Water Heating Economics in a Dynamic Energy Landscape

PREPARED BY
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GDS Associates
Rich Hasselman

PREPARED FOR
The Beneficial Electrification League

BEL ELECTRIC WATER HEATING SUMMIT | MAY 4, 2023
Study Perspective

Our study focuses on the relative societal costs associated with the adoption and operation of various residential water heating technologies. That is a different – and more holistic – view of costs than those faced by an individual household.

Societal cost factors:

- Equipment and installation costs
- Wholesale fuel costs (e.g., electricity, natural gas, propane)
- Infrastructure costs to deliver fuel to end-use consumers
- Losses in the delivery of fuel to consumers
- Greenhouse gas emissions associated with the production, delivery, and consumption of fuel

PRIMARY FOCUS OF THIS STUDY

Household adoption decision factors:

- Equipment and installation costs
- Retail fuel costs
- Customer’s personal preferences (e.g., technology familiarity, green proclivity, comfort considerations, aesthetics, contractor availability and familiarity, etc.)
We quantify the total societal costs of different water heating technologies across multiple housing configurations using latest modeling tools and data developed by Brattle and GDS.

Analytical Framework

1. Determine suitable housing types and water heating technologies to model (we analyze roughly 100 different combinations)

2. Simulate fuel consumption patterns for each water heating technology/housing configuration combination, based on Southeastern U.S. market and climate characteristics

3. Develop estimates of the marginal energy system cost, emissions cost, and water heating technology cost using recent historical market data

4. Evaluate the total societal cost of installing and operating each water heating technology for each housing type, considering grid-interactivity where applicable

5. Perform sensitivity analyses to estimate the impact of changes in equipment costs, fuel prices, power grid carbon intensity, and the assumed cost of carbon
The economically optimal heating option varies by building type & size

- Electric resistance (grid-interactive), heat pump water heaters, and gas water heaters all could be the most economic option depending on building type.
- HPWHs are more economical for larger homes, since their large upfront cost is offset by higher annual energy savings.
- There is only a modest price difference between Standard Electric Resistance water heaters and Gas water heaters, but GIWHs provide additional load shifting benefits which reduce their overall cost.
- Certain options may have technical restrictions which further limit their applicability. For example, there may be size restrictions to installing heat pump water heaters or 80 gallon electric resistance water heaters in smaller homes.

### ANNUAL COST FOR WATER HEATING TECHNOLOGIES ($/YEAR)

<table>
<thead>
<tr>
<th></th>
<th>SF-1</th>
<th>SF-2</th>
<th>SF-3</th>
<th>SF-4</th>
<th>MFG-1</th>
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<tr>
<td>Std Electric Resistance</td>
<td>$300</td>
<td>$359</td>
<td>$419</td>
<td>$480</td>
<td>$293</td>
<td>$342</td>
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<tr>
<td>GIWH (40/50 Gal)</td>
<td>$297</td>
<td>$350</td>
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<td>HPWH</td>
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<td>Gas</td>
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<td>$304</td>
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<td>$493</td>
<td>$594</td>
<td>$346</td>
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<td>$457</td>
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</table>

Most Expensive Option: Propane  
Cheapest Option: Std Electric Resistance
The most economic option is sensitive to market and policy factors

Conclusions about the most economic water heating technology change across all scenarios.

Results are sensitive to installed cost assumptions. Gas water heaters, particularly older models, can be bought for relatively low prices. They therefore have the cheapest low-end of the cost range, and consistently out-compete other technologies at that end of the range.

GIWHs are advantageous in scenarios with lower emissions costs and lower electricity costs, where the lower efficiency of the technology is offset by its lower up-front cost and incremental benefits to the power system.

HPWHs remain viable for larger homes across most scenarios (especially when rebates are available), but cost-effectiveness from high efficiency is reduced when emissions are not a factor.

### CHEAPEST WATER HEATING TECHNOLOGIES BY SCENARIO

<table>
<thead>
<tr>
<th></th>
<th>SF-1</th>
<th>SF-2</th>
<th>SF-3</th>
<th>SF-4</th>
<th>MFG-1</th>
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<tr>
<td><strong>Base Case</strong></td>
<td>GIWH</td>
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<td>Gas</td>
<td>HPWH</td>
<td>GIWH</td>
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<tr>
<td><strong>High Installed Cost</strong></td>
<td>GIWH</td>
<td>GIWH</td>
<td>GIWH</td>
<td>HPWH</td>
<td>GIWH</td>
<td>GIWH</td>
<td>GIWH</td>
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<tr>
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<tr>
<td><strong>Higher Fuel Prices</strong></td>
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<td><strong>Carbon-free Electricity</strong></td>
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<tr>
<td><strong>HEEHRA Rebate</strong></td>
<td>HPWH</td>
<td>HPWH</td>
<td>HPWH</td>
<td>HPWH</td>
<td>HPWH</td>
<td>HPWH</td>
<td>HPWH</td>
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</tbody>
</table>

Note: *High/Low Installed Costs* scenarios represents the upper and lower ranges of commercially available water heater costs. *Higher Fuel Prices* scenario includes adjustments for higher fuel prices due to global fuel supply shocks. *Carbon-Free Electricity* scenario assumes electricity production in a high decarbonized grid has zero marginal emissions. *High/Low Carbon Price* scenarios account for both a relatively high ($190/ton of CO$_2$) and low (zero) cost of carbon. *HEEHRA Rebate* scenario assumes 100% of the $1,750 rebate available through the High-Efficiency Electric Home Rebate Act applies to low-income households, though we note that total system cost calculations in certain jurisdictions may exclude tax credits and rebates.
Additional Insights

- Propane water heating consistently results in the highest cost
- Tankless water heaters could be attractive options in smaller dwellings
  - ... but upgrades to the distribution system are a critical consideration
- Grid-interactivity enhances value, but benefits are market-specific
- Water heating economics can be significantly different from a customer’s perspective

Source: Gettyimages
Data Development: Repeatable Methodology

Adapted RESNET DHW algorithms
- Based on industry standards used for home simulation models
- Algorithm based on national research
- Similar to many TRMs, but not all regions have TRMs to reference

Focus on relatively simple tank and tankless configurations
- Duct kit costs for HPWH
- Low/mid/high pricing

Method allows for project-specific conditions as inputs
- Ground water temperature
- Occupancy (a deviation from RESNET)
- Single-family detached and manufactured homes

Baseline assumes end of life replacement
Data Development: Key Considerations

There are thousands of possible conditions to model – impractical for general purposes.

Results are directional – not necessarily applicable to all situations

- Relative energy costs
- Physical locations and conditions
- HVAC interactions

While directional, results and method allow for confidence moving forward

The more hot water consumption in a household, the more important energy costs and relative efficiencies become
### Example: Heat Map to Compare Operating Costs From Household Perspective

HPWH UEF = 3.0  
Gas Tank WH UEF = 0.56  
Cost savings per MMBTU of Delivered Heat

<table>
<thead>
<tr>
<th>Price of Natural Gas ($/therm)</th>
<th>Price of Electricity ($/kWh)</th>
<th>Cost savings per MMBTU of Delivered Heat</th>
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<tr>
<td>$0.10</td>
<td>$0.11</td>
<td>$0.12</td>
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<td>$0.13</td>
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<tr>
<td>$0.28</td>
<td>$0.29</td>
<td>$0.30</td>
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</table>
For further detail...

Volume I: Summary Report

Volume II: Technical Appendix
Grid Interactive Water Heaters
Building a DER fleet with HPWH

Jon Kenney
Energy Management Program Architect, LPEA
Integrated systems
for situational awareness and control
Grid Interactive Heat Pump Water Heater Pilot Project
Installation Considerations

Venting

Option A – Ambient Venting
Option B – Interior location, exhausted to exterior
Option C – Exterior location, intake from interior
Option D – Interior location, intake, and exhaust to exterior
Installation Considerations
Mixing Valve

• Allows for stored water temperatures above typical 120°F

• Longer load shift

• Likely only valuable in high water use homes

• Heat pump operation upper limit
Installation Considerations

Other

• Insulation

• Vibration and Sound Mitigation

• Leak Detection
Issued Experienced

- Sound
- Service Access
- Wi-Fi Connection and Enrollment
- Vent Duct Routing
- Vent Duct Pinching and Insulation
Data Reporting and Testing

- Total Utility Cost Delta: Gas + Electric
- LPEA ROI
- Demand Coincidence
- Ability to Load Shift
- Stress Testing
- Homeowner Experience

La Plata Electric Association, Inc.
Who we serve

- 27 member-owner cooperatives
  - $3.8 billion total assets
  - $1.1 billion revenue
- 4,400 miles of transmission lines
- 1,800+ MW (nameplate) owned-generation
- 960 MW wind under contract
  - Add’l 866 MW wind planned
Great River Energy membership

- Commercial and industrial: 41%
- Residential: 57%
- Seasonal: 2%

% Based on energy sales
Power supply energy transition

2021

- Wind: 25%
- Coal: 57%
- Natural gas: 15%
- Market: 3%

2037 (projected)

- Renewable: 72%
- Hydro: 5%
- Natural gas/fuel oil: 7%
- Market: 16%
Technology adoption

Historical and projected annual electricity consumption for the report's demand-side adoption scenarios

Residential Energy Consumption by End Use

- Appliances, Electronics, and Lighting 30%
- Space Heating 52%
- Water Heating 16%
- Air Conditioning 2%

Primary Heating Fuel in MN

- Oil 1%
- Gas 4%
- Methane 1%
- Electric 3%
- Other 9%

By 2050, with 87%
Economy-wide scenario, potentially significant additional increases in load from 2030 in all components, except cooling, due to end-use incentives with this type of policy to use low-carbon electricity to decarbonize.
Case Study: Water Heaters

- High prevalence of tech
  - Adoption is not uniform
- Relationships are key
- Opportunities for growth
- Stronger together

Proportion of Water Heaters in GRE Programs

<table>
<thead>
<tr>
<th></th>
<th>PS</th>
<th>ETS</th>
<th>ETS+PS</th>
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<tbody>
<tr>
<td>Program Participants</td>
<td>274,884</td>
<td>256,053</td>
<td>209,058</td>
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<tr>
<td>Non-participants</td>
<td>46,995</td>
<td>65,826</td>
<td>112,821</td>
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<tr>
<td>Gas Water Heaters</td>
<td>321,879</td>
<td>321,879</td>
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</table>
Integrated Energy Network

Customers at the center

Flexible central generation, storage, new loads, active customers and better forecasts balance variable generation

Physical connections augmented by secure data and communications

Energy and Natural Resource Systems are Integrated to Provide Reliable, Safe, Affordable, Cleaner Energy and Expanded Customer Choice
Yoga for the Distribution Grid: Demand Flexibility for Customers, Utilities, and System Stability

Teresa Ringenbach
VP, Business Development
Demand response is many things which keep the grid in balance.
True grid support requires flexible approaches.
Grid-Integrated Water Heater Control for the 21st Century
Aquanta Water Heater Controller
Aquanta Water Heater Controller

- **“Fleet” Control** via Aquanta Portal or DERMS Integration
  - Adjustable, customer comfort-aware control modes
  - Integration w/ major DERMS vendors

- **Advanced Analytic Capabilities**
  - Aggregate + device-level 5 min data
  - Energy, connectivity, control mode, etc.

- **Easy, (Near-)Universal Retrofit**
  - < 15 min install
  - Compatible w/ nearly all ERWH models
  - Version for gas WH available

- **Cellular & WiFi Versions**
Aquanta Cellular vs. WiFi Versions

**WIFI**
- Lower Hardware Cost
- “Free” Data Backhaul
- Lower Average Connectivity
  - ~75% over time w/o program intervention

**CELLULAR**
- Higher Cost
- “Lifetime” Data Plan Included
- Higher Average Connectivity
  - AT&T, T-Mobile 4G, Cat M1 LTE
  - >98% availability
  - Auto-connecting
Enabling Diverse DSM Use Cases

1. **Automated TOU**
   - Aquanta TOU Scheduler feature optimizes water heating to pre-loaded TOU schedules & rates

2. **Aquanta Fleet Manager**
   - Load shifting, DR controls through fleet dashboard
   - Fleet O&M – device monitoring, alerts, Tier 1 support enablement
   - M&V – predictive analytics & post-event reporting

3. **Integration w/ Utility & 3rd Party DERMS/DRMS**
   - Full range of grid management use cases
   - Cloud-cloud integration via Aquanta API
Adaptive Control Example

- Long-Duration (Storage) Use Case
- “Hot Water Available” Override Preserves Customer Comfort
- Highly Granular Energy & Control State Data
Utility Customer List (partial)
Distributed, but when aggregated grid-scale Thermal Energy Storage

Dynamically pairs consumer usage to the needs of the grid

Enables Renewable Integration\Flexible loads for Carbon Reduction

WIN-WIN-WIN for Consumer – Utility – Environment

100,000 Residential installations in North America

Distributed 8 GWh of Thermal Energy Storage

10 to 480 KWh Storage Capacity
Grid-interactive Electric Thermal Storage (GETS)

Dynamically pairs consumer usage to real-time grid needs.

ETS Unique Value Proposition

- Proven Energy Storage – for over 50 years
- Low Cost and Reliable Energy Storage Solution
- Complements other Energy Storage Devices – Grid Based and Distributive
Value with Traditional Peak Shaving Controls
Greater Value with Active Controls to:

1. Follow the real-time up and down needs of all parts of the grid
2. Ensure every building and occupant is always comfortable
3. Provide Visibility, Controllability, and Verification to the utility

Active Controls Delivers Dispatchability for
Real-time needs of the Grid today and Future
The 3 Basic Principles

1. Consume energy to meet the real-time needs of the grid

2. Ensure every building is always comfortable and has adequate hot water

3. Provide Visibility, Controllability, and Verification
Aggregation Cloud
Flexible loads provide real time control for the grid while maintaining comfort.
Dispatchable Aggregated Resources

**MW**\(_{(\text{electric})}\)

*Charge Rate*

Coupled to the real-time needs of grid

**MW**\(_{(\text{thermal})}\)

*Discharge*

Delivery of hot water

**MWh**\(_{(\text{thermal})}\)

*State of Charge*
LORA Deployment

- 80-unit housing development
- 80-gal water heaters equipped with LoRa radios
- Tektelic Kona LoRa gateway
- Cellular backhaul
Ethernet Deployment
Heat Pump Water Heating

- Multi-Residential
- Up to 1500 gallons of Storage
- CTA-2045 for Utility Control
- Plug and Play Design
Bayview Towers Project
Seattle Housing Authority
Seattle, WA
July 2020 Installation and Startup
100 Unit Low Income Housing
59% Energy Reduction
Introducing the Voltex AL
Smart Residential Hybrid Electric Heat Pump Water Heaters

Market leading performance and features

• 4x to 5x more efficient than a standard electric or gas water heater*
  – 4.02 UEF (66-gal); 3.80 UEF (50-gal)
• Top & Front Water Connections
• Zero Clearance Design (sides/back)
• Quiet Operation (45 dBA)
• iCOMM™ Smart Connectivity w/ Leak Detection
• Smart Anode, Anti-Leak Detection
• ENERGY STAR certified, NEEA Tier 4
• 50, 66, 80-gal sizes

*Comparing a Voltex AL heat pump against pre-2015 similarly-sized standard electric and gas water heaters using DOE EF to UEF conversion rates
Product Training Resources

Confined Space Ventilation Options

If room is $\geq 450$ ft$^3$ no additional ventilation is required

- **Room $\geq 450$ ft$^3$**
  - Enclosed room is allowed

- **Room 84-449 ft$^3$**
  - a) Louvered door
  - b) Double louver
  - c) Single louver and undercut door

- **No minimum size**
  - Inlet or Outlet ducting and
    - a) Single louver
    - b) Undercut door

- **No minimum size**
  - Inlet and Outlet ducting
Federal Tax Credit and Utility Rebate Finder

Rebates & Tax Credits

Rebate and incentive programs provide savings to consumers for the purchase of water heaters that meet certain energy efficiency standards.

Find Rebates & Tax Credit

Hotwater.com
Heat Pump Water Heaters Tax Credit

Information updated 12/30/2022

This tax credit is effective for products purchased and installed between January 1, 2023, and December 31, 2032.

See tax credits for 2022 and previous years.

You can claim:

30% of project cost
$2,000 maximum amount credited

Annual Limits on Energy Efficient Home Improvement Tax Credits

In addition to limits on the amount of credit you can claim for any particular equipment installation or home improvement, there are annual aggregate limits. The overall total limit for an efficiency tax credit in one year is $3,200. This breaks down to a total limit of $1,200 for any combination of home envelope improvements (windows/doors/skylights, insulation, electrical) plus furnaces, boilers and central air conditioners. Any combination of heat pumps, heat pump water heaters and biomass stoves/boilers are subject to an annual total limit of $1,000. (Note: ENERGY STAR certified geothermal heat pumps are eligible for a separate tax credit and not counted against these limits.)

What products are eligible?

Heat pump water heaters that have earned the ENERGY STAR are eligible for this credit.

https://www.energystar.gov/about/federal_tax_credits/water_heaters_non_solar
Tax Credits for Home Builders

Federal Tax Credits for Builders of Energy Efficient Homes

As part of the recently passed Inflation Reduction Act, the Section 45L Tax Credit for Energy Efficient New Homes has been updated and extended. For homes and units acquired on or after January 1, 2023, the base level tax credit will be specifically tied to ENERGY STAR certification for single-family manufactured, and multifamily homes. This tax credit has been extended through 2032. Details are below:

- **Single-Family New Homes**: $2,500 available for ENERGY STAR certified homes.
  - January 1, 2023 – December 31, 2024: ENERGY STAR Single-Family New Home National Version 3.1 (or the regional program requirements applicable to the home).
  - January 1, 2025 – December 31, 2032: ENERGY STAR Single-Family New Homes National Version 3.2 (or the regional program requirements applicable to the home).

- **Manufactured Homes**: $2,500 available for ENERGY STAR certified manufactured homes meeting the most recent ENERGY STAR Manufactured New Homes program requirements (currently Version 2, with Version 2.1 currently proposed to be implemented in May 2023).

- **Multifamily**: $500 available for ENERGY STAR certified multifamily units meeting the ENERGY STAR Multifamily New Construction National program requirements (or the regional program requirements) applicable to the dwelling unit, as specified in Section 13304. A larger tax credit is available for multifamily projects that meet prevailing wage requirements.

https://www.energystar.gov/about/federal_taxCredits/federal_tax_credit_archives/taxcredits_home_builders
Grid-Capable Water Heaters

<table>
<thead>
<tr>
<th>Features</th>
<th>Grid-Capable</th>
<th>Smart Grid-Capable</th>
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<tr>
<td>Wi-Fi supports openADR</td>
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<td>Programmable ToU Rates</td>
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<td>Leak Detection With Alert</td>
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<td>Automatic Shut Off Valve</td>
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<td>iCOMM App (Smart Home)</td>
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Grid-Capable Water Heaters

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<th>Available Models</th>
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<td>50 Lowboy</td>
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The new degree of comfort.®

Rheem Sustainability
A Greater Degree of Good
Options for Load Management and Energy Use Reduction (Pre 2015)
Options for Load Management and Energy Use Reduction (Post 2015) NAECA III

- Grid Enabled Water Heaters (Utility Only)
- Heat Pump Water Heaters

Grid Enabled Marathon

Hybrid Heat Pump
Inflation Reduction Act 25C.

### Federal Tax Credits

**Water Heater Incentives**

Beginning 2023, the expanded version of 25C, now called the Energy Efficient Home Improvement Tax Credit, under the Inflation Reduction Act of 2023, will provide up to $500 to the credits for qualified water heaters as well as credits for electric vehicles. Unlike the existing program, the expanded 25C tax credit has generous annual limits (50% lifetime limits), meaning that the same customer could receive the credit for qualified energy efficient upgrades annually. This program will extend the program out to 2032.

Read qualifying water heaters and respective incentives as selected energy efficient products. Inverters are being treated as separate product category items under 2632A. There are additional tickets of certification required above mentioned allowance.

<table>
<thead>
<tr>
<th>HEAT PUMP WATER HEATER CATEGORY</th>
<th>36 &amp; 48 Amp Hybrid Electric Heat Pump</th>
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<tbody>
<tr>
<td><strong>Product Water Heater</strong></td>
<td><strong>Technology/Color</strong></td>
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<tr>
<td>Standard Electric</td>
<td>SEER 15.0</td>
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<td>SEER 16.0</td>
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<table>
<thead>
<tr>
<th>ALL 120V 15 Amp Plug-In Heat Pump Models</th>
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<tbody>
<tr>
<td><strong>Product Water Heater</strong></td>
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<tr>
<td>Standard Electric</td>
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<table>
<thead>
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<th>HIGH EFFICIENCY GAS WATER HEATER CATEGORY</th>
<th>Gas-Fired Tankless - Rheem RRCG Series</th>
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<tbody>
<tr>
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<td>Standard Gas</td>
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</tbody>
</table>

Please keep this Certification Statement and our stated proof of purchase available for federal tax filing purposes. Homeowners must submit IRS Forms 5695 and meet all federal tax credit requirements to qualify. The credit is limited to an existing home and must be the homeowner’s primary residence. New construction and rental and do not apply. Any tax credit that exceeds the consumer’s regular tax liability for the taxable year may not be refunded or carried forward under Section 25G. Please consult with a tax professional for complete details.

**Rheem.com/water-incentives**
ProTerra Lineup

**HYBRID BUILDER**
- NEW! 40, 50, 65, 80 Gallon Capacities
- Remote Access (Integrated WiFi)
- Zero Clearance Requirement
- Widest Range of Ambient Temp
- Less Than Two-year Payback
- Meets NEEA Tier 3
- Leak Detection Ready

**PROTERRA**

In addition to the Builder model features, this model includes...
- Up to 4.07 UEF
- Demand Response Ready (CTA 2045)
- Quietest (<50 dBA)
- Automatic Maintenance Alert
- $4,800 Energy Cost Savings
- Leak Detection and Shutoff Valve Ready
- Meets NEEA Tier 3

**PROTERRA W/LEAKGUARD**

In addition to the Plus model features, this model includes...
- Auto Water Shut-off Valve (LeakGuard)
- Integrated 360° Water Leak Detection (LeakSense)
**Modes Of Operation**

**ENERGY SAVER** (default mode)
- A recovery using the heat pump and upper element. Primary recovery with Heat Pump (up to 1,700W equivalent) and element when needed (4,500W). In high output situations, heater is producing the equivalent of up to 6,200W

**HEAT PUMP**
- Delivers up to 1,700W to the water at standard ambient conditions
- Operating temperature of 37⁰ - 145⁰

**HIGH DEMAND**
- Upper/lower element along with heat pump simultaneously heats the water. Up to 6,200W of recovery. Elements in this mode activate quicker

**ELECTRIC**
- Either element is used to heat the water

**VACATION**
- Tank temperature will be maintained at 65⁰ for 1-28 days or held indefinitely when "HOLD" feature is used
Rheem “ECO PORT”

- CTA 2045
  - Open source plug which allows for the utility company to control the water heater during a demand response or load shift event.
### ProTerra Plug-in Models Selection Guide

<table>
<thead>
<tr>
<th>Plugin</th>
<th>Selection Consideration</th>
<th>Plugin w/ HydroBoost</th>
</tr>
</thead>
<tbody>
<tr>
<td>The unit being replaced has a cord, such as tankless or power damper. Verify that the receptacle is dedicated.</td>
<td>Replacing Gas Heater</td>
<td>The unit being replaced did not have a cord.</td>
</tr>
<tr>
<td>15A dedicated circuit</td>
<td>Electrical Circuit Requirements</td>
<td>15A shared circuit</td>
</tr>
<tr>
<td>Need the tank to recover quickly. Multiple showers in short time span.</td>
<td>Hot water usage</td>
<td>Not expecting to drain the entire tank during hot water usage.</td>
</tr>
<tr>
<td>40, 50</td>
<td>Available Tank Gallon Capacities</td>
<td>40, 50, 65, 80</td>
</tr>
<tr>
<td>Need 1200 cubic ft of make up air, Similar size room to 12’x10’x10’. Cannot vent inlet air. Outlet air can be vented out.</td>
<td>Heater location</td>
<td>Need 700 cubic ft of make up air, Similar size room to 7’x10’x10’. Can vent inlet air in if room does not have sufficient make up air. Can also vent outlet air.</td>
</tr>
</tbody>
</table>
For **OPTIMAL OPERATION**, installation in the **teal-colored** areas of the US Map zone is recommended. The average ambient air temperature in January is above 37°F.
Lower Energy Costs
Save up to $491 per year in energy costs—that’s almost $5,000 over 10 years!

Energy Saving Scheduling
Program your water heater to match your needs throughout the day—higher production during high use times, like the morning, and lower production for energy savings when no one is home.

Demand Response Scheduling
You can save up to $400 over the life of the heater thanks to off-peak energy rate scheduling with built-in demand response scheduling—letting your utility company shift the energy usage in response to the overall demand for energy at a given time.

Smart Mobile Connection
Built-in EcoNet WiFi technology lets you adjust water temperature, track energy usage and set operating mode—all from your mobile device.

Most Efficient
The Richmond ENCORE Series Hybrid utilizes heat pump technology to pull heat energy from the air around it to heat your water, making it the most efficient water heater on the market with up to a 4.0 UEF.

Peace of Mind Protection
LeakGuard™ Auto Water Shut-off Valve prevents water damage with all-inclusive leak detection and prevention system that limits leaks to no more than 20oz of water.

Save with Vacation or Away Mode
Reduce water heating costs while you’re away for a week or just for the day—it’s easy to set from your phone even if you’ve already left home.

Intelligent Service
Plumbers can view detailed alerts and alarm codes while at the water heater via the Contractor App to expedite service.
Demand Response Event

- Integrated WiFi
- CTA 2045 Module

Utility

Demand Response
- Peak Shaving
- Energy Storage
- Grid Emergency
Demand Response Event

Integrated WiFi

CTA 2045 Module

Utility

Demand Response
- Peak Shaving
- Energy Storage
- Grid Emergency
Demand Response Event

Integrated WiFi

OR

CTA 2045 Module

Utility

[Images of a water heater, a person, a smartphone, and a graph indicating demand response event]

- Demand Response
  - Peak Shaving
  - Energy Storage
  - Grid Emergency

Rheem

[Graph showing time vs. flow rate]
JA13 scheduling allows for utilities to load a custom rate schedule via MyRheem portal. This custom rate schedule is then loaded into the water heater (wirelessly) at the time of installation. This data is then stored in the water heater until the unit is ready for use (new construction scenarios).
The scheduling feature allows users to program the water heater to their desired temperature each day (using up to 4 different time blocks). This scheduling feature helps to conserve energy by reducing the set point of the water.
PHYSICAL INSTALLATION
Typical Installation

- **Installation of drain pan is required on all installs**

- **Flexible Connection recommended (Such as PEX)**
  - Hot water outlet to fixtures
  - Primary condensation (3/4") to open drain or outdoors
  - 6" Air gap
  - Shut-off valve
  - Drain valve
  - Cold water supply
  - Thermal expansion tank (if required)
  - 6" Minimum clearance above heat pump to allow for filter maintenance
  - Piping Tee to be installed in condensate plumbing to provide access opening for yearly inspection and cleaning

*To open drain, line should be at least 3/4" ID and pitched for proper drainage.*
# Ducting

## Maximum Duct Lengths

<table>
<thead>
<tr>
<th>Duct Type / Diameter</th>
<th>8”</th>
<th>7”</th>
<th>6”</th>
<th>5”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid</td>
<td>340’</td>
<td>160’</td>
<td>65’</td>
<td>17’</td>
</tr>
<tr>
<td>Flexible</td>
<td>125’</td>
<td>65’</td>
<td>25’</td>
<td>--</td>
</tr>
</tbody>
</table>
**Rheem Marathon**

#1 Utility choice for load management for over 30 years

**Rheem ProTerra HPWH**

- Highest Efficiency
- Quietest
- Zero Clearance
- Connectivity
- Leak Detection/Prevention
- Recovery
- 10 - Year Warranty

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