
- M and V/QA of installs
- Energy audits of homes
- ***Potentially improve cost effectiveness of measures and programs***

https://www.clearesult.com/insights/whitepapers/guide-to-smart-thermostats/

Coming around the bend…

What's next?

Gas driven heat pump technologies?

Edit	Absorption	Adsorption
Definition	Assimilation of molecular species throughout the bulk of the solid or liquid is termed as absorption.	Accumulation of the molecular species at the surface rather than in the bulk of the solid or liquid is termed as adsorption.
Phenomenon	It is a bulk phenomenon	It is a surface phenomenon.
Heat exchange	Endothermic process	Exothermic process
Temperature	It is not affected by temperature	It is favoured by low temperature
Rate of reaction	It occurs at a uniform rate.	It steadily increases and reaches equilibrium
Concentration	It is same throughout the material.	Concentration on the surface of adsorbent is different from that in the bulk

Gas driven heat pump technologies?

Absorption

- The process in which a fluid is dissolved by a liquid or a solid (absorbent).
- Absorption involves the entire volume of the absorbing substance
- Used for heat pumps that can heat or cool

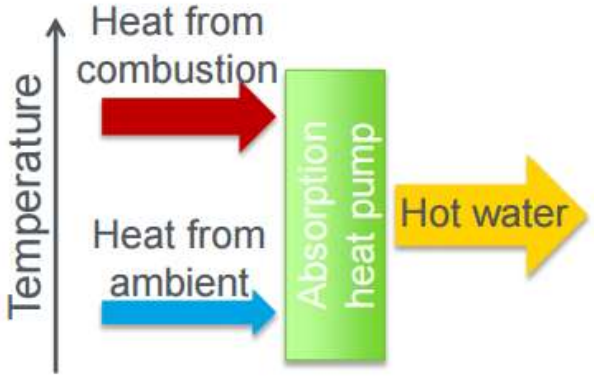
Adsorption

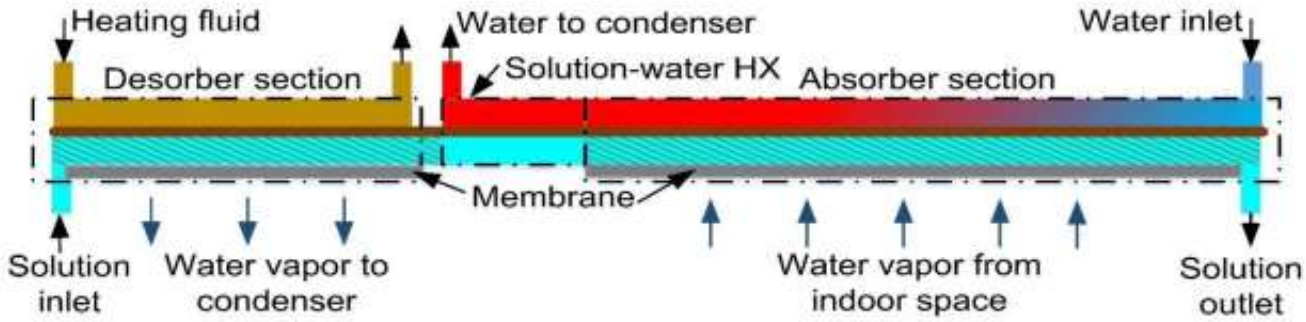
- The process in which atoms, ions or molecules from a substance (it could be gas, liquid or dissolved solid) adhere to a surface of the adsorbent.
- Adsorption is a surface-based process where a film of adsorbate is created on the surface
- Primarily used for chillers

www.diffen.com

How do they work?

GF-HPWH
How they work





Images from energy.gov

Absorption water heaters

Image and data courtesy of: Oak Ridge National Lab and DOE

Potential energy savings:

- Goal is energy factor (EF) of 1.0–1.3
  - 40 percent savings over current standard .62 EF tank
- Commercial units testing beta prototype
- Residential units struggling with costs and performance

Gas-driven heat pumps

Air to air

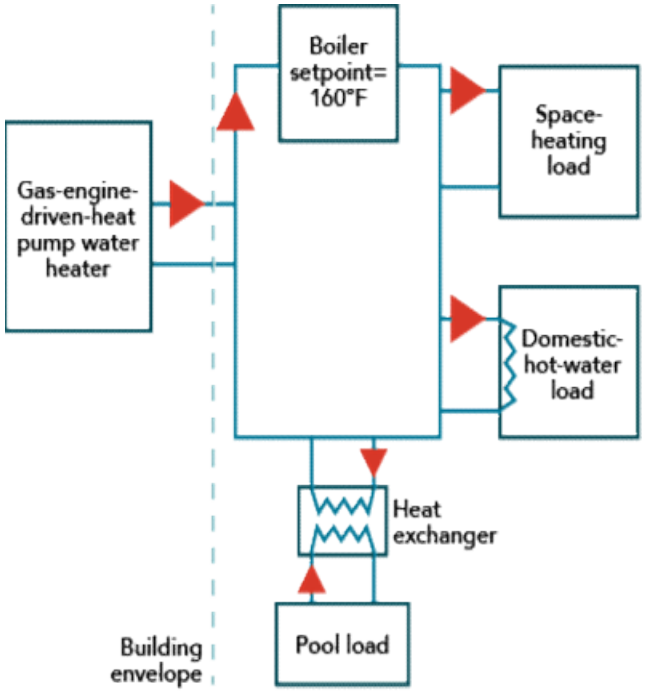
Image courtesy of: Department of Energy

Potential energy savings:

- "Air to air" provides:
  - Cooling with COP 1.3
  - Heating with COP 1.5
  - Waste heat for water heating
- Challenges with sizing for residential and manufacturing cost make this "almost there" for increased applications

Gas-driven heat pumps – part 2

Air to water



Potential energy savings:

- System used as gas-driven heat pump water heater
- The more systems included, the better the savings over traditional systems
  - ~55 percent estimated savings when performing space and water heating
  - Savings go up with pool heaters

Resources

Image and data courtesy of: UTD

For more terrific information:

- Gas Technologies Institute
- Department of Energy
- NEEA

- https://www.utd-co.org/Documents/UTD-Annual-Report-Project-Summaries-2015-2016.pdf

Winning Strategies

Space heating equipment

Water heating equipment

Optimizing systems

Onsite generation?

- For Space heating, come to terms with cooling becoming the norm nationally
- Did you know, those Dettson's have a HE HP that can supplement heat and deliver AC?
- For water heating, great appliances are good.
- But we can see real savings and improved HERS scores with OnDemand recirc, insulated plumbing, and WaterSense fixtures

Same old advice…

Do what it takes to get rid of ducts or move them inside!

And consider simplified zone heating

Thank You!!

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