MEMORANDUM

Prepared for: Members of the Joint Task Force On Resilient Efficient Buildings
Date: August 12, 2022
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Re: Existing Buildings Policy Options

LPRO: LEGISLATIVE POLICY AND RESEARCH OFFICE

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SUMMARY

The Task Force on Resilient Efficient Buildings (Task Force) has developed a comprehensive list of policy options to address its statutory charge. The policy options have been organized into two categories: existing and new buildings. Within each category, there are policies that relate to three sectors—residential, commercial, and industrial. Policy options are labeled as belonging to one or more subcategories, depending on which part of a building it is targeting: envelope, heating/cooling, renewables, electric, consumer products, or other. This memo only focuses on policies identified by Task Force members that relate to existing buildings. The memo provides background, policy examples, identifies potential co-benefits and offers source information for each policy proposal. The memo does not include analysis or evaluative considerations of the policy proposals put forward by members.

BASELINE: WHERE THE BUILDING SECTOR IS TODAY

In Oregon, buildings account for 34 percent of greenhouse gas emissions.[1] Older buildings typically consume more energy than newer ones and can have significant barriers to energy upgrades. Over 85 percent of Oregon's single-family residences—many non-multifamily residences are single-family detached—were built before 2000, before the prevalence of energy codes (Table 1).

Table 1: Distribution of Homes by Vintage

Age of Residence	Percentage (%) in Oregon
Pre 1951	31%
1951-1960	9%
1961-1970	9%
1971-1980	14%
1981-1990	8%
1991-2000	15%
2001-2010	10%
Post-2010	5%

Source: Joint Task Force on Resilient Efficient Buildings[2]

[1] Oregon Department of Energy, 2020 Biennial Report, (2020), *available at* <2020-BER-Energy-by-the-Numbers.pdf> (last visited July 8, 2022).
[2] Edie Taylor, New Buildings Institute/Rocky Mountain Institute, *Joint Task Force on Resilient Efficient Buildings - Group Presentation no. 2*, (May 31, 2022), <https://olis.oregonlegislature.gov/liz/2021I1/Downloads/CommitteeMeetingDocument/255583> (last visited June 30, 2022).

Other factors that may affect how the Task Force chooses to prioritize the existing building sector include, but are not limited to, age of building stock, number of buildings in each sector, and occupant demographics.

TASK FORCE CONSIDERATIONS

The policy options included in the memo have been proposed and discussed by individual Task Force members at the Task Force meetings on July 12, 2022 and August 9, 2022. The purpose of this document is to be used as a guide to assist Task Force members in completing the individual interest survey.

POLICY OPTIONS IDENTIFIED FOR EXISTING BUILDINGS

Building Performance Standards

Building Type	Existing Buildings
Sector	Commercial, Multifamily, or Public Building Requirements
Policy Subcategory	Envelope, heating/cooling, renewables, electric, consumer products
Policy Suggestions Submitted by Task Force Members* *these suggestions were provided by members via email, in meetings, from the Jamboard, etc. and have not been verified or analyzed by staff	Broad Program Design • Ensure no pre-emption for local action (e.g., Build/Shift). • Minimum size of buildings that would be included in the program. • Tying compliance timing to the end of the system's useful life. • Incorporate embodied carbon and refrigerant requirements into BPS. • Promote reusing materials like steel. • Options for "Lost-Cause" Buildings. There will be buildings with no fiscally viable path to the targets. Owners of multiple buildings might have portfolio compliance pathways. Regulators will need a slate of penalty and incentive options. • Plans for when investments may fail to yield the promised savings. If an owner invests in good faith and savings don't materialize, regulatory fines may be counterproductive. • Measurable, obtainable and accountable objectives. Incentives/Cost Protections • Including renter protections (if the BPS includes multi-family units). • Early adopter incentive funds. • Strong incentive to replace hot water heaters, HVAC systems, and other major appliances with more efficient models. • Consider cost of complying with BPS and who would pay for upgrades. • We Need "Blueprint Pathways" to Achieve the Carbon and Energy Targets. A willing building owner should have easy access to an investment strategy to reach compliance.

	Workforce • Workforce development language. • State Registered Apprenticeship programs for all contractors on Rebuild projects (15% -20%?) This will give workers opportunities at good family wage careers & help the skilled trades worker shortage. Metrics for Measurement • Performance at the meter. • Potential metrics for measurement: greenhouse gas emissions reductions, lifecycle cost, and ASHRAE 105 standard for building energy performance and GHG emissions. • Oregon Global Warming Commission process for considering social cost of carbon. • Building Energy Work Group lifecycle analysis tool. Public/Institutional Buildings • Including provisions for campuses (e.g., hospitals) to allow flexibility. • Standards for Public Buildings.
Policy Background	A building performance standard (BPS) establishes specific performance levels that buildings must achieve. BPS policies can be designed to target improvements in a variety of building aspects—including energy use, water use, and emissions. The Environmental Protection Agency (EPA) lays out key policy considerations for designing a BPS[3]: • align and establish goals; • determine covered properties; • consider compliance approaches; • provide support to building owners; and • establish reporting requirements. Although targeting existing construction, BPS programs can influence new construction design because the new structures would eventually be subject to increasingly stringent standards. Some state and local governments have enacted programs to ensure funding is available to building owners to make necessary improvements. According to the EPA, examples of funding sources include: • incentive program offerings from local utilities targeted to covered buildings (an example is Washington's early adopter incentive program); • Property Assessed Clean Energy (PACE) financing; • a green bank, similar to Connecticut's; and • financial instruments that leverage public funding to attract private capital for investments in clean energy projects, which can also be a source of financing for building owners.

[3] Environmental Protection Agency, *Building Performance Standards: Overview for State and Local Decision Makers,* (2021), *available at* <https://www.epa.gov/sites/default/files/2021-02/documents/benchmarking_building_performance_standards_section2.pdf> (last visited June 30, 2022).

Co-Benefits	Economic/Jobs:[4] • The BPS in New York City is estimated to have the potential to create a $20 billion retrofit market and lead to the creation of more than 140,000 jobs by 2030. Air Quality:[5] • Clean energy upgrades can reduce power plant emissions, leading to improvements in outdoor air quality and public health in the surrounding community. • BPSs can also improve the comfort and productivity of building occupants. As building owners seek to manage indoor air quality, high-efficiency HVAC systems with improved controls have become increasingly important.
Examples	Tier 1 of the State Clean Buildings Law (Washington, HB 1257, 2019):[6] • Created performance standards for existing large (over 50,000 square feet) commercial buildings, with some exemptions (e.g., in the manufacturing and industrial sectors) • Tier 1 buildings need to engage in energy management planning, operations and maintenance planning, and benchmarking. • Tier 1 buildings that exceed the target must make improvements to energy usage. • A $75 million incentive fund is available to early adopters. Climate Solutions Now Act of 2022 (Maryland, SB 0528, 2022):[7] • Requires energy efficiency and emissions reductions for certain buildings. • Sets BPSs for buildings over 35,000 square feet. • Reporting of direct emissions from heat begins in 2025. • Covered buildings are required to reduce direct emissions 20% below 2025 by 2030 and achieve net-zero direct emissions by 2040. • Historic properties, public/private elementary or secondary buildings, manufacturing buildings, and agricultural buildings are exempt from the requirements.

[4] U.S. Environmental Protection Agency, *Building Energy Benchmarking and Transparency: Overview for State and Local Decision Makers*, (2021), *available at* < https://www.epa.gov/sites/default/files/2021-02/documents/benchmarking_building_performance_standards_section1.pdf#:~:text=While%20implementing%20a%20benchmarking%20policy%20alone%20does%20not,savings%20and%20increased%20property%20value%20for%20building%20owners> (last visited July 2, 2022).
[5] *Id.*
[6] Emily Salzberg, State of Washington Department of Commerce, *Building Sector Decarbonization in WA*, (2022), *available at* <https://olis.oregonlegislature.gov/liz/2021I1/Downloads/CommitteeMeetingDocument/255665> (last visited June 30, 2022).
[7] Edie Taylor, New Buildings Institute/Rocky Mountain Institute, *Joint Task Force on Resilient Efficient Buildings - Group Presentation no. 2*, (May 31, 2022), <https://olis.oregonlegislature.gov/liz/2021I1/Downloads/CommitteeMeetingDocument/255583> (last visited June 30, 2022).

	New York City's Local Law 97:[8] Establishes BPS that sets greenhouse gas (GHG) emissions caps for the city's largest buildings starting in 2024.
Source Material	Environmental Protection Agency, *Building Performance Standards: Overview for State and Local Decision Makers,* (2021), *available at* <https://www.epa.gov/sites/default/files/2021-02/documents/benchmarking_building_performance_standards_section2.pdf > (last visited June 30, 2022). American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), *Task Force for Building Decarbonization - Building Performance Standards Resources and Publications, (*2021), *available at* <https://www.ashrae.org/file%20library/about/bps-resources-and-publications-for-web-posting---final.pdf> (last visited June 30, 2022). ASHRAE. *Task Force for Building Decarbonization - Building Performance Standards Overview*, (2021), *available at* <https://www.ashrae.org/file%20library/about/building-performance-standards-overview-2021-9-16---staff-review.pdf> (last visited June 30, 2022).

Benchmarking and Disclosure

Building Type	Existing Buildings
Sector	Commercial, Residential, or Public Buildings
Policy Subcategory	Envelope, heating/cooling, renewables, electric, consumer products
Policy Suggestions Submitted by Task Force Members* *these suggestions were provided by members via email, in meetings, from the Jamboard, etc. and have not been verified or analyzed by staff	Disclosure • Require mortgage lenders to provide an energy and climate disclosure form to any borrower. The disclosure form would identify operational cost of energy and its related greenhouse gas (GHG) emissions as an important consideration. The disclosure form would also provide information about the HUD, Fannie Mae and Freddie Mac mortgages that can be used to finance energy and resilience improvements as part of any mortgage origination. • Different forms of disclosure: commercial buildings or larger multifamily buildings typically disclose energy score based off utility bills using EPA system; residential, up to four units, use the U.S. Department of Energy Homes Energy Scoring System; and a different system for new residential buildings. • Understandable measurements for the public. • Limited to obtaining and disclosing at the time of sale. Measurement

[8] *Id.*

	• To ensure emissions benefits are not overstated, use actual use vs. modeled energy use. • Compare savings of electric heat pumps and gas furnaces in cold and peak heating conditions in Portland General Electric (PGE) and PacifiCorp territories instead of modeled assumptions to ensure emissions benefits are realized • Require a source-based evaluation of building energy use: Pursuant to the Taskforce mission, require a source-based evaluation of building energy use when modeling efficiency. Public/Institutional Buildings • Benchmarking state buildings.
Policy Background	Benchmarking and disclosure is a market-based policy tool used to increase building energy performance awareness and transparency. Benchmarking energy use provides a mechanism for measuring how efficiently a building uses energy relative to the same building over time, similar buildings, or modeled simulations built to a certain standard or code. Disclosure to a state or local government is often required to facilitate market transformation by informing prospective purchasers or renters but also to inform policy decisions. This information is often shared at the time of lease or sale or may be maintained in a publicly available online database.[9] Other considerations when designing a benchmarking and disclosure program are the scope and structure of the rating and disclosure policy, the actual mechanism for disclosure, and the implementation schedule.[10] The Institute for Market Transformation reports that more than 35 U.S. jurisdictions have passed some type of benchmarking and disclosure policy.[11] Related Existing Oregon Policy Some Oregon local governments have adopted benchmarking and disclosure policies. The City of Portland Commercial Building Energy Reporting program requires commercial buildings over 20,000 square feet to track and report energy performance annually.[12] Portland, Milwaukie, and Hillsboro all require sellers of most single-family homes to obtain and disclose a home energy score at the time of sale. The Oregon Department of Energy has developed a voluntary home energy scoring system.

[9] U.S. Department of Energy, *State and Local Energy Benchmarking and Disclosure Policy,* <https://www.energy.gov/eere/slsc/state-and-local-energy-benchmarking-and-disclosure-policy> (last visited July 1, 2022).
[10] Institute for Market Transformation and Local Governments for Sustainability, *Commercial Energy Policy Toolkit – Fact Sheet for Local Governments—Benchmarking & Disclosure*, <https://www.imt.org/wp-content/uploads/2018/02/Commercial_Energy_Policy_Fact_Sheet_-_Benchmarking__Disclosure.pdf> (last visited July 1, 2022).
[11] Institute for Market Transformation and Local Government for Sustainability, *Building Performance Policy Center*, <https://www.imt.org/public-policy/building-performance-policy-center/> (last visited 7/2/2022)
[12] City of Portland, *Commercial Building Energy Reporting*, <https://www.portland.gov/bps/climate-action/energy-reporting> (last visited July 1, 2022).

Co-Benefits	Energy Savings/Jobs:
	• According to the EPA, buildings that are consistently benchmarked achieved an average annual energy savings of 2.4 percent.[13]
	• An evaluation of the New York City program showed that:[14]
	  • New York City saw cumulative energy savings of 5.7 percent during the first four years of the policy, from 2010 through 2013. This resulted in total savings of $267,492,147; and
	  • Estimated labor/job increases from benchmarking activities in New York City were: 2010, 13 full-time equivalents (FTE) jobs; 2011, 35 FTE jobs, 2012, 40 FTE jobs, and 2013, 39 FTE jobs.

Examples	In 2022, Washington State enacted Tier 2 of the State Clean Buildings Law, requiring buildings 20 – 50K square feet in size to do benchmarking, energy, and operations planning by 2027. After the Tier 2 buildings have completed the planning process in 2027, the Department of Commerce will make recommendations to the Legislature on whether it should become a performance standard by 2031.[15]
Source Material	Environmental Protection Agency, *Building Energy Benchmarking and Transparency: Overview for State and Local Decision Makers*, (2021), *available at* <https://www.epa.gov/sites/default/files/2021-02/documents/benchmarking_building_performance_standards_section1.pdf#:~:text=While%20implementing%20a%20benchmarking%20policy%20alone%20does%20not,savings%20and%20increased%20property%20value%20for%20building%20owners> (last visited July 2, 2022). U.S. Department of Energy, *State and Local Energy Benchmarking and Disclosure Policy*, <https://www.energy.gov/eere/slsc/state-and-local-energy-benchmarking-and-disclosure-policy> (last visited July 2, 2022). Institute for Market Transformation and Local Government for Sustainability, *Commercial Energy Policy Toolkit – Fact Sheet for Local Governments-Benchmarking & Disclosure*,<https://www.imt.org/wp-content/uploads/2018/02/Commercial_Energy_Policy_Fact_Sheet_-_Benchmarking__Disclosure.pdf> (last visited July 1, 2022). City of Portland, *Commercial Building Energy Reporting*, <https://www.portland.gov/bps/climate-action/energy-reporting> (last visited July 1, 2022).

[13] U.S. Environmental Protection Agency, *Building Energy Benchmarking and Transparency: Overview for State and Local Decision Makers*, (2021), *available at* <https://www.epa.gov/sites/default/files/2021-02/documents/benchmarking_building_performance_standards_section1.pdf#:~:text=While%20implementing%20a%20benchmarking%20policy%20alone%20does%20not,savings%20and%20increased%20property%20value%20for%20building%20owners> (last visited 7/2/2022).
[14] U.S. Department of Energy, *New York City Benchmarking and Transparency Policy Impact Evaluation Report*, (2015), *available at* < https://www.energy.gov/eere/slsc/downloads/new-york-city-benchmarking-and-transparency-policy-impact-evaluation-report> (last visited 7/2/2022)
[15] Emily Salzberg, State of Washington Department of Commerce, *Building Sector Decarbonization in WA*, (May 2022), *available at* <https://olis.oregonlegislature.gov/liz/2021I1/Downloads/CommitteeMeetingDocument/255665>, (last visited June 30, 2022).

Modify Energy Trust of Oregon's Metrics and Operations

Building Type	New or Existing Buildings
Sector	Commercial, Residential, or Public Buildings
Policy Subcategory	Envelope, heating/cooling, renewables, electric, consumer products
Policy Suggestions Submitted by Task Force Members* *these suggestions were provided by members via email, in meetings, from the Jamboard, etc. and have not been verified or analyzed by staff	Metrics • Change Energy Trust of Oregon's (ETO) mission to lead with greenhouse gas (GHG) emissions reductions and equity instead of leading with fuel-neutral energy efficiency. • Need to make changes to performance-based standards and ETO's mission so they are standardized and simplified. • Direct the PUC to consider GHG reduction in Energy Trust/utility conservation programs. Program Operations • Remove barriers to customer choice through ETO funds and other programs that provide efficiency incentives to replace bulk fuels with a more efficient electric system (rather than a forced switch). Coverage • ETO programs should be made available statewide.
Policy Background	The Energy Trust of Oregon's (ETO) mission is to help utility partners and their customers acquire cost-effective energy efficiency and install small-scale renewable energy projects.[16] ETO's funding is largely derived from Oregon utility customers of Portland General Electric, Pacific Power, NW Natural, Cascade Natural Gas, and Avista. The Oregon Public Utility Commission (PUC) annually sets funding levels for cost-effective energy efficiency through the standard PUC rate-making process. Funding for the installation of renewable energy and distribution system-connected technologies is a set percentage of the state's public purpose charge. ORS Chapter 757 is the primary chapter that governs the funds Energy Trust can invest on behalf of investor-owned utility customers.[17] The ETO estimates that, since 2002, their investments have generated 1,006 average megawatts of electricity and saved 87 million therms of natural gas, avoiding 22.3 million tons of carbon dioxide emissions. Although greenhouse gas emission reductions are not among the ETO's PUC performance metrics, they do estimate and annually report emission reductions to the PUC.[18]

[16] Hannah Cruz, Senior Stakeholder Relations and Policy Manager, Energy Trust of Oregon presentation to the task force on May 3, 2022.
[17] Email from Hannah Cruz, Senior Stakeholder Relations and Policy Manager, Energy Trust of Oregon, to Beth Reiley, Legislative Policy and Research Office (July 7, 2022, 4:43 PM) (on file with Legislative Policy and Research Office).
[18] *Id.*

Co-Benefits	Co-benefits will vary based on how the metric is included with existing requirements.
Examples	
Source Material	Energy Trust of Oregon, *About Us*, <https://www.energytrust.org/about/> (last visited July 1, 2022).

Building Electrification Study

Building Type	New or Existing Buildings
Sector	Commercial, Residential, or Public Buildings
Policy subcategory	Renewables; electricity
Policy Suggestions Submitted by Task Force Members* *these suggestions were provided by members via email, in meetings, from the Jamboard, etc. and have not been verified or analyzed by staff	• Maryland required Public Service Commission and Building Codes Administration to study and make recommendations on the electrification of buildings.
Policy Background	Building electrification, where fossil fuel–based energy systems are replaced by electricity generated by renewable and nonrenewable energy sources, has been found by some states to be the lowest-cost and primary building decarbonization strategy.[19] Studying various pathways to achieve building electrification in different timeframes can demonstrate what is feasible in terms of cost, resources, and technological innovation, among other factors.
Co-Benefits	Co-benefits will vary based on the policy options chosen from the results of a building electrification study.
Examples	Maryland Department of the Environment and the Maryland Commission on Climate Change initiated a study[20] to investigate opportunities for building decarbonization. The study looked at three scenarios for decarbonizing

[19] Washington Department of Commerce, *2021 State Energy Strategy*. <https://www.commerce.wa.gov/growing-the-economy/energy/2021-state-energy-strategy/> (last viewed July 5, 2022).
[20] Energy + Environmental Economics. *Maryland Building Decarbonization Study,* (2021), *available at* <https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/MWG_Buildings%20Ad%20Hoc%20Group/E3%20Maryland%20Building%20Decarbonization%20Study%20-%20Final%20Report.pdf> (last viewed on July 5, 2022).

	buildings: high electrification, electrification with fuel back up, and high decarbonized methane. It also considered retrofitting existing buildings as well as electrifying all new buildings.
Source Material	Maryland Building Decarbonization Study

Align Energy Efficiency Programs with State's Climate Goals

Building Type	New or Existing Buildings
Sector	Commercial, Residential, and Public Buildings
Policy subcategory	Envelope, heating/cooling, renewables, electric, consumer products
Policy Suggestions Submitted by Task Force Members* *these suggestions were provided by members via email, in meetings, from the Jamboard, etc. and have not been verified or analyzed by staff	Legislative Executive Order 20-04 • Legislate the executive order. • Legislate the energy use targets in code that are in the Executive Order 20-04. • Language would need to be crafted carefully to avoid unintended consequences.
Policy Background	In 2020, Governor Brown issued Executive Order 20-04 which directed state agencies to take certain actions to reduce and regulate GHG emissions. The policy proposal would be to enact the energy use targets in EO 20-04 in statute. The Executive Order "establishes science-based GHG emissions reduction goals and calls for the State of Oregon to reduce its GHG emissions (1) at least 45 percent below 1990 emissions levels by 2035; and (2) at least 80 percent below 1990 emissions levels by 2050." In addition, the Executive Order directs state agencies to take certain actions.
Co-Benefits	Statutory consistency with the Executive Order 20-04.
Examples	
Source Material	Executive Order 20-04 eo-energy-20-04.pdf (oregon.gov)

Further Enhance the Efficiency of Appliances and Equipment

Building Type	New or Existing Buildings
Sector	Commercial and Residential Buildings

Policy subcategory	Consumer products
Policy Suggestions Submitted by Task Force Members* *these suggestions were provided by members via email, in meetings, from the Jamboard, etc. and have not been verified or analyzed by staff	Replace Inefficient Systems • Electric baseboard heating in new and existing building stock. It continues to be the primary source of electric heating, primarily in lower-income houses, and has twice the emissions and operation cost. Natural Replacement and Retrofits • Looking at older homes- over the next 20 years, everyone will have to put in a new heating system because they don't last longer than that. The people who build those new systems (and markets) to incentivize lower carbon models to replace old ones after their natural lifespan. • Increase the energy efficiency of existing buildings through retrofits. • Look at appliance standards in the context of natural replacements. Without any additional incentives this could help change in the background the makeup of energy using appliances. • Reduce the amount of household income that goes toward energy costs in Oregon lends itself to specifically looking at older homes. New construction shouldn't be the focus. Specific Standards • Create a Zero NOx Appliance Standard. • Allow federal standards to regulate appliances. • Use data systems to use energy more efficiently in public buildings, similar to modeling done by Alajmi et al., 2020.
Policy Background	The Northwest Power and Conservation Council estimates that the cumulative energy generated through energy efficiency and improvements since 1978 is enough to meet the energy needs of approximately 5.1 million homes in the Northwest. Oregon has designated several programs to encourage energy efficiency and conservation. **Related existing Oregon policy: Energy efficiency standards** The state appliance efficiency standards program, established in 2005, is intended to increase energy efficiency in commercial appliances. The enabling legislation in 2013 established minimum energy efficiency standards for televisions, large battery charger systems, inductive charger systems, certain small battery charger systems, and high light output double-ended quartz halogen lamps. Since 2013, additional appliance standards have been enacted for twelve products, including ten new standards and two updates to existing standards. The 2020 Governor's Executive Order (No. 20-04) further establishes appliance standards to meet GHG reduction goals. The Oregon Department of Energy coordinates with partners to review the minimum state energy efficiency standards and evaluate opportunities to update existing standards or adopt new standards to promote energy conservation in Oregon and achieve cost effectiveness for consumers.

	Oregon Heat Pump Deployment Program and Fund Senate Bill 1536 (2022) established the Heat Pump Deployment Program and Fund in the Oregon Department of Energy (ODOE) to provide grants to entities to support the purchase and installation of heat pumps and related upgrades; $10 million was appropriated to the Fund. The target populations of the heat pump program are environmental justice communities, individuals who rely on bulk fuels or electric resistance heating, and homes that lack functioning heating or cooling devices. **Portland State University Energy Performance Analysis** Researchers from Portland State University studied how to convert conventional buildings to net-zero-energy buildings using **energy performance analysis**.[21] Their findings show that "existing buildings can be converted to NZEBs [net-zero-energy buildings] by implementing EESs [energy efficiency strategies] in those buildings" and installing solar panels to generate on-site power.[22] The report authors recommend Pacific Northwest states focus on converting existing mid-size office buildings to net-zero-energy buildings using their findings.[23]
Co-Benefits	Economic: • Residential customers may save money by reducing their energy and water use.[24] Energy affordability also helps relieve stress and improve mental well-being.[25] Energy providers receive direct benefits through "avoided costs for energy generation, transmission and distribution (T&D) capacity, and line losses."[26] Health: • Potentially reduce respiratory disease symptoms from improved indoor and outdoor air quality.[27]
Examples	**California NOx regulations[28]:** The Bay Area Air Quality Management District, which regulates "stationary sources of air pollution in the nine counties that surround San Francisco Bay" in California, is currently amending Regulation 9, Rules 4 and 6, to reduce emissions of nitrogen oxides from residential and commercial furnaces and water heaters in buildings in the Bay Area.

[21] Alajmi, A., Short, A., Ferguson, J. et al., *Detailed energy efficiency strategies for converting an existing office building to NZEB: a case study in the Pacific Northwest,* 13 EE 1089, (1089–1104) (2020) (overview of building energy analyses), *available at* <https://doi.org/10.1007/s12053-020-09861-9> (last visited June 28, 2022).
[22] *Id.*
[23] *Id.*
[24] Oregon Department of Energy, *Energy Efficiency Standards: Appliances and Other Products,* <https://www.oregon.gov/energy/energy-oregon/Pages/Appliance-Standards.aspx> (last visited July 5, 2022).
[25] International Energy Agency, *Capturing the Multiple Benefits of Energy Efficiency*, (2014), *available at* <https://iea.blob.core.windows.net/assets/28f84ed8-4101-4e95-ae51-9536b6436f14/Multiple_Benefits_of_Energy_Efficiency-148x199.pdf> (last visited July 5, 2022).
[26] *Id.*
[27] *Id.*
[28] Bay Area Air Quality Management District, *Rules 9-4 and 9-6 Building Appliances,* <https://www.baaqmd.gov/rules-and-compliance/rule-development/building-appliances> (last visited June 28, 2022).

	• Regulation 9, Rule 4 limits emissions of nitrogen oxides from natural gas-fired fan-type residential central furnaces. • Regulation 9, Rule 6 limits the emissions of nitrogen oxides from natural gas-fired water heaters and boilers. These rules are being amended in 2022 to require zero-NOx emissions from residential and commercial space and water heaters.
Source Material	Alajmi, A., Short, A., Ferguson, J. et al., *Detailed energy efficiency strategies for converting an existing office building to NZEB: a case study in the Pacific Northwest,* 13 EE 1089, (1089–1104) (2020) (overview of building energy analyses), *available at* <https://doi.org/10.1007/s12053-020-09861-9> (last visited June 28, 2022). Bay Area Air Quality Management District, *Rules 9-4 and 9-6 Building Appliances*, <https://www.baaqmd.gov/rules-and-compliance/rule-development/building-appliances> (last visited June 28, 2022). International Energy Agency, *Capturing the Multiple Benefits of Energy Efficiency*, (2014), *available at* <https://iea.blob.core.windows.net/assets/28f84ed8-4101-4e95-ae51-9536b6436f14/Multiple_Benefits_of_Energy_Efficiency-148x199.pdf> (last visited July 5, 2022). Oregon Department of Energy, *Energy Efficiency Standards: Appliances and Other Products*, <https://www.oregon.gov/energy/energy-oregon/Pages/Appliance-Standards.aspx> (last visited July 5, 2022).

Advanced Metering Infrastructure (AMI)

Building Type	New or Existing Buildings
Sector	Commercial, Residential, or Public Buildings
Policy subcategory	Envelope, heating/cooling, renewables, electric, consumer products
Policy Suggestions Submitted by Task Force Members* *these suggestions were provided by members via email, in meetings, from the Jamboard, etc. and have not been verified or analyzed by staff	Technology • Follow California's lead on adopting smart appliance standards which require all new appliances to be smart-enabled in order to take advantage of time-of-use rates and programs from utilities. • Create a "smart appliance" standard. • Use technology to manage consumption. • Utilizing technology to drive energy efficiency savings. • Use data systems to use energy more efficiently in public buildings. • Follow California's recently launched "Market Access program." This program targets a statewide peak period energy shortfall and encourages businesses to bring any non-emitting project that can save energy during that peak. The Commission streamlined the

	contracting process and removed red tape to speed-up the process for getting projects approved. Performance for these projects is measured at the meter based on the actual results achieved; since this assures that ratepayers only pay for actual savings, cost-effectiveness was entirely waived. Data • Follow California's lead on creating an online database of all time-of-use rates and time-of-use carbon emission factors so that 3rd-party vendors can help utilities and ratepayers make better decisions. • Collect data and put in a public place so people or third parties can create something for utilities to use. • Shape building energy loads to better align with grid needs. Consumer Choice • Focusing on the energy performance of a building at the meter allows businesses and building owners to consider how best to align with grid needs and potential grid price signals through the mix of tools available to them: energy efficiency, demand response, onsite renewable generation, distributed battery storage etc. Applicable Entity • Develop strategies for institutional application of AMI (e.g., on college campuses) and possibly provide funding for a pilot program. • Smart-grid ready appliances and smart meters for the utilities would be good.
Policy Background	Advanced Metering Infrastructure (AMI) creates communication channels between utilities and customers by integrating smart meters, data management systems, and communication networks. The National Energy Technology Laboratory for the U.S. Department of Energy suggests that, "Through the integration of multiple technologies (such as smart metering, home area networks, integrated communications, data management applications, and standardized software interfaces) with existing utility operations and asset management processes, AMI provides an essential link between the grid, consumers and their loads, and generation and storage resources."[29] Residential or commercial customers can voluntarily enroll in a demand-response program to adjust their energy usage with, for example, smart thermostats or water heaters, to avoid peak usage periods and increase efficiencies. In Oregon, ODOE established a demand-response ready requirement for electric storage water heaters as a product standard, first in rule (OAR 330-092-0020(16) in 2020) and then in statute through House Bill 2062 (2021) to extend the requirement. All water heaters manufactured after the effective date will need to meet the standard in order to be sold in Oregon.

[29] National Energy Technology Laboratory for the U.S. Department of Energy, *Advanced Metering Infrastructure*, (2008), <https://netl.doe.gov/sites/default/files/Smartgrid/AMI-White-paper-final-021108--2--APPROVED_2008_02_12.pdf> (last visited on June 29, 2022).

	Time-of-use (TOU) rates help align the costs of electricity supply and demand by pricing electricity differently by the time of day and alerting consumers to those costs. Consumers benefit by adjusting their electricity consumption voluntarily to save money. There are two types of TOU rates[30]: static, where rates are determined in advance, or dynamic, where the rates are determined in real time based on the actual system conditions. Advanced metering infrastructure is necessary for time-based rate programs.
Co-Benefits	Economic: • AMI and time-of-use rates may reduce operating costs for utilities and customers[31, 32] Resiliency: • AMI may support grid modernization.[33]
Examples	**California — advance metering infrastructure and time-of-use rates:** After a three-year study of proposed rate reforms for the three major investor-owned utilities, California invested in advance metering infrastructure to promote energy efficiency and conservation. The utilities will be able to allocate costs more accurately and set energy rates that align with the cost of service.[34] **Washington — demand-response water heater standard:** In 2020, the state of Washington created a demand-response ready requirement for electric storage water heaters as a product standard, which went into effect on January 1, 2022 (WAC 194-24-180).
Source Material	International Renewable Energy Agency (IRENA), *Innovation Landscape Brief: Time-of-Use Tariffs,* (2019), *available at* <https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Feb/IRENA_Innovation_ToU_tariffs_2019.pdf?la=en&hash=36658ADA8AA98677888DB2C184D1EE6A048C7470> (last visited July 5, 2022).

[30] International Renewable Energy Agency, *Innovation landscape brief: Time-of-use tariffs*, (2019), *available at* <https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Feb/IRENA_Innovation_ToU_tariffs_2019.pdf?la=en&hash=36658ADA8AA98677888DB2C184D1EE6A048C7470> (last visited on July 5, 2022).
[31] National Energy Technology Laboratory for the U.S. Department of Energy, *Advanced Metering Infrastructure,* (2008), *available at* <https://netl.doe.gov/sites/default/files/Smartgrid/AMI-White-paper-final-021108--2--APPROVED_2008_02_12.pdf> (last visited June 29, 2022).
[32] Ramdas, Ashwin, Kevin McCabe, Paritosh Das, and Benjamin Sigrin. *California Time-of-Use (TOU) Transition: Effects on Distributed Wind and Solar Economic Potential: NREL/TP-6A20-73147*, *available at* <https://www.nrel.gov/docs/fy19osti/73147> (last visited June 27, 2022).
[33] National Energy Technology Laboratory for the U.S. Department of Energy, *Advanced Metering Infrastructure*, (2008), *available at* <https://netl.doe.gov/sites/default/files/Smartgrid/AMI-White-paper-final-021108--2--APPROVED_2008_02_12.pdf> (last visited June 29, 2022).
[34] Ramdas, Ashwin, Kevin McCabe, Paritosh Das, and Benjamin Sigrin, *California Time-of-Use (TOU) Transition: Effects on Distributed Wind and Solar Economic Potential* (2019). Golden, CO: National Renewable Energy Laboratory, NREL/TP-6A20-73147. <https://www.nrel.gov/docs/fy19osti/73147> (last visited June 27, 2022).

	National Energy Technology Laboratory for the U.S. Department of Energy, *Advanced Metering Infrastructure*, (2008), *available at* <https://netl.doe.gov/sites/default/files/Smartgrid/AMI-White-paper-final-021108--2--APPROVED_2008_02_12.pdf> (last visited June 29, 2022). Public Utilities Commission of the State of California, *Decision on Residential Rate Reform for Pacific Gas and Electric Company, Southern California Edison Company, And San Diego Gas & Electric Company and Transition to Time-of-use Rates,* (2015), *available at* <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M153/K110/153110321.PDF> (last visited June 28, 2022). Ramdas, Ashwin, Kevin McCabe, Paritosh Das, and Benjamin Sigrin, *California Time-of-Use (TOU) Transition: Effects on Distributed Wind and Solar Economic Potential, Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-73147*, (2019), *available at* <https://www.nrel.gov/docs/fy19osti/73147.pdf> (last visited June 27, 2022).

Evaluate Hybrid Natural Gas and Electric Energy System (Previously Titled "Hybrid vs. All-Electric Model")

Building Type	New or Existing Buildings
Sector	Commercial, Residential, or Public Buildings
Policy Subcategory	Heating/cooling, electric, consumer products
Policy Suggestions Submitted by Task Force Members* *these suggestions were provided by members via email, in meetings, from the Jamboard, etc. and have not been verified or analyzed by staff	Energy System Type • Compare Hybrid Model to All-Electric Model similar to Énergir and Hydro-Québec's hybrid rate/tariff gas electric approach to decarbonizing buildings. • Look at hybrid model verses and all-electric model. • Look into the hybrid heating systems, this provides a redundant energy options & uses the best option for the conditions. Metrics/Analysis • Consider benefit of the compounding effect of emissions saved today for hybrid heating. Fuel Type • Promote clean hydrogen projects to mix w/ natural gas. • Gas generators are resiliency back-up (appliances that work in an outage).
Policy Background	Electrifying buildings fueled by fossil fuels can reduce their greenhouse gas emissions. In dual-energy, or hybrid, systems, fossil fuel (e.g., natural gas) is replaced with electricity, but can still be relied on during periods of very cold weather or when there are peak demands on the electric systems.
Co-Benefits	Economic:

	• Making buildings more energy efficient through the replacement of natural gas-powered energy systems with hydro-powered electricity in buildings will potentially reduce costs for consumers.[35] Resiliency: • Producing green hydrogen and bioenergy that can become part of the electrical grid may help cities or states become less reliant on imported fossil fuels and diversify its fuel sources.[36]
Examples	Hybrid-fuel system in Québec, Canada[37]: Québec, Canada's two main energy distributors, Hydro-Québec and Énergir, are working together to meet the goal of reducing building heating GHGs by 50% by 2030. The partnership is using a hybrid-fuel model to phase out the use of natural gas and replace it with electricity (sourced from renewable hydropower) and other renewable energy over time.
Source Material	Government of Québec, *2030 Plan for a Green Economy,* (2020). *available at* <https://cdn-contenu.quebec.ca/cdn-contenu/adm/min/environnement/publications-adm/plan-economie-verte/plan-economie-verte-2030-en.pdf?1635262991> (last visited June 27, 2022).

Enact Residential or Expand Commercial PACE Financing

Building Type	New or Existing Buildings
Sector	Commercial or Residential Buildings
Policy subcategory	Envelope, renewables, appliances, heating/cooling, hot water, electric
Policy Suggestions Submitted by Task Force Members* *these suggestions were provided by members via email, in meetings, from the Jamboard, etc. and have not been verified or analyzed by staff	Residential • Enact residential PACE financing. Commercial • Support expansion of commercial PACE or other "green" financing.

[35] Government of Québec, *2030 Plan for a Green Economy: Framework policy on electrification and the fight against climate change*, (2020), *available at*: https://cdn-contenu.quebec.ca/cdn-contenu/adm/min/environnement/publications-adm/plan-economie-verte/plan-economie-verte-2030-en.pdf?1635262991 (last viewed June 27, 2022).
[36] *Id.*
[37] *Id.*

Policy Background	Property assessed clean energy (PACE) is a financing model implemented at the city or county level. In this model, the city or county creates a type of land-secured financing district (or similar municipal bond mechanism) that is repaid through a property owner's tax bill. Energy or eligible projects are funded through the financing program for both commercial and residential properties (C-PACE and R-PACE respectively). The unique aspect of this type of financing is that the assessments are attached to the property rather than the individual so the debt of improvement may transfer with property ownership. This addresses a key area of concern for property owners when they are uncertain whether they will stay in the property long enough for the improvements to pay off. Potential additional benefits are: • The longer timeline of financing with no upfront payment allows more projects to become cash-flow positive. • The debt will not stop the ability to refinance or sell. • The debt may be a deduction from income tax liability. • Energy efficiency or renewable potential without putting general funds at risk. • Taps into large sources of private capital. Potential drawbacks are: • Only available to property owners. • Portable efficiency improvements are not eligible. • Local government staff time and high legal and setup costs. • Only for investments over $2,500. • If the property goes into foreclosure, the property may be subordinated to the unpaid debt. **Related existing Oregon policy** Oregon has enacted commercial PACE authorization, but local governments must separately authorize the program for use in their area for commercial use. PropertyFit is a commercial PACE program in Multnomah County. Funded projects combine seismic resiliency with energy efficiency upgrades, renewable energy, and water conservation. Residential PACE has not yet been enacted in the state.
Co-Benefits	• Increase condition/value of the building stock. • Increase in resilience if coupled with protections against extreme weather or disasters; landscaping for solar gain, shading, and natural ventilation; and/or incorporation of sustainability measures such as selection of building materials or water conservation measures.[38] • May be used for health-related improvements such as HVAC and indoor air quality.

[38] United Nations Environment Programme (UNEP), *A Practical Guide to Climate-Resilient Buildings & Communities,* 70-78, (2021), *available at* <https://wedocs.unep.org/xmlui/bitstream/handle/20.500.11822/36405/Adapbuild.pdf> (last visited July 1, 2022).

Examples	California, Florida, and Missouri have enabling legislation and municipalities that sponsor programs. Residential PACE projects may include the replacement of failing heating and cooling systems and water heaters; air and insulation; ENERGY STAR appliance; and water conservation and resiliency measures (such as seismic retrofits and wind hazard protection).
Source Material	Office of Energy Efficiency & Renewable Energy, *Property Assessed Clean Energy* Programs, <https://www.energy.gov/eere/slsc/property-assessed-clean-energy-programs> (last visited June 29, 2022). Office of Energy Efficiency & Renewable Energy, *Commercial Property Assessed Clean Energy (C-PACE): A Fact Sheet for State and Local Governments* 1-2, <https://www.energy.gov/sites/prod/files/2017/10/f39/FL1710_WIP_CPACEv2.PDF> last visited June 29, 2022).

Promote, Incentivize, and/or Subsidize Heat Pumps

Building Type	New or Existing Buildings
Sector	Commercial or Residential Buildings
Policy subcategory	Heating/cooling, hot water
Policy Suggestions Submitted by Task Force Members* *these suggestions were provided by members via email, in meetings, from the Jamboard, etc. and have not been verified or analyzed by staff	Incentive/Subsidy Programs • High-efficiency heat pump and water heater incentive programs. • Vast expansion of efficient heat pump incentives. • Allow the incentive to be acquired even if the heat pump water heater is replacing a combustion unit. • Eliminate barriers to customer choice in all agency incentive programs. • Subsidize high-efficiency heat pumps for cost-effective heating and cooling for previously underserved communities. • Incentivize window-unit heat pumps. • Incentivize heat pump water heaters. Resilience • The cooling availability will also represent a resiliency strategy regarding dealing with increased heat and smoke. Coupled Policies • Pair these [heat pump incentives] with efficiency/weatherization programs so that upgrades to existing homes can happen all at once (which will save money). Pricing by Metrics • Provide incentives for heat pump water heaters to make the first cost equivalent to resistance units.

	Policy Goal • Provide a numerical goal for a specific number of heat pumps by a certain time. Hybrid • Plan for incentives for gas heat pumps for space and water heating in new and existing buildings, especially for retrofitting existing gas equipment—allowing a leap from federal minimum efficiency to industry maximum efficiency. • Incentivize hybrid gas heat pumps. Energy Recovery • Provide a fund or incentives for heat-recovery ventilation, especially for ductless heat pump systems that don't offer ventilation as a product feature.
Policy Background	Like refrigeration, heat pumps use electricity to transfer heat, cool, or warm a space depending on the season. Types of heat pumps include air-to-air, water source, and geothermal. Because they transfer heat rather than generate heat, heat pumps are efficient. Although most heat pumps have resistance heaters as backup for extreme cold, hybrid heat pump systems may be combined with a gas furnace. **Related existing Oregon policy** In 2022, the Oregon Legislature passed SB 1536 which is focused on cooling systems. This bill: • establishes the Heat Pump Deployment Program to provide grants to support the purchase and installation of heat pumps; • establishes an advisory council, Heat Pump Deployment Fund, and Residential Heat Pump Fund; and • authorizes ODOE to make available rental housing grants for upgrades to support rebates for heat pump purchases and installations. Grants are provided to assist landlords with creating or operating community cooling centers, which may include ground-source or air-source heat pumps. The bill sunsets funds and programs on January 2, 2025.
Co-Benefits	Resilience and equity • Extreme weather events and wildfires have a disproportionate impact on low-income communities.[39] Heat pumps may increase energy efficiency and reduce the economic impacts of weather events. Energy and economic savings: • Ductless heat pumps and heat pump water heaters reduce heating and cooling or water heating energy use by 50 percent compared to

[39] U.S. Environmental Protection Agency, *Climate Change and Social Vulnerability in the United States,* 4-8, (2021) *available at* <https://www.epa.gov/system/files/documents/2021-09/climate-vulnerability_september-2021_508.pdf> (last visited June 28, 2022).

	electric heating resistance such as furnaces and baseboard heaters.[40] Air quality improvements: • Widespread replacement of gas boilers with air/water heat pumps is projected to reduce primary energy requirements, decrease CO_2 production, and reduce air pollutants.[41]
Examples	Colorado, SB22-051, 2022 created a 10% tax credit and state sales tax exemption for heat pump systems including ground-source, air-source, and water-source heat pumps as well as refrigerant flow heat pump systems and commercial heat pump water heaters. Features of the bill include: • Exemption from state sales and use tax on all sales, storage, and use of heat pump systems, heat pump water heaters, or energy storage systems that are used in commercial or residential buildings. • Investor-owned gas utilities may apply to the Public Utilities Commission for approval to measure the amount of use for billing purposes in either fuel commodity units or for energy services provided which may reduce the need for a yearly base rate adjustment and promote cash flow. • Sales and use tax exemptions for qualifying building materials (see *Promote Building Materials*).
Source Material	Office of Energy Efficiency & Renewable Energy, *Heat Pump Systems*, *available at* <https://www.energy.gov/energysaver/heat-pump-systems> (last visited June 28, 2022).

Promote, Incentivize, and/or Subsidize Energy Efficiency and Heating/Cooling Efficiency Increases

Clarification resulting from Task Force discussion: This section addresses heating and cooling energy efficiency/conservation increases rather than programs specifically targeting heat pumps.

Building Type	Existing Buildings
Sector	Commercial, Residential, or Public Buildings
Policy Subcategory	Heating/cooling, envelope
Policy Suggestions	Incentives • Provide incentives for high-efficiency cooling units for renters.

[40] U.S. Department of Energy (DOE), *Heat Pump Systems*, <https://www.energy.gov/energysaver/heat-pump-systems> (last visited June 29, 2022).
[41] Alberta Carella & Annunziata D'Orazio, *The Heat Pumps for Better Urban Air Quality*, 75 SCS, (2021) (replacement scenarios for heat pumps) *available at* <*https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8445611/*> *(last visited July 5, 2022).*

Submitted by Task Force Members* *these suggestions were provided by members via email, in meetings, from the Jamboard, etc. and have not been verified or analyzed by staff	• Incentivize replacement of 80% furnaces with 95% furnaces (which are equivalent to a 9.5HSPF or 278% efficient heat pump) in existing buildings. • Incentivize bundling of upgrades to high-efficiency furnaces and water heaters together in existing buildings. • Fund masonry, site-built woodburning fireplace changeout to lower emissions and improve air quality. • Create an energy efficiency resiliency fund. • Incentivize program to replace oil space heat in the moderate- to low-income and rental markets. Accessibility • Develop a fund and a program to replace electric resistance heating targeting low-income households. • Eliminate barriers to customer choice in all agency incentive programs. • Provide free window and door weatherization kits to low-income communities. • Target heating and cooling energy efficiency in manufactured housing Limit Minimum Efficiency • Make sure no new gas furnaces below 94 or 96% efficiency are installed or at least that they aren't inefficient. Prioritization/Focus • Prioritize repairs and upgrades with the greatest carbon reduction ROI. • Prioritize those repairs or upgrades that last the life of the building vs. heating or water heating equipment that has a much shorter end of life. • Incentivize and subsidize energy efficiencies in existing buildings built before 2010. • Reducing use of electric resistance heating. • Electric baseboard heating in new and existing building stock. It continues to be the primary source of electric heating, primarily in lower-income houses, and has twice the emissions and operation cost. • Focus on weatherization of existing homes. • Use the existing supply chain/contractor knowledge on existing-home weatherization. Educational Program • Public service announcement program to 'turn it off'. The only better option to greening of our electricity needs is to not use the electrons in the first place. Hybrid with Energy Recovery

	• Support use of water heaters that burn natural gas or propane as an electric generator and reclaims the heat to make the hot water. Puts the energy back into the grid or wall. Consumer Choice • Allow for efficiency dollars to be spent on high-efficiency electric appliances so customers aren't forced to keep fossil fuel appliances. Metrics/Analysis • Consider the whole system for carbon and efficiency including source use when making comparisons. • Consider from the energy system point-of-view on a longer timeline (20 years). • Standardize accurate data collection on grid impact at the utility level.
Policy Background	Space heating, space cooling, and water heating are some of the largest energy expenses in a building (also see *Promote heat pumps*). Energy-efficient installations for existing buildings may include weatherization and energy efficiency upgrades and retrofits. There is a wide range of strategies, in addition to a selection of home heating and cooling systems, that address space heating and cooling including programmable thermostats, air sealing, equipment maintenance, minimizing duct losses, installation of energy-efficient windows and doors, daylighting, shading, and ventilation.
Co-Benefits	Energy peak demands • Energy efficiency reduces winter and summer peak demands as well as increases reliability during times of stress on electric systems.[42] Costs • Incorporating energy efficiency may cost less than electricity generation and is an environmentally benign resource.[43] Greenhouse Gas Mitigation • A shift to energy-efficient, climate-friendly air conditioning units may result in significant mitigation of greenhouse gas emissions, especially as the expected number of air conditioners is predicted to significantly increase by mid-century.[44]

[42] Oregon Department of Energy, *Biennial Energy Report: Energy Efficiency*, (2018) 3, *available at* <https://www.oregon.gov/energy/Data-and-Reports/Documents/BER-Chapter-6-Energy-Efficiency.pdf> (last viewed June 27, 2022).
[43] *Id*, at 2.
[44] International Energy Agency (IEA), *Climate-friendly Cooling Could Cut Years of Greenhouse Gas Emissions and Save Trillions of Dollars*, <https://www.iea.org/news/climate-friendly-cooling-could-cut-years-of-greenhouse-gas-emissions-and-save-trillions-of-dollars> (last viewed June 27, 2022).

Examples	Colorado, SB22-051, 2022 created a 10% tax credit and state sales tax exemption for heat pump systems (see *Promote heat pumps* above for details). Energy Smart Colorado provides residential rebates on energy-saving appliances, renewable installs, hot water heater heat pumps, heating and cooling, window blinds, radon mitigation, insulation, and air sealing. Washington Weatherization programs –The federal government and Washington State offer weatherization programs for qualified low-income households. The Department of Commerce contracts local agencies to the work in existing homes and apartments. Community Energy Efficiency Program (CEEP) – CEEP was created by the Washington State Legislature in 2009 to assist with residential energy efficiency upgrades and retrofits. The program focuses on households and businesses that existing energy efficiency enhancement programs have had a harder time serving. These include low to moderate-income households, rental housing, manufactured housing, homes heated with oil/propane/wood, and small businesses. The community-based programs are managed by the Washington State University Energy Program. The project costs of hiring qualified contractors are shared by CEEP and public utilities, planned unit developments, or cities.
Source Material	Office of Energy Efficiency & Renewable Energy, *Energy Saver*, *available at* < https://www.energy.gov/energysaver/energy-saver > (last viewed June 28, 2022). Energy Smart Colorado, *Save Energy with Energy Smart Colorado*, *available at* https://www.energysmartcolorado.com/ (last viewed July 6, 2022).

Promote, Incentivize, and/or Subsidize Air Purification Systems

Building Type	New or Existing Buildings
Sector	Commercial, Residential, or Public Buildings
Policy subcategory	Heating/cooling, envelope
Policy Suggestions Submitted by Task Force Members* *these suggestions were provided by members via email, in meetings, from	Incentives • Promote, incentivize, and/or subsidize air purification systems. • Use only approved product list of effective air cleaners. Prioritization • Prioritize efficiencies upgrades and clean air systems in Oregon schools. • Further prioritize schools that serve diverse or disadvantaged communities.

the Jamboard, etc. and have not been verified or analyzed by staff	
Policy Background	Exposure to poor indoor air quality is linked to negative health impacts that predominantly impact vulnerable groups such as children, young adults, and older adults. Additionally, research has shown disparate impacts on various communities: • People of color are exposed to more particulate pollution on average, increasing the risk of cumulative health impacts including lung and heart disease.[45] • Low socio-economic status households generally live with poorer indoor air quality.[46] • Households with higher socio-economic status have been found to have higher radon concentrations.[47] Radon has been identified as the second leading cause of lung cancer.[48] Several strategies may improve indoor air quality including source control, improved ventilation, and air cleaners. • Sources of indoor pollution may be sealed or enclosed such as those that contain asbestos. Other sources like gas stoves, can be adjusted to decrease emissions. Source control may be more cost-efficient than increasing ventilation as energy costs may increase with increased ventilation.[49] • Building modifications may worsen indoor air quality without adjustments to ventilation. Improved ventilation is one approach to lowering indoor air pollutants. Increasing the outdoor ventilation rate with air conditioners with vent controls as well as local exhaust fans and vent hoods will remove indoor contaminants, flushing them outside. Radon mitigation systems, which typically improve ventilation by use of an exhaust fan, are an example of a ventilation strategy to improve indoor air quality. Energy-efficient whole-house ventilation systems and heat exchangers are designed to increase fresh air while conserving energy.[50] The various types of whole-house ventilation systems have benefits or drawbacks when considering climate, costs, and contractor availability. • Air cleaners may improve indoor air quality. However, the levels of effectiveness vary. An effective cleaner has a high efficiency rate (how well it collects pollutants) coupled with a high flow rate (how

[45] U.S. Environmental Protection Agency, *Study Finds Exposure to Air Pollution Higher for People of Color Regardless of Region or Income*, <https://www.epa.gov/sciencematters/study-finds-exposure-air-pollution-higher-people-color-regardless-region-or-income> (last viewed July 6, 2022).
[46] Lauren Ferguson, et al., *Exposure to Indoor Air Pollution Across Socio-Economic Groups in High-Income Countries*, 143 EI 1 (1-18), *available at* <https://doi.org/10.1016/j.envint.2020.105748> (last viewed July 6, 2022).
[47] *Id,* at 4.
[48] Pawel D. & Puskin J., *The US Environmental Protection Agency's Assessment of Risks from Indoor Radon*, 87 HP 68 (68–74), *available at* <https://pubmed.ncbi.nlm.nih.gov/15194924/> (last visited July 6, 2022).
[49] U.S. Environmental Protection Agency, *Improving Indoor Air Quality (IAQ)*, <https://www.epa.gov/indoor-air-quality-iaq/improving-indoor-air-quality> (last visited June 29, 2022).
[50] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, *Whole-House Ventilation*, <https://www.energy.gov/energysaver/whole-house-ventilation> (last visited June 29, 2022).

	well it draws air through the filtering element). The effectiveness of the air filter also depends on the strength of the source of pollutant. **Related Existing Oregon Policy** Oregon HB 2842 established The Oregon Healthy Homes Program awards grants to eligible entities to provide financial assistance to low-income households and communities disproportionately affected by environmental pollution or other hazards, and to landlords for the repair and rehabilitation of residential dwelling units. Effective March 23, 2022, the Oregon Legislature passed SB 1536 which contains language establishing emergency clean air shelters. This bill: • provides access to clean air shelters at no cost. • equips public buildings with smoke filtration systems. • provides grants to local governments, public education providers, and federally recognized Indian tribes in Oregon to establish clean air spaces, install smoke filtration systems, and install warming and cooling facilities in public buildings.
Co-Benefits	Health improvements: Reduction of exposure to unhealthy air with clean air strategies may increase health outcomes for vulnerable communities. • Indoor environmental conditions may provide substantial improvements in health and productivity.[51] • Cost-effectiveness modeling estimates that remedial measures will generally be more cost-effective in buildings that have poorer initial indoor environmental quality (IEQ) or more existing adverse health effects.[52]
Examples	Colorado HB 22-1362, enacted in 2022, generally concerns building greenhouse gas emissions but includes high-efficiency heating upgrades that are cited to improve indoor air. The legislation establishes the appointment of an energy code board to develop building codes. Additionally, it established the Clean Air Building Investments Fund for High-Efficiency Electric Heating and Appliances Grant program. Local governments, utilities, nonprofits, and housing developers are eligible for grants to install high-efficiency electric heating equipment.
Source Material	U.S. Environmental Protection Agency, *Improving Indoor Air Quality (IAQ)* (2021), *available at* <https://www.epa.gov/indoor-air-quality-iaq/improving-indoor-air-quality> (last visited June 29, 2022). U.S. EPA, The Inside Story: A Guide to Indoor Air Quality*, available at* <https://www.epa.gov/indoor-air-quality-iaq/inside-story-guide-indoor-air-quality> (last visited June 28, 2022).

[51] Olli Seppanen and William J. Fisk, U.S. Department of Energy Office of Scientific and Technical Information, *A Model to Estimate the Cost Effectiveness of Indoor Environment Improvements in Office Work, available at* <https://www.osti.gov/servlets/purl/875736> (last viewed July 6, 2022).
[52] *Id.*

Create Public Climate or Environmental Justice Hubs (Previously Titled "Upgrades to and Increasing Supply of Affordable Housing")

Building Type	New or Existing Buildings
Sector	Commercial, Residential, or Public Buildings
Policy Subcategory	Envelope, heating/cooling, renewables, electric
Policy Suggestions Submitted by Task Force Members* *these suggestions were provided by members via email, in meetings, from the Jamboard, etc. and have not been verified or analyzed by staff	Learning/Funding Hubs • Create a pilot for climate resilience hubs—public spaces with solar and storage microgrid tech, electric heat pumps (for cooling), and greenspace. • Establish environmental justice hubs. Accessibility • Should be accessible for low-income, aging, and BIPOC communities.
Policy Background	Programs that support the quality and quantity of housing supply, particularly for low-income households, are considered to increase community resiliency. These programs may include remediation of low-quality and condemned properties, purchase and transition of housing stock into affordable housing, providing land banking and land trust strategies, and/or financing energy improvements in single- or multi-family affordable housing. Energy improvements may include efficiency improvements, electric measures, and renewable energy systems for existing homes, existing rental units, and new housing construction. **Related Existing Oregon Policy** In Oregon, HB 2842 (2021) established the Healthy Homes Program within the Oregon Health Authority to award grants to eligible entities. These grants provide financial assistance to low-income households and communities disproportionately affected by environmental pollution or other hazards, and to landlords for the repair and rehabilitation of residential dwelling units. The bill also established: • The Healthy Homes Repair Fund to provide grants and cover administrative costs. • The Interagency Task Force on Healthy Homes will propose and evaluate solutions to address health hazards in housing.
Co-Benefits	Public Health

	Access to affordable housing has various positive implications for public health. Stable housing can[53]: • reduce hospitalizations and emergency department visits for homeless patients with mental illness and those impacted by domestic violence; • improve management of chronic medical conditions; • increase classroom continuity for children; and • increase the likelihood of meeting childhood development milestones. Equity • Cost-burdened households are considered those that spend more than 30 percent of their income on housing. These households are more likely to face underemployment and poor health, and less likely to access education or create wealth.[54] Resilience • Increased discretionary income from lower rent burdens allows for increased adaptive capacity after a disaster.[55] • Community resilience is increased by resilient affordable housing reducing impacts of, and increasing recovery from, severe events. Benefits include enhancing social cohesion, enabling residents to create connections, and building community ties.[56]
Examples	Colorado, HB22-1304, 2022 – The Strong Communities and Affordable Housing Colorado is a grant program to support infill. Invested $40 million in the Strong Communities Grant Program, $178 million for affordable housing, and included land use and transportation-related provisions. California AB 1087 – Environmental Justice Community Hubs Program, which established the Environmental Justice Community Resilience Hubs Program to fund building upgrade projects in both public spaces and qualified housing, using 5% of the annual utility GHG allowance revenue for five years.
Source Material	Georgetown Climate Center, *Resilient Affordable Housing, Anti-Displacement & Gentrification*, *available at* <https://www.georgetownclimate.org/adaptation/toolkits/equitable-adaptation-toolkit/resilient-affordable-housing-anti-displacement-gentrification.html?chapter> (last visited June 29, 2022). Georgetown Climate Center, *Funding Tools for Housing*, *available at* <https://www.georgetownclimate.org/adaptation/toolkits/equitable-adaptation-toolkit/funding-tools-for-housing.html> (last visited July 6, 2022).

[53] Kottke, T., *Access to Affordable Housing Promotes Health and Well-Being and Reduces Hospital Visits*, PermJ 22 (2017), *available at* <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5737920/> (last visited June 29, 2022).
[54] Georgetown Climate Center, *Resilient Affordable Housing, Anti-Displacement & Gentrification*, <https://www.georgetownclimate.org/adaptation/toolkits/equitable-adaptation-toolkit/resilient-affordable-housing-anti-displacement-gentrification.html?chapter> (last visited June 29, 2022).
[55] *Id.*
[56] *Id.*