December 13, 2022

Co-Chairs Senator Lieber and Representative Marsh, and fellow members of the Resilient Efficient Buildings Task Force,

We're writing to provide feedback on the task force process and to respond to two letters from Northwest Natural ("NW Natural") that were added to the record on November 15, 2022 and December 12, 2022 (the "NW Natural letters").[1] Specifically, we hope to correct the record to ensure factual accuracy is the foundation of all deliberations and dialogue, and to avoid having any mischaracterizations – whether intentional or not – risk sowing further confusion.

## I. Brief Background on Task Force Mission: Equitable Decarbonization and Resilience

As two members of the Resilient Efficient Buildings Task Force ("REBuilding Task Force") appointed to provide expertise on climate and energy policy, we first want to reiterate that our participation in this process has focused on achieving the mission spelled out in SB 1518: identifying and evaluating policies related to building codes and building decarbonization for new and existing buildings that would enable Oregon to meet our state greenhouse gas emissions reduction goals while maximizing benefits including energy efficiency, improving resilience against climate change, improving public health and air quality, reducing energy burden, and mitigating displacement and climate change impacts like wildfire smoke and heat waves.[2]

It's been a robust process reflective of the major task at hand – to evaluate policies that rapidly reduce our climate pollution in the built environment while ensuring resilience and equity. Equitable decarbonization and increased resilience is the goal on which we've stayed laser-focused. Because fossil fuels (primarily coal, oil, and "natural" gas) are responsible for the majority of greenhouse emissions in Oregon and continue to play a prominent role in our energy, transportation, and buildings sectors,[3] it should not be surprising nor controversial that decarbonizing these sectors involves deep energy efficiency and replacing fossil fuels with carbon-free clean energy alternatives. Those are the key ingredients of policies aimed at achieving our climate goals across Oregon's economy.

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[1] See NW Natural Letter (November 15, 2022) Submitted by Kim Rush, available at https://olis.oregonlegislature.gov/liz/2021I1/Downloads/CommitteeMeetingDocument/257434;' See also NW Natural Letter (December 9, 2022) Submitted by Kim Rush, available at https://olis.oregonlegislature.gov/liz/2021I1/Downloads/CommitteeMeetingDocument/258275.

[2] See SB 1518 (2022), available at https://olis.oregonlegislature.gov/liz/2022R1/Downloads/MeasureDocument/SB1518/Enrolled.

[3] See Oregon Global Warming Commission, Biennial Report to the Oregon Legislature, 2020: https://static1.squarespace.com/static/59c554e0f09ca40655ea6eb0/t/5fe137fac70e3835b6e8f58e/1608595458463/2020-OGWC-Biennial-Report-Legislature.pdf.

This is why the Legislature has required that our electric sector transition from coal and gas power to 100% clean electricity, and has passed many complementary energy efficiency, renewable energy, and electrification policies. Similarly, the Legislature has passed many effective policies in addition to the Climate Protection Program's baseline requirement that oil companies achieve a 90% greenhouse gas reduction by 2050. These complementary policies have focused on (1) replacing diesel and gasoline through regulations and incentives to increase vehicle electrification, cleaner fuels, and (2) investing in more robust transit, safe biking and walking alternatives (to reduce car dependence, i.e., use the transportation system we have more efficiently and equitably). Now it is our task to do the same for Oregon's buildings sector: decarbonize and increase resilience. Naturally, the policies that do so most effectively involve increasing energy efficiency and replacing fossil fuels with clean energy alternatives.

Given our mission and focus as Task Force members to achieve deep decarbonization and equitable resilience, we are pleased to see a final Task Force report with recommendations of some top policies that can move our state's homes and buildings toward achieving our state climate goals. We are glad that there is a major focus in the report's recommendations on policies that also reduce low income Oregonians' energy burden, increase resilience against extreme climate impacts, provide life-saving heating and cooling affordably, reduce air pollution (including in schools) and otherwise maximize co-benefits. We want to express a hearty note of gratitude to the LPRO staff, SSG modelers and the legislative co-chairs for months of hard work to provide such detailed information and elicit feedback from a large and diverse Task Force membership to provide this strong report and recommended policies.

## II. Response to Claims in NW Natural's Letters

While our policy organizations' goal is to see Oregon rapidly and equitably reduce its climate and air pollution and benefit both rural and urban communities through increased resilience, some interests represented on the REBuilding Task Force have a financial stake in *how* the state reduces greenhouse gas emissions in the built environment. As a baseline, NW Natural is an investor-owned gas company, and its executives and shareholders have a vested interest in its continued profits under its current business model. It is unsurprising that we would hear arguments against building electrification from the gas company, like we have frequently heard the oil industry argue against transportation electrification or a cigarette company argue against common-sense public health interventions. Quite simply, of course the oil and gas industry argues against policies that would meaningfully reduce demand for their product.

It is deeply concerning, however, that many of the arguments in the NW Natural letters appear to include misleading information and citations of others' studies that mischaracterize conclusions or leave out crucial context. Indeed, a quick review of three other jurisdictions' reports and actions that were cited in the NW Natural letters purportedly to bolster NW Natural's claims responded that those jurisdictions' reports and actions were mischaracterized and/or taken out of context. While a healthy debate is always welcome, Oregon's legislative processes, dialogue and deliberations should be based on a factual foundation.

Below we share a section-by-section response, but a few of the most concerning examples from NW Natural's recent letters entered on the record include:

1. The NW Natural letters rely in large part on a gas-industry funded report[4], rather than acknowledging the substantial body of data and research from the Pacific Northwest and across the country and globe that support the need for, and benefits of, beneficial electrification in buildings to decarbonize rapidly, cost-effectively, and provide other benefits (see research report citations on p. 4 below);
2. The NW Natural letters "mischaracterizes both the graphic and the information" of a City of Eugene study according to the City of Eugene staff, as described in its letter to the Task Force on December 12, 2022 (see Eugene's letter and below at p. 6);[5]
3. The NW Natural letters leave out important context and therefore do not accurately portray the City of Portland's Decarbonization Pathways Tool analysis;[6]
4. The NW Natural letters include misleading statements about RNG as they relate to Denmark's energy strategy. This was confirmed by a representative of the Danish Energy Agency and through a review of the Denmark Ministry of Climate, Energy and Utilities' published "Green Gas Strategy" report.[7]

Despite NW Natural Letters' Claims, PNW Decarbonization Studies Overwhelmingly Find that Efficiency and Electrification are the Clear Path to Lower Emissions

As has been consistently communicated in Task Force meetings, from both climate and energy experts on the Task Force and from state agency staff, the electricity sector is on a trajectory to significantly reduce emissions in the coming decades, including a guaranteed phase-out of coal and fossil fuel generation as required by House Bill 2021 (2021). In addition to consumer-owned utilities' primarily carbon-free BPA power, the two major investor-owned electric utilities in Oregon are required and on a path to serve electricity that is 80% carbon-free by 2030, 90% by 2035 and 100% by 2040. Given this rapid decarbonization of the electric sector and the efficiency gains of electric appliances like heat pumps and heat pump hot water heaters, nationwide and regional climate and energy experts consistently recommend electrifying as much of our buildings and transportation sectors as possible, and doing so as quickly and efficiently as possible. It's important to note that this conclusion that 'electrification of buildings is a key solution' is consistently reached even when these studies and models compare electrification pathways to using RNG and hydrogen to help decarbonize the gas sector.

[4] See E3, "Pacific Northwest Pathways to 2050" (2018), available at https://www.ethree.com/wp-content/uploads/2018/11/E3_Pacific_Northwest_Pathways_to_2050.pdf.
[5] See public comment letter from City of Eugene Sustainability Manager Ian E. Penn, "RE: Correcting external data characterizations on impact of potential restriction of fossil fuel infrastructure in new buildings in Eugene", available at https://olis.oregonlegislature.gov/liz/2021I1/Downloads/CommitteeMeetingDocument/258329.
[6] See Technical Memo at https://www.portland.gov/sites/default/files/2022/portland-decarbonization_pathways_analysis_technical_memo_7-19-2022.pdf.
[7] See Danish Ministry of Climate, Energy and Utilities, "Green Gas Strategy" (2021), available at https://ens.dk/sites/ens.dk/files/Naturgas/groen_gasstrategi_en.pdf.

There have been numerous deep decarbonization studies in the Pacific Northwest over the past five years, modeling the most feasible and prudent ways to reach state and national greenhouse gas targets. Just like national studies and other states' studies, the independent Pacific Northwest studies **all** find that to achieve deep decarbonization (and Oregon's greenhouse gas reduction goals) there is a need to:

(1) continue to increase energy efficiency across sectors, including the building sector;
(2) significantly increase electrification of the transportation and building sectors; and
(3) achieve a decarbonized electricity grid.[8]

As examples, here are **four recent Pacific NW decarbonization studies** all concluding that policies accelerating energy efficiency and electrification are the best paths for building decarbonization (as opposed to continued expansion of the gas system and reliance on expensive, limited renewable natural gas, hydrogen, and utility efficiency to achieve these outcomes):

1. Clean Energy Transition Institute Modeling for Decarbonization in Pacific Northwest (2019)[9]

   The Clean Energy Transition Institute (CETI) released the Northwest Deep Decarbonization Pathways (NWDDP) study in June 2019. CETI contracted with Evolved Energy to conduct the modeling, which covered the four state Pacific Northwest region.

   Key findings included (1) that deep decarbonization is possible in the Pacific Northwest at a reasonable cost; (2) that increased energy efficiency is crucial to achieving a low carbon future at reasonable cost by reducing the overall need for energy; and (3) **Widespread electrification of both the transportation and building sectors will be crucial to reduce emissions at least cost**, and clean electricity needs to replace oil and gas to heat and cool buildings in a low-carbon future.

2. State of Washington State Energy Strategy (2020)[10]

   The Washington Department of Commerce developed this publicly-funded report as part of the 2021 State Energy Strategy implementation, which was performed collaboratively

[8] The only exception that we are aware of is the E3 deep decarbonization study that NW Natural funded itself. This study reached a different conclusion for preferred pathways than all other deep decarbonization studies by third-party neutral experts not funded by the oil and gas industry. See E3, "Pacific Northwest Pathways to 2050" (2018), available at https://www.ethree.com/wp-content/uploads/2018/11/E3_Pacific_Northwest_Pathways_to_2050.pdf.

[9] See Clean Energy Transition Institute, 2019, Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest, available at https://uploads-ssl.webflow.com/5d8aa5c4ff027473b00c1516/5dd59b2d1c31640c39fbaa15_Clean%20Energy%20Transition%20Institute%20NWDDP%20Study%20Full%20Report.pdf.

[10] See Washington State Department of Commerce, Washington State 2021 Energy Strategy (First Draft), 2020, available at https://www.commerce.wa.gov/wp-content/uploads/2020/11/WA-2021-State-Energy-Strategy-FIRST-DRAFT-2.pdf.

with stakeholders and members of the public, including a 27-member advisory committee made up of legislators, government officials, and representatives of civic organizations, energy and utility businesses, as well as public interest advocates.

The State of Washington's state energy study concludes that the preferred pathway is highly focused on building energy efficiency and electrification. Washington's study found that **"the data show that electrification is the most efficient and cost-effective building decarbonization strategy for Washington state.** Under an electrification scenario, energy-efficient buildings become a critical resource for a rapidly decarbonizing grid."[11]

3. Clean Energy Transition Institute Oregon Clean Energy Pathways Analysis

An NGO coalition that included Renewable Northwest, GridLab, and the Clean Energy Transition Institute contracted with Evolved Energy Research to analyze several decarbonization scenarios for Oregon state. This study found that Oregon can meet its existing 2035 emission reduction targets by (1) removing coal from the electricity mix and replacing it with new clean energy resources and (2) **reducing energy consumption by rapidly electrifying the buildings, transportation, and industrial sectors**.[12]

4. Energy Innovation (EI) "Oregon Energy Policy Simulator" (2022)

The Oregon Energy Policy Simulator is a free, open-source model that allows users to estimate climate and energy policy impacts on statewide emissions, the economy, and public health using publicly available data. This model takes into account the Clean Fuels Program, Clean Truck Rule, Climate Protection Program, and 100% Clean Electricity policy on the books in Oregon. Its analysis found that Oregon is not yet achieving its statutory goal of 80% GHG reduction by 2050, but its climate policies are getting us closer while growing our economy and reducing air pollution.[13]

The modeling found that the remaining GHG reductions primarily need to come from the building sector and further reductions in the transportation sector. This simulator demonstrates that buildings are a key sector to focus on to meet GHG emissions goals. The modeled "NDC Scenario" to meet Oregon's proportional share of the Paris Climate Accords target includes standards for electrifying building components, energy efficiency standards, and retrofitting existing buildings. **The majority of emissions reductions are attributed to strong building electrification policies leading to 100% sales of**

[11] See Operation 2030: Scaling Building Decarbonization in Washington State.
[12] See Clean Energy Transition Institute, Oregon Clean Energy Pathways Analysis, https://www.cleanenergytransition.org/projects/oregon-clean-energy-pathways-analysis.
[13] See Energy Innovation, Oregon Energy Policy Simulator (2022), available at https://energyinnovation.org/wp-content/uploads/2022/03/Oregon-Energy-Policy-Simulator-Insights.pdf.

**electric building components by 2030**, which also offer consumer fuel savings and health benefits.

In addition to disregarding the above research, the NW Natural letters' characterization of the E3 study findings are concerning to us for a variety of reasons. At a baseline, **the letter does not mention that the gas industry paid for this study from E3.**[14] As with any industry-funded study, its conclusions about the viability of the industry should be carefully scrutinized. To that end, the NW Natural letters highlight that this analysis "identified that widespread electrification in our area with electric heat pumps, including cold climate heat pumps, would mean a five to 10 times increase (17,000 – 37,000 MW) in winter peak electricity demands, relative to comparable gas system utilization scenarios." This characterization conveniently left out that **even this gas-funded study by E3 finds that electrification is one of the four broad emissions reduction strategies shared across deep decarbonization studies for both the Pacific Northwest and nationwide.**[15] Further, the gas industry-funded study relies heavily on "gas heat pumps" (which are not commercially available) and unrealistic levels of biogas (i.e., RNG) and hydrogen deployment (assuming it will make up approximately 30% of their mix). These assumptions are not generally considered cost-effective or a reliable assumption to delay climate action now in hope that one day it comes true.

Meeting energy and peak demand

In response to NW Natural's concerns about electric grid impacts and meeting energy and peak demand, we recommend asking the electric utilities directly about their plans for meeting increased electric loads over time, and the OPUC how they will ensure it happens. The OPUC provides rigorous oversight of the electric utilities' planning processes like the Integrated Resource Plans (IRPs) and Clean Energy Plans to ensure achievement of HB 2021's emission mandates along with providing continued reliability, safety, and affordability.

In June 2022, Synapse released a study, commissioned by the Sierra Club, about achieving "Net Zero Emissions for Oregon Buildings." **The Synapse study showed that, with full state-wide adoption of heat pumps, residential electrical loads could actually *decline* because of the significant efficiency savings of switching to high-efficiency electric heat pumps from electric resistance and gas furnace heating.** Additionally, the study showed that total grid demand would likely only increase 13% by 2050 (or about half a percent per year) from comprehensive electrification of both commercial and residential buildings in the state with high efficiency heat pumps for space and water heating, which is consistent with the current trajectory of growth in grid demands. If there is a legitimate concern about peak load, the focus should be on passing policies that achieve deep energy efficiency, demand response and demand management (like grid-connected smart electric appliances that rank highest on

[14] See https://www.ethree.com/wp-content/uploads/2018/11/E3_Pacific_Northwest_Pathways_to_2050.pdf at 2.
[15] See https://www.ethree.com/wp-content/uploads/2018/11/E3_Pacific_Northwest_Pathways_to_2050.pdf at 6.

efficiency ratings) to shave down energy use at peak times, not cling to fossil fuel business-as-usual plans.

Mischaracterization of Local Cities' Analysis

In its spurious claim that local electrification policies are not backed up by local governments' own analyses, the NW Natural letters refer to the City of Eugene, saying "the City of Eugene's own climate action planning analysis showed a ban on natural gas in new construction would result in a net carbon savings on the residential side of 0.1%, and for commercial 1.7% by 2037." This is a mischaracterization, and in fact, not what City of Eugene has found. As the City made clear in its response letter to the Task Force, **the City of Eugene's analysis actually found that a policy restricting new fossil fuel infrastructure in residential and commercial buildings would reduce forecasted natural gas emissions in 2037 by 13% compared to a 2017 – 2019 annual average baseline.** This is a significant reduction in a 15 year time period. Similarly, the NW Natural letters leave out important context and therefore do not accurately portray the City of Portland's Decarbonization Pathways Tool analysis and findings, including the substantial emission reductions from electrifying existing buildings in addition to new ones.[16]

Misleading Statements about RNG and Denmark's Energy Strategy

The NW Natural letters also include misleading statements about renewable natural gas (RNG) and Denmark's Energy Strategy. First, the NW Natural letter dated November 19, 2022 states that "RNG is not a fossil fuel and does not emit more carbon dioxide into the atmosphere when used." A more accurate statement would be that renewable natural gas (i.e., RNG or biogas) is primarily methane – chemically nearly identical to traditional "natural" gas and a greenhouse gas approximately 86 times more potent a climate driver than carbon dioxide. And as with "natural" gas, RNG emits hazardous air pollutants and climate pollutants when combusted. Further, methane leaks at every stage of extraction, processing, and distribution and is now understood to be a primary cause of the climate crisis worldwide.[17] RNG also has the exact same indoor air pollution concerns as "natural" gas when combusted indoors (more below on the health effects). And although RNG is captured from other industrial and biogenic processes, recent research demonstrates that it is much more emissions-intensive than initially thought and may even be climate-intensive rather than climate neutral.[18] RNG is also generally expensive to produce.[19]

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[16] For a full background on the City's analysis, see Technical Memo at https://www.portland.gov/sites/default/files/2022/portland-decarbonization_pathways_analysis_technical_memo_7-19-2022.pdf.

[17] See, e.g., World Resources Institute, "5 Mitigation Strategies to Reduce Global Methane Emissions," (2021), available at https://www.wri.org/insights/methane-gas-emissions-climate-change; see also Earthjustice, "Methane: Everything You Need To Know (Updated 2022), available at https://earthjustice.org/features/methane-everything-you-need-to-know.

[18] See https://iopscience.iop.org/article/10.1088/1748-9326/ab9335.

[19] See, e.g., Sightline Institute, "The Four Fatal Flaws of Renewable Natural Gas," (2021), available at https://www.sightline.org/2021/03/09/the-four-fatal-flaws-of-renewable-natural-gas/; see also Emily Grubert, "'Renewable' natural gas may sound green, but it's not an antidote for climate change," (2020), available at https://theconversation.com/renewable-natural-gas-may-sound-green-but-its-not-an-antidote-for-climate-change-138791.

RNG sources that are more cost-effective and affordable are also very limited in supply, and thus far, primarily directed to the transportation sector due to lucrative Clean Fuels credits.

The NW Natural letters state that "Denmark has already displaced 25% of their conventional natural gas use with RNG, with new targets to raise it to 75% by 2030. By doing so, they are leveraging a system in place to significantly reduce emissions, finding a cost-effective solution to waste, and retaining energy system diversification and resiliency." **This statement is also misleading, because in fact, buildings in Denmark are heated primarily with district heating and the country is in the process of *phasing out* remaining gas heating in buildings through either district heating or electric heat pumps.**[20] According to Denmark Energy Agency representatives and their extensive reports cited here, the country's political aim is (1) to ensure that from 2035, no buildings will use a natural gas boiler; and (2) to have large-scale electrification of the heating sector, with a focus on heat pumps and district heating. The goal is to reduce gas use by around 70% by 2035 compared to 2014 levels. Denmark's investments in biogas and green hydrogen are expected to be used in high-temperature industrial processes and heavy-duty and marine transport, respectively.[21]

Resiliency Claims

The NW Natural letters claim that investing in two energy systems, electric and gas, is the best way to ensure resiliency in the face of the climate crisis. Yet every dollar that we spend investing in the continued use and expansion of the fossil fuel energy system, a system that is *driving* extreme weather and further climate instability, is a dollar that could instead be spent on hardening our existing electrical grid and expanding local renewables, storage and microgrid infrastructure.

With the tremendous amount of federal funding coming to states from the Inflation Reduction Act, we have an opportunity to make long-term investments in our electric system to ensure that it is resilient in the face of increasingly extreme weather. The market is also shifting toward increased renewables and battery backup and microgrid technologies for resiliency of the power system. Many of Oregon's rural communities are now benefiting from these clean energy resilience projects supported by the Community Renewable Energy Grant Program.[22]

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[20] See Danish Energy Agency, Energy Statistics 2020 (2021), available at https://ens.dk/sites/ens.dk/files/Statistik/energy_statistics_2020.pdf; see also Danish Ministry of Climate, Energy and Utilities, "Green Gas Strategy" (2021), available at https://ens.dk/sites/ens.dk/files/Naturgas/groen_gasstrategi_en.pdf; see also Danish Ministry of Climate, Energy and Utilities, The Government's strategy for Power-To-X (2021), available at https://ens.dk/sites/ens.dk/files/ptx/strategy_ptx.pdf.

[21] See Danish Ministry of Climate, Energy and Utilities, "Green Gas Strategy" (2021), available at https://ens.dk/sites/ens.dk/files/Naturgas/groen_gasstrategi_en.pdf; see also, Danish Ministry of Climate, Energy and Utilities, "The Government's strategy for Power-To-X" (2021), https://ens.dk/sites/ens.dk/files/ptx/strategy_ptx.pdf

[22] See examples at: ODOE, "OREGON DEPARTMENT OF ENERGY GRANT PROGRAM SUPPORTS RENEWABLE ENERGY PROJECTS FROM ASHLAND TO ONTARIO," October 18, 2022, https://energyinfo.oregon.gov/blog/2022/10/18/oregon-department-of-energy-grant-program-supports-renewable-energy-projects-from-ashland-to-ontario

Of course resilience means much more than just the reliability of the power system. Resilience also includes the safety and comfort of people in homes and buildings through expanded access to efficient, affordable mechanical cooling and heating. Electric heat pump technology offers efficiency 4-5 times higher than conventional gas appliances, providing significant savings for consumers and allowing for the modular heating to avoid unnecessary energy use and expense to heat or cool empty rooms. Heat pumps also do not bring in smoky air, so they can recirculate cleaner indoor air during wildfire smoke events. It is critical that when we discuss community resilience, considerations of consumer comfort, affordability and safety are central to the conversation.

Finally, it is also important to note that the gas system is not impervious to the impacts of extreme weather, and that, unlike electricity, the gas system is prone to toxic leaks and explosions. An "accident or incident" occurs on the U.S. gas distribution systems on average every six days,[23] causing dozens of fatalities, hundreds of injuries, and millions of dollars in property damage every year.

To list just a few of these instances locally and on the West Coast:

- An October 2016 gas explosion in Northwest Portland injured eight people and caused $17.2 million in property damages, including the total destruction of a historically significant building;[24]
- In January 2020, a gas leak closed down portions of Willamette Street in Eugene and forced parents to pick their children up from daycare;[25]
- In 2016, the largest known methane leak occurred at a natural gas storage facility in LA County, at Aliso Canyon. It resulted in large-spread safety and public health concerns and demands to close the storage facility entirely.[26]

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The risk of a massive earthquake in Western Oregon, the Cascadia Subduction Zone earthquake, only increases concerns, as highly pressurized gas pipelines run a high risk of exploding during earthquakes and of causing fires. All-electric buildings are more resilient following earthquakes, as electricity can be restored more quickly than repairs can be made to ruptured gas lines.

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[23] See US Department of Transportation, "Distribution, Transmission & Gathering, LNG and Liquid Accident and Incident Data," PHMSA, available at https://www.phmsa.dot.gov/data-and-statistics/pipeline/distribution-transmission-gathering-lng-and-liquid-accident-and-incident-data.
[24] See Aimee Green, "10 lawsuits filed in aftermath of NW 23rd Ave. explosions" (2018) The Oregonian, available at https://www.oregonlive.com/portland/2018/10/10_lawsuits_filed_in_aftermath.html.
[25] See "Gas leak closes Willamette Street in South Eugene, parents pick up kids from daycare" (2020), KVAL, available at https://kval.com/news/local/gas-leak-closes-willamette-street-in-south-eugene.
[26] See Mihir Naveri, "Corroded Well Lining Caused Aliso Canyon Gas Leak That Displaced Thousands, Report Says" (2019), The New York Times, available at Corroded Well Lining Caused Aliso Canyon Gas Leak That Displaced Thousands, Report Says - The New York Times (nytimes.com).

Indoor air quality

It is particularly important to us to correct the record regarding the NW Natural letters' claims related to indoor air quality. First, at a baseline, there is robust evidence supporting the public health harms of gas combustion in buildings. Dozens of peer-reviewed studies have shown pollutants emitted by gas burning stoves and ovens in residential homes are, in fact, harmful to health, especially the health of children, the elderly, those with underlying health conditions, and vulnerable minority and low income communities. The Multnomah County Public Health Department just released a literature review[27] of over a dozen peer-reviewed and government studies, all concluding that fossil fuel-combustion appliances (including gas) carry health risks**,** and recommending the County move away from fossil fuel-combustion appliances indoors. In particular, a meta-analysis of 26 years of research provides evidence that **children living in homes with gas stoves have a 42% increased risk of asthma symptoms**.[28]

The NW Natural letters cite one specific study to refute the dozens of peer-reviewed studies showing the health impacts of gas stoves – a study that notably did NOT measure concentrations of NOx in homes. Instead, this study - Wong et al (2013)[29] - was a self-reporting survey of 250,000 children in 31 countries through independent academic and national health studies. This single study is based on a self-reported global survey in which the respondents were children aged 13-14 and parents of kids aged 6-7.

This critique of the Wong study is shared by one of its own co-authors. In an interview with EnergyWire, published in April, 2022:

> *One of the co-authors of that 2013 study, however, said the research was based on "a short, self-administered questionnaire" on the presence of cooking appliances. The co-author — Bert Brunekreef, an emeritus professor of environmental epidemiology at Utrecht University in the Netherlands — also pointed to guidelines from the World Health Organization dating back to 2010 that call for governments to enact indoor air standards and list gas stoves as being among "the most important indoor sources" of NO2.*
>
> *A separate analysis co-authored by Brunekreef in the International Journal of Epidemiology in 2013 found that in children, gas cooking increased the risk of asthma.* ***That analysis combined detailed evidence on indoor NO2 from a large number of studies, making it "more valid than just the presence or absence of a gas cooker,"***

[27] See Multnomah County, "A Review of the Evidence: Public Health and Gas Stoves," (2022), available at https://www.multco.us/multnomah-county/news/multnomah-county-health-department-report-recommends-transitioning-away-gas.
[28] See Weiwei Lin, Bert Brunekreef, Ulrike Gehring.Meta-analysis of the effects of indoor nitrogen dioxide and gas cooking on asthma and wheeze in children. International Journal of Epidemiology, Volume 42, Issue 6, December 2013, Pages 1724–1737, https://doi.org/10.1093/ije/dyt150.
[29] Wong, GW; Brunekreef, B; Ellwood, P; Anderson, HR; Asher, MI; Crane, J; Lai, CK. 2013. "Cooking fuels and prevalence of asthma: A global analysis of phase three of the International Study of Asthma and Allergies in Childhood (ISAAC)." ISAAC Phase Three Study Group. Lancet Respir. Med. 1(5):386-394. doi: 10.1016/S2213-2600(13)70073-0.

***he said, adding that it "should carry more weight" than the study mentioned by the AGA.[30]***

In addition to the harmful concentrations of nitrogen dioxide that are produced within a few minutes of cooking with gas stoves, a growing body of research shows gas appliances are continually releasing harmful pollutants in homes, even while off. This includes studies from Stanford which established that gas stoves leak around the clock,[31] and Harvard, which found that in addition to planet-warming methane, the gas that is piped into homes contains 21 hazardous air pollutants.[32] A recent study from PSE Healthy Energy put a finer point on those chemicals, finding leaks from gas stoves in California are creating benzene concentrations indoors that are up to seven times higher than California's recommended benzene exposure limits. Benzene is a dangerous carcinogen and the World Health Organization and all reputable health authorities agree there is no safe concentration of benzene when it comes to cancer risk.

Dozens of peer reviewed studies have been performed that show that the use of polluting gas in homes and buildings leads to both indoor and outdoor air pollution with harmful chemicals including Nitrogen Dioxide.

While the NW Natural letters deny that natural gas appliances cause hazardous indoor air quality, it is an accepted fact that the combustion of fossil fuels, including gas, emits pollutants including nitrogen oxides (NOx), carbon monoxide, and particulate matter into both indoor and outdoor air. Two comprehensive reviews, one conducted jointly by Physicians for Social Responsibility, the Rocky Mountain Institute, Mothers Out Front, and the Sierra Club[33] and the other by researchers at the UCLA Fielding School of Public Health[34] analyzed peer reviewed studies concluding that cooking food itself produces certain air pollutants, especially particulate

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[30] EnergyWire/PoliticoPro. Report: Gas stove emissions are dangerous, need federal regs. David Iaconangelo (April 25, 2022), available at https://subscriber.politicopro.com/article/eenews/2022/04/25/report-gas-stove-emissions-are-dangerous-need-federal-regs-00024690?utm_campaign=Hot%20News&utm_medium=email&_hsmi=211136778&_hsenc=p2ANqtz-9zj_mDnXrlJvsYDKAqPsoX8Mdx_EpDUHdMlEduff2Ok-rt6a6wcNT5GJ8KJTe-ycvqDJSjeuTDtdFGBPbw3P_5gzzJ4A&utm_content=211136778&utm_source=hs_email

[31] See Lebel, E. et al., 2022, Methane and NO*x* Emissions from Natural Gas Stoves, Cooktops, and Ovens in Residential Homes, Environmental Science & Technology, available at https://pubs.acs.org/doi/10.1021/acs.est.1c04707; see also Washington Post, "Gas stoves in kitchens pose a public health risk [. . .]" (2022), available at https://www.washingtonpost.com/climate-environment/2022/01/27/gas-stoves-kitchens-pose-risk-public-health-planet-research-finds/.

[32] See Michanowicz, D.R. et al., 2022, Home is Where the Pipeline Ends: Characterization of Volatile Organic Compounds Present in Natural Gas at the Point of the Residential End User, Environmental Science & Technology, available at https://pubs.acs.org/doi/10.1021/acs.est.1c08298; see also Elena Shau, "Gas piped into homes contains benzene and other risky chemicals, study finds," New York Times, available at https://www.nytimes.com/2022/06/28/climate/natural-gas-home-toxic-chemicals.html.

[33] See Brady Seals and Andee Krasner, 2020, "Gas Stoves: Health and Air Quality Impacts and Solutions," available at https://rmi.org/insight/gas-stoves-pollution-health.

[34] See UCLA Center for Occupational & Environmental Health, 2020, "Effects of Residential Gas Appliances on Indoor and Outdoor Air Quality and Public Health in California," available at https://coeh.ph.ucla.edu/effects-of-residential-gas-appliances-on-indoor-and-outdoor-air-quality-and-public-health-in-california/. .

matter. Combustion of gas from stoves and ovens produces additional NOx and carbon monoxide. **Average nitrogen dioxide (NO2) levels are approximately 50% to over 400% higher in homes with gas rather than electric cookstoves**, especially where individuals live in smaller homes and cook for longer periods of time.

Conclusion

In summary, our goal of submitting this letter is to help correct the record, and provide a foundation of information to inform future deliberations about policies emerging from the REBuilding Task Force report and recommendations. We urge legislators to rely on the significant body of peer-reviewed research that demonstrates that policies to support Oregon's transition to efficiently constructed and retrofitted buildings coupled with high-efficiency electric appliances in our buildings will not only reduce greenhouse gas emissions and mitigate the climate crisis, but will also protect public health and safety and increase community resilience.

Thank you for your consideration and the robust REBuilding Task Force process. We look forward to supporting strong buildings-related policies that move Oregon closer to achieving our climate goals while increasing resilience and lowering pollution and energy burden for communities across our state.

Sincerely,

Meredith Connolly, Climate Solutions

Neil Baunsgard, The Environmental Center