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***Getting into Hot Water: Heat Pump
Water Heaters Put Builders on
Target for Reducing the Single
Largest Load in New Homes***

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Outline

- HPWH Magnitude of savings
 - Specifications
- Who makes the major brands?
- Installation considerations (the water heater as a system)
 - Size
 - Location
 - Plumbing layout
 - Circulator pumps and drain water recovery
- Emerging Trends:
 - Connected home
 - Demand Response (CTA 2045)
 - Split Systems
 - New Products Coming
- Value Proposition to Customer:
 - Total Cost of ownership



Experience in the Room



Which best describes your business?

- Builders
- Developers
- HVAC Installers
- Plumbers
- Home Performance Contractors



How many have sold Heat Pump Water Heaters (HPWHs)?

- 1 year or more
- 2-3 or more
- 5 years or more



How many heat pumps are in the typical home?



Old Standard vs. HPWH – The New Standard



All Three of the major OEMs are making great products-
AO Smith
Rheem
Bradford White

Consumer Profile

Accounts for 18% of energy load



BUYERS ARE EARLY
ADOPTERS



40%

heat their homes with a
ductless heat pump



66%

earn more than \$60k
per year (on average)



63%

have a bachelor's
degree or higher



50%

or more perform
self-installs

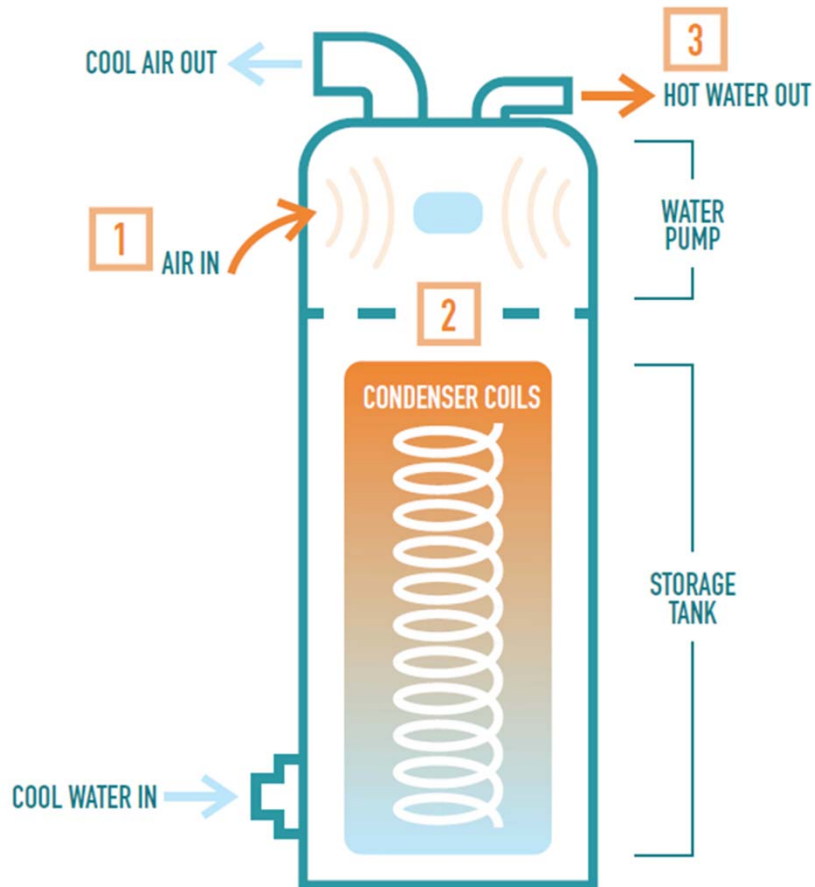


99%

own their home



Explaining the Technology Features

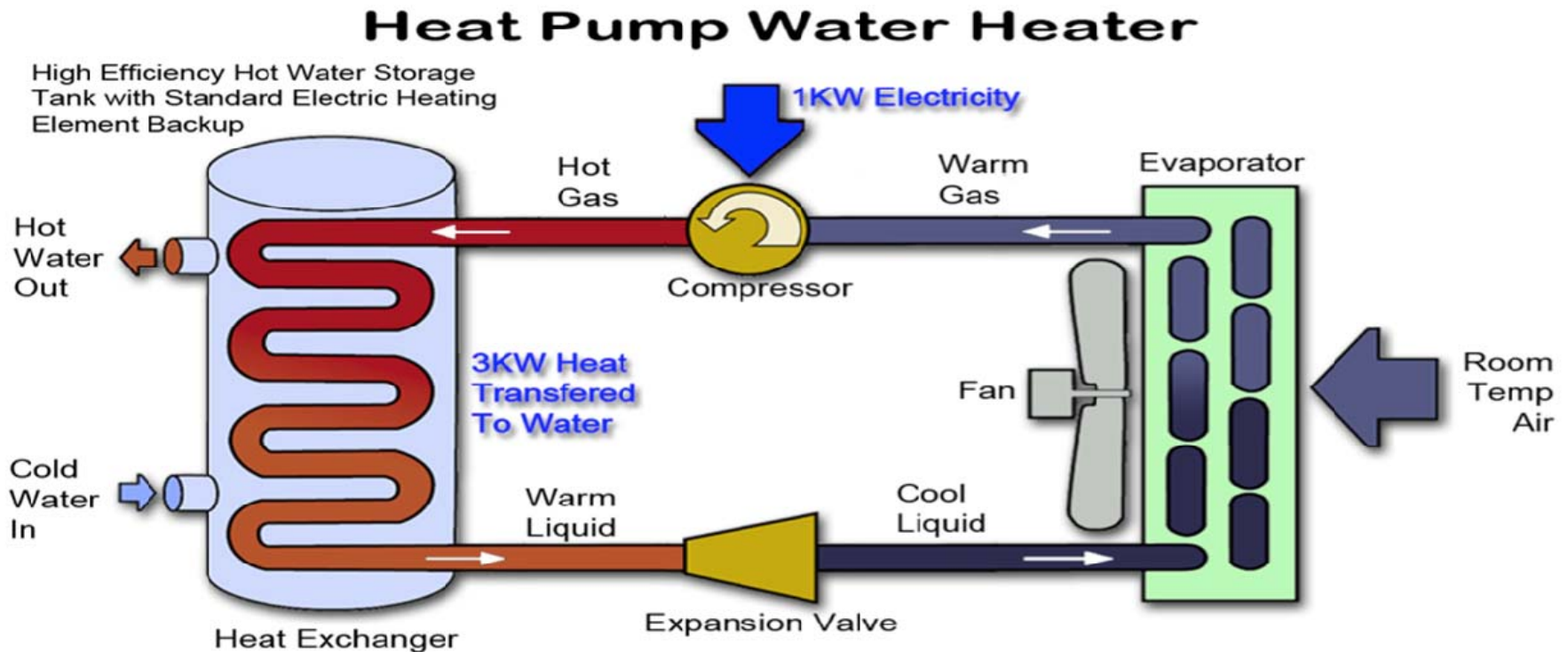


Heat pump technology:

- Heat is moved from the surrounding air to the water in the tank
- Transferring heat allows for a 60% less energy use
- Most have leak protection
- 10 year warranty

Heat pump technology:

2 to 4 times more efficient than electric resistance



Moves heat (like a fridge or A/C in reverse) instead of generating it (like electric resistance water heaters)

HPWH Benefits vs. a Standard Tank

FEATURES	BENEFITS	HPWH	STANDARD TANK
Reliable Hot Water	Hot water when you need it	✓	✓
10 Year Warranty	Peace of mind	✓	
Cuts cost by up to 60%	Save up to \$400/year or over \$4,000 over 10 years	✓	
Incentive and Tax Credits up to \$1,100	Low upgrade costs lead to faster pay back of 2-3 years	✓	
Leak Detection	Avoids a \$4,000 water damage invoice	✓	

AeroTherm vs. Standard Electric



Installation Considerations

Space

- 700 cubic ft. of space or ducting
- Clearance requirements
 - Piping
 - Anode rod service
 - Air filter replacement

Condensate

- Remove condensate
 - Pump or sloped system
 - Terminate into an existing drain or outside
 - Condensate is non-toxic

Ducting

- Confined spaces or to remove cold air
- Mounting – vibration isolation recommended



*Ideal Locations**

1. Insulated garage
2. Attic*
3. Uninsulated garage*
4. Laundry room
5. Heated basement
6. Basement mechanical room (staircase from hell)
7. Dugout crawl space
8. Closet built around existing water heater
9. Unheated basement
10. Low boy under the sink

*** Climate dependent**

Training Example: How would you respond?



I'm not sure these are Reliable... 10 year warranty

It's too expensive...

60% savings and incentives

The technology is too new...

Heat pump technology has been around for over 60 years

I don't want to run out of hot water...

Same delivery as a standard tank



Value Proposition to Installers and Builders

Installer Value (approximate)	Standard Tank	HPWH
Gross profit per water heater	\$550	\$700 - \$1,300
Gross profit for 24 units / year	\$13,200	\$16,800 - \$31,200

30%-140% more than standard tank

Large Scale Builder Value (approximate)	Standard Tank	HPWH
Gross profit per water heater	\$80	\$200 - \$400
Gross profit for 600 units / year	\$48,000	\$120,000 - \$240,000

150%+ more than standard tank

Includes local average incentives

States with Large Target Markets and Significant Incentive Coverage

▶ Replacement & New Construction Markets

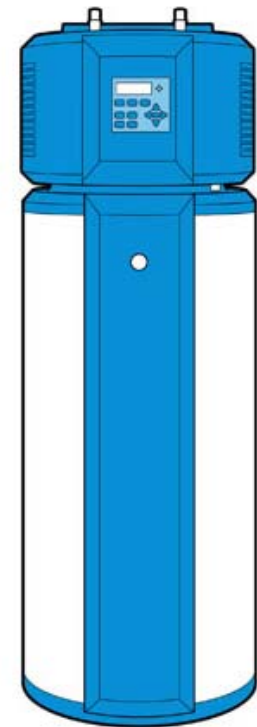
- SE: North Carolina, South Carolina, Georgia
- NW: Washington, Oregon
- MW: Ohio
- SW: Arizona

▶ Replacement Market

- Mid-Atlantic: Pennsylvania, Maryland, DC

▶ New Construction Market

- California
- Florida



HPWH Benefits to the Customer



Up to \$400 / annual savings
Reduced total cost of ownership

Immediate savings
through incentives



Peace of mind through warranty



Same **reliable hot water** delivery

Avoids **average \$4,000** water
damage bill through leak detection

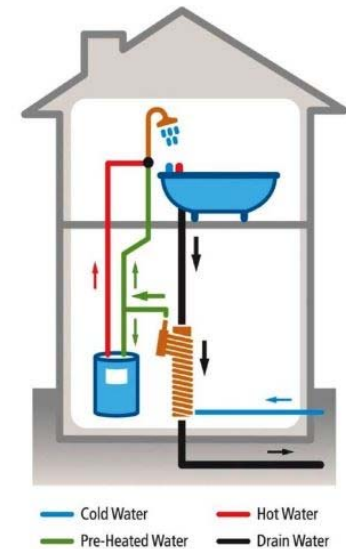
Water heating as a system for maximum appreciation

- Proper sizing of tank
- Ideal location of tanks
- Plumbing considerations
 - Core location
 - Trunk, branch and twig
- Circulator considerations
 - Timer minimum
 - Learning controls
 - On demand ideal
- Fixtures
 - Low Flow
 - Temperature activated
- Waste heat recovery

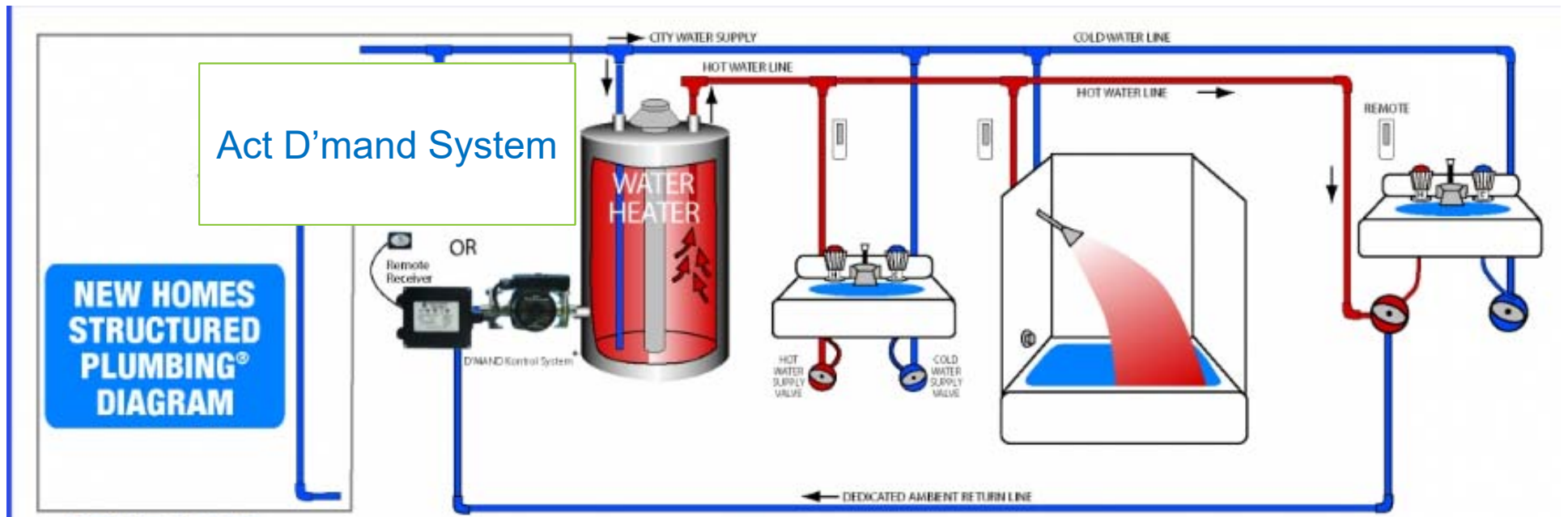
What size water heater do I need?

The right heat pump water heater for your home is determined by the number of bedrooms and bathrooms in your home, not by the number of occupants.

Bedrooms	Bathrooms	Size Needed
1 - 2	1 - 2.5	50 Gallons
3	1 - 3.5	60 Gallons
4 - 6	2 - 3.5	80 Gallons



Example of Recirculation System On Demand System



Plumbing Distance Matters: Lessons learned?

Plumbing layout and pumps greatly impact delivered hot water times

Homeowner expectations in high efficiency homes are high

Homeowner education is key to meeting both expectations and performance

HOW LONG SHOULD WE WAIT?

Volume in the Pipe (ounces)	Minimum Time-to-Tap (seconds) at Selected Flow Rates					
	0.25 gpm	0.5 gpm	1 gpm	1.5 gpm	2 gpm	2.5 gpm
2	4	1.9	0.9	0.6	0.5	0.4
4	8	4	1.9	1.3	0.9	0.8
8	15	8	4	2.5	1.9	1.5
16	30	15	8	5	4	3
24	45	23	11	8	6	5
32	60	30	15	10	8	6
64	120	60	30	20	15	12
128	240	120	60	40	30	24

ASPE Time-to-Tap Performance Criteria

	Acceptable Performance	1 – 10 seconds
	Marginal Performance	11 – 30 seconds
	Unacceptable Performance	31+ seconds

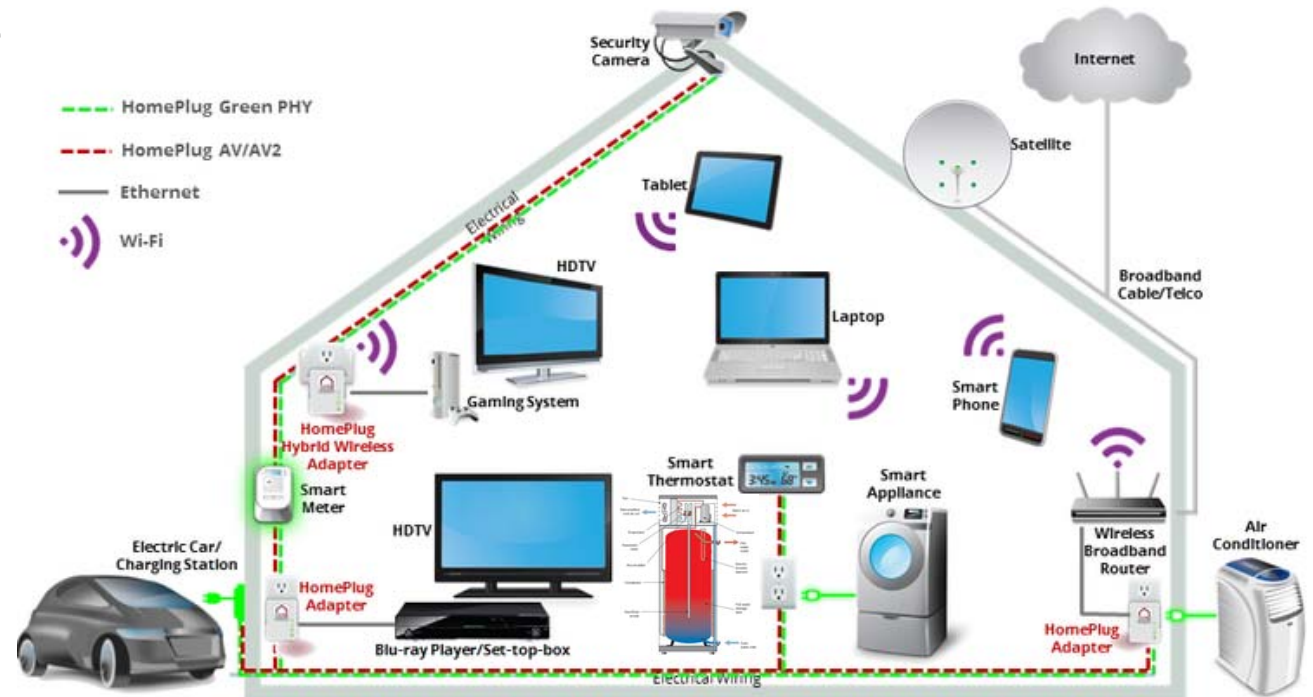
Source: Domestic Water Heating Design Manual – 2nd Edition, ASPE, 2003, page 234

Emerging Trends

- Connected home
- Demand response (CTA 2045)
- Split systems
- Sustainable communities
 - Renewable integration
 - Gas to electric or all electric homes
- New Products

Connected Home Core Values

- Device Control
- Security
- Energy Management
- Maintenance



Demand Management Requirements

– Utility's Perspective

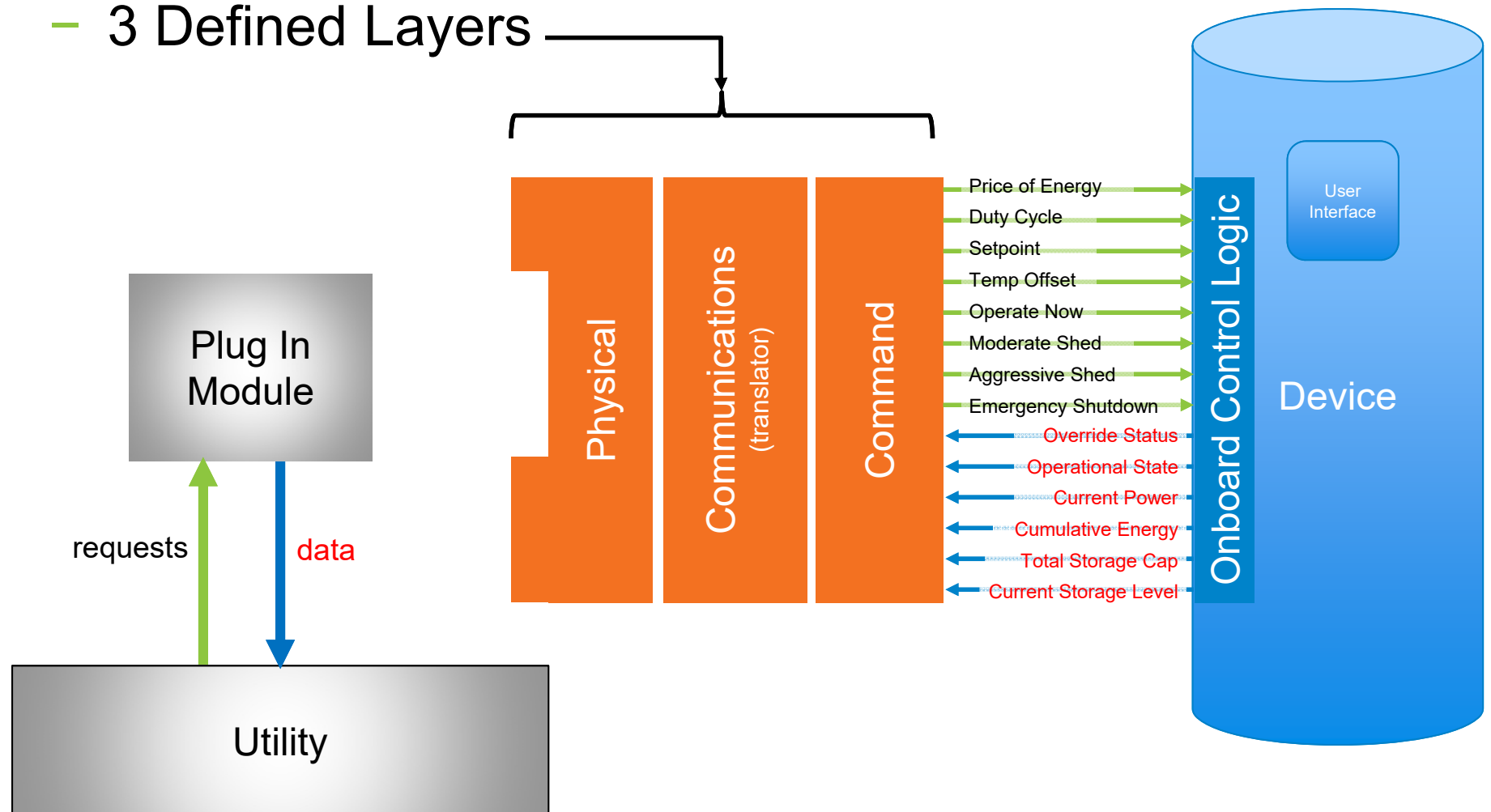
1. Dispatch-able (aka reliable)
2. Measureable demand reduction
3. Low cost
4. Can be built incrementally

– Customer Perspective

5. Does not impact benefits provided from connected device (water is hot, room temperature is good . . .)
6. No effort required
7. What's in it for me? (\$, services, feel good, mgmt.)

CTA 2045

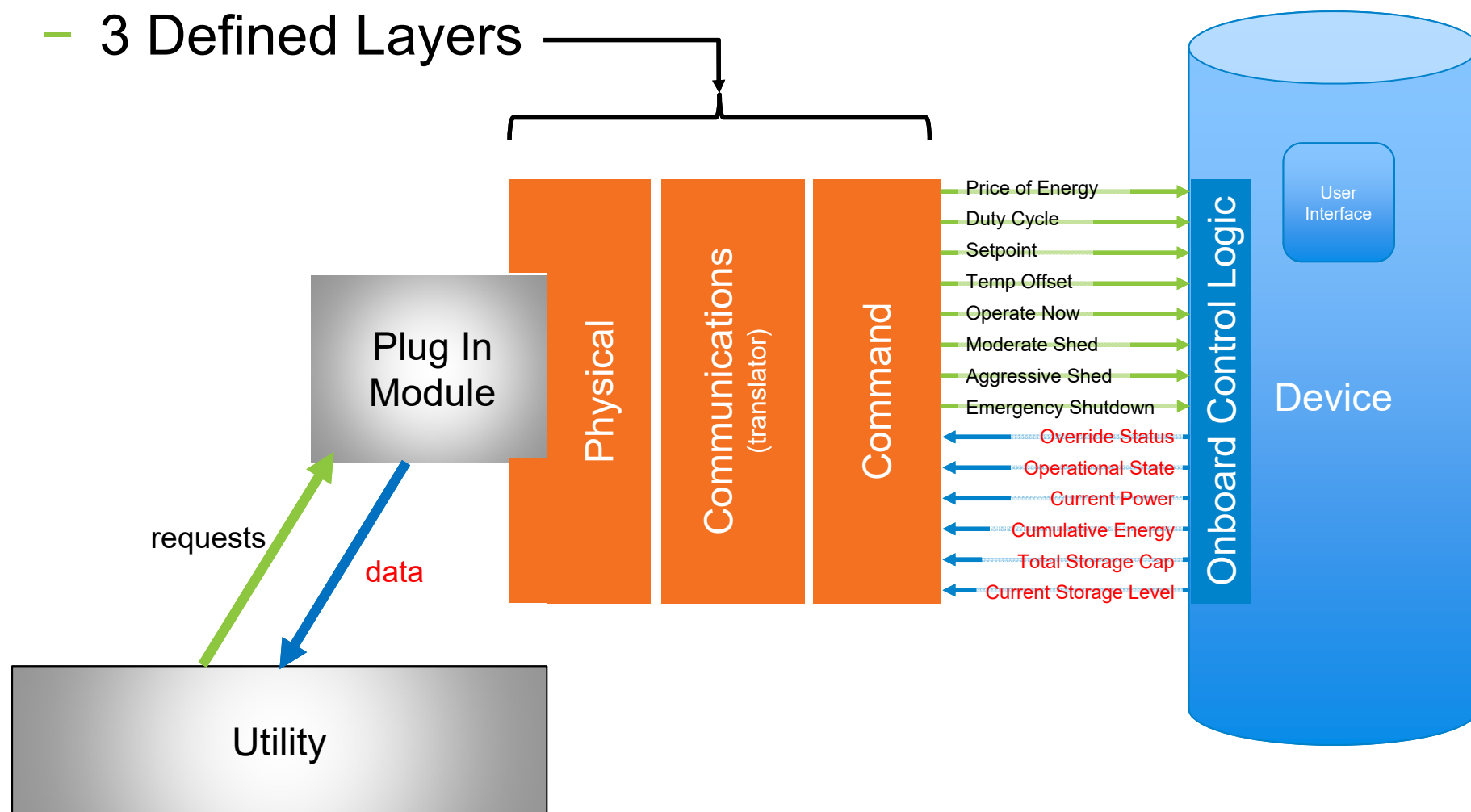
- Open Source Standard for demand management
- 3 Defined Layers



*CTA = Consumer Electronics Association

CTA 2045

- Open Source Standard for demand management
- 3 Defined Layers



Water Heater Example



Split Systems – Great COP more coming



North America's first eco-friendly CO₂ hot water solution

**A GREEN BUILDING INNOVATION FOR
HIGH-PERFORMANCE, ULTRA-EFFICIENT HOT WATER**

#1 PERFORMANCE IN FHR X4

UP TO 70% SAVINGS

LOW GLOBAL WARMING POTENTIAL

FLEXIBLE INSTALLATION

SANCO₂ Hot water, *naturally.*

Heat Pump Water Heaters

The advertisement features a vertical indoor unit on the left and a horizontal outdoor unit below it. The background is a light green gradient with a blue banner at the top and bottom. The central text is in green and blue. Four circular icons illustrate key benefits: a showerhead with 'X4' for performance, a pair of scissors cutting an 'ENERGY BILL' for savings, a globe with a green leaf for low global warming potential, and a house with a 'TANK' and 'HP' for flexible installation.

Benefits

- COP of over 4
- Operate at lower temperatures
- High capacity

Sustainable Communities

- Growing number of communities across the US
- Aggressive CO2 goals
- See Heat Pump technologies as prime partners to meet goals
- Integrating more renewables
- Electronification ~ Gas to Electric conversions
- All electric homes ~ moving to code reqd.

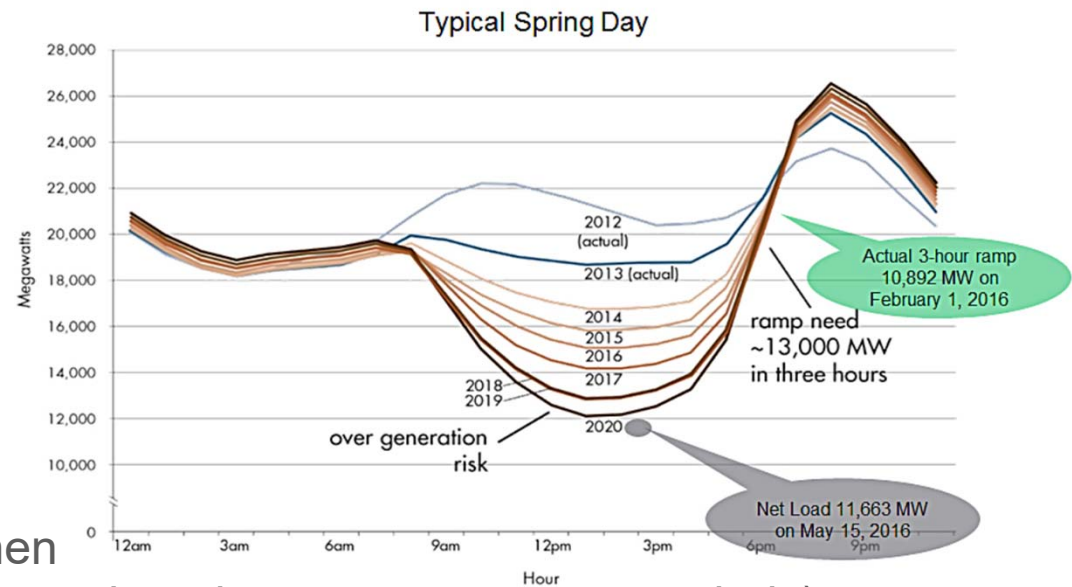


**Sustainable
Communities**

The Age of Renewable Generation

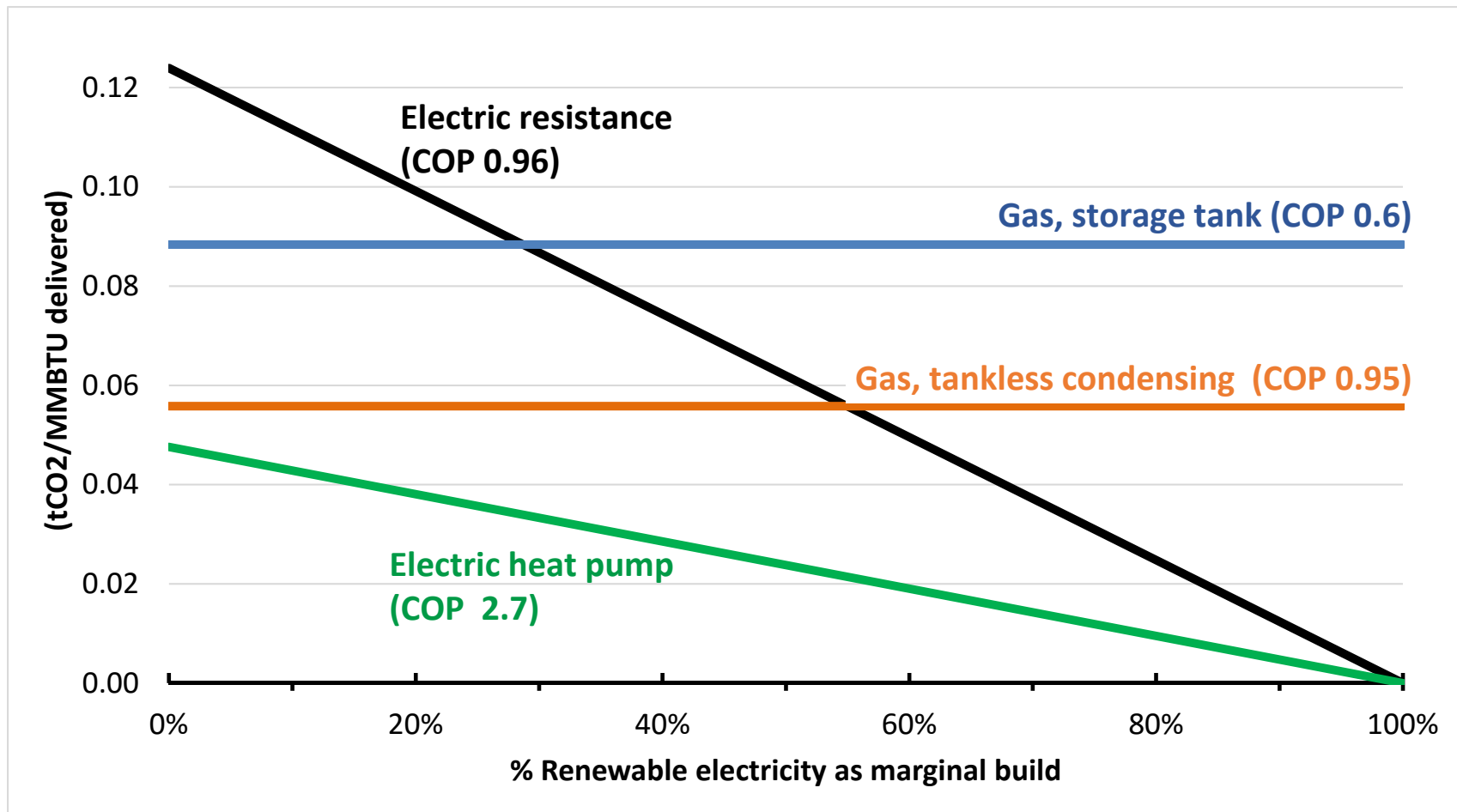
Three Solutions

1. Turn off PV or Wind (wasteful)
2. Battery Storage (expensive, but essential)
3. Flexible Loads (use renewable electricity when surplus and delay use during peak and extreme ramp rate periods)



Water heater CO2 emissions*

As CA grid gets cleaner, HPWH offer pathway to very low-GHG hot water



* Assumes:

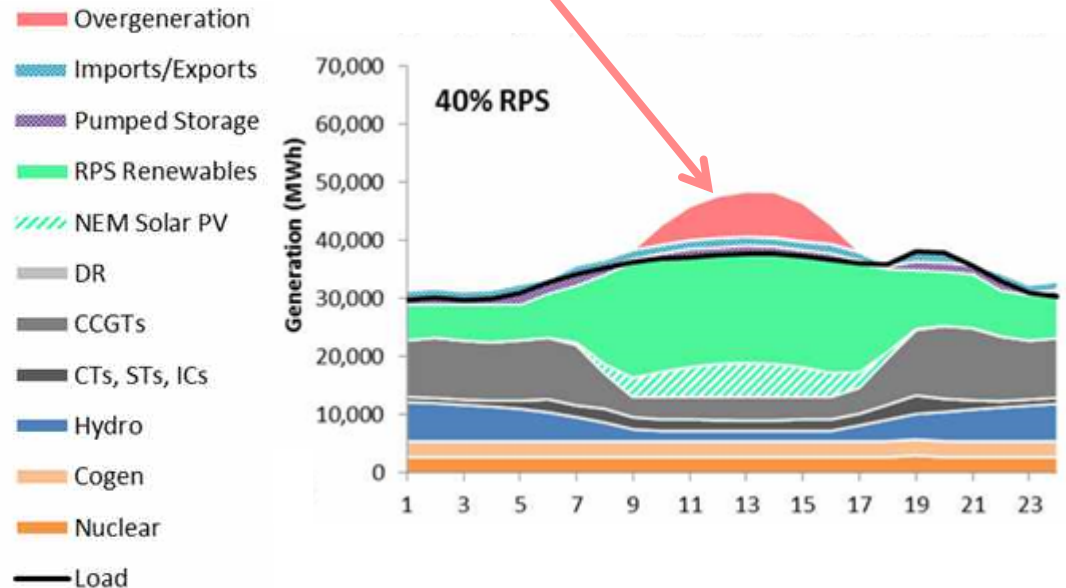
- 1) Fugitive methane emissions not included
- 2) 45%-efficiency combined cycle gas plant (build margin)



Store Excess Energy

- Solar & Wind produce energy in limited hours
- Output varies
- Energy with no place to go!

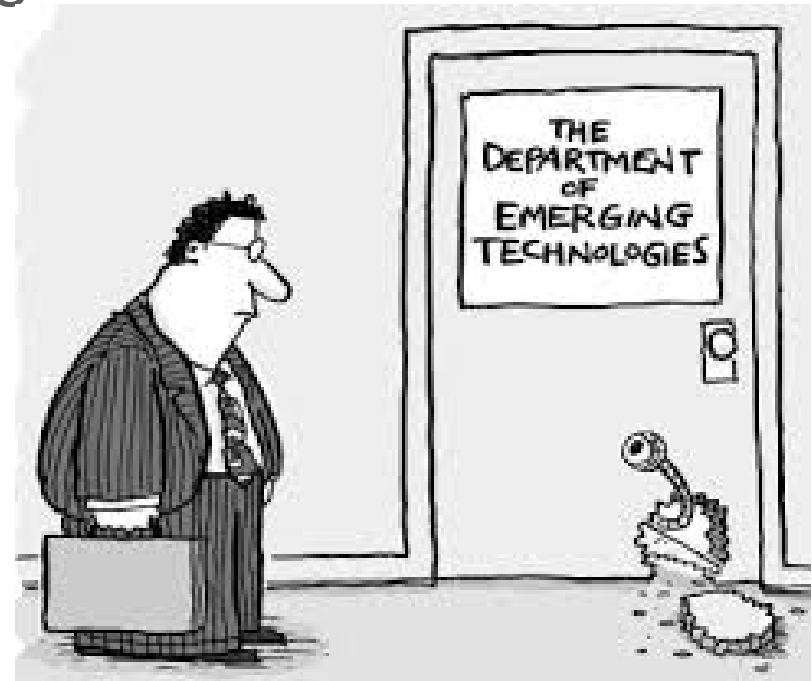
Overgeneration



Reference: *Investigating a Higher Renewables Portfolio Standard [RPS] in California*, Energy and Environmental Economics, Inc., 101 Montgomery St. San Francisco, CA 94104. Jan 2014

New designs and products coming

- Split systems for challenging installs
- Higher tank temperatures with mixing valves
- Smaller tank heat pumps
- PV direct powered systems
- 120 volt system
- Multi-family solutions
- Change in refrigerants
- Off shore suppliers



Get Ready

- ✓ Source product and pricing at a local distributor
- ✓ Install water heaters as systems
- ✓ Gather local rebate details
- ✓ Ensure all staff are ready to talk about the benefits and details of HPWHs
- ✓ Print best practices guides for installations and homeowner guides for customer education
- ✓ Get educated by your manufacturer if you haven't already

Resources to Get You Started

Installer Resources

- [Best Practices Installation Guide](#)
- [Homeowner Quick Reference Guide](#)
- [Hot Water Solutions Image Library](#)
- [Sales sheet](#)
- [Advanced Water Heater Specification](#)
- [Qualified Products List](#)
- [Incentive listings](#)

- Program Website:
<http://hotwatersolutionsnw.org/partners/resources>





Thanks for your Time
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TOGETHER We Are Transforming the Northwest

