

# ET Summit 2021

Presented by



# Technology Transformation: Multifamily / Commercial Water Heater Systems

presented by:

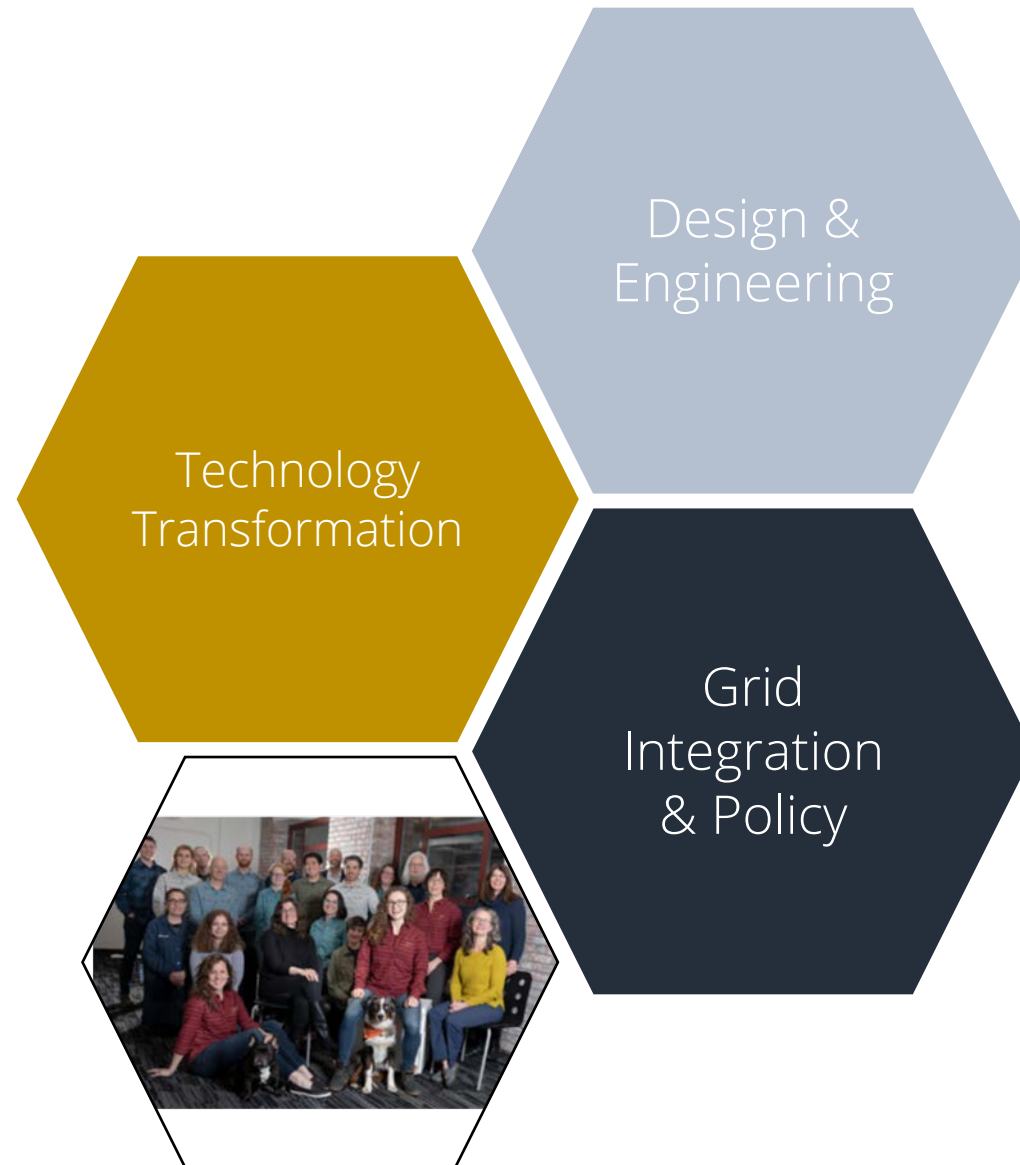
Jonathan Heller, P.E.  
President

November 2021



# PURPOSE

*Leading transformation of the building industry to energy efficient carbon neutral buildings*





## Building Industry Response to the Climate Crisis

Electrify Everything:  
Technology  
Transformation

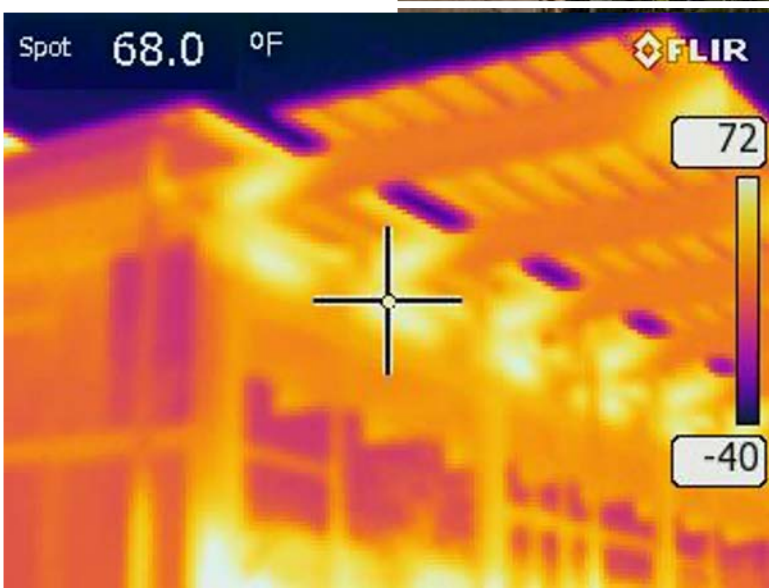
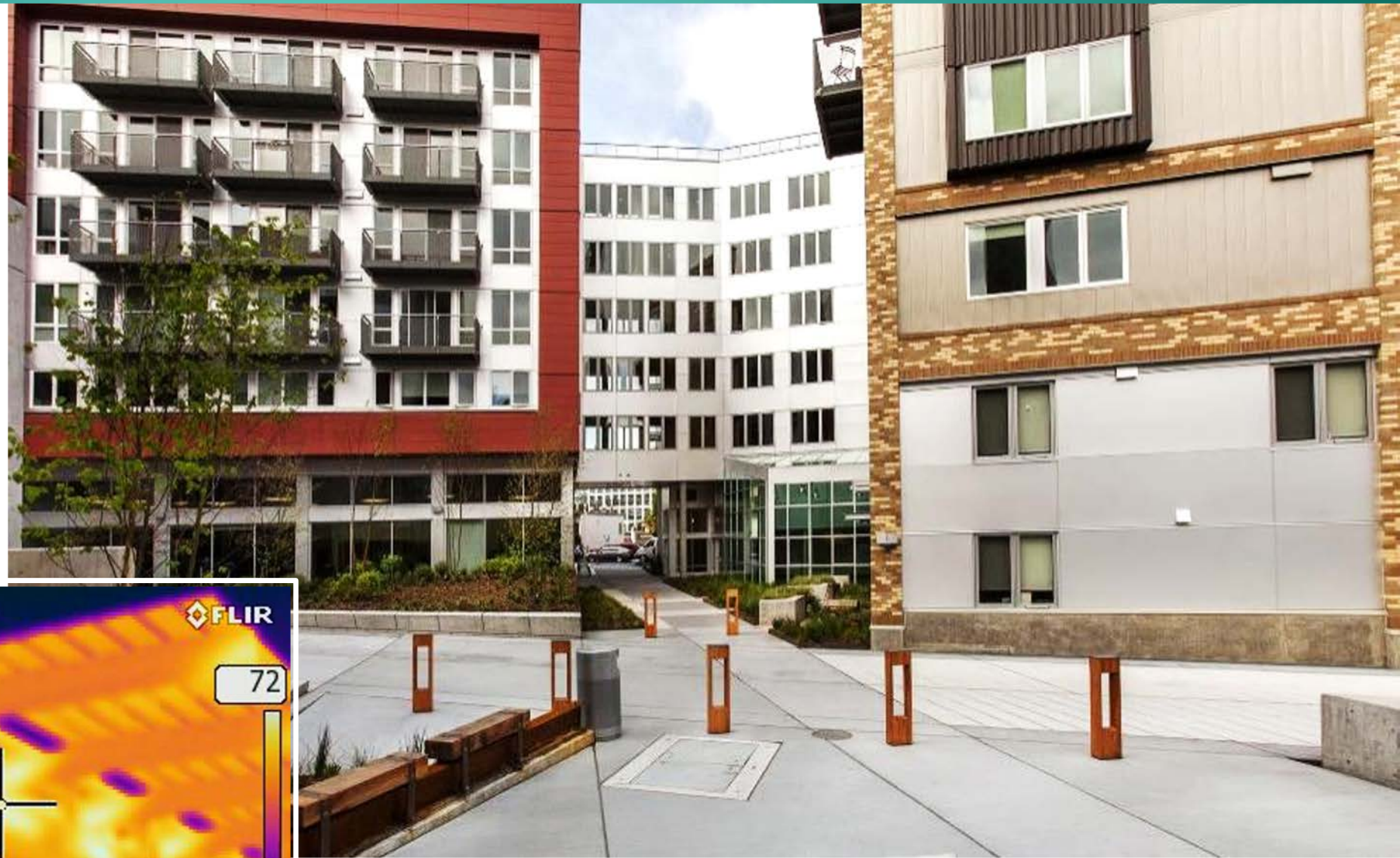


Sitka Apartments / Runberg Architecture Group



## Building Industry Response to the Climate Crisis

Efficiency is Energy:  
Design and Engineering



Stackhouse Apartments / Runberg Architecture Group



## Building Industry Response to the Climate Crisis

When Matters:  
Grid Integration





# Advanced Water Heating Initiative

**nbi** new buildings  
institute



## Vision for Market Transformation



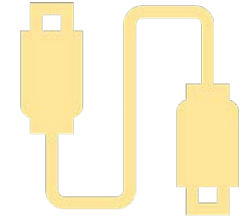
Heat Pumps are  
Standard Practice for  
Water Heating



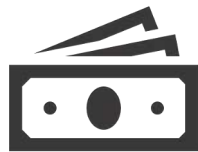
Average System COP  
of 3.0 or better



Use Low-GWP  
Refrigerants  
(GWP<750)



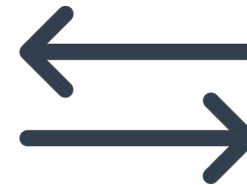
Plug-and-Play



Affordable



Reliable and  
Redundant Systems



Ability to Load Shift



## The Big Picture

### VISION

HPWHs are universal – in all homes and businesses

### GOAL

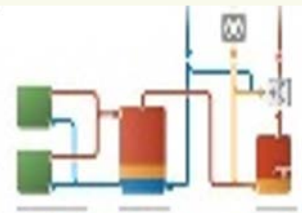
CHPWH systems are installed 90% of new MF by 2026

### APPROACH



#### PRICE

competitive product pricing via standards, incentives or codes



#### PRODUCTS

fully packaged plug-and-play systems



#### CUSTOMER

market actors know how to design, sell, commission and optimize systems



# CHPWH Target Markets

## *Multifamily*





# CHPWH Target Markets *Restaurant*





# CHPWH Target Markets

## *Grocery*





# CHPWH Target Markets

## *Lodging*



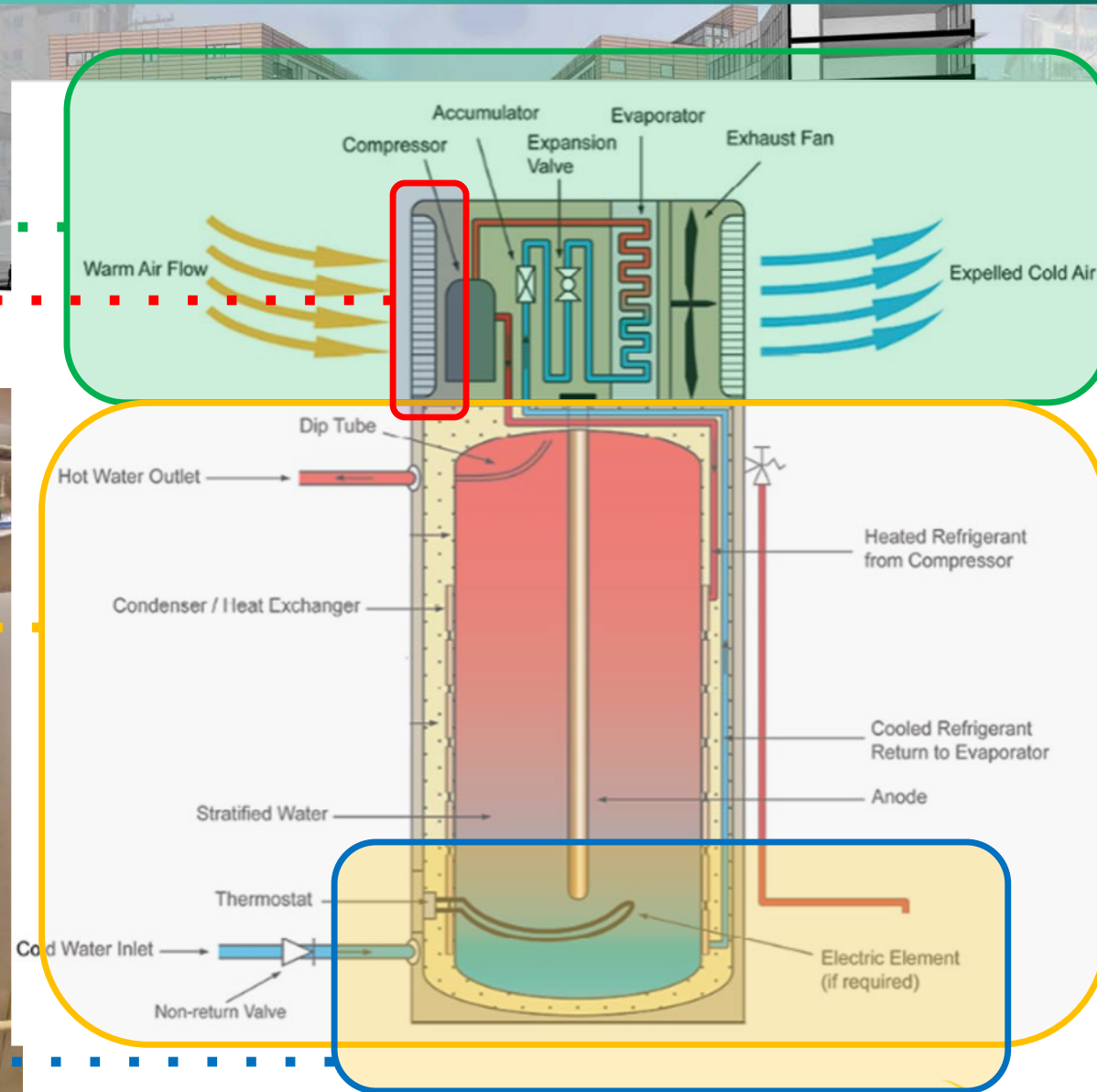
# 10-Year Impact in Multifamily Target Market

*Ramping up to 100% of New Construction and 50% of 20-yr Equipment Replacements*

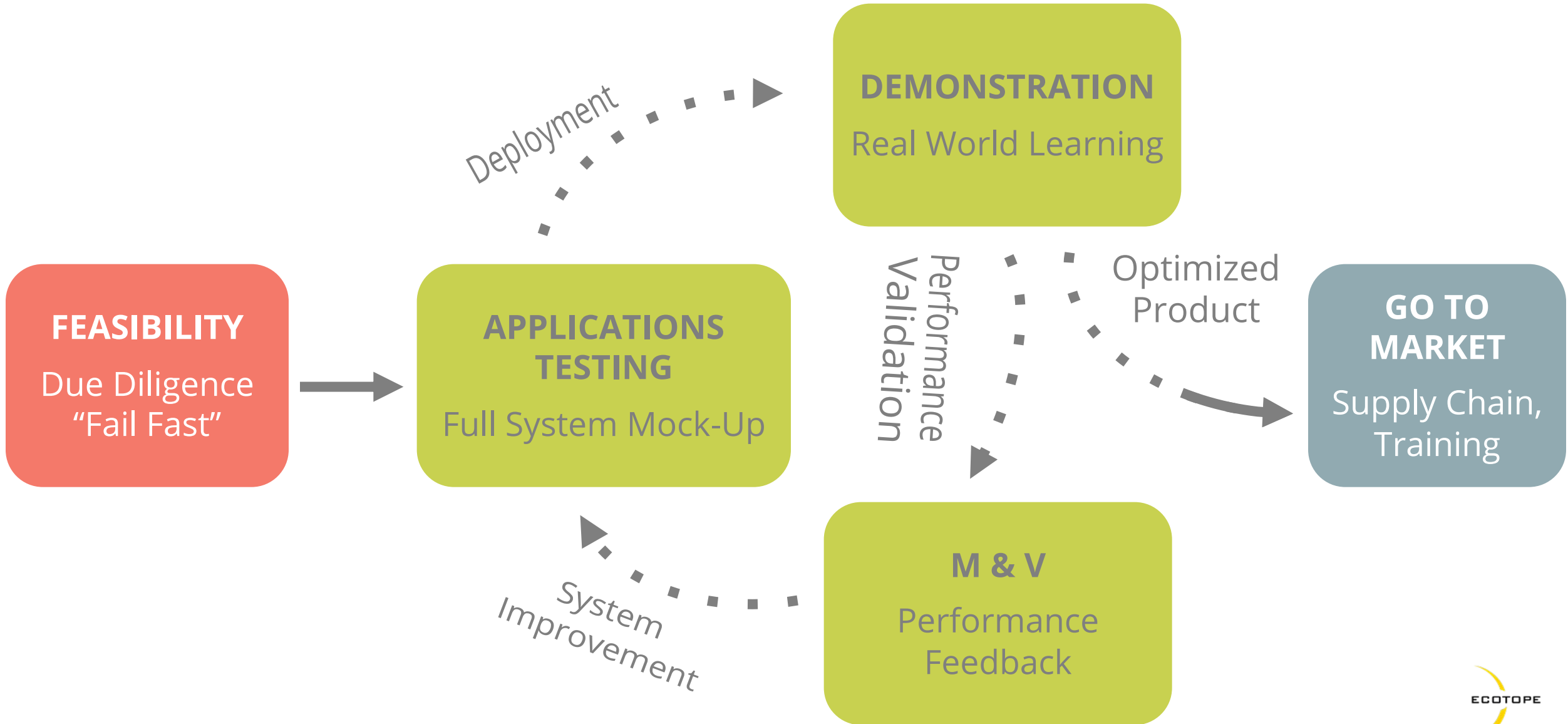
- > Electric Conservation Potential: 2400 aMW
- > Grid Impact of Fuel Switching: 800 aMW
- > Reduction in Connected Load: 10,000 MW
- > Demand Response Potential: 6400 MW



# CHPWH System Components



# Technology Innovation Model





## System Design Impacts



**55 Tons / 1,000 Gallons**



**5 Tons / 520 Gallons**



# Market Delivery of CHPWH Systems

## *Business As Usual*



### **CUSTOM ENGINEERED SYSTEM**

All the pieces are separate and come from multiple distributors and/or manufacturers.

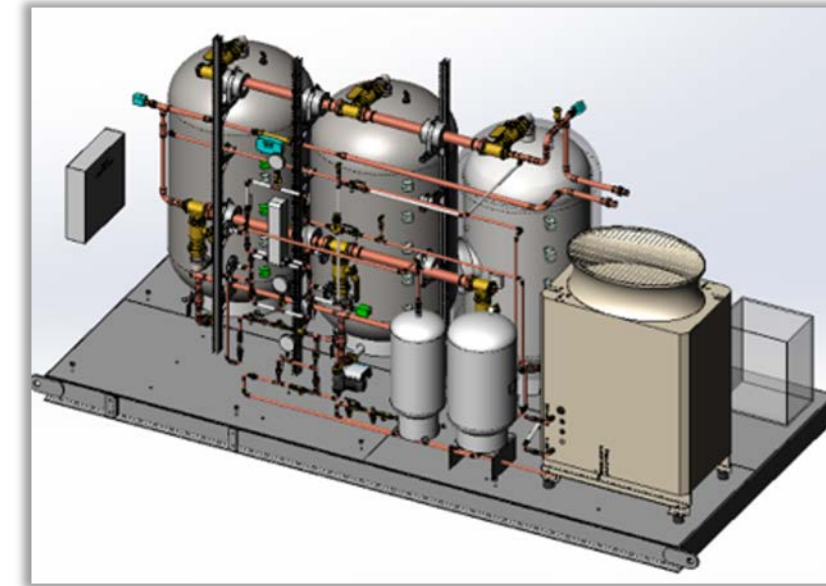
## *Current Market*



### **SPECIFIED BUILT-UP SYSTEM**

All the pieces are separate but come from a single distributor or manufacturer.

## *Future Market*



### **PACKAGED / SKID**

Everything is assembled and delivered in a single package.

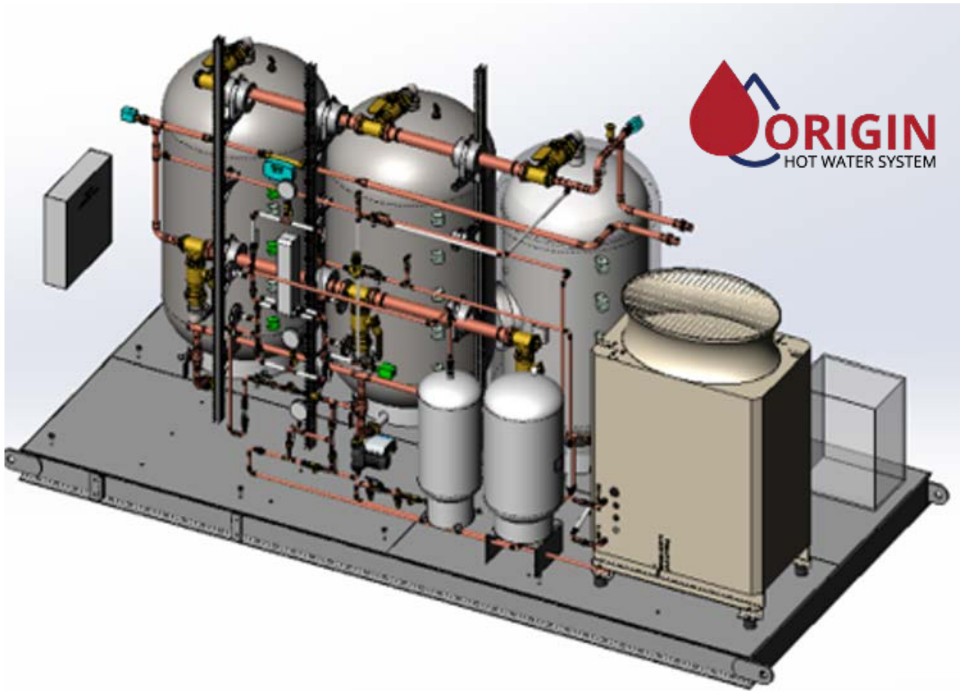


# Plug and Play Systems

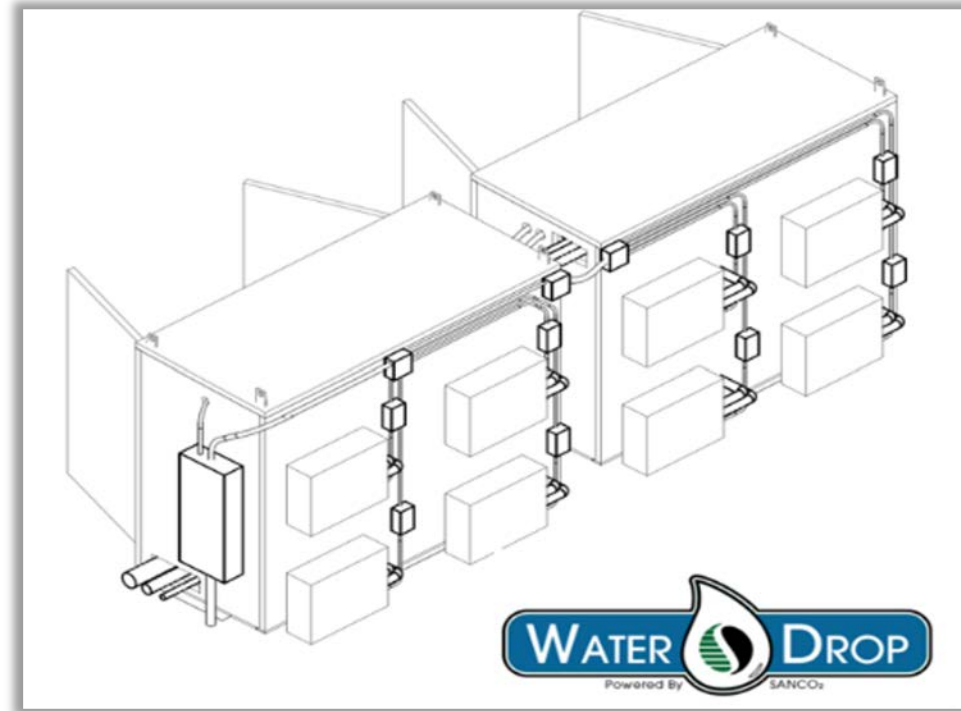
- A **system** of components
  - > Compressor, Storage Tanks, Temperature Maintenance, Controls
- Purchased pre-packaged on a skid or individual components with assembly instructions
  - > Easy install, single point of contact
- Reduced risk
  - > Reduce need for custom design solutions
  - > Reliable repeatable results
  - > Reduced pricing over time
  - > Single warranty



# Fully Packaged System Options



Mitsubishi



SanCO<sub>2</sub>



AO Smith



# Origin by Steffes: Mitsubishi Engine



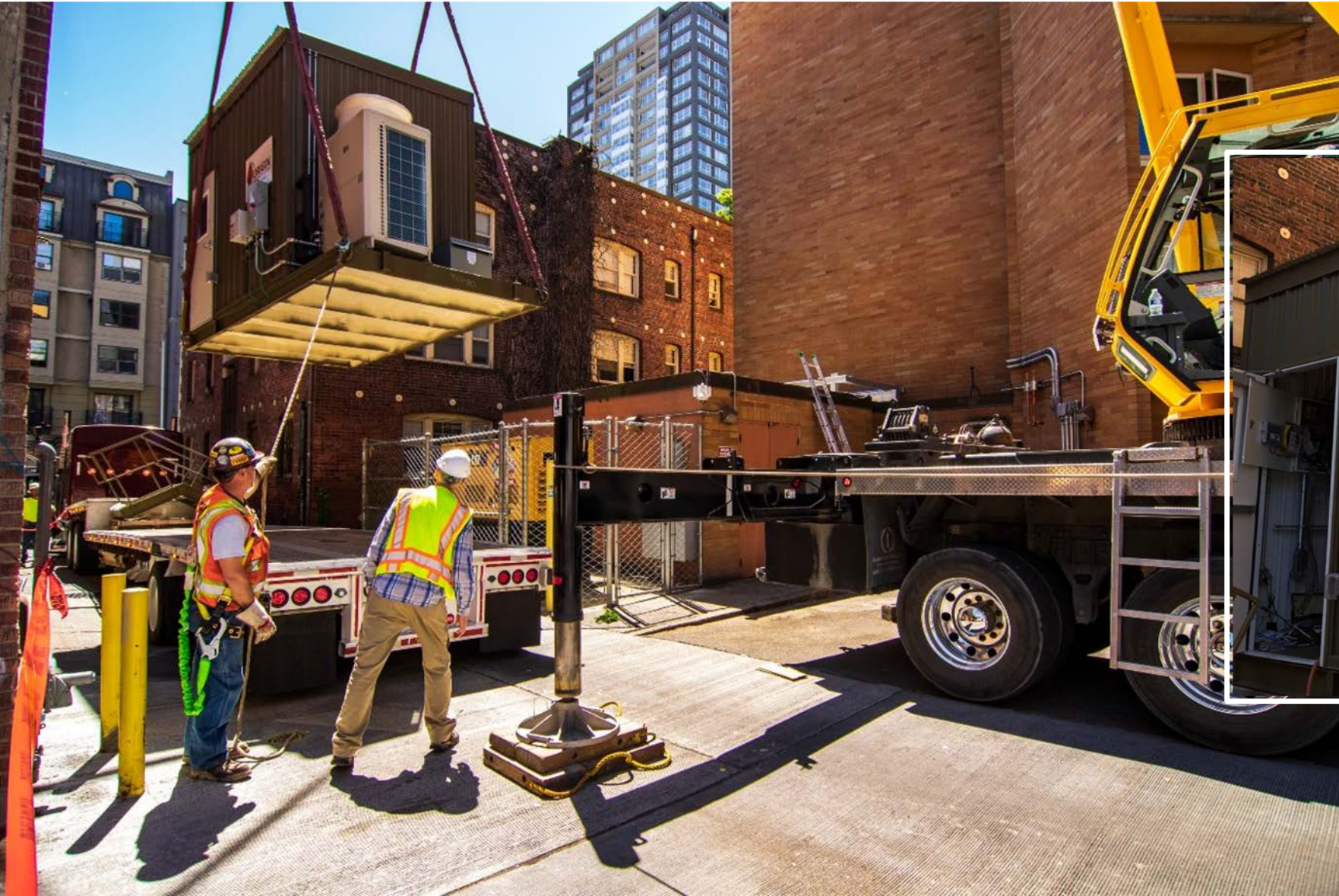


# Fully-Packaged CHPWH Product Delivered

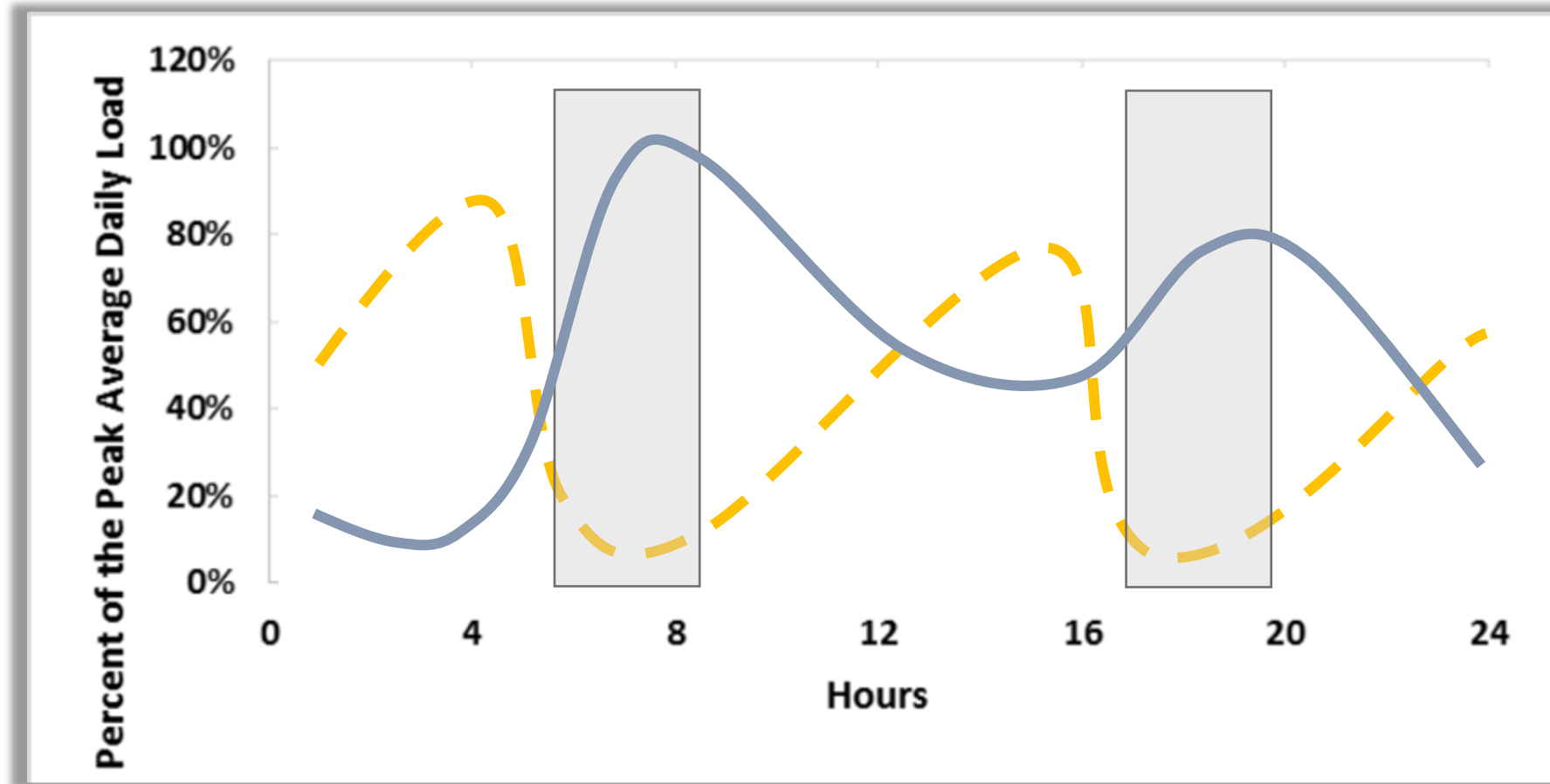




## ... and Installed



# Load Shifting Water Heating



Water Heating – Baseline  
Water Heating – Load Shift



nea.org/our-work/advanced-water-heating-specification



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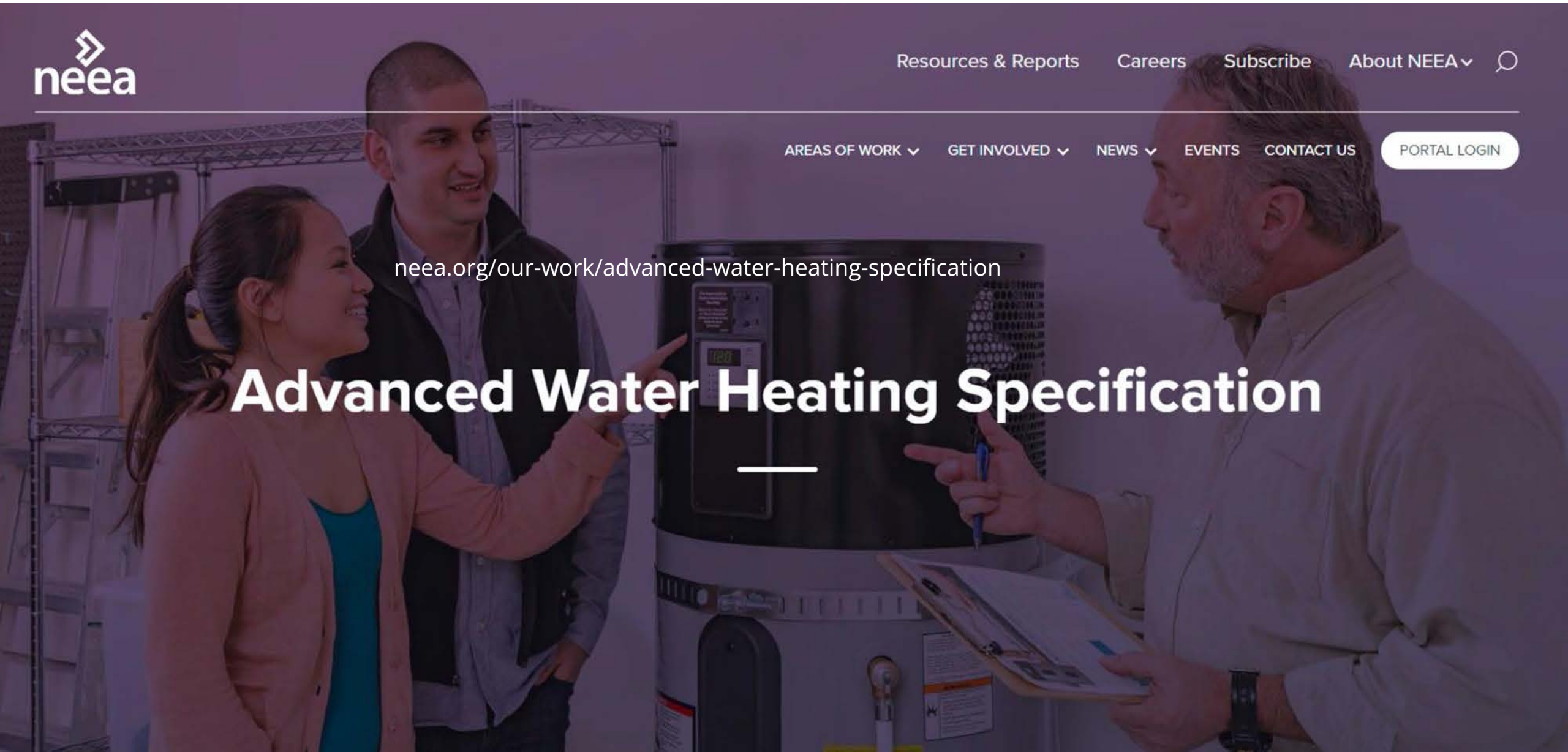
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nea.org/our-work/advanced-water-heating-specification

# Advanced Water Heating Specification





## EcoSizer

Open source  
sizing tool



## EcoSim

Open source  
energy modeling  
tool



## M&V Data Base

Central data  
library

### HOW TO USE THIS TOOL

1. Identify weather conditions (cold water temperature and ambient temperature) on the design day, which is usually the coldest day of the year.
2. Select a HPWH technology and identify its temperature setpoint limitations. Consider its potential performance limitations under winter design conditions.
3. Provide input method and values to determine design-day hot water demand.
4. Provide the storage, delivery, and incoming water temperature settings for your system.
5. Select the configuration for the temperature maintenance system.
6. Revise default values for advanced inputs, if needed.
7. Click "Size Your System" to obtain minimum sizing results and the Primary Sizing Curve.
8. Select the actual HPWH heating capacity according to performance characteristics of the selected HPWH technology. Use the Primary Sizing Curve to find the minimum storage volume based on the actual HPWH design-day heating capacity. Alternatively, select a storage volume first and use the Primary Sizing Curve to find the corresponding HPWH output capacity needed to meet the design-day hot water demand.



## Training and Workforce Development



Virtual interactive tours



TILE modules that target  
architects and engineers



Pursuit of CEUs through AIA and  
other accreditation entities

# Planned Activities Next 24 Months

- > Continued engagement with manufacturers through TIM towards plug-and-play solutions and product improvements
- > Research, test, demonstrate, and monitor load shift capabilities
- > Expand and Improve Ecosizer and create accessible Ecosim Tool
- > Complete AWHS with QPL and simulated performance across climates
- > Collect unified M&V data across products and climates to validate AWHS and Ecosim
- > Create model code and model program templates
- > Expand training and educational materials and platform
- > Expand market outreach



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