

# Scaling Up: Demonstrating Risk Reduction and Cost Compression for Commercial Heat Pump Water Heaters (Abstract)

CRADA #625 (PNNL #81966)

April 2024

*Carmen E Cejudo Marmolejo*

1. D+R International, Ltd.
2. Ecotope, Inc.
3. Northeast Energy Efficiency Partnerships (NEEP)

## DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor Battelle Memorial Institute, nor any of their employees, **makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights.** Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or Battelle Memorial Institute. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

PACIFIC NORTHWEST NATIONAL LABORATORY  
*operated by*  
BATTELLE  
*for the*  
UNITED STATES DEPARTMENT OF ENERGY  
*under Contract DE-AC05-76RL01830*

Printed in the United States of America

Available to DOE and DOE contractors from  
the Office of Scientific and Technical  
Information,  
P.O. Box 62, Oak Ridge, TN 37831-0062  
[www.osti.gov](http://www.osti.gov)  
ph: (865) 576-8401  
fox: (865) 576-5728  
email: [reports@osti.gov](mailto:reports@osti.gov)

Available to the public from the National Technical Information Service  
5301 Shawnee Rd., Alexandria, VA 22312  
ph: (800) 553-NTIS (6847)  
or (703) 605-6000  
email: [info@ntis.gov](mailto:info@ntis.gov)  
Online ordering: <http://www.ntis.gov>

# **Scaling Up: Demonstrating Risk Reduction and Cost Compression for Commercial Heat Pump Water Heaters (Abstract)**

CRADA #625 (PNNL #81966)

Abstract

April 2024

Carmen E Cejudo Marmolejo

Prepared for  
the U.S. Department of Energy  
under Contract DE-AC05-76RL01830

Pacific Northwest National Laboratory  
Richland, Washington 99354

## Abstract

Commercial heat pump water heater (CHPWH) systems significantly decarbonize the commercial and multifamily sectors by eliminating the reliance on gas-fired water heating. CHPWH systems are also well suited to include load shift controls that enable load-up and shed commands for supporting grid reliability and time-of-use pricing structure. However, they have not had wide adoption due to factors including price, complexity, and perceived risk.

Although CHPWHs have been available in the US for decades, they have not made significant market gains in part because the systems have required significant and costly engineering design expertise and proved lackluster performance. Successful widespread market adoption requires a different approach; a shift from the current custom specialized expertise project design and installation to a repeatable approach that requires little specialized knowledge or expertise and can deliver persistent performance. Using this type of holistic systems approach requires effectively integrating four CHPWH system key components: primary air-to-water heat pumps; primary thermal storage tanks, a temperature maintenance system, and a control system which has capabilities to manage the primary heat pump cycles, any back-up, supplemental, or temperature maintenance heating, alarms, and grid connectivity allowing for demand response (DR), and/or load shifting.

The project team has developed and will implement a suite of tools to support faster, less expensive, and more reliable field installations of CHPWH technology and with the resulting data used to further improve the tool set. These tools include:

- A tool for optimizing system size and costs.
- A tool that predicts annual energy use and overall system efficiency.
- The Advanced Water Heater Specification (AWHS 8.0) defining the components of a full CHPWH system addressing performance requirements by climate zone.
- The Qualified Products List: (QPL) of approved products that meet the specifications requirements.
- Training materials including online on-demand modules, instructor-led training, and virtual interactive video tours of CHPWH installations in multifamily buildings.

Demonstration site identification in low-income buildings in underserved communities is currently underway. Preliminarily, the team anticipates having three demonstrations in the Pacific Northwest and three in the Northeast for a total of six sites.

After the demonstration sites are finalized, and M&V instrumentation installations are complete, the team will gather performance data and confirm whether the CHPWH systems perform as predicted and use the data to improve the existing tools.

# **Pacific Northwest National Laboratory**

902 Battelle Boulevard  
P.O. Box 999  
Richland, WA 99354  
1-888-375-PNNL (7665)

***[www.pnnl.gov](http://www.pnnl.gov)***