High-Efficiency, Demand-Flexible Water Heating for Ontario

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Introduction

In 2018, Ontario committed to reducing greenhouse gas (GHG) emissions to 30 per cent below 2005 levels by 2030.[1] However, it is now projected to miss this target by at least 3.5 megatonnes of carbon dioxide equivalent (Mt CO_{2e}),[2] approximately 19 per cent of the mitigation required from 2019.[3] Water heating is Ontario's second largest residential energy end use after space heating and is responsible for a quarter of residential GHG emissions.[4] Making water heating more efficient and water heating demand more responsive and "flexible" are great opportunities for Ontario to help households save money, cut emissions, and improve provincial energy system resilience and stability.

Ontario's residential water heating is more carbon intensive than the Canadian average — as of 2023, nearly three-quarters (73.6 per cent) of its 6.2 million residential water heaters are gas-fired.[5] Nationally, just less than half (49 per cent) of residential water heaters are gas-powered.[6] While federal equipment efficiency standards have increased the efficiency of both electric and natural gas water heaters over the past two decades, Ontario's direct emissions from water heating have still increased by 200 kilotonnes CO_{2e} since 2000.[7]

Beneficial or "smart" electrification of water heating could help address this. In 2024, approximately 84 per cent of Ontario's electricity generation came from non-emitting

[1] Ministry of the Environment, and Conservation and Parks, "Preserving and Protecting Our Environment for Future Generations: A Made-in-Ontario Environment Plan."

[2] Office of the Auditor General of Ontario, "Report on Progress to Reduce Greenhouse Gas Emissions."

[3] Ontario's annual GHG emissions were 201 Mt in 2005 and 161 Mt in 2018: Environment Canada, *National Inventory Report 1990–2005: Greenhouse Gas Sources and Sinks in Canada*; Ministry of the Environment, and Conservation and Parks, "Preserving and Protecting Our Environment for Future Generations: A Made-in-Ontario Environment Plan."

[4] Natural Resources Canada, "National Energy Use Database - Comprehensive Energy Use Database - Residential" Ontario - Table 10.

[5] Ontario - Table 28: Natural Resources Canada, "National Energy Use Database - Comprehensive Energy Use Database - Residential."

[6] Canada - Table 34: Water Heater Stock by Building Type and Energy Source: Natural Resources Canada, "Residential Sector Canada Table 34."

[7] Natural Resources Canada, "National Energy Use Database - Comprehensive Energy Use Database - Residential" Ontario - Table 10.

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sources.[8] As a result, one gigajoule (GJ) of energy from electricity produces 54 per cent less GHG emissions than the equivalent from natural gas.[9] Electric water heaters — especially heat pump water heaters — can achieve efficiency levels far above natural gas water heating, meaning potential emissions reductions are even greater.

Residential water heaters typically have lifespans of eight to 20 years.[10] This means that equipment decisions made today could still be influencing bills and emissions into the 2040s. While the average emissions intensity of Ontario's electricity system has risen in recent years — and is expected to increase again in 2027 — from 2028—50, it is forecasted to drop from 124 to three gCO_{2e} per kilowatt-hour,[11] largely due to the federal Clean Electricity Regulations.[12] Accordingly, electrifying water heating produces significant emissions savings now and will improve further over the lifespan of the equipment.[13] Making electric water heating more "demand flexible" will also help to manage the Independent Electricity System Operator's (IESO) expected growth in electricity demand over this time frame while providing direct benefits to households now.[14]

Electrifying water heating could also have resiliency and energy security benefits. In 2025, approximately 63 per cent of gas consumed in Ontario was imported from the U.S.[15] Recent developments in the Canada-U.S. relationship raise the prospect of energy being included in trade and tariff disputes,16 increasing uncertainty around natural gas supply and costs. Natural gas prices are historically more volatile than electricity rates in Ontario. Over the 10-year period from October 2016 to October 2026, residential

[8] Nuclear, hydro, wind, solar, biofuel: Independent Electricity System Operator, "IESO 2024 Year-End Data."

[9] 2026 forecasted average emissions: Maryam Shekarrizfard, "Ontario Electricity Emissions Factors and Guidelines"; 2026 marketable gas: Environment and Climate Change Canada, "Emission Factors and Reference Values - Version 4.0"; 2026 - Average of North & South: Enbridge Gas, "Unit of Measure Conversion Information - Annual Heat Information."

[10] Michael Thompson, "How Long Do Hot Water Tanks Last?"

[11] Maryam Shekarrizfard, "Ontario Electricity Emissions Factors and Guidelines."

[12] Environment and Climate Change Canada, "Canada Gazette, Part 2, Volume 158, Number 26."

[13] Environment and Climate Change Canada, "Canada's Clean Electricity Future."

[14] Heather McDiarmid, "Current Thinking."

[15] Ronan, "Why Electrification Is an Energy Security Strategy."

[16] Lauren Krugel, "Fact File."

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gas prices ranged from a low of 20.84 ¢/m³ in October 2016 to a high of 53.9 ¢/m³ in October 2022. Over the same period, electricity base rates increased by an average of 1.48 per cent annually.[17] Gas prices sit at 27.08 ¢/m³ as of October 2026, though Enbridge has proposed a residential gas rate of 33.65 ¢/m³ from Jan. 1, 2027.[18]

This policy brief will explore policies and programs that promote high-efficiency, demand-flexible water heating in other North American jurisdictions, the current barriers to greater heat pump and demand-flexible water heating adoption in Ontario, and potential solutions to address these barriers.

Making water heating more efficient

Heat pump water heaters (HPWHs) are the most energy-efficient way to produce hot water in Canadian homes and are a mature technology — first introduced to the North American market about 70 years ago.[19] Rather than generating heat through less efficient combustion (e.g., oil, propane and gas water heaters) or heating elements, like electric resistance water heaters (ERWHs), HPWHs use a refrigerant to efficiently move heat from the surrounding air (or from outdoor air for split models) to the water.[20]

HPWH models available at big-box home improvement retailers in Ontario typically have a uniform energy factor (UEF)[21] of 3.88 to 4.0, almost six times more efficient than a

[17] Averaged increase across off-peak, mid-peak and on-peak time-of-use rates: Ont. Energy Board, " Historical Electricity Rates."

[18] Detailed rates - Enbridge Gas - Union South Rate Zone, assuming first 100 m3 delivery rate, before HST: Ont. Energy Board, "Historical Natural Gas Rates"; Justin Egan, Enbridge Gas, "Re: Enbridge Gas Inc. Enbridge Gas) Ontario Energy Board (OEB) File No.: EB-2026-0157 2027 Rates Application and Evidence."

[19] Mills, "Market Spoiling and Ineffectual Policy Have Impeded the Adoption of Heat Pump Water Heating for US Buildings and Industry."

[20] ENERGY STAR, "How It Works — Heat Pump Water Heaters (HPWHs)."

[21] UEF is a rating of the efficiency of a water heater, determined based on its "heat transfer efficiency, recovery rate, and standby losses over a 24-hour period". The higher the UEF, the more efficient. UEF replaced the energy factor metric, as it addresses energy losses when the equipment is not actively heating (standby or off modes) — not just on-mode energy use: U.S. Department of Energy, "Energy Conservation Program"; O Smith, "Uniform Energy Factor (UEF) For Water Heaters."

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gas storage water heater that meets federal minimum standards.[22] All HPWH models identified in this September 2026 review of the Ontario market were hybrid electric models that pair a heat pump with back-up electric resistance elements. The resistance elements work less efficiently than the heat pump but help to ensure fast recovery time during periods of high hot water demand, low water inlet temperatures and, for split models, low outdoor temperatures (how low depends on model).

The potential savings from switching from either natural gas or electric resistance water heating are significant. For a typical Southern Ontario household with Canadian average hot water consumption of 225 litres per day,[23] switching from a 50-gallon gas storage water heater to an HPWH would save 17.1 GJ (83 per cent) of energy,[24] 937 kilograms CO_{2e} (92 per cent) of GHG emissions,[25] and $57 annually in energy costs (excluding connection fees).[26] If the gas water heater is the last gas appliance in the home, switching to an HPWH would also eliminate natural gas service and all associated fixed monthly fees, saving the typical household $381 annually.[27] Swapping gas water heating for HPWHs also eliminates a potential source of indoor carbon monoxide.[28]

Switching from a conventional electric resistance tank heater could save 11.4 GJ (76 per cent) of energy,[29] 260 kg CO_{2e} (76 per cent), and $421.32 in annual energy costs.

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[22] Assuming 50 gallon storage volume and high draw pattern: Home Depot Can., "Rheem ProTerra 50 Gal (189L) 10 Year Warranty Smart High Efficiency Hybrid Heat Pump Water Heater"; RONA Can., "A.O. Smith Connected Water Heater with Heat Pump - 40-Gal. Imp (189-L)"; Home Hardw., "GSW 50 Gal 240V 4500W Connected Heat Pump Water Heater"; Natural Resources Canada, "Gas-Fired Storage Water Heaters - Household."

[23] Natural Resources Canada, "Water Heater Guide."

[24] Assuming: 0.675 UEF gas water heater & 3.88 UEF HPWH: HowMuchWatts, "Water Heating Cost Calculator"; Assuming 8.3°C average water inlet temperatures for Southern Ontario: Rinnai, "North America Ground Water Temperature Map."

[25] Environment and Climate Change Canada, "Emission Factors and Reference Values - Version 4.0"; Forecasted 2026 average emissions factor: Maryam Shekarrizfard, "Ontario Electricity Emissions Factors and Guidelines."

[26] Before HST: Ont. Energy Board, "Electricity Rates"; Justin Egan, Enbridge Gas, "Re: Enbridge Gas Inc. (Enbridge Gas) Ontario Energy Board (OEB) File No.: EB-2026-0157 2027 Rates Application and Evidence."

[27] Justin Egan, Enbridge Gas, "Re: Enbridge Gas Inc. (Enbridge Gas) Ontario Energy Board (OEB) File No.: EB-2026-0157 2027 Rates Application and Evidence."

[28] McDiarmid, *Canada's Home Electrification Toolkit*.

[29] College of Earth and Mineral Sciences, "7.9 Energy Efficiency."

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Unitary (non-ducted) HPWHs also provide beneficial dehumidification and cooling in the summertime — which coincides with when Ontario's electricity demand peaks due to air conditioning.[30] However, it should be noted that this style of HPWH also suffers from a heating penalty in the winter, as it draws heat from its surroundings that must be made up by the space heating system.

Despite these energy cost and emissions savings, HPWHs capture little market share in Ontario. The Building Decarbonization Alliance estimates that, as of 2024, only 51,000 (0.8 per cent) of Ontario homes have an HPWH.[31] To be on track to hit net-zero emissions by 2050, the authors calculated that over 135,000 HPWHs would need to be sold just between 2024 and 2026. While there are a few months left in 2026 at the time of writing this brief, it seems clear Ontario will not manage to achieve this level of market penetration.

Over the past five years, there have been consecutive rebate programs in Ontario to support the uptake of HPWHs. The current program is not as generous as in other provinces. In May 2021, Natural Resources Canada (NRCan) launched the Canada Greener Homes Initiative, offering a $1,000 rebate for eligible HPWHs.[32] In January 2023, NRCan and Enbridge launched and co-delivered the Home Efficiency Rebate Plus (HER+) program, which increased the offering to $1,300 for eligible HPWHs.[33] Both programs required a pre- and post- retrofit EnerGuide evaluation to access the grants. Applications for the HER+ program were accepted until Feb. 5, 2024.[34]

HPWHs were not one of the top five completed retrofits as part of the Greener Homes Initiative, and thus installation numbers were not included in progress updates.[35]

[30] These benefits were not included in savings calculations: Mills, "Market Spoiling and Ineffectual Policy Have Impeded the Adoption of Heat Pump Water Heating for US Buildings and Industry"; Indep. Electr. Syst. Oper. IESO, "Peak Tracker."

[31] Vérin and Poirier, *Pace of Progress: Achieving the Necessary Momentum to Meet Canada's 2050 Climate Goals in the Residential Building Sector* Version 1.0.

[32] Natural Resources Canada, "Canada Greener Homes Initiative: Eligible Retrofits and Grant Amounts."

[33] Enbridge Gas Inc., "2023 Demand Side Management Annual Report."

[34] Enbridge Gas Ontario, "DRAFT 2024 Demand Side Management Annual Report."

[35] Natural Resources Canada, "Greener Homes Initiative Progress Update."

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Through the HER+ program, 258 HPWHs were installed in 2023, 1,045 in 2024 and 259 in 2025,[36] for a total of 1,562. The closure of the Canada Greener Homes Initiative in 2025 prompted changes to the HER+ program.[37]

The IESO launched a 12-year, $10.9-billion electricity conservation and demand-side management framework, including beneficial electrification programs, on Jan. 1, 2025.[38] As part of this plan, the IESO and Enbridge collaborate on the delivery of a single Home Renovation Savings program, replacing Enbridge's HER+. Under this new program, the IESO and Enbridge Gas offer a $500 rebate on ENERGY STAR®-certified HPWHs.[39]

As with earlier offerings, participants must first have a home energy assessment completed to access the rebate. Unlike with previous offerings, they must also complete at least one other eligible upgrade. The prerequisite home energy assessment includes HOT2000 energy modelling, so homeowners are informed of the interactive effects with space heating equipment,[40] as HPWHs that are not vented draw heat from the surrounding air. Accordingly, the rebate is well suited for households upgrading water heating equipment as part of a planned renovation, but inaccessible in the event of emergency equipment failure. Between January 2025 and September 2026, 188 homeowners accessed the Ontario Home Renovation Savings program HPWH rebate.[41]

By comparison, program offerings in some provinces are more generous or have less friction. BC Hydro offers a $1,000 rebate for HPWHs as part of its Home Renovation Rebate Program, which is open to all customers, regardless of income.[42] While BC Hydro's program is only available to customers replacing an ERWH, no energy audit or pre-approval is required. The provincial government's income-qualified CleanBC Better Homes Energy Savings Program also supports HPWH adoption, offering 100 per cent of eligible upgrade costs, up to $3,500.[43] Rebate amounts in the CleanBC program depend

[36] Enbridge Gas Ontario, "DRAFT 2025 Demand Side Management Annual Report."

[37] Enbridge Gas, "Home Efficiency Rebate Plus."

[38] Ontario Ministry of Energy and Mines, "New Proposal for An Electricity Energy Efficiency Programming to Promote Beneficial Electrification."

[39] Save on Energy, "Home Renovation Savings Program."

[40] "Meeting with the IESO Home Renovation Savings Program Team," September 9, 2026.

[41] "Meeting with the IESO Home Renovation Savings Program Team."

[42] BC Hydro, "Heat Pump Water Heater Rebates."

[43] Government of British Columbia, "Better Homes - Energy Savings Program Rebate Requirements."

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on household income levels, the total assessed value of the property at which the HPWH will be installed, and the fuel source of the existing water heater. When switching from a fossil-fuel-fired water heater, for example, a four-person household could have a maximum combined pre-tax income of $189,800 and property value up to $1.82 million and receive the rebate. However, when switching from electric resistance, a four-person household would only be eligible for the rebate if its combined pre-tax income is $94,900 or less and property value $1.2 million or less.

Efficiency Nova Scotia offers an $800 rebate for household HPWHs, either as an in-store instant rebate at participating retailers or through contractors that participate in its Efficiency Preferred Partners program.[44] The rebate is available to households switching from electric resistance or oil water heaters and requires no pre-approval. Efficiency Nova Scotia also launched a Heat Pump Water Heater Market Transformation pilot program in 2024, which includes information to educate homeowners on the technology.[45]

Market transformation activities are crucial as uptake of HPWH often remains low, even with incentive programs.

Across California, there have been more than 30 HPWH incentive programs.[46] Nevertheless, HPWHs still represent only about five to six per cent of annual water heater sales. In 2022, the state utility commission established the California Market Transformation Administrator (CalMTA), a centralized body run by Resource Innovations to design statewide, long-term market transformation initiatives. In 2024, CalMTA identified HPWHs as a potential technology to focus on and published an advancement plan in September.[47] In mid-2026, CalMTA filed the full HPWH plan with the state utility commission with a goal of having HPWHs in the majority of California homes.[48]

Among the opportunities the plan identified to increase HPWH adoption are matching HPWH technologies (unitary, ducted, split, 120-volt (V), etc.) to housing stock and

[44] Efficiency Nova Scotia, "Understanding Rebates for Heat Pump Water Heaters."

[45] Effic. N. S., "Is a Heat Pump Water Heater Right for My Home?"; Effic. N. S., "Heat Pump Water Heater Myth Busting."

[46] Alexis Allan et al., *Residential Heat Pump Water Heating Market Transformation Initiative Plan.*

[47] Katie Teshima and Alexis Allan, *Residential Heat Pump Water Heating Market Transformation Advancement Plan.*

[48] Alexis Allan et al., *Residential Heat Pump Water Heating Market Transformation Initiative Plan.*

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identifying technology gaps; and prioritizing easy-to-install markets to build contractor confidence and drive sales. This is built upon prior work by CalNEXT (also a ratepayer-funded organization overseen by the California Public Utilities Commission, which assesses emerging technologies).[49]

Finally, outside of incentive programs and market transformation initiatives, regulations can help drive HPWH adoption. The U.S. Energy Policy and Conservation Act requires the Department of Energy to set standards that achieve the "maximum improvement in energy efficiency" that is both technologically feasible and economically justified whenever appliance and equipment efficiency standards are being amended.[50] Consequently, the U.S. has finalized new standards from May 2029 that will require all new residential electric storage water heaters (ESWH) with a 35- to 120-gallon (132.5 to 454.2 L) capacity to employ heat pump technology (at least 2.3 UEF), except those that are greater than 75 gallons (283.9 L) and grid-enabled.[51]

Canada chose not to align with the U.S. in requiring almost all ESHWs to employ heat pump technology in the most recent amendments to Canada's Energy Efficiency Regulations. Environment and Climate Change Canada has instead proposed splitting the ESWH category into two — with separate standards for conventional ERWHs and HPWHs.[52] Standards for ERWHs will increase incrementally from May 2029. For just HPWHs, the standard will require a UEF of at least 2.3 from January 2028,[53] not the transformational standards for all electric water heaters that the U.S. has finalized.

Provincial building codes are another regulatory pathway that can promote HPWH adoption. HPWHs are particularly well suited for new homes, since mechanical rooms can be easily designed to provide ample airflow around the tank for optimal performance. Ontario has yet to adopt the latest national model code,[54] which awards energy conservation points for HPWHs under the tiered energy compliance pathway and includes operational emissions.[55]

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[49] CalNEXT, "Approved Projects."

[50] U. S. Congr., "R47038: Energy Policy and Conservation Act."

[51] U.S. Department of Energy, "Energy Conservation Program."

[52] Natural Resources Canada, "Canada Gazette, Part 1, Volume 160, Number 25."

[53] Natural Resources Canada, "Canada Gazette, Part 2, Volume 159, Number 8."

[54] Ministry of Municipal Affairs and Housing, "Ontario's Building Code."

[55] National Research Council Canada, *National Building Code of Canada 2025.*

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Challenges

There are several, often interconnected, barriers to scaling HPWH adoption in Ontario.

1. Higher upfront purchase price

At a big-box home improvement retailer, an HPWH costs $1,000–$2,080 (100–165 per cent) more than a similar-sized and warrantied natural gas water heater,[56] or $1,030–$2,490 (48–300 per cent) more than a similar-sized and warrantied conventional electric resistance model. At a large HVAC retailer-installer, including standard installation costs, the difference was $3,850 (175 per cent) more for the HPWH.[57]

2. Inability to access rebate during emergency replacement

As part of the 2019 Survey of Household Energy Use, 57 per cent of Ontario households that listed a reason for replacing their water heater did so due to an emergency replacement.[58] Other surveys have identified much higher percentages of emergency water heater equipment replacements, ranging from 75 to 90 per cent.[59]

3. Added complexity when switching from gas

The electrical work required when switching from gas to electric water heating can complicate emergency replacements. Gas water heaters typically require very little electricity and can generally operate using a standard 120V, 15-amp outlet. In contrast, electric water heater models currently available in Ontario require a dedicated 240V circuit rated for 20–30 amps. As a result, switching from gas to electric water heating often requires additional electrical work, potentially including upgrades to the home's electrical panel, which can increase installation costs and delay emergency replacements.

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[56] Home Depot, RONA, and Home Hardware, 50 gallon, 10 year warranty for comparison, when possible: RONA Can., "A.O. Smith Connected Water Heater with Heat Pump - 40-Gal. Imp (189-L)"; Home Hardw., "GSW 50 Gal 240V 4500W Connected Heat Pump Water Heater"; Home Depot Can., "Rheem ProTerra 50 Gal (189L) 10 Year Warranty Smart High Efficiency Hybrid Heat Pump Water Heater."

[57] Go Lime, "Bradford White 50 Gallon Electric Water Heater"; Go Lime, "Bradford White AeroTherm Heat Pump Water Heater - 50 Gallon."

[58] 1,362,712/2,371,230 households surveyed: Natural Resources Canada, "2019 Survey of Household Energy Use," tbl. 9.1.

[59] Chris Badger et al., *Emergency Replacement Heat Pump Water Heater Market Study.*

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120V plug-in heat pump water heaters

120V plug-in HPWHs are ideal for converting from gas, as they can be plugged into a standard 15-amp wall socket and therefore do not require additional electrical capacity, which could necessitate a panel upgrade. There are 12 brands that offer a total of 76 models of 120V HPWH in the U.S., but none could be confirmed to be sold on the Canadian market.[60]

4. Product availability

Given the prevalence of emergency replacements, it is essential that the right equipment is always available at retailers and distributors, including HPWHs with different tank sizes (189–303 L), shapes (tall and thin or short and wide to account for mechanical room limitations) and configurations (split-system, flexible voltage). This is currently rarely the case in Ontario, with most home improvement retailers only stocking one model of HPWH.

5. Split incentive for rental housing

As of 2021, 31.4 per cent of Ontario households are renters.[61] While there are incentives available for multi-unit residential buildings for high-efficiency water heaters,[62] landlords are often disincentivized from energy efficiency upgrades, like installing HPWHs, as they would pay the higher upfront equipment cost, while the energy bill savings would go to the renter.[63]

6. Rental water heater contracts in new home builds

Ontario is the only Canadian province where the majority of households rent their water heater.[64] Rental water heater companies also often have agreements with new home

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[60] U.S. Environmental Protection Agency, "Product Finder — ENERGY STAR Certified Heat Pump Water Heaters;" Through email correspondence with all manufacturers of 120V HPWHs listed as available on the Canadian market on the ENERGY STAR Product Finder website and/or the Canadian distributors for those manufacturers.

[61] Statistics Canada, "Census Profile, 2021 Census of Population - Ontario - Household and Dwelling Characteristics."

[62] Enbridge Gas, "Ontario Affordable Housing Multi Residential Program."

[63] Brendan Haley and Abhilash Kantamneni, *Energy Efficiency for Low-Income Tenants*.

[64] Ceara Allen and Michael Lio, *Domestic Hot Water Tanks and Other Equipment - A Consumer Perspective*.

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builders in Ontario that prevent new home buyers from choosing an electric water heater for their new home or from purchasing it outright,[65] locking owners of new homes into gas water heater rental contracts for 10–15 years, delaying decarbonization, or subjecting them to costly rental water heater contract buyouts.

Making water heating demand flexible

ESWHs, including heat pump and electric resistance models, have hot water tanks that can act as thermal batteries, preheating water in anticipation of a peak event. With the right controls, they can become "demand flexible," avoiding drawing power from the electricity grid during peak demand events and/or when electricity rates are at their highest under time-of-use (TOU) pricing with minimal interference to hot water availability. Demand-flexible appliances, like ESWHs, can also help intermittent renewable electricity sources, like wind and solar, better integrate into electricity systems.[66]

According to research from the University of Technology Sydney, an ESWH with a 300-litre (79-gallon) tank can store approximately 15 kilowatt-hours of energy, the same as a second-generation Tesla Powerwall.[67] In a technical study of distributed energy resources (DERs) in Ontario for Clean Energy Canada, The Brattle Group estimated the total achievable DER potential of grid-interactive water heaters to be 195 MW in 2035 and 306 MW in 2045.[68] This means that by 2045, water heating could shave peak demand 63 per cent more than the Peak Perks smart thermostat program achieved in 2025.[69]

Simple timers to shift water heating have been available for decades. The technology has evolved to allow for a greater degree of control and connectivity, including greater

[65] Taylor, "New-Build Buyers Say Home Contracts Hide 10-Year Water Heater Rental Traps."

[66] Cara Goldenberg and Mark Dyson, "Pushing the Limit."

[67] David Roche et al., *Domestic Hot Water and Flexibility*; Roche, "Using Electric Water Heaters to Store Renewable Energy Could Do the Work of 2 Million Home Batteries – and Save Us Billions."

[68] SANEM SERGICI et al., *The Value of Using DERs for Distribution System Services in Ontario*; Sanem Sergici, Principal at The Brattle Group, "RE: Ontario DER: Water Heating Peak Demand Reduction Potential Value."

[69] Independent Electricity System Operator, "2025 Annual Report."

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protections against Legionella — which can grow when the tank water temperatures drop too low for too long.[70] Demand-flexible water heater controllers can be either a communications interface socket installed by the manufacturer or a separate device added on by the end-user. The communications interface can be proprietary to the manufacturer and controlled via a mobile application or comply with a non-proprietary, open-source standard such as Air-Conditioning, Heating, and Refrigeration Institute (AHRI) 1430 or Consumer Technology Association (CTA)-2045, with products that comply with the latter commonly referred to by the marketing name "EcoPort."[71] Oregon and Washington state require a EcoPort socket and Colorado requires an AHRI 1430 compliant interface socket to be installed on all ESWHs at point-of-sale.[72] EcoPort sockets offer a modular connection, akin to a USB port for ESWHs, that can be connected to via Wi-Fi, cellular, or an FM signal once a compliant module (typically provided by the utility) is plugged into it.

With a CTA-2045 compliant communications module attached to the socket, utilities can use Open Automated Demand Response (OpenADR), a non-proprietary, standardized demand-response interface to control water heaters enrolled in their programs.[73] As of 2024, the communications modules cost about US$150, though some estimate that costs could drop to US$50 with economies of scale (regulations to require such control modules would thus help to drive down costs).[74]

Post-market water heater controllers installed by the end-user are typically not CTA-2045 compliant. Most commonly, they connect to a proprietary platform that the utility sends demand response signals to via a cloud-to-cloud connection.[75] Having a water

[70] Public Health Agency of Canada, "Legionellosis (Legionnaires' Disease and Pontiac Fever)."

[71] Cox et al., "It's Flex Time: Using Flexible Demand Appliance Standards to Deliver Peak Load and CO2 Reductions"; Air-Conditioning, Heating, & Refrigeration Institute, *AHRI Standard 1430-2022 (I-P), Demand Flexible Electric Storage Water Heaters, with Addendum 1*; Consumer Technology Association, *Modular Communications Interface for Energy Management (ANSI/CTA-2045-B)*.

[72] State Energy Office, "Appliance Standards & Design Requirements Guidebook"; House Bill 2062; CONCERNING ENVIRONMENTAL STANDARDS FOR CERTAIN PRODUCTS, AND, IN CONNECTION THEREWITH, MAKING AN APPROPRIATION.

[73] Bienert et al., "OpenADR and CTA-2045."

[74] Cox et al., "It's Flex Time: Using Flexible Demand Appliance Standards to Deliver Peak Load and CO2 Reductions."

[75] Sinopé Technol., "Sinopé Pro - Energy Partnership"; Hilo Hydro-Qué., "Hilo Smart Water Heater Controller"; Aquanta, "What If Water Heaters Were Smart?"

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heater controller retrofitted onto an installed tank costs $100-150 for the equipment and about $100 for the service call from a licensed plumber or HVAC contractor.[76] However, some styles of controllers can be installed by a "handy do-it-yourselfer", eliminating the installation cost.[77]

Beyond control technologies, utilities can also use rate schedules to incentivize consumers to shift their usage to times more advantageous to the grid. This can be accomplished through static or predefined rate changes, such as TOU rates, which vary pricing by time of day, or through dynamic rate packages that provide signals to consumers based on current grid events (e.g., spot market pricing).[78] The latter is less common for residential consumers in Canada, though TOU rates are more widespread — Ontario first piloted one in 2006, and as of 2020, approximately 90 per cent of Ontario households participate.[79] Assuming a typical Ontario household with an ERWH shifts half of water heating to during off-peak rates, it could save over $70 a year in electricity costs. Given the aforementioned costs of a post-market smart water heater controller, the device could pay for itself in less than two years if self-installed or less than three years with professional installation.[80]

Rates-based initiatives are not typically considered "dispatchable" or controllable by the utility (or grid operator) to be called upon when needed. Dispatchable capacity to grids can be provided by a range of distributed energy resources, such as battery storage or localized smart grids, as well as energy efficiency and demand response programs administered by the utility.

Ontario has experimented with residential demand response on and off over the past two decades. The *peaksaver*PLUS program was a demand response program for air conditioners, electric water heaters and pool pumps that more than 315,000

[76] Sinopé Technol., "Calypso - Smart Water Heater Controller V2"; Aquanta, "Smart Electric and Gas Water Heater Controller"; Ont. HVAC Quotes, "Water Heater Installation Ontario."

[77] "Installing Your Smart Water Heater Controller."

[78] Prakash et al., "From the Cloud to Your Basement: Can New Communication Protocols Solve the Interoperability Roadblocks in Residential Demand Flexibility?"

[79] Ont. Energy Board, "Ontario Smart Price Pilot"; Ahmad Faruqui and Cecile Bourbonnais, "Time of Use Rates."

[80] Assuming 4172 kWh of annual electricity consumption. Baseline: 25.8 per cent on-peak, 25.9 per cent mid-peak and 48.3 per cent off-peak: Ont. Energy Board, "Electricity Rates."

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homes and businesses participated in from 2007 to 2017.[81] The program offered the electricity system up to 180 MW of potential peak demand reduction but was used far less frequently than modern demand response programs — an average of only twice per year.[82] The program was not continued when administration shifted from local distribution companies to the IESO in 2018.

The IESO launched a replacement program, Peak Perks, in June 2023. It offers a $75 prepaid credit card enrollment incentive and $20 for each additional year enrolled in the program for smart thermostats connected to a central air conditioner or heat pump.[83] The jointly delivered Home Renovation Savings program from the IESO and Enbridge also offers a $125 rebate on the purchase of a smart thermostat,[84] complementing the Peak Perks thermostat program. In January 2025, the province announced the program would be expanded to include water heating, though at the time of writing, this has not yet occurred.[85] Discussions with stakeholders revealed that this is due in part to a third-party cost-effectiveness study that found the potential expansion uneconomical, largely due to the small number of demand-flexible ESWHs already in Ontario homes.[86]

Other provinces and territories offer programs and rates to support demand-flexible water heating. For example, BC Hydro's Peak Saver program offers $50 per year and a one-time enrollment bonus of $100 to remotely control electric water heaters during winter season demand peaks.[87] BC Hydro also offers a TOU rate to encourage shifting demand.[88] Yukon Energy's Peak Smart program offers a rebate of up to 75 per cent of the purchase and installation cost of an eligible water heater controller (up to $750) to customers enrolled in their Peak Smart demand response program.[89]

[81] IEA, "Hydro One PowerShift Peaksaver PLUS – Policies."

[82] Jay, "Ontario Pulls Plug on Little-Used Peaksaver Energy Program."

[83] Ministry of Energy, "Ontario Launches Peak Perks and Expanded Energy-Efficiency Programs."

[84] Enbridge Gas and Save on Energy, "Get Smart Thermostat Rebate."

[85] Government of Ontario, "Ontario's New and Expanded Energy Efficiency Programs."

[86] "Meeting with the IESO DSM Team Re: Demand Flexible Water Heating," March 5, 2026.

[87] BC Hydro, "Enroll Your Smart Home Devices in Peak Saver."

[88] BC Hydro, "Time-of-Day Pricing."

[89] Peak Smart, "Peak Smart Rebates."

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Through Hydro-Québec's Hilo residential demand response program, customers can receive a Hilo-branded smart water heater controller free of charge or receive a $105 to $125 rebate on compliant controllers.[90] Hydro-Québec also offers a $100 rebate on the made-in-Québec 60-gallon Giant ECOPEAK® ERWH.[91] Hydro-Québec's incentives are complemented by the utility's "Flex D" dynamic rate schedule, which allows Hilo participants to benefit from automated utility control of their devices around up to 30 peak events per year.[92] Hydro-Québec says that customers can save up to 20 per cent on their winter electricity bills with Rate Flex D and Hilo.[93] All three programs recognize the Sinopé Calypso controllers as compliant.

Challenges

While demand-flexible water heating faces some of the same barriers as HPWHs in Ontario, there are a few unique challenges to overcome.

1. **Insufficient demand-flexible water heaters ready to participate in Peak Perks program**

A significant portion of residential water heating in Ontario is gas-powered, and a small share of existing electric resistance water heating possesses the capability to add on a smart controller.

2. **High cost to retrofit controllers**

While the controllers themselves are inexpensive, the cost for the service call to retrofit an installed ESWH with a controller decreases the lifecycle savings that the household and/or utility can achieve from demand-flexible water heating.

[90] Hilo Hydro-Qué., "Smart Water Heater Controllers."

[91] Hydro-Québec, "ECOPEAK® Three-Element Water Heater."

[92] Hilo Hydro-Qué., "How Hilo Works - Save More by Using Less."

[93] Hydro-Québec, "Rate Flex D."

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How to scale high-efficiency, demand-flexible water heating

Based on the above review of technologies, programs, and barriers, we can identify three broad strategies that Ontario could consider in order to capture the latent potential in improving water heating efficiency and flexibility.

Program design

The first broad strategy the province could explore is to tweak and modify existing incentive programs for water heating and residential demand response. One simple solution is to increase incentives, up to 100 per cent of the additional cost of an HPWH. While this may raise concerns about the overall cost-effectiveness of the measure, these tests may not be considering the full potential value of the technology (e.g., through non-energy benefits from cleaner air). On the demand-flexibility side, program administrators could incorporate incentives for the smart controllers that allow for homeowners to adapt their existing technology, like in the Yukon or Quebec.

Another option to address upfront costs is on-bill financing through local distribution companies. Given that 49 per cent of Canadians feel they are living paycheque to paycheque and 63 per cent of Ontarians say "at least half of their income is already committed to bills, debt payments, and regular expenses before it arrives,"[94] high upfront costs — particularly in situations of emergency water heating equipment failure — can be a financial hardship for households. On-bill financing combined with generous rebates could help reduce this barrier.

To address the emergency replacement challenge, the Home Renovation Savings Program HPWH rebate should be moved to the "single upgrades" stream, like heat pumps and smart thermostats. This stream does not require an energy audit or second upgrade to receive a rebate. To address the concern of space heating interactive effects,

[94] Foran, "New Survey Finds Nearly Half of Canadians Are Living Paycheque to Paycheque"; Caryl Newbery-Mitchell, "MNP Consumer Debt Index: Ontarians Caught in Pre-Spent Paycheque Cycle amid Sustained Cost Pressures."

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the Save on Energy program could provide training to contractors on how to coach customers through the decision whether or not to vent their HPWH to the outdoors.

Rebates for HPWHs have not been available in Ontario for rental equipment, significantly limiting program reach. The Home Renovation Savings Program could be expanded to include rental HPWHs. As rental water heating contracts can be predatory, the province could provide access to HPWH rebates for rental equipment, with requirements for the rental companies to provide fair terms to customers covering the monthly payment and equipment buyout terms.

Ontario could also follow Nova Scotia's lead and make the rebates available at point-of-sale and mid-stream through contractors so households can access the rebate during an emergency replacement. This would help eliminate the sticker shock and the stress of waiting to receive the rebate weeks or months after the HPWH is purchased. This would also make landlords far more likely to choose an HPWH when water heating equipment in rental units fails. Midstream incentives for contractors and distributors could also help address the lack of heat pump and demand-flexible-ready water heaters available to consumers during an emergency replacement. Incentives could encourage distributors to stock a variety of HPWH sizes and configurations when households want them; contractors can be incentivized to not just steer customers toward more familiar and quicker-to-install gas water heaters.[95]

The Canada Greener Homes Affordability Program provides no-cost home energy efficiency retrofits to low-to-median-income homeowners and renters.[96] As the program is administered provincially, HPWHs could be included as an upgrade measure for Ontario participants with end-of-service-life water heating equipment.

The IESO could also provide an installer incentive to encourage selling demand-flexible water heaters and water heater controllers at the time of install, therefore avoiding a separate service call and enabling customers to take advantage of off-peak TOU rates and/or participate in a future water heating demand response program.

[95] Northeast Energy Effic. Partnersh. NEEP, "Best Practice Guide: High-Performance HVAC Mid-Stream Programs."

[96] Natural Resources Canada, "Canada Greener Homes Affordability Program."

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Market transformation

Another solution is to invest in market transformation. California's example of establishing an organization dedicated to market transformation that is overseen by the regulatory board is something to consider. Special rules could be established to allow such an organization to conduct activities that traditional utilities may be challenged to do cost-effectively within existing rules and procedures. Such an initiative could also help the province identify and target specific, emerging technologies that could help address unique problems in the provincial buildings sector.

For example, GE has introduced a flexible-voltage (120V and 240V) HPWH that simplifies emergency replacements from gas water heaters.[97] The unit can therefore plug into a standard 120V socket until the necessary electrical work can be performed to accommodate the 240V voltage that can be better suited for electric water heating in Canadian conditions.[98] Flexible-voltage HPWHs mean that households aren't stuck with a like-for-like gas water heater replacement for the next 10–15 years, or without hot water for several days, due to sudden equipment failure.[99]

The province could also focus on building up mid- or upstream incentives and capacity building initiatives, like ensuring flexible-voltage HPWHs are available throughout the province and that contractors are aware of the benefits, in order to offer them to customers. This could also involve incentivizing contractors to provide emergency replacement customers short-term loans of gas-fired equipment to bridge the time needed to make the necessary electrical work to enable switching to an HPWH.[100] Power-efficient design — using load-management systems and load-sharing devices — may also help to avoid the need for costly panel upgrades.[101]

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[97] GE Appl., "GE Profile GeoSpring Heat Pump Water Heater with FlexCAPACITY." A sales manager for GE Appliances confirmed to us that there are two major distributors that carry the GE Profile GeoSpring HPWH with FlexCAPACITY in Ontario

[98] The government of Canada recommends 60°C setpoint to prevent Legionella, whereas U.S. government recommends 49 °C (120 °F) for greater energy efficiency: Public Health Agency of Canada, "Water Temperature and Burns/Scalds"; Building America Solution Center, "Check Water Heater Temperature."

[99] Territory Sales Manager – Ontario - GE Appliances, "RE: [EXT] Re: Efficiency Canada– 120V Heat Pump Water Heater Inquiry."

[100] Chris Badger et al., *Emergency Replacement Heat Pump Water Heater Market Study.*

[101] Dunsky Energy + Climate Advisors, "The Consortium for Power Efficiency."

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Such options would need to be paired with strong customer outreach and education to ensure awareness of these solutions. The IESO could therefore develop easy-to-understand educational materials for households that communicate the cost-saving potential of high-efficiency, demand-flexible electric water heaters, similar to the educational materials developed by Efficiency Nova Scotia's HPWH market transformation program. Given the favourable payback of water heater controllers for Ontario households participating in the TOU rate class, consumer education could greatly increase the number of demand-flexible water heaters installed in Ontario, which would improve the cost-effectiveness of including water heating in the Peak Perks demand response program.

Regulatory solutions

Finally, there are regulatory options that could further help to transform markets for high-efficiency, flexible water heating. Presently, "An Act to amend the Energy Efficiency Act" (Bill S-4) is progressing through the federal legislature.[102] If passed as currently written, the amended Act would give the federal government the authority to set interoperability standards for regulated appliances and equipment. Such standards could be used to require all electric storage water heaters to come with an EcoPort or another demand-flexibility capability. Assuming Bill S-4 passes in early 2027 and typical schedules are followed for introducing new product standards, the earliest a federal interoperability standard could be in place is 2029–30. As noted above, this could help drive down costs of the components and improve the overall cost effectiveness of the regulations.

But Ontario could take action itself. While the provincial and federal governments have committed to work toward harmonization of energy efficiency standards,[103] Ontario continues to set its own, more ambitious, appliance efficiency standards for several products, primarily by harmonizing with higher U.S. standards.[104] Many of Ontario's higher standards have been subsequently adopted federally.[105] The province thus has

[102] Government Bill (Senate) S-4 (45-1) - Third Reading - An Act to Amend the Energy Efficiency Act.

[103] Natural Resources Canada, "Regulatory Cooperation - Harmonizing Energy Efficiency Requirements."

[104] Ontario Ministry of Energy and Mines, *O. Reg. 509/18: ENERGY AND WATER EFFICIENCY - APPLIANCES AND PRODUCTS.*

[105] Government of Canada, "Canada Gazette, Part 2, Volume 159, Number 8."

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an opportunity to introduce requirements for demand-flexible-capable water heating similar to those in Oregon, Colorado or Washington. Given Ontario's more agile process for amending its energy efficiency regulations (requiring only a single 30-day comment period), the province could feasibly implement such a standard years before the federal government.[106] This could dramatically increase the availability of demand-flexible electric water heaters in the province available to participate in a demand response program.

Another option is for the province to revisit its existing building code regulations. Ontario has yet to adopt the latest national model codes. When it does, the province could consider optional amendments to set requirements for high-efficiency, demand-flexible water heating, like installing models that possess CTA-2045-B or AHRI 1430 demand response functionality.

Conclusion

High-efficiency, demand-flexible electric water heaters can provide Ontario households with potential energy cost savings and significant emissions reductions while offering essential peak demand reduction and other benefits to the Ontario electricity system. There are several barriers that have held back their adoption to date, including costs, availability and incentive design. Ontario can implement strategic policy and program solutions — inspired by successful initiatives in other jurisdictions — to ensure more households can access high-efficiency, demand-flexible electric water heaters.

[106] Ministry of Energy and Mines, *O. Reg. 509/18: ENERGY AND WATER EFFICIENCY - APPLIANCES AND PRODUCTS*; Ministry of Energy and Mines, *Proposal to Amend O. Reg. 509/18 (Energy and Water Efficiency - Appliances and Products) under the Electricity Act, 1998 ("Efficiency Regulation").*

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