

THE ULTIMATE GUIDE TO TANKLESS WATER HEATERS VOL. 2

LEARN HOW TO TAKE
YOUR INSTALLATIONS TO
THE NEXT LEVEL

Min. Vent Pressure (for adjustments)
4.3 in. W.C. (1.04 kPa)
Max. Vent Pressure (High PFA)
8.52 in. W.C. (2.23 kPa)
Max. Vent Pressure (Low PFA)
88%
Energy Factor (EF)
0.97
Capacity (1st Hour Rating)
150 gal
Max. Water Pressure
Less than 55 psi

Min. Clearance
(Permitted to South Coast Air Quality Management District Rule 1146.2)
Minimum clearance from combustibles:
Back: 8 inch Front: 8 inches
Side: 2 inches Floor: 12 inches
For clearances, 6" from front.
Minimum clearance from noncombustibles:
Back: 8 inch Front: 8 inches
Side: 1/2 inch Bottom: 8 inches

FOR INDOOR INSTALLATION
120 VOLT 60 HZ LESS THAN 3"
For field-wired connections use No. 14 AWG

Minimum Wall Thickness: 4 inches
Maximum Wall Thickness: 29 inches

ANSI
Model
SERIAL
98, 02
MADE IN JAPAN

This water heater is made for one type of gas only. Failure to use the correct gas can cause problems which can result in serious injury, death or property damage. See your installation manual for more information.

Not for use in residential water (potable) heating (ONLY). The water heater is not intended for use in any space heating system, combination space heating system, or commercial water heating system.

This appliance must be installed in accordance with local codes, the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and the manufacturer's installation instructions.

FOR YOUR SAFETY
Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

A pressure relief valve (PRV) is required on all water supply systems. The PRV must be installed in accordance with the manufacturer's instructions. The PRV must be installed at the time of installation. The PRV must be installed in accordance with the manufacturer's instructions. Local codes shall prevail in the event of a conflict between the manufacturer's instructions and local codes.

No valve shall be placed between the relief valve and the discharge of the pressure relief valve. The discharge of the pressure relief valve shall be piped to a safe place where it will cause no damage. Also, the discharge of the pressure relief valve shall be piped to a safe place where it will cause no damage. Also, the discharge of the pressure relief valve shall be piped to a safe place where it will cause no damage. Also, the discharge of the pressure relief valve shall be piped to a safe place where it will cause no damage.

See Installation Manual for details. *Pressure Relief Valve (PRV) discharge from the pressure relief valve should be piped to a safe place where it will cause no damage to the building structure and/or the occupants. The PRV discharge should be piped to a safe place where it will cause no damage to the building structure and/or the occupants.

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Grow your business by adding tankless installation to your services lineup.

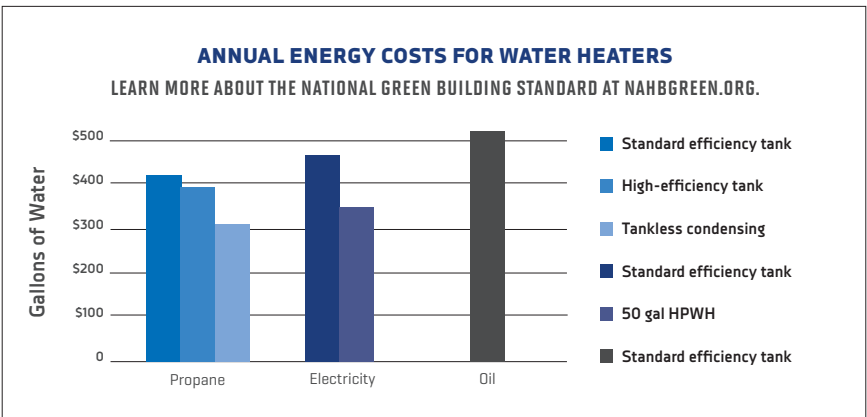
MORE AND MORE HOME AND BUILDING OWNERS WANT TANKLESS WATER HEATERS. IS YOUR BUSINESS READY TO MEET THE GROWING DEMAND?

Thanks to their potential for lower energy costs, tankless water heaters are an increasingly popular option in new homes today and as a replacement for storage tank units in existing projects. Propane tankless water heaters can save more than \$150 annually in energy costs compared with typical electric tank models. Their small footprint, ability to heat water quickly on demand, and ease of installation near the point of use are also attractive features.

Construction pros like you know that simply installing a tankless water heating system isn't enough to get the job done. Your customers expect you to educate them on the value those units will deliver upon installation and over time.

In **"The Ultimate Guide to Tankless Water Heaters"** you learned the basics of installing tankless systems and the advantages of fueling them with propane. In this follow-up edition, we help you take your tankless business to the next level and show how propane can help. Here, we've brought together a selection of our newest and most popular resources on tankless water heaters in a comprehensive e-book format that's easy to email or print out and share with your crew, subs, and even customers.

With energy efficiency data, installation tips, and case studies of projects that have already made the switch, the following pages will help you raise the quality of your tankless installations and boost your bottom line.



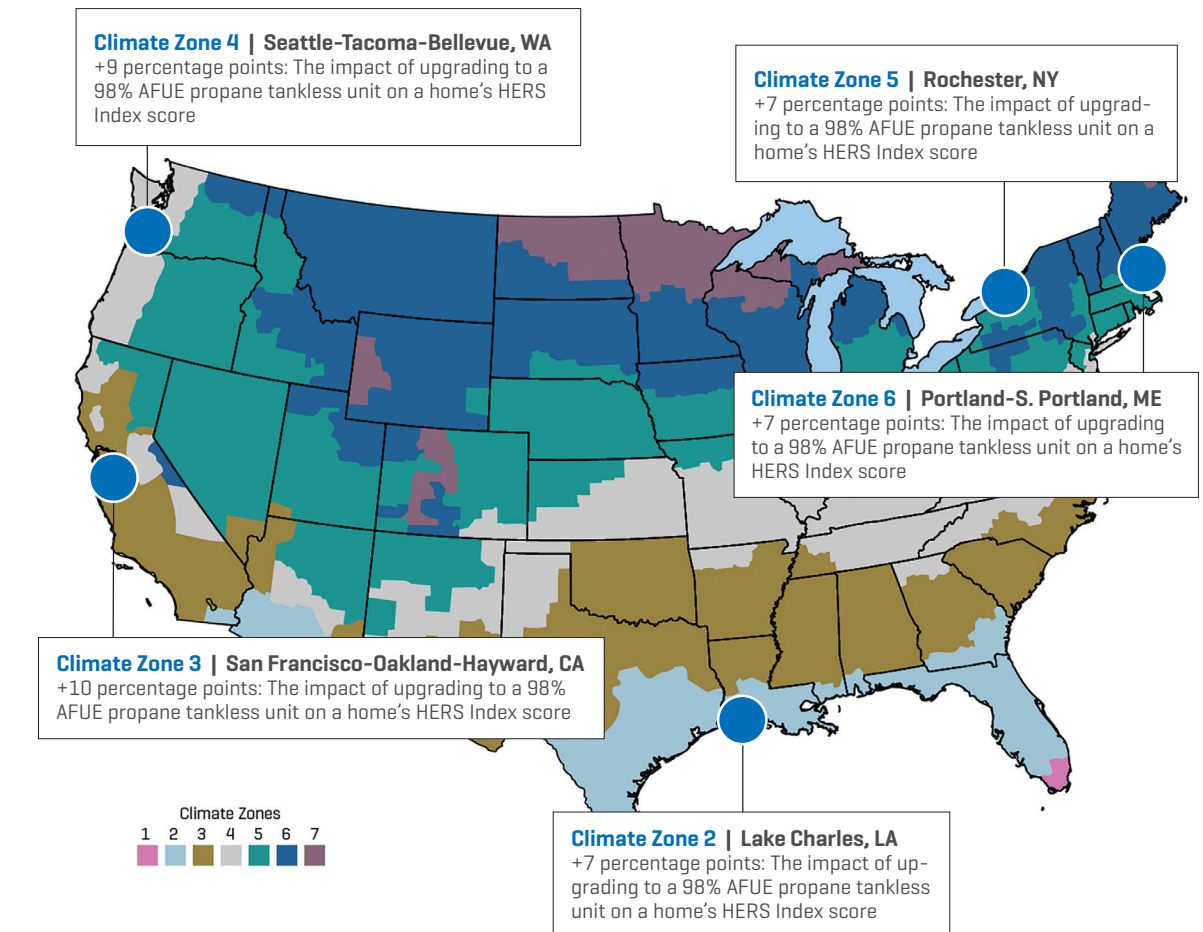
Source: Residential Water Heaters under the New 2015 Federal Standards: An Analysis of Energy, Economics, and Emissions. Newport Partners LLC, April 2015.

HELP YOUR CUSTOMERS UNDERSTAND THE IMPACT OF UPGRADING TO A TANKLESS WATER HEATER

Unlike a storage tank unit, tankless models heat water only when it's called for, meaning less energy is used. But saving energy isn't just about cutting utility costs, though that can be a positive outcome. Show customers you're serious about saving energy by telling them how upgrading to tankless can improve their home's HERS score.

A HERS score is a measure of a home's energy performance relative to a reference model (based on the 2006 International Energy Conservation Code [IECC]) reflecting its size, location, systems, and fuels. HERS scores can range from 130-plus for an existing home to 100 for a typical built-to-code new home, and 0 for a net-zero energy home. Moving one point along the linear scale is equivalent to a one percentage point change in energy performance.

Updates in the 2015 IECC have made HERS scores more relevant. A new compliance path called the Energy Rating Index [ERI] gives builders more flexibility in meeting code, making it easier to build efficient homes. It allows for trading off performance between building elements and mechanical systems, using the HERS Index as a standard efficiency measurement. The ERI requires a HERS score of 51 to 55, depending on the climate zone. [A home with a HERS score of 55 is 45 percent more efficient than the benchmark home.]



Switching from an electric tank heater to a propane tankless water heater can shave 5 to 10 points off a home's HERS score, according to data from energy efficiency consultant Energy Inspectors. The figure varies by region because lower outdoor temperatures mean more energy is needed to heat water to the desired temperature for indoor use, which is typically around 120 degrees. Still, those points can deliver a big

impact on the home's energy profile. The map on this page shows the impact of making the switch in the top metros for propane use in select climate zones. Check out our interactive [Tankless Opportunity Map](#) to see the propane advantage in your county.



DOES YOUR TANKLESS PROJECT NEED MORE THAN ONE UNIT? HERE'S HOW TO TELL.

Even as more home and building owners go tankless, determining the right configuration for their projects isn't always straightforward. Whether you're considering a single unit for the whole home or multiples run in tandem, knowing how to predict demand is key to giving your customers a setup that meets their performance and cost expectations.

Consider the following three factors when right-sizing a tankless system for your project.

1. HOW MUCH WATER WILL YOUR HOMEOWNERS (ACTUALLY) NEED?

How many people will live in the home? Will they all be full-time residents? How often do the owners expect to host visitors, and how long will they be staying? Knowing who will be using hot water in the home, and for what purposes, is the first step toward implementing a system to fulfill those needs.

Then, take stock of the number and type of appliances and systems requiring hot water and note their water delivery rates. [See the sidebar on the next page, "Pro tip: Know the formula for a hot shower," to learn how to calculate a home's peak demand rate.] Features such as in-floor radiant heating and spas, for instance, can considerably raise a home's hot water demands.

Be sure to ask your customers about their habits. When do they shower? How often do they do laundry? Do they use or expect to install radiant heating? Asking specific questions to help understand occupants' lifestyles can help determine expected peak demand and allow you to specify a system that can meet those needs.

2. HOW MUCH WILL THE WATER NEED TO BE HEATED?

Installers should also know the difference between outdoor ground temperatures and the desired indoor hot water temperature, or Delta T. That will tell you how much the water will need to heat and, therefore, how quickly the unit can deliver hot water.

For this example, assume the incoming groundwater temperature is 50 degrees. Actual groundwater temperatures vary across the U.S., but 50 degrees is considered roughly average, according to the U.S. Department of Energy. The typical showerhead delivers 2.5 gallons per minute [GPM]. In most cases, water should be heated to at least 120 degrees, so the home will need a tankless unit that can heat 2.5 GPM by 70 degrees. Lower flows can be heated to a bigger temperature rise and higher flows to a smaller temperature rise.

Most propane or natural gas tankless water heaters on the market can handle a rate of 5 GPM at a 70-degree temperature rise. As fixtures are added, demand on the system increases, and that 5 GPM rating can quickly get overwhelmed.



3. WHAT CAN THE HOME ACCOMMODATE?

Peak demand scenarios are why pros shouldn't assume an undersized system will cover their client's full range of needs. Oversizing isn't as big of a concern with tankless systems. While oversizing a traditional tank water heater would result in significant wasted energy over the life of the unit, tankless units vary their flow rates based on demand. Therefore, having excess capacity doesn't necessarily mean a tankless system is using more energy. Adding another unit can significantly increase the cost to the client, however.

New projects can more easily accommodate tankless units at the point of use than can existing homes, which are often designed for a central tank system and therefore may be better-suited for one or more units installed in the basement. For most projects, one unit is sufficient. Multiple units may be used to handle larger loads or as homeowners scale up in the future as their hot water needs change.

To determine the optimal number of tankless units for a home, help owners understand their consumption habits and how you can size a system to meet their expectations. Determine peak demand and gauge actual usage and lifestyle habits. Then, compare prices for systems that meet those needs relative to your client's budget. Put in as much capacity as those factors will allow to balance cost and comfort.



PRO TIP: KNOW THE FORMULA FOR A HOT SHOWER

To calculate peak demand, the Department of Energy advises counting the number and gallons per minute [GPM] rate of faucets, showers, and appliances that could be in use in the home at any given time.

Don't know a fixture's GPM rate? Time how long it takes that fixture to fill a one-gallon jug. The sum of those GPM rates for fixtures across the home is peak demand.

Another way to find peak demand is to turn on each hot water tap and appliance throughout the home and time how long it takes for the water to run cold. Divide that by the size of the tank water heater currently installed in or planned for the home.

Then, determine the temperature rise needed during winter in the area, and compare that to manufacturer specs for tankless water heaters you're considering.

Keep in mind, even if the client says they won't be using all of the fixtures at once, code requirements may dictate installing enough capacity for that worst-case scenario.

NEW PROJECTS CAN MORE EASILY ACCOMMODATE TANKLESS UNITS AT THE POINT OF USE THAN CAN EXISTING HOMES.



EIGHT COLD-CLIMATE TIPS FOR TANKLESS WATER HEATERS

Tankless water heaters are popular due to their small size and ability to heat water on-demand. And because they can run on propane, you can take them anywhere, including places that experience snow and frigid temperatures. Here are a few tips for specifying, installing, and maintaining tankless units in cold climates.

Size the unit for the cold: As temperatures fall, more time and energy is needed to heat water to the desired level. To ensure your tanks meet demand throughout the year, know how they'll perform in cold weather. For example, in Washington, D.C., a unit that can produce 8.5 GPM on a steamy summer day will produce only 5 to 6 GPM in the cold winter.

Design for the coldest conditions: Be aware of how low ground temps can go and how much water a household will need, as well as the difference between the set unit temperature and the ground temperature — also known as Delta T. The bigger the gap, the lower the unit's flow rate will be.

Bring it inside: Many tankless units have some degree of built-in freeze protection. Check the product specs — and your region's historical weather patterns — to determine where to install the tank.

Vent smart: Proper venting is important. Installations should avoid freezing winds and have sufficiently long vent runs. In cold areas, the recommended minimum vent run is six feet.

Keep vents clear of snow: Before a big snowstorm, remind customers to keep a few feet around the vent clear of snow. Some models offer air intake from the outer pipe — if that's blocked, the unit may turn itself off.

Remind recirculators: Educate customers whose systems have a recirculating loop — which shortens the wait time for hot water — to remember to turn off that function when bad weather is on the way. If the vent termination is snowed under, the unit will eventually power off with an error code.

Consider condensation: Drain condensate from condensing units into a conditioned space to avoid drain freezes, which will cause the unit to turn off.

Be ready with backup power: Many tankless water heaters need electricity for freeze protection and ignition. A propane standby generator or battery backup system ensures the hot water will continue to flow, even during an outage.

PUTTING THE “INSTANT” BACK IN INSTANTANEOUS WATER HEATERS

Tankless water heaters used to be known by a different name: “instantaneous” water heaters. The problem with this term quickly became apparent when unhappy customers complained they had to wait the same amount of time for hot water to come out of the faucet.

After all, while propane tankless water heaters generate hot water instantly, it still must be delivered through the home’s piping. Recirculation technology brings the dream of instant hot water closer to reality.

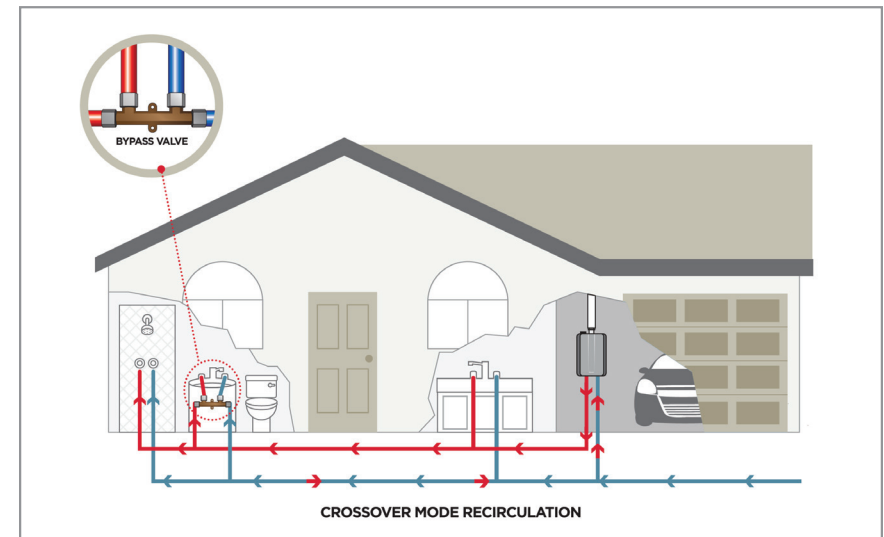
By quickly pumping hot water from the water heater to the fixture, recirculation cuts the wait time from more than a minute to just a few seconds. And while the use of recirculation systems with tankless water heaters has previously been a niche application, new integrated technology is making recirculation possible with tankless.

In the past, most tankless recirculation systems required a dedicated return line. A pump would push warm water to the furthest fixture, and the return line would carry the cold water sitting in the pipes back to the water heater. That’s a fairly simple solution for new construction, where it’s relatively easy to install a third line of plumbing. But only one percent of existing homes have dedicated return lines, so recirculation with a tankless water heater was not an option for retrofits.

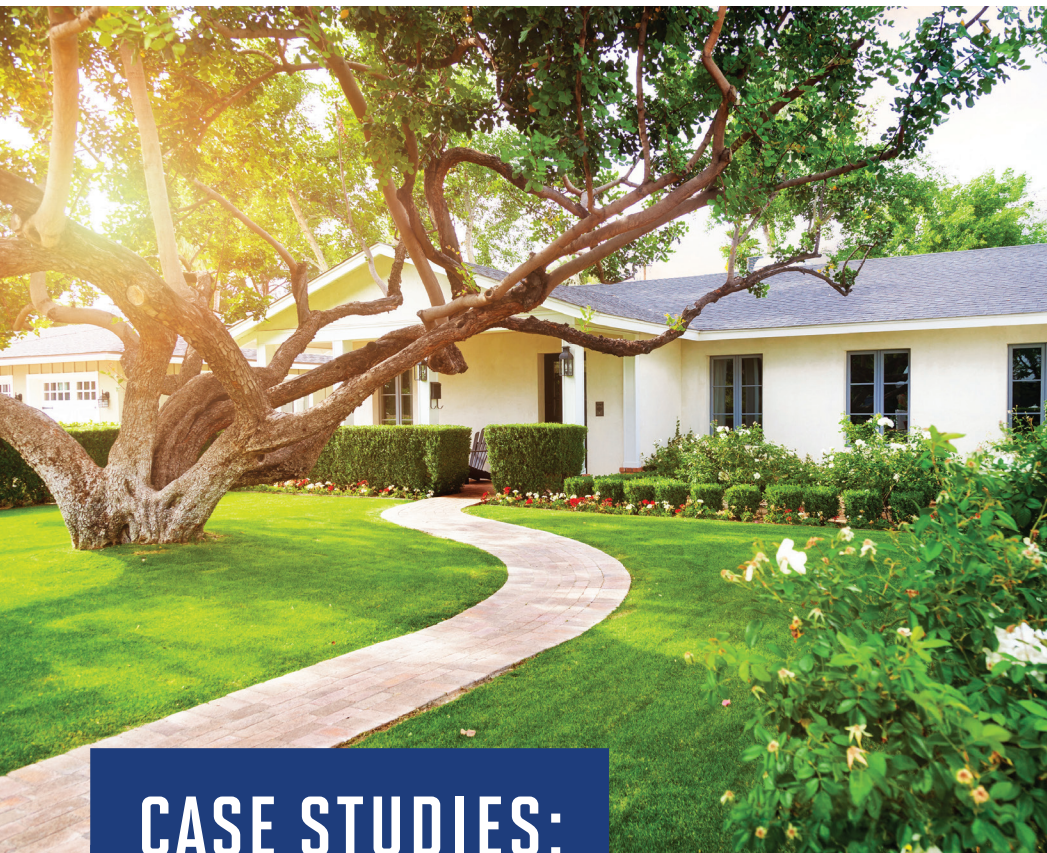
In response, Rinnai introduced tankless units featuring a built-in recirculation system with bypass technology that works with or without a dedicated return line. The tankless unit includes a pump, timer, and controller on board, so the installer does not need to purchase those systems separately. The unit also comes with a thermal bypass valve. When a dedicated return line is unavailable, the bypass valve can be installed at the fixture farthest from the water heater, where it acts as a bridge between the hot and cold water lines.

At preset intervals based on the user’s schedule, the pump pushes warm water to the faucet. Cold water already in the pipes flows through the installed valve and recirculates back to the tankless water heater through the cold water line. Once the water at the bridge reaches 98 degrees, flow through the crossover valve reduces to a trickle so it won’t unduly heat the cold water line.

Depending on the size of the home, tankless recirculation can reduce the time it takes hot water to travel from a unit in the basement to a second-story bathroom from more than a minute and a half to under 10 seconds. Plus, it cuts down on water waste — keeping customers happy with hot water sooner and their water bill down.



New technology is taking tankless recirculation mainstream.



CASE STUDIES: RESIDENTIAL

Tankless water heaters are a draw for their energy efficiency and cost savings, but the technology isn't only for ultra-efficient homes. The following three case studies show the advantages of tankless in projects from small manufactured homes to robust luxury residences.

NATIONWIDE CUSTOM HOMES: MARTINSVILLE, VIRGINIA



Tankless water heaters' compact size is an advantage for manufactured homebuilder Nationwide Custom Homes, in Martinsville, Virginia. The units are easy to install in the factory, take up little space in the building plan, and can run on propane, which allows Nationwide to site its homes anywhere. Visit [Propane.com](https://www.propane.com) to learn how Nationwide Custom Homes uses tankless water heaters and other propane-fueled appliances.

MODULAR LIFESTYLES: PASO ROBLES, CALIFORNIA



A propane tankless water heater helped California builder Steve Lefler design his home to the state's forthcoming net-zero energy standards well ahead of the compliance deadline. A 3 kW photovoltaic system provides nearly all of the home's needs — except for water heating. But instead of installing a larger solar array to handle that demand, he simply turned to a propane tankless water heater. Visit [Propane.com](https://www.propane.com) to learn how propane helped Lefler build net-zero.

HICKORY CONSTRUCTION: ALCOA, TENNESSEE



High-end custom homebuilder Hickory Construction offers tankless water heaters as standard. The company often supplements the tankless units with a small, tanked water heater and ties in a recirculation system to ensure water supply is ample and at a consistent temperature. Visit [Propane.com](https://www.propane.com) to learn how propane tankless water heaters help Hickory keep customer satisfaction high.



CASE STUDIES: COMMERCIAL

Growing use of tankless water heaters in homes is encouraging adoption in commercial projects, too. Building owners look to tankless to help handle high peak demand and reduce energy lost delivering hot water throughout a building. The following three case studies show the tankless advantage in a variety of nonresidential projects.

RUBY'S INN: BRYCE CANYON, UTAH



After a long day on the road, all that visitors to Ruby's Inn near Utah's Bryce Canyon National Park want is a hot shower. But the 700-room resort's aging water heating system couldn't handle peak demand, and the resulting cold showers were costing around \$60,000 annually in discounts and refunds. Visit [Propane.com](https://www.propane.com) to learn how replacing the existing storage tank systems with 175 tankless units has lowered costs and kept the hot showers coming.

PALA CASINO RESORT AND SPA: PALA, CALIFORNIA



From guest rooms to restaurants to luxury services, the Pala Casino Resort and Spa in Southern California uses a significant amount of hot water. So when its three tank water heaters began showing signs of age, Pala upgraded to an array of 19 propane-fueled tankless units. Visit [Propane.com](https://www.propane.com) to learn why the resort chose propane units over electric and how the new water heating system's design meets the array of hot water needs at the large — and growing — casino resort.

SANFORD SCHOOL DISTRICT: SANFORD, MAINE



To help save money amid \$3 million budget cuts, the Sanford School District in southern Maine upgraded from oil to propane to fuel its buildings more efficiently. As part of that process, the school added three tankless units for its cafeteria dishwashers as well as three propane-based condensing boilers and new controls. Visit [Propane.com](https://www.propane.com) to learn how incorporating propane across the district lowered operating costs and improved efficiency.



DON'T LET THESE FOUR MYTHS ABOUT TANKLESS WATER HEATERS SLOW YOU DOWN

For Matt Risinger's clients, running out of hot water is simply not an option. Risinger, a custom builder and remodeling contractor in Austin, Texas, has a reputation with his high-end clients for never settling when it comes to home performance. For many of his projects, that means choosing the limitless hot water delivery of a propane tankless water heater. We asked Risinger to set the facts straight on some common misconceptions that might keep pros and their clients from upgrading to a tankless water heater.

MYTH 1: TANKLESS WATER HEATERS ARE TOO EXPENSIVE.

Upgrading to a tankless water heater may add a bit to the cost of a project. But for Risinger, the trade-offs inherent in stepping down to an entry-level tank aren't worth the small savings.

"They're not super efficient, you're going to run out of hot water at least on an occasional basis, and they're only going to last 10 years or so before you've got to get a replacement," he says. "For not that much money, you're going to step up to all the benefits of tankless, as well as the limitless hot water and the greater efficiency, which is a big deal. And typically double the life of the product for your client."

Risinger says upgrading from an electric tank to a propane tankless unit can easily save a client \$200 to \$250 annually, which can pay off the upgrade in three or four years. But more importantly, his clients expect to never run out of hot water. "The situation we talk about as builders all the time is what if you fill up that big soaker tub in your master?" he says. "Now that you've drained your tank on that one bathtub, how does anyone do anything with hot water in the house?"

For tankless retrofits or upgrades, clients will immediately appreciate the step up in performance. "You realize you don't have to change your lifestyle based on what's happening with your hot water situation."

Pros can start the conversation by having their clients take the quiz at [KnowYourWaterHeater.com](https://www.knowyourwaterheater.com), where homeowners can answer five questions about their current equipment and see if it's time to upgrade to a new, high-efficiency propane water heater.

MYTH 2: TANKLESS REQUIRES NATURAL GAS.

Propane tankless water heaters offer the same features as those fueled by natural gas. That's important for Risinger, who frequently utilizes propane even for projects only 15 to 20 minutes outside of downtown Austin. One such home, a 14,000-square-foot house, uses three propane tankless water heaters zoned for different rooms.

“There are still lots of builders in more rural areas who are using electric tanks and don’t necessarily think about propane tankless just because it’s not as common, it’s not as talked about.” But switching from two or three electric tanks to space-saving propane tankless units could free up a large amount of space in a garage or utility room, an important consideration when every square foot of space is at a premium.

MYTH 3: TANKLESS REQUIRES COMPLICATED VENTING.

In his southern climate, Risinger loves the ability to install tankless water heaters on the exterior — where no venting is required. “A lot of the houses I work with, the architects have pretty limited mechanical room space, especially because we don’t have basements down here,” he says. “Being able to hang one of these units outside in a mechanical area where I’ve also got HVAC condensers and things like that makes it super easy.”

Upgrading from an electric tank to an interior gas tankless water heater may require more planning, but high-efficiency units can be vented straight through the wall with inexpensive PVC pipe. “A concentric vent makes it really easy for us as builders,” he says. “And anytime I can avoid a roof penetration, I want to.”

MYTH 4: TANKLESS WON’T WORK WITH WELL WATER.

When a water heater heats water, a small amount of scale can form on the heat exchanger, so periodic flushing is required to keep tankless water heaters functioning at their best. Homes with harder water or more usage will have more scale, but Risinger says he’s noticed no significant difference between homes with well water or city water. Many modern tankless water heaters will notify the owner when they need to be flushed, or can even be set up to notify a technician when maintenance is required.

A water softener can greatly reduce the scale created, allowing for much longer intervals between flushing. But Risinger believes that like a finely tuned car engine, the regular maintenance is a positive, not a downside. “Maintain it, and it’ll last twice as long,” he says.



Watch as builder [Matt Risinger](#) explains the advantages of going tankless in our four-part YouTube series that you can share with your crew and customers to get them on board.

“YOU REALIZE YOU DON’T HAVE TO CHANGE YOUR LIFESTYLE BASED ON WHAT’S HAPPENING WITH YOUR HOT WATER SITUATION.”

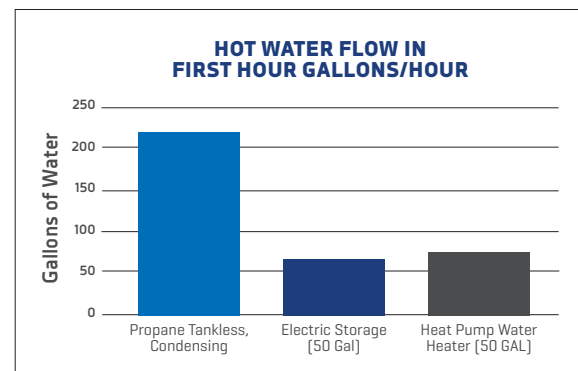


MAKING THE MOST OF TANKLESS

Tankless water heaters are capturing customers' attention — is your business prepared to capitalize on the upside? Learn how to overcome common misperceptions of tankless from builders who have successfully made it part of their business.

- Bring customers up to date:** Perceptions of tankless water heating as a slow-to-deliver, inefficient system still linger from earlier versions of the technology. But manufacturers have continued to update their products based on user feedback. The latest versions on the market are effective for all types of uses, from the light trickle needed for shaving to a steady stream for tub fillers and washing machines.

- Speak the code:** Increasingly stringent energy codes and regulations favor tankless' heat-as-you-go capabilities. Energy use is often communicated to customers by discussing cost, but that's not the only way. Energy-efficient homes can command a higher selling price. Help customers see the advantage by using metrics such as the potential for lower HERS scores that propane tankless units afford [see p. 3].
- Highlight the small footprint:** Tankless units can save up to 12 square feet of space in the home compared with a storage tank alternative. That space matters, especially in small projects. The small footprint and wall-mounting options mean the units can be placed nearly anywhere in the house — including the main level, which can attract homeowners who want to age in place.
- Go inside or out:** Homes in warm, moderate climates can install their tank on an exterior wall, making it easy for service professionals to access and freeing up space indoors. In colder climates, indoor installation may be preferred to reduce the energy needed to prevent freezing in cold temperatures and keep output consistent throughout the year.
- Size it right:** One tankless unit is usually enough to handle a home's water heating needs at peak demand. If you decide that more than one unit is required, consider factors such as the size and setup of the home when determining whether to link the units together or install separate units at the point of use.



Source: Residential Water Heaters under the New 2015 Federal Standards: An Analysis of Energy, Economics, and Emissions. Newport Partners LLC, April 2015.



TAKE THE NEXT STEP AT PROPANE.COM

Learn more about how propane can fuel your tankless water heater business by visiting [Propane.com](https://propane.com) to access free tools and resources. While you're there, read up on the variety of home systems that can run on clean and efficient propane, including furnaces, fireplaces, and standby power.

ENERGY CALCULATOR

[Propane.com](https://propane.com)

Estimate annual heating costs and emissions outputs for different heating systems with our Space Heating Energy Calculator and Water Heating Energy Calculator apps available in the Apple and Android play store.

PROPANE CONSTRUCTION INCENTIVE PROGRAM

[Propane.com/ConstructionIncentive](https://propane.com/ConstructionIncentive)

See how you can earn up to \$1,500 per house and up to \$7,500 per year by including propane in new construction projects and remodels.

VIRTUAL RESIDENTIAL AND COMMERCIAL BUILDING TOURS:

[Propane.com/Interactive-Training-Module](https://propane.com/Interactive-Training-Module)

Explore propane's measurable and marketable advantages across residential and commercial projects, new or existing.

FREE CONTINUING EDUCATION CERTIFIED TRAINING:

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Boost your bottom line by taking one of our free online propane training courses and earn credits from the AIA, NAHB, NARI, and GBCI [in conjunction with the USGBC].