State of Oregon Department of Environmental Quality

Comments

Greenhouse Gas Emissions Program: Contracted Modeling Study "Business as Usual" Case

This document is a compilation of written comments received on the "business as usual" case of a contracted modeling study to forecast emissions and potential impacts of a new program to reduce greenhouse gas emissions. DEQ held an open comment period in early November 2020 requesting feedback from stakeholders and the public about the initial inputs and assumptions to be considered for this reference case.

Comments

1411 East Mission Avenue
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Submitted via email: capandreduce@deq.state.or.us

November 13, 2020

Lauren Slawsky
Oregon Department of Environmental Quality
700 NE Multnomah Street, Suite 600
Portland, OR 97232

RE: Avista comment on the Oregon Cap and Reduce Program, proposed modeling study on program scenarios.

Dear Ms. Slawsky:

Avista appreciates the opportunity to provide comments to the Oregon Department of Environmental Quality (DEQ) as part of the program to cap and reduce greenhouse gas (GHG) emissions in Oregon.

Avista operates a natural gas local distribution company (LDC) that serves almost 100,000 customers in Oregon. In addition, Avista owns a natural gas fired electrical generation unit (Coyote Springs II) in Oregon operating with common facilities to a generation unit owned by Portland General Electric. Relative to an effort to cap and reduce emissions associated with natural gas delivery, Avista's interest is to balance meeting emissions goals under our legal obligation to serve Oregon customers with due consideration given to compliance cost impacts to our customers. Natural gas plays, and should continue to play, an important role in supplying Oregonians with clean energy. Natural gas can provide highly efficient and lower lifecycle GHG emissions in many cases, particularly as a direct-use fuel. Natural gas is a reliable and cost-effective fuel for many Oregon businesses, such as food processors, nurseries, the wood products industry, manufacturers and others. Natural gas can continue to provide this value while reducing its GHG emissions.

Pursuant to the questions posed by DEQ to stakeholders, Avista provides the following comments.

1. ***The business as usual case is generally meant to be representative of rules and regulations that are currently in effect to act as a baseline for gauging the effectiveness of additional program scenarios. For example, DEQ intends to account for the state's current Clean Fuels Program requirements. DEQ seeks input on any other state programs that should be included for the following sectors/topics: Natural Gas***

Natural Gas Demand Forecast

Avista requests that DEQ utilize available demand forecasts for the business as usual case.

Avista provides an estimate of natural gas demand in its most recently published Integrated Resource Plan (IRP) for the following services areas in Oregon: Medford, Roseburg, Klamath Falls, La Grande. Per Chapter 2 of the IRP, average growth for the services areas listed above is estimated for the period from 2018-2037. During this period, the number of customers is expected to increase at an average annual rate of 0.9 percent, with demand growing 0.70 percent per year.[1]

In addition, the Northwest Gas Association, in its' most recent Gas Outlook study, shows natural gas growth demand for the state of Oregon grows at a rate of less than 1% (about 0.6%), for the period from 2019-2019, based upon the IRPs of all Oregon LCDs.[2]

2. ***There are a number of rules and regulations that have anticipated changes in the near future that could impact the business as usual case. For example, DEQ is trying to determine how best to incorporate expanded Clean Fuels Program requirements that DEQ is expected to begin work on in 2021. Should DEQ consider a "business as usual plus" case to represent the most likely changes to rules and regulations that may be expected in the near future? If yes, what other planned, proposed, or expected programs should DEQ consider?***

Demand Side Management

Avista requests that DEQ consider the opportunity for increased Demand Side Management (DSM) energy reductions as concluded in the 2018 IRP. Slightly higher customer growth continues to be offset by lower use-per-customer and an increased amount of DSM; this trend is expected to continue into the future.

Renewable Natural Gas

Avista requests that DEQ incorporate the anticipated increased use of renewable natural gas (RNG). Avista is evaluating potential opportunities to acquire RNG as allowed under Senate Bill 98. Avista will also be providing information about opportunities, challenges, barriers, and a strategy for acquisition of RNG in the next IRP scheduled to be published on April 1, 2021.

Interaction with Federal and Washington State Policies

Avista requests that the DEQ consider the potential emission reduction impact in Oregon of federal policies such as the corporate average fuel economy standards, fuel efficiency standards, and appliance standards.

In addition, the DEQ might also consider the impact of the Washington State Clean Energy Transformation Act and the possibility of lower utilization of the Coyote Springs electrical generation facility.

3. ***DEQ collects greenhouse gas emissions data that will be used to inform the modeling. Other state agencies, such as the Oregon Department of Transportation, and other sources of publicly available data, such as from the U.S. Environmental Protection Agency and U.S. Energy Information Administration may also be of interest to include in the analysis. Are there other data sources DEQ should consider for inputs to the model for the business as usual case? If yes, please provide the sources or let us know if you would like to provide data for consideration.***

   Specific to its gas distribution in Oregon, Avista has provided EPA Greenhouse Gas Mandatory Reporting Rule (MRR) data for Subpart NN of the MRR to the EPA since 2010. In addition, Avista reported data to the EPA for years 2011-2015 under Subpart W (LDC NG fugitives) of the MRR. Reporting was discontinued after five years due to emissions being below the Subpart W applicability criteria during that five-year period. This data is publicly available from the EPA at the EPA Greenhouse Gas Reporting Rule website. Resumption of Subpart W reporting will resume in 2022 for 2021, per OAR 340-215.

Avista appreciates the opportunity to comment on the initial inputs and assumptions to be considered for the modeling program on Cap and Reduce program scenarios. We look forward to participating in further discussions as these modeling program scenarios are more fully developed. Please direct any questions regarding these comments to me at 509-495-4738 or kevin.booth@avistacorp.com.

Sincerely,

Kevin Booth
Sr. Environmental Scientist

3 Nov response to DEQ Cap and Reduce Effort Request

Request for comment for upcoming modeling
To inform the study at this time, DEQ is seeking public and stakeholder feedback on initial inputs and assumptions to be considered for the business as usual case.
Suggestions are below.

Questions
1. The business as usual case is generally meant to be representative of rules and regulations that are currently in effect to act as a baseline for gauging the effectiveness of additional program scenarios. For example, DEQ intends to account for the state's current Clean Fuels Program requirements. DEQ seeks input on any other state programs that should be included for the following sectors/topics:

- Transportation
- Without additional promotion by government:
- What will be the number of EV's in transportation and in off-road (logging, construction, and farming) use in 2025? Of public charging stations? Of fleet stations, home charging?
- What conversion in Oregon of individual internal combustion engines will be occurring in 2025?
- Natural gas
- Without public promotion
- What amount of fossil gas and of renewable gas will be consumed in 2023 and 2025?
- What proportion of new and renovated in-door space will be heated by gas?
- Will there be measurement of methane escape from well, transport and storage?
- Electricity
- Without government promotion:
- What will be total consumption of electric power in 2025?
- What will be amount in 2025 of industrial solar, decentralized roof solar, large industrial wind, small wind?
- Will there in 2025 be feed in tariff for roof residential solar? Community solar?
- Buildings
- Without public promotion
- What will in 2025 be the rate of replacement of construction concrete by laminated wood?
- What portion of new housing in 2025 will have auto park space zoning requirements?

- Energy efficiency
- Without public promotion,
- What will be amount of money spent on secondary weatherizationand and on more weatherization than required by code on new construction?
- What will replacement rate in 2025 for less efficient refridgerators and refridgeration systems and home laundry?

2. There are a number of rules and regulations that have anticipated changes in the near future that could impact the business as usual case. For example, DEQ is trying to determine how best to incorporate expanded Clean Fuels Program requirements that DEQ is expected to begin work on in 2021. Should DEQ consider a “business as usual plus” case to represent the most likely changes to rules and regulations that may be expected in the near future? If yes, what other planned, proposed, or expected programs should DEQ consider?

ANSWER: Should try to avoid rewarding those advances that are going to happen anyway.

3. DEQ collects greenhouse gas emissions data that will be used to inform the modeling. Other state agencies, such as the Oregon Department of Transportation, and other sources of publicly available data, such as from the U.S. Environmental Protection Agency and U.S. Energy Information Administration may also be of interest to include in the analysis. Are there other data sources DEQ should consider for inputs to the model for the business as usual case? If yes, please provide the sources or let us know if you would like to provide data for consideration.

4. What information or results from the modeling of program scenarios would you find most useful?

Next steps

Program scenarios to be modeled will be developed beginning in early 2021 and will be informed by the Rulemaking Advisory Committee and rulemaking process. Rulemaking Advisory Committee meetings are anticipated to begin in January 2021, where there will be an opportunity to provide input on potentially modeled program scenarios. All Rulemaking Advisory Committee meetings are open to the public and each meeting will provide an opportunity for the public to comment. Initial results of the study are expected in early 2021, with final results expected later in 2021. This study is intended to inform the overall program design as well as the fiscal impacts analysis conducted as part of formal rulemaking.

Submitted electronically to via email at capandreduce@deq.state.or.us

November 13, 2020

Lauren Slawsky
Office of Greenhouse Gas Programs
Oregon Department of Environmental Quality
700 NE Multnomah St.
Suite 600
Portland, OR 97232

Dear Ms. Slawsky:

The Oregon Department of Environmental Quality (DEQ) has announced that the agency has hired ICF to conduct specialized economic and greenhouse gas and co-pollutant emissions modeling to study design options for the GHG Cap and Reduce Program. According to DEQ, ICF will start this study by compiling data and assumptions for modeling a business as usual (BAU) case. Cascade Natural Gas Corporation (Cascade) has reviewed the request for input and assumptions posted on the DEQ's website and appreciates the opportunity to provide the preliminary input below. As there was a quick turnaround for responses, we may need to supplement this information after additional review. Depending on how data is modeled, Cascade may have additional recommendations for DEQ and ICF.

DEQ requested input on GHG emission data to use for the business as usual case and stated that a source of this information could be the U.S. Energy Information Administration (EIA). For assumptions of natural gas usage in Oregon, we do not recommend using EIA data. Each utility company provides projections of natural gas sales to the Oregon Public Utilities Commission through biennial integrated resource plans (IRPs). We believe the most accurate source of natural gas sales projections to calculate GHGs emissions for natural gas customers would be from utility IRPs since IRPs consider regional and local factors and regulatory requirements and company-specific modeling of energy and conservation programs.

The Northwest Gas Association (NWGA) compiles a Gas Outlook Study that includes utility company projections and other information. The NWGA 2020 Gas Outlook report can be found on the following webpage and includes an Integrated Resource Plan link where the most recent individual company IRPs are posted: https://www.nwga.org/gas-outlook/2020-outlook-study/. Currently, Cascade's 2018 IRP is posted on the NWGA site. However, Cascade recently completed the 2020 IRP and that IRP can be found here: https://www.cngc.com/rates-services/rates-tariffs/oregon-integrated-resource-plan/.

Utility company IRPs include projections of core customer sales, as well as non-core customer sales. Non-core, or transport, customers are predominantly industrial or large commercial facilities that consume larger amounts of natural gas, usually for manufacturing products or other purposes and may be considered energy intensive and trade exposed (EITE) businesses. Transport customers may potentially be large stationary sources that are sending emissions data to DEQ separately per this request. Cascade recommends DEQ and ICF carefully evaluate the date received and compiled for modeling to ensure emissions are not double counted.

DEQ also asked what information or results from the modeling of program scenarios would be most useful. Cascade believes there is a role for natural gas utilities to continue to play in Oregon's clean energy future. The modeling should inform stakeholders on the best cost pathway for achieving emission reductions and include evaluation of risk when considering any fixed pathways to decarbonize. Although the rule may not include electric sector emissions, there would still be emissions impacts from that sector that need to be considered when proposing to reduce emissions from the use of natural gas. We expect the modeling results to provide perspective on this. We also believe the modeling should inform stakeholders on leakage potential and impacts to low-income and vulnerable populations. We will continue to review DEQ's questions and provide additional feedback in future.

DEQ has notified Cascade that the agency has proposed to the Environmental Quality Commission that Alyn Spector be appointed to the Regulatory Advisory Committee. We appreciate DEQ appointing Alyn to the RAC and Cascade looks forward to engaging with DEQ and RAC members in this rulemaking process. Again, Cascade appreciates the opportunity to provide input to DEQ. If you have any questions or would like to discuss these comments, please contact me at abbie.krebsbach@mdu.com or 701-222-7844.

Sincerely,

Abbie Krebsbach
Director of Environmental

cc: Cory Fong – Director of Governmental Affairs and Communication
Scott Madison – Executive VP, Business Development & Gas Supply
Mike Parvinen – Director of Regulatory Affairs
Alyn Spector – Manager, Energy Efficiency Policy
Monica Cowlishaw – Manager, Energy Efficiency & Community Outreach

COMMENTS ON PROGRAM MODELING ASSUMPTIONS AND SCENARIOS

Submitted by Robert Yuhnke on behalf of

Elders Climate Action

Elders Climate Action submits these comments on the proposed modeling project for the Cap and Reduce rulemaking. We understand from the brief description in the invitation for comments that the modeling will include three elements: 1) forecasting emissions based on various policy options; 2) estimating the impact that emission scenarios will have on air quality; and 3) the impact that changes in air quality will have on public health. Our comments address each of these points.

I. Forecasting Emissions.

We are not prepared to address emissions forecasting in detail here. However, we believe that at least one future case should assume a path to achieve zero CO2 emissions by 2050, with half that reduction by 2030, from all on-road, rail, and commercial shipping mobile sources, and all major industrial sources that rely on carbon fuels to power their processes. Policy makers need to know what the benefits will be of achieving the IPCC targets for reducing CO2 to the levels deemed necessary to keep global temperatures from rising above 1.5 C.

II. Estimating Emission Impacts on Air Quality.

The first step is to determine the pollutants to be modeled for the purpose of evaluating the impact of emission control scenarios on air quality. We recommend that modeling be used to estimate expected future concentrations of ozone precursors and PM2.5, at a minimum, for a number of reasons, including—

1) the ubiquity of public exposure to these two pollutants,

2) the severity of the health outcomes associated with exposure to these pollutants,

3) the strength of the evidence establishing causal associations between exposure to these pollutants and adverse health outcomes that have a significant impact on community health, and

4) the magnitude of the emissions inventory for these pollutants that is attributed to the combustion of carbon fuels and the potential reductions in emissions that will result from replacing carbon fuels with zero emission alternatives.

Ozone.

ECA raised the concern in our comments on the goals and framework of the OCAP that as the climate continues to warm, and the summer temperature profile in Oregon adds more days in the 90 to 100 F temperature range over a longer summer season, local climate conditions will

increase the number of days when ozone levels will exceed the level of the NAAQS creating potential future violation of the ozone NAAQS. For that reason, we believe that modeling future emissions scenarios should include ozone modeling.

Modeling for ozone needs to account for both a base case with expected changes in emissions from growth in the state's population, VMT growth from both in-state and interstate travel, increase land area occupied with human settlement that increases the heat-island effect, and likely changes in the local climate regime that include more days above both 90 F and 100 F, dry conditions and an extended summer season.

Typically the assumption common to most modeling exercises is that once a model is validated against monitored data for 3 or 4 base case days, only one variable – emissions -- should be adjusted between the baseline scenario and the future case to be evaluated. But this does not account for the effect that climate change will have on future air quality.

Ozone chemistry is especially sensitive to temperature as a variable that drives the atmospheric chemistry. In the case of Portland, the days in 2017 when ozone levels exceeded the NAAQS were associated with high temperature events. The frequency of those events will increase over time as the global climate and ocean temperatures warm. Assumptions need to be made to account for the likely effect those changes will have on ozone chemistry in the state.

PM2.5.

As discussed in section III, Health Effects, PM2.5 has a significant adverse impact on public health. PM2.5 is emitted from natural sources, but is elevated above background levels in areas influenced by anthropogenic activities that involve the combustion of carbon fuels.

PM2.5 emissions create the greatest health risk to communities exposed to the hazardous pall of pollution in the neighborhoods around transport hubs such as highways, airports, ports and rail yards, and industrial sources. Exposures in these neighborhoods have been found to be significantly higher than concentration measured at "regional" monitors not located near industrial sources or highways. For this reason when EPA last revised the NAAQS for these pollutants, States were required to revise their monitoring networks for PM2.5 and NO2 to add near-highway monitors. In some cities, near-highway monitors report annual concentrations ranging from 20% to 40% greater than regional monitors.

These higher exposures contribute to increased incidence of cardiovascular and respiratory diseases among children, adults and the elderly that 1) increases the need for hospital and urgent care, 2) causes pre-mature death that significantly shortens the lives of residents, 3) increases the prevalence of asthma among children which interferes with school attendance and education, and requires medical treatment and hospitalization, 4) interferes with normal lung development in children and adolescents that results in permanent, lifetime impairment of lung function, 5) increases the incidence of debilitating or fatal cancers, and 6) impairs immune function.

To account for the health consequences of these higher exposures, and properly estimate the health benefits of converting sources at these locations to zero carbon emission alternatives, modeling of PM2.5 must include smaller scale grids along highway corridors, rail, air and port

terminals, and major industrial sources. Regional modeling typically is performed at multi-kilometer scales, but the elevated concentration monitored near highways and industrial sources are best characterized with grids beginning at 10 meters adjacent to the source and expanding to 50 meters at distances more than 50 M from the source. EPA's Transportation Conformity modeling guidance provides appropriate parameters for estimating PM2.5 concentrations near major highways.

Replacing internal combustion engines and industrial processes that rely on carbon fuels with zero emission technologies will eliminate most exposures to PM elevated above background levels, except for PM emissions caused by earth moving or materials crushing activities. Eliminating the co-pollutants from carbon combustion from these sources will provide real public health benefits, but reliably characterizing the magnitude of the benefits will require that the modeling parameters be appropriately defined to quantify the full reductions that will occur in the communities near major sources.

III. Health Effects of Pollution Exposures.

The modeling analysis should attempt to quantify the public health benefits of replacing fossil-fueled engines and industrial processes with zero emission technologies.

A. Carbon Combustion in Transport Vehicles, Power Plants and Industrial Sources Causes or Contributes to Premature Death and Disease.

Global warming and climate disruption is now causing, and will continue to increase, injury to human health. Extreme high temperatures during heat waves are causing increased deaths from heat stroke. Warmer temperatures are expanding the geographic range of insects that carry serious diseases including zika, west Nile virus, dengue fever and malaria to regions previously disease free. Warmer waters in lakes, rivers and oceans are spawning algal blooms that contaminate seafood and drinking water with deadly toxins. Firestorms burning uncontrolled for weeks are killing trapped residents and causing widespread smoke pollution that triggers heart attacks and severe respiratory distress among residents far removed from the fire zone. Massive floods from lingering hurricanes and repeated storm fronts are contaminating public and private water supplies and isolating elderly and at-risk persons from access to medications and health care. Stopping further climate disruption is essential if the worsening of these growing threats to health are to be prevented.

The combustion of carbon that produces CO2 also emits a complex array of hazardous pollutants that U.S. EPA has found cause deadly and debilitating effects on human health, including premature death, cardiovascular disease, chronic obstructive pulmonary disease, lung cancer, impaired fetal development, low birthweight babies, autism, childhood asthma, impaired lung development, chronic obstructive pulmonary disease and impaired cognitive function among children and adults.

The actions needed to stabilize the climate and prevent the accelerated worsening of the adverse effects on human health from a hotter climate will also provide other substantial public health benefits. The most important health benefits will flow from eliminating the exposures of over

one hundred and thirty million Americans, including most Oregon residents, to life-shortening air pollutants by not burning carbon fuels. Other health benefits will be achieved by not poisoning the air with toxic pollutants emitted from oil and gas well fields, oil refineries and fuel transport terminals, by ending the scourge of Black Lung disease when coal miners' lungs are no longer destroyed in coal mines, and by not poisoning water supplies now being contaminated by fracking fluids, ruptured oil pipelines and derailed oil trains.

B. Ending the combustion of carbon will save thousands of lives annually and protect children from life-long health impairment.

CO2 is emitted from the combustion of carbon in petroleum fuels, coal, natural gas, alcohol and bio-fuels (wood, peat and agricultural wastes) to produce energy. CO2 causes adverse effects on health that flow directly from heating the atmosphere and its contribution to climate disruption. Carbon combustion also causes the emission of numerous other air pollutants that shorten lives and impair human health in ways that degrade the quality of life and interfere with the enjoyment of life by preventing the normal development of children into healthy fully functional adults.

These disease outcomes are significantly elevated in communities exposed to the pollutants emitted from combustion of coal, oil and natural gas. Exposures are greatest near coal-fired power plants, industrial plants where fossil fuels produce heat for processes such as making steel and refining oil, and transport facilities where fossil fuels are combusted to generate the motive power used to transport goods and passengers on roads, rail, water and airports.

The air pollutants that U.S. EPA has identified as most responsible for causing premature death and the increased incidence of disease among urban dwellers and other exposed populations include:

- fine particles (soot containing both elemental carbon and complex carbon compounds including benzene, formaldehyde, acetylene, 1,3 butadiene, and polycyclic aromatic hydrocarbons).
- carbon monoxide (the product of incomplete combustion of carbon fuels).
- oxides of nitrogen (formed in high temperature combustion of carbon that occurs in power plants and internal combustion engines).
- sulfur dioxide and sulfate (formed during combustion of carbon fuels containing sulfur – coal and oil), and
- ozone (formed in the atmosphere from the chemical interaction of nitrogen oxides and organic carbon compounds emitted from carbon fuel combustion).

The latest health effects research estimates that air pollution from burning carbon was expected to take an estimated 242,000 lives in the U.S. during 2020 assuming normal economic activity

not slowed by the COVID pandemic.[1] Earlier work by EPA staff using older mortality risk factors derived from health effects research available in 2016 estimated 110,000 deaths annually.[2] As a proximate cause of death, air pollution from fossil fuel combustion would rank as the third-leading cause of death in the U.S. contributing to eight of the top ten causes—heart disease; cancer; chronic lower respiratory diseases; stroke (cerebrovascular diseases); Alzheimer's disease; diabetes; influenza and pneumonia; and nephritis, nephrotic syndrome, and nephrosis.[3] Shindell estimates that ending the combustion of carbon fuels will save 1.4 million American lives between now and 2040.

Both studies attribute roughly 70 -75% of the pre-mature mortality to PM exposures, with ±25% to ozone exposures.

1. PM2.5 Health Effects.

These are also the pollutants that are associated with greatest non-fatal adverse health effects. Greater frequency of the hospitalization of children with asthma and higher rates of cardiovascular disease are two health outcomes that EPA identified as most causally linked to exposure to PM2.5.

In its last reviews before the current Administration's review of the adequacy of the NAAQS for PM2.5 (2009) and NO2 (2008), EPA identified strong causal relationships between exposure to these pollutants and fatal adverse health outcomes. In its review of the health effects literature available through 2009 as part of the Agency's determination to make the NAAQS for PM2.5 more protective, EPA found [bold in original] [4] –

- "**a causal relationship exists between short-term exposures to PM2.5 and mortality**."
- "**a causal relationship exists between long-term exposures to PM2.5 and mortality.**"
- "**a causal relationship exists between short-term exposures to PM2.5 and cardiovascular effects."**
- **"a causal relationship exists between long-term exposures to PM2.5 and cardiovascular effects."**

[1] *See* testimony "Health and Economic Benefits of a 2ºC Climate Policy," Appendix: Methods, *Premature Mortality*, p. 10; presented by Dr. Drew Shindell, Nicholas School of the Environment, Duke University, to the House of Representatives, Oversight Committee (August 5, 2020): https://nicholas.duke.edu/sites/default/files/documents/Shindell_Testimony_July2020_final.pdf. Shindell uses the most recent risk factors for modeling the mortality caused by exposure to fine particles (soot) and ozone (smog) updating the earlier work of EPA staff.

[2] Kenneth Davidson, et al., 2020 *Environ. Res. Lett.* **15** 075009.

[3] National Center for Health Statistics, Centers for Disease Control and Prevention, Leading Causes of Death, https://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm.

[4] *Integrated Science Assessment for Particulate Matter* (US EPA, December 2009), pp. 2-10, 2-11, 2-12.[hereinafter *ISA for PM*]

EPA did not attribute these effects exclusively to fine particles emitted from motor vehicles, but EPA cited studies that establish a causal relationship between exposure to traffic PM, or one or more components of traffic PM emissions, and pre-mature mortality and emergency treatment for cardiovascular outcomes. For example, "multiple outcomes have been linked to a PM2.5 crustal/soil/**road dust** source, including cardiovascular mortality"; "studies have reported associations between other sources (i.e., traffic and wood smoke/vegetative burning) and cardiovascular outcomes (i.e., mortality and ED visits)"; "Studies that only examined the effects of individual PM2.5 constituents found evidence for an association between EC and cardiovascular hospital admissions and cardiovascular mortality";[5] "studies found an association between mortality and the PM2.5 sources: …, traffic"; "recent studies have suggested that PM (both PM2.5 and PM10-2.5) from .. road dust sources or PM tracers linked to these sources are associated with cardiovascular effects."[6]

In addition, EPA cited studies demonstrating a causal relationship between exposure to PM2.5 and childhood asthma: "road dust and traffic sources of PM have been found to be associated with increased respiratory symptoms in asthmatic children and decreased PEF in asthmatic adults."[7]

EPA also found a causal relationship between exposure to NO2 and childhood hospitalization for asthma:

"Epidemiologic evidence exists for **positive associations of short-term ambient NO2 concentrations below the current [1983] NAAQS level with increased numbers of ED visits and hospital admissions for respiratory causes, especially asthma.** These associations are particularly consistent among children and older adults (65+ years) when all respiratory outcomes are analyzed together, and among children and subjects of all ages for asthma admissions."[8]

More recent studies not available for EPA's 2008 *ISA for Oxides of Nitrogen*, or 2009 *ISA for PM*, confirm and strengthen these associations. All of the relevant research currently available establishes the relationship between exposure to traffic pollution and the adverse health outcomes occurring in residents living along heavily trafficked highways such as the I-5 and I-84 corridors, including cardiovascular disease, pre-mature mortality, childhood asthma and cancer, impaired lung and central nervous system development, low birth weight, and early symptoms of COPD. [9] All demonstrated associations between exposures to these pollutants and adverse health outcomes should be included in the analysis.

[5] Note that "EC" is short-hand for "elemental carbon" which is primarily unburned carbon from fossil fuel combustion, and is a significant component of fine particles emitted from diesel and gasoline engines.
[6] *ISA for PM,* p. 2-26.
[7] *Id.*
[8] *Integrated Science Assessment for Oxides of Nitrogen – Health Criteria* (US EPA, July 2008), p. 5-11.
[9] New research shows unexpected development of COPD symptoms in childhood associated with air pollution exposures: "Early-life Risk Factors for Reversible and Irreversible airflow limitation in young adults," (available at

EPA Finds No Threshold for Safe Exposure to PM.

The analysis of health benefits should not cut off the investigation of benefits at the levels of the applicable national ambient air quality standards.

EPA also found that there is no safe level of exposure to these pollutants. In the *ISA for PM*, at p. 2-25, EPA concluded that "evidence from the studies evaluated supports the use of a no-threshold, log-linear model." EPA reached a similar conclusion with respect to NO2: " In studies that have examined concentration-response relationships between NO_2 and health outcomes, the concentration-response relationship appears linear within the observed range of data, including at levels below the current standard. There is **little evidence of any effect threshold.**"[10] [Emphasis in original.]

The most critical implication of these findings for purposes of assessing health impacts is that evidence showing that concentrations of PM2.5 and NO2 are below the NAAQS for these pollutants cannot be relied upon to support a conclusion that exposure to existing concentrations of each of these pollutants is not contributing to the adverse health outcomes being observed in near-highway communities along heavily trafficked corridors, or in the vicinity of industrial sources where carbon fuels contribute to emissions.

In addition, research shows a direct correlation between disease outcomes and the portion of PM2.5 that is contributed by carbon particles emitted from diesel trucks and automobiles and other sources of the co-pollutants of carbon combustion.

EPA's findings regarding the link with cardiovascular disease that was reported in EPA's *Integrated Science Assessment* for PM reviewed all of the hundreds of published scientific research reports available in 2011. That review convinced EPA to (i) tighten the NAAQS for PM2.5 in 2012, and (ii) mandate for the first time that states monitor PM air quality in communities adjacent to highways because of the elevated levels of pollution found near highways, and the link between exposure to highway emissions of PM2.5 and adverse health effects.

More recent health effects research published since the EPA's 2009 *ISA* was prepared link the adverse health effects associated with PM to the portion of PM emitted from highways. Highways emit particles containing carbon from fuel combustion, tire wear and asphaltic road surface material. The research published by a team from the Keck School of Public Health at USC,[11] and another study published by the California Office of Environmental Health Hazard

https://thorax.bmj.com/content/thoraxjnl/early/2020/11/05/thoraxjnl-2020-215884.full.pdf); "Assessment of chronic bronchitis and risk factors in young adults: Results from BAMSE," (available at https://erj.ersjournals.com/content/early/2020/09/17/13993003.02120-2020).

[10] *ISA for Oxides of Nitrogen*, p. 5-15.
[11] "Near-Roadway Air Pollution and Coronary Heart Disease: Burden of Disease and Potential Impact of a Greenhouse Gas Reduction Strategy in Southern California," Ghosh, et al (EHP, July 2015) http://dx.doi.org/10.1289/ehp.1408865.

Assessment[12] identifies carbon particles as the component of PM2.5 most associated with cardiovascular disease.

Research performed in Arkansas show that cardiovascular disease decreased significantly during the decade between 2000 and 2010 because annual PM2.5 concentrations were reduced during that period by 3 ug/M3 at levels below the NAAQS.[13] This research shows that reducing PM concentrations below the levels of the NAAQS have public health benefits.

The public health analysis should account for health benefits that will result from reducing exposures below the levels of the PM NAAQS in communities exposed to emissions from both industrial sources and on-road internal combustion engines..

2. Ozone Health Effects.

Ending carbon combustion will protect millions of Americans now sickened by urban smog every year. The ozone national ambient air quality standard (NAAQS) is violated when the level of the NAAQS (70 ppb) is exceeded over an 8 hour period on at least four different days during three consecutive ozone seasons (annual periods) at the same ozone monitor.[14] But adverse health effects are experienced by populations each day when ozone is elevated above background levels. The NAAQS is not an appropriate benchmark for determining when ozone concentrations harm public health.

Ozone is formed in the atmosphere from the chemical reaction of the pollutants emitted from carbon combustion: volatile organic carbon (VOC) compounds and nitrogen oxides (NOx). In most urban areas, more than ninety percent of these pollutants are emitted from vehicle engines that burn petroleum fuels, and power plants that burn coal. When fossil fueled vehicles are replaced with zero emission technologies, and coal is no longer burned to generate electricity, urban ozone and its devastating impacts on human health will become a footnote in history.

Ozone-Caused Asthma Attacks Linked to Daily Exposures.

EPA's Clean Air Science Advisory Committee found that every day when ozone concentrations reach the level of the national ambient air quality standard (70 ppb), 8 to 20% of all children will experience a reduction in lung function deemed adverse to the health of an asthmatic child. When ozone concentrations reach 75 ppb, only 5 ppb above the standard, from 11% to 22% of all school aged children will experience at least one such an event, and 1 to 6% of children will experience such adverse health events on 6 or more days.[15] Both the percentage of children

[12] "Associations of Mortality with Long-Term Exposures to Fine and Ultrafine Particles, Species and Sources: Results from the California Teachers Study Cohort," Ostro, B, et al. (EHP, January 2015) http://dx.doi.org/10.1289/ehp.1408565.

[13] "Trends of Non-Accidental, Cardiovascular, Stroke and Lung Cancer Mortality in Arkansas Are Associated with Ambient PM2.5 Reductions," Charbot, M., et al. *Int. J. Environ. Res. Public Health* (2014), 11, 7442-7455.

[14] 40 C.F.R. §50.10.

[15] "CASAC Review of the EPA's *Second Draft Policy Assessment for the Review of the Ozone National Ambient Air Quality Standards,*" letter to EPA Administrator Gina McCarthy (June 26, 2014), 14.

experiencing harmful effects and the number of days when exposures produce harmful effects continue to increase as ozone concentrations are elevated further above the level of the NAAQS. In most nonattainment cities, ozone levels routinely exceed 80 ppb, and in the worst polluted areas 8 hour concentrations can reach 110 ppb.

Nearly three million asthmatic children are exposed to elevated ozone levels in ozone nonattainment areas. The U.S. population exposed to levels of ozone elevated above the NAAQS in 201 EPA-designated nonattainment counties is currently an estimated 132 million. As of 2018, the U.S. Census estimates that 22.4% of the U.S. population are under 18 years of age: https://www.census.gov/quickfacts/fact/table/US/PST045218. The childhood population exposed to elevated ozone in ozone nonattainment areas is roughly (132 x .224) 29.5 million. The CDC reports that "About 1 in 10 of all children have asthma, and about 1 in 6 (17%) of non-Hispanic black **children** had **asthma** in 2009." The incidence of asthma is higher in ozone nonattainment areas and in predominantly black neighborhoods, therefore the national cohort of asthmatic children exposed to elevated ozone is at least 2.95 million.

The Oregon health analysis should identify children likely to be exposed to days with elevated concentrations of ozone above levels at which adverse effects have been observed, such as 60 ppb, 65 ppb, 70 ppb, etc., so that children exposure days can be determined as an initial step in estimating expected adverse health outcomes.

In its review of the health effects research, EPA found that populations exposed to elevated ozone will experience other adverse health effects in addition to asthma attacks, including both respiratory and cardiovascular disease outcomes. Both asthma attacks and these other adverse health outcomes often require resort to medications, and many require urgent or emergency medical care. Adults who require care often miss work, lose income and incur medical costs. Children miss school. If they miss many days, their education is disrupted and students fall behind which contributes to high school dropout rates. Childhood asthma, autism and impaired cognitive development linked to pollutant exposures all contribute to failed educational achievement, which in turn is strongly correlated with lower lifetime income, poor health histories and shorter lifespans.

When the high frequency of asthma attacks is added to the expected frequency of other adverse health outcomes, the best estimates are that high ozone pollution days will cause from 1% to 3% of the entire exposed population to experience an adverse health outcome that interferes with personal health to the degree that normal daily activity is disrupted and some medical intervention is required. In every large metropolitan area, hundreds of thousands of Americans suffer significant adverse health events on each high ozone pollution day.

Frequent High Ozone Days Magnify Adverse Health Effects.

Each elevated ozone day contributes to adverse health outcomes. Frequent high ozone days in addition to the 12 days required to violate the ozone NAAQS (i.e., at least four days exceeding 70 ppb, the level of the NAAQS, per ozone season for three consecutive ozone seasons) significantly magnify the adverse impact on public health. In Oregon, days that exceed the NAAQS are few, but when they occur they cause significant impacts on human health.

In the future, ozone exceedance days are expected to increase as the summer temperature regime becomes hotter. Oregon does not have the current ozone problem that California has, but as Oregon summers become hotter the frequency of elevated ozone concentration days is likely to become more similar to California where most nonattainment areas exceeded the level of the NAAQS on many more than 12 days during the last three ozone seasons (2017-19).[16]

Nonattainment area	Total Exceedance days
Sacramento	118
San Diego	93
San Joaquin Valley	329
South Coast	412
Ventura County	41
W. Mojave Valley	272
Coachella Valley	199
Mojave Valley	127
Eastern Kern County	98
Imperial County	61
Mountain Counties –Central	25
Mountain Counties – Southern	74
Butte County	37
Western Nevada County	105

Regional Ozone Exposures Are Exacerbated by Exposure to Additional Pollutants Emitted from Carbon Combustion.

Residents in ozone nonattainment areas who live near highways are also exposed to elevated levels of other pollutants emitted by motor vehicles. Near-highway residents are exposed to 25% to 40% higher concentrations of fine particles and toxic air pollutants emitted from the combustion of carbon fuels in vehicles on heavily trafficked highways compared to residents not near highways. Exposures are also greater for residents near oil refineries that produce refined petroleum fuels for cars, trucks, locomotives and aircraft. EPA has found that these pollutants further contribute to the adverse health outcomes caused by ozone such as asthma, and to other adverse health effects not linked to ozone such as cancer.

Cancer risk has been studied extensively in the five county South Coast Air Basin in California. The latest iteration of the Multiple Air Toxics Exposure Study (MATES-IV) continues to show that localized exposures to toxic air pollutants and resulting cancer risks are many times higher

[16] "Latest Year's (Annual) Ozone Summaries for Selected Regions (PST)", California Air Resources Board, https://www.arb.ca.gov/aqmis2/ozone_annual.php (referenced Feb. 16, 2020).

near highways and major industrial sources than at locations not near these sources of carbon combustion.[17] Except for metals and solvents, the pollutants that account for most of the cancer risk are the products of carbon combustion, with diesel exhaust contributing most to atmospheric cancer risk.[18]

Residents exposed directly to highway and refinery emissions suffer additional adverse health outcomes beyond the effects caused by region-wide exposures to ozone resulting in a greater total air pollution health burden.

Meeting I.P.C.C. CO2 Reduction Targets will save lives and Liberate Urban Americans from the Diseases of Air Pollution.

Adverse health impacts caused by the combustion of carbon impose a heavy burden of lost opportunity and cost on American families. That burden is greatest on low income Americans, both because they 1) are more likely to reside in high exposure neighborhoods near industrial facilities and major highways where the combined exposure to regional ozone levels and local emissions of fine particles and toxic pollutants are greatest, and 2) are least able to bear the economic impacts of medical care and lost income.

Very few of the metropolitan areas that violated the national health standard for ozone when the Clean Air Act was enacted in 1970 attained the current public health standard by 2016. Cars and power plants are much cleaner today, but compliance with the ozone standard has not been achieved in the largest metropolitan areas where one-third of Americans reside.

Achieving the latest (2018) International Panel on Climate Change target of zero CO2 emissions by 2050, with at least half of that reduction by 2030, will enhance the health and longevity of millions of Americans. These targets are achieved by eliminating coal, oil and natural gas for electric power generation by 2030, and by requiring that all new passenger vehicles meet a zero emission standard by 2030. Achieving zero carbon from power plants and tailpipes will also eliminate all the other pollutants that threaten human health. The strategies needed to achieve climate stability will eliminate most sources of air pollution making urban air safe to breathe for the first time since the beginning of the industrial age.

The replacement of internal combustion engines with zero emission technologies to power autos and trucks, rail locomotives, and ships will also bring an end to new drilling for oil and gas eliminating the release of nearly all toxic air pollutants from well fields, and preventing further contamination of water supplies with drilling chemicals. Replacing ICEs will also eliminate toxic emissions from most oil refineries. Some oil refining capacity will still be needed to refine crude pumped from existing well fields to produce petroleum-derived products not burned as fuel such as lubricants, chemicals and plastics, but most refineries will no longer remain as a source of toxic contamination for nearby neighborhoods.

[17] Multiple Air Toxics Exposure Study IV (South Coast AQMD, 2015), available at: http://www.aqmd.gov/docs/default-source/air-quality/air-toxic-studies/mates-iv/mates-iv-final-draft-report-4-1-15.pdf?sfvrsn=7.
[18] *Id.*

November 13, 2020

Oregon Department of Environmental Quality
Office of Greenhouse Gas Programs
700 NE Multnomah St. Suite 600
Portland, OR 97232

capandreduce@deq.state.or.us ***Submitted via Email***

cc: *Kristen Sheeran, Nik Blosser, Richard Whitman*

Environmental Defense Fund (EDF) appreciates this opportunity to comment and submits the following comments in response to the questions that DEQ has posed to the public on its contracted modeling study for the cap and reduce program:

1. *The business as usual case is generally meant to be representative of rules and regulations that are currently in effect to act as a baseline for gauging the effectiveness of additional program scenarios. For example, DEQ intends to account for the state's current Clean Fuels Program requirements. DEQ seeks input on any other state programs that should be included for the following sectors/topics: transportation, natural gas, electricity, buildings, energy efficiency.*

- An accurate business as usual (BAU) scenario should include rules and regulations that are currently in effect and are driving quantifiable emission reductions or concrete system-level changes that effect energy use and consumption. The BAU should also capture any regulations affecting non-energy greenhouse gas emissions. BAU inputs should reflect enforceable policies, and should be calibrated to ensure double-counting is avoided. Such a BAU is essential for getting an accurate understanding of the delta between where Oregon's emissions are projected to be under current conditions and the emission reduction targets in the executive order, as well as the cap and reduce program's impacts.
- In addition to Oregon's existing rules and regulations, DEQ should consider any federal regulations that are currently in effect and have a present and future impact on Oregon's greenhouse gas emissions. However, it is important to note the significant uncertainty around federal rules and regulations, given questions about which regulatory rollbacks will be reversed under a new administration, and the timing of when such reversals would occur.

2. There are a number of rules and regulations that have anticipated changes in the near future that could impact the business as usual case. For example, DEQ is trying to determine how best to incorporate expanded Clean Fuels Program requirements that DEQ is expected to begin work on in 2021. Should DEQ consider a "business as usual plus" case to represent the most likely

changes to rules and regulations that may be expected in the near future? If yes, what other planned, proposed, or expected programs should DEQ consider?

- Modeling the impacts of anticipated, near-future changes can provide useful information. However, it is important to note that such a sensitivity case would be a supplemental analysis, and would not substitute for a BAU based on rules and regulations that are currently in effect. EDF recommends that this analysis be characterized as a policy case sensitivity, allowing the DEQ and stakeholders to understand how the cap & reduce policy scenarios interact with complementary policies under consideration.
- Modeling likely policies—such as the E.O. 20-04's clean fuels, food waste, and new construction energy efficiency directives, which have specified targets for ambition and timelines for implementation—can provide important perspective on the amount of emissions reductions that the cap and reduce program will ultimately be responsible for. A range of supplemental analyses may be useful for providing such insight. In the context of evaluating backstop emissions control policies (which is what the Cap & Reduce program will be serving as), modeling typically accounts for the impacts of complementary policies that affect emissions, and then assumes that the "cap" program will be responsible for driving the remaining emission reductions needed to meet overall targets. Modeling the cap and reduce program should involve a similar approach, where the cap & reduce budget is calibrated to ensure that the cumulative emission reductions consistent with achieving the executive order targets is achieved. The likely "complementary" policies to the backstop cap can be appropriately modeled as sensitivities in the policy cases, helping demonstrate the range of reductions that the cap & reduce program may ultimately be responsible for.
- It would also be helpful to do an additional sensitivity scenario that would explore how choices that agencies might make in implementing EO 20-04 could affect results depending on the level of ambition of those choices. This full picture would provide a better understanding of costs, benefits, and opportunities from increasing the ambition of the cap and reduce program.

3. DEQ collects greenhouse gas emissions data that will be used to inform the modeling. Other state agencies, such as the Oregon Department of Transportation, and other sources of publicly available data, such as from the U.S. Environmental Protection Agency and U.S. Energy Information Administration may also be of interest to include in the analysis. Are there other data sources DEQ should consider for inputs to the model for the business as usual case? If yes, please provide the sources or let us know if you would like to provide data for consideration.

- EDF has found the EIA Annual Energy Outlook (AEO) to be a valuable source of information. In the past, we've used the high oil & gas supply case to reflect lower natural gas prices; these prices from the high oil & gas supply case have trended closer to

real world prices. It would be useful to run sensitivity analyses with the high oil & gas supply case to see its natural gas prices impact results and to demonstrate a "range" of possible business-as-usual trajectories. We've found that gas prices is often the most valuable input to vary

- The National Renewable Energy Laboratory (NREL)'s Annual Technology Baseline (ATB) provides a set of technology cost and performance data. The NREL ATB could be a useful data source, particularly for prices related to renewable energy.
- EDF also recommends that the DEQ not over-estimate the emissions-lessening impacts associated with COVID-19 in any BAU scenarios. While it is critical to understand the range of uncertainty, early indications are that emissions are already rebounding even faster than experts initially expected. In a recently-distributed research note, the Rhodium Group found the world's largest economies are beginning to return to pre-pandemic emission levels in industry, electric power, and transportation.[1] By July, power generation in the U.S. had fully recovered to 2019 levels. Scientists have noted the significant difference between stopping all activity versus instituting critical structure changes, and point to the quick rebound after the 2009 recession as countries poured vast resources into reviving economies. Emissions in China are back to pre-pandemic levels. Most problematically, cities that have reopened in China and Europe are seeing a surge in vehicle traffic[2] and experts are warning that transportation emissions in particular are likely to spike relative to prior, pre-pandemic levels as more Americans get back in their cars instead of relying on public transportation—a structural shift that could take years to reverse. It's valuable to understand the uncertainty from a CoVid-19 sensitivity, but this should not inform the calibration of the emissions budget necessary under the policy cases.

4. What information or results from the modeling of program scenarios would you find most useful?

- EO 20-04's emission reduction targets are an important reference point for developing scenarios. All scenarios modeled should ensure that the cap is calibrated to at minimum meet a cumulative reduction budget consistent with a linear trajectory towards the executive order targets. DEQ may also wish to provide references to even more ambitious targets, for example net-zero emissions within covered sectors by 2050.
- Modeling should include the impact of different program scenarios on levels of cumulative emissions. It is possible to meet the EO's 2030 and 2050 targets with

[1] Rivera, A., Pitt, H., Larsen, K., Young, M. Road to Recovery? Tracking the Impact of COVID-19 on the World's Major Economies. *Rhodium Group.* (2020). https://rhg.com/research/covid-energy-impacts-major-economies/

[2] Newburger, E. CDC wants people to drive solo to avoid coronavirus, sparking fear over more congestion and emissions. *CNBC*. (2020). https://www.cnbc.com/2020/06/04/cdc-guidance-against-mass-transit-sparks-fears-of-congestion-emissions.html

different outcomes for cumulative emissions, based on how yearly budgets are set and how early action is incentivized. It would be useful to see how different pathways to meeting the EO's targets result in different levels of cumulative emission reductions, given the critical importance of the cumulative metric for greenhouse gas pollution.

- The program scenarios should include at least one scenario that sets a cap that covers, at a minimum, emissions associated with all transportation fuels, residential natural gas and heating oil, all electric power generated in Oregon, and all greenhouse gas emissions from industrial operations. The cap should (at minimum) decline consistently from the January 2022 start date of the program, linearly, consistent with meeting the 2030 target while accommodating any major emission reductions already in the pipeline such as announced coal retirement dates. The scenario should enable compliance through a DEQ-issued "credit" or an "allowance" (total compliance instruments issued would be equivalent to the emissions budget) that is equivalent to one ton of co2e, and allow flexible emissions trading between compliance entities. Compliance with any "credits" from outside of the DEQ-issued instruments should be from sources *outside* of capped sectors, and be limited to a small percentage of compliance instruments (ie, 4-6%). There should be no payment option for non-compliance. The scenario should assume the opportunity to bank allowances for future compliance, but not borrow from future compliance years.
- If the DEQ is contemplating excluding any of the above sectors from a comprehensively-designed program, it is important that DEQ compare abatement costs for any scenario with reduced coverage to the broader-coverage scenario.
- DEQ should also evaluate a compliance scenario where Oregon sources can comply with cap & reduce program requirements by using emissions allowances from other state programs, i.e. California.
- The model outputs should include greenhouse gas emissions (cumulative reductions as well as emissions in specific years), cost/ton of co2e reduced, description of sectoral changes, criteria pollution emission reductions, and quantified benefits of both carbon and criteria pollutant reductions. It is important that the modeling study models broad coverage across all scenarios, and provide economy-wide results.
- Equitable distribution of costs and benefits is also a critical priority for the cap and reduce program, so understanding the distributional effects of modeled scenarios is crucial. Modeling could also include an assessment of benefits from any investments that are made as part of the cap and reduce program by evaluating program options where all compliance instruments are not directly allocated to firms, but instead value is captured for reinvestment priorities or households.

Thank you for your consideration. We look forward to continued engagement

Sincerely,

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And

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Senior Analyst, Environmental Defense Fund
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November 13, 2020

Office of Greenhouse Gas Programs Department of Environmental Quality

RE: Cap and Reduce Projection Study

Dear DEQ Office of Greenhouse Gas Programs:

I appreciate that DEQ is working on doing these projections. However, I am skeptical of the ability of any model to predict up to 28 years in the future, especially for a program with multiple sectors and a number of options. In particular, the initial conditions/assumptions are critical.

Questions

1. The business as usual case is generally meant to be representative of rules and regulations that are currently in effect to act as a baseline for gauging the effectiveness of additional program scenarios. For example, DEQ intends to account for the state's current Clean Fuels Program requirements. DEQ seeks input on any other state programs that should be included for the following sectors/topics:

Transportation
Natural gas
Electricity
Buildings
Energy efficiency

2. There are a number of rules and regulations that have anticipated changes in the near future that could impact the business as usual case. For example, DEQ is trying to determine how best to incorporate expanded Clean Fuels Program requirements that DEQ is expected to begin work on in 2021. Should DEQ consider a "business as usual plus" case to represent the most likely changes to rules and regulations that may be expected in the near future? If yes, what other planned, proposed, or expected programs should DEQ consider?

> Business as usual plus should include all the changes required to be made by the Executive Order 20-04.

3. DEQ collects greenhouse gas emissions data that will be used to inform the modeling. Other state agencies, such as the Oregon Department of Transportation, and other sources of publicly available data, such as from the U.S. Environmental Protection Agency and U.S. Energy Information Administration may also be of interest to include in the analysis. Are there other data sources DEQ should consider for inputs to the model for the business as usual case? If yes, please provide the sources or let us know if you would like to provide data for consideration.

> Consider data from other states, Oregon universities, environmental and environmental justice organizations. These will also be good sources for the economic and public health predictions.

4. What information or results from the modeling of program scenarios would you find most useful?

Easily understandable outputs for the general public and ability to run options to see the results.

A record of the assumptions used for the model.

The Economic Impacts of Cap-and-Trade in Oregon

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(Revised September 6, 2020)

For the last several years, cap-and-trade bills have been debated in Oregon but no proposal has gotten through the legislature. One point of contention has been the projected economic impacts in Oregon of putting a price on greenhouse gases (GHGs). In 2017, Associated Oregon Industries (AOI, now Oregon Business & Industry or OBI) retained FTI Consulting to prepare an economic impact analysis of HB 1574, the cap-and-trade bill introduced in 2016. Also in 2017, the Oregon Department of Environmental Quality (DEQ) retained Energy + Environmental Economics (E3) to prepare a report on economic impacts, as directed in SB 5701. In early 2019, Berkeley Economic Advising and Research (BEAR) assessed HB 2020 for the Oregon Carbon Policy Office. E3, FTI, and BEAR all forecasted changes in gross domestic product (GDP) and employment in Oregon due to cap-and-trade; Table 1 is a summary.[1]

Table 1: Forecasted Economic Impacts of Cap-and-Trade

Source	Date	Bill	Study Period	Carbon Allowance Price ($2016)	Forecasted Impacts	
					GDP	Employment
E3 for DEQ	2017	SB 5701	2035 only	Assumed $32/ton and $89/ton	+0.19% to -0.08%	+0.32% to -0.07%
FTI for AOI	2017	SB 1574	Through 2050	Based on feedback effects in the state economy	-0.4% in 2035 -0.9% in 2050	-0.2% in 2035 -0.6% in 2050
BEAR for OCP	2019	HB 2020	Through 2050	From WCI	About +2.5% by 2050	About +1% by 2050

[1] E3, Memorandum on Macroeconomic Modeling, February 2017, Appendix 3 to State of Oregon, Department of Environmental Quality, "Considerations for Designing a Cap-and-Trade Program in Oregon", February 2017, https://www.oregon.gov/deq/FilterDocs/app3memo.pdf; FTI Consulting, "Oregon Cap-and-Trade – An Economic Impact Analysis of SB 1574 (2016)", March 2017, https://www.fticonsulting.com/~/media/Files/us-files/insights/reports/oregon-cap-trade-sb-1574.pdf; BEAR, "Oregon's Cap-and-Trade Program (HB2020): An Economic Assessment", [March 2019], https://www.oregon.gov/gov/Documents/CPO_BEAR_HB2020_Economic_Assessment.pdf.

A "plus" sign in Table 1 indicates *higher* total future GDP and employment due to cap-and-trade, and vice versa, although there would probably be winners and losers. In early February 2020, the Senate Republican Caucus submitted comments in opposition to SB 1530, rejecting sole reliance on the BEAR study, and citing "conflicting [economic] analyses … on similar legislation." The Caucus did not mention any specific studies, but this note explains why the FTI study specifically is flawed and unhelpful, and should be discarded.

FTI constructed a forecast of the price of Oregon carbon allowances under cap-and-trade: how much might it cost to hold the right to emit (an "allowance") under cap-and-trade?[2] Carbon allowances are tradable permits to emit carbon dioxide and related chemical compounds. In a cap-and-trade system, the number of carbon allowances (the "cap") falls over time to achieve lower emissions, and the acts of acquiring, holding and submitting (the "trade") allowances for compliance may create economic impacts. Allowances are traded in markets and determine allowance prices. In each year, "covered entities" (e.g., utilities, factories, and fuel suppliers) that are responsible for reducing their emissions must demonstrate that they hold and submit allowances ("compliance instruments"), which are then retired by the relevant regulatory agency and taken out of circulation. Modeling exercises are used to forecast the economic impacts (e.g., changes in GDP or employment) of cap-and-trade; higher allowance prices drive higher impacts.

> High forecasted GHG allowance prices are the principal driver of … economic losses. Based on our modeling, [FTI] forecast[s] GHG allowance prices to start at $13 per metric tonne in 2021, rise to $84 per tonne in 2035, and *end at $464 per tonne in 2050* (2016$'s).[3]

[2] "Endogenous" means that the reported allowance prices reflect decisions in the electricity and fuel sectors, and are not just programmed into the models as fixed inputs. Those decisions could put both upward and downward pressure on allowance prices, depending on the options assumed to be available to decision-makers.

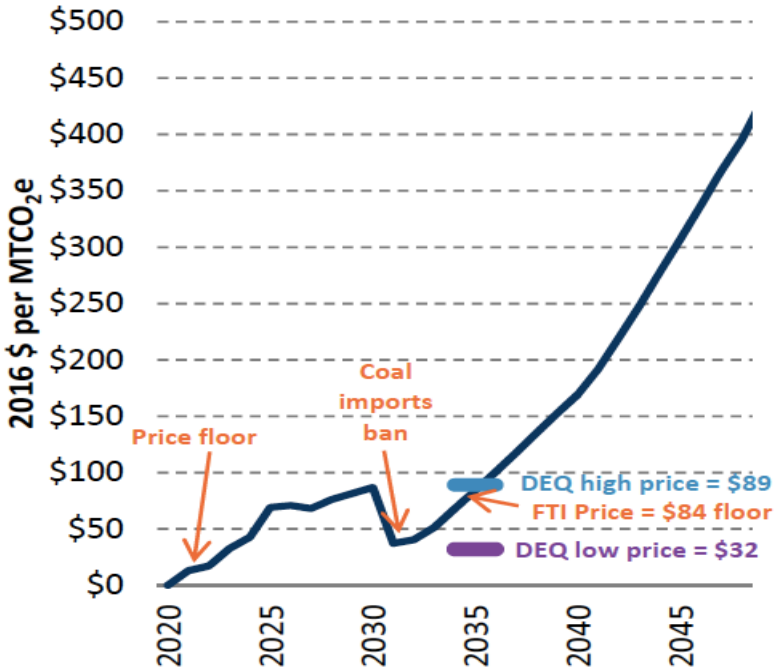
[3] FTI, p. 1 (emphasis added). Allowance prices are in "$/metric ton of carbon dioxide equivalent" ($MTCO_2e$)", abbreviated here to "$/ton".

However, if allowance forecasts of allowance prices are biased (up or down), then forecasts of economic impacts will also be biased.

FTI used three models to forecast allowance prices through 2050: (a) PLEXOS, for impacts in the electricity market; (b) the Carbon Tax Assessment Model (CTAM, developed in Washington State to analyze carbon taxes) for other fuel markets; and (c) REMI PI+, for the ultimate forecasts of changes in GDP and employment driven by changes in electricity and fuel markets.[4] This three-model approach was designed allow behavioral responses to allowance prices to affect those prices through feedback mechanisms between the economy and the allowance market. For example, if relatively inexpensive investments and operational changes can reduce emissions, there will be less upward pressure on allowance prices, and vice versa. The following Figure 4 shows FTI's results, as well as the prices that E3 assumed at about the same time, which were based on price limits in California allowance auctions.

[4] FTI, pp. 2, 18. FTI described their result as "[e]ndogenously generated carbon [allowance] prices".

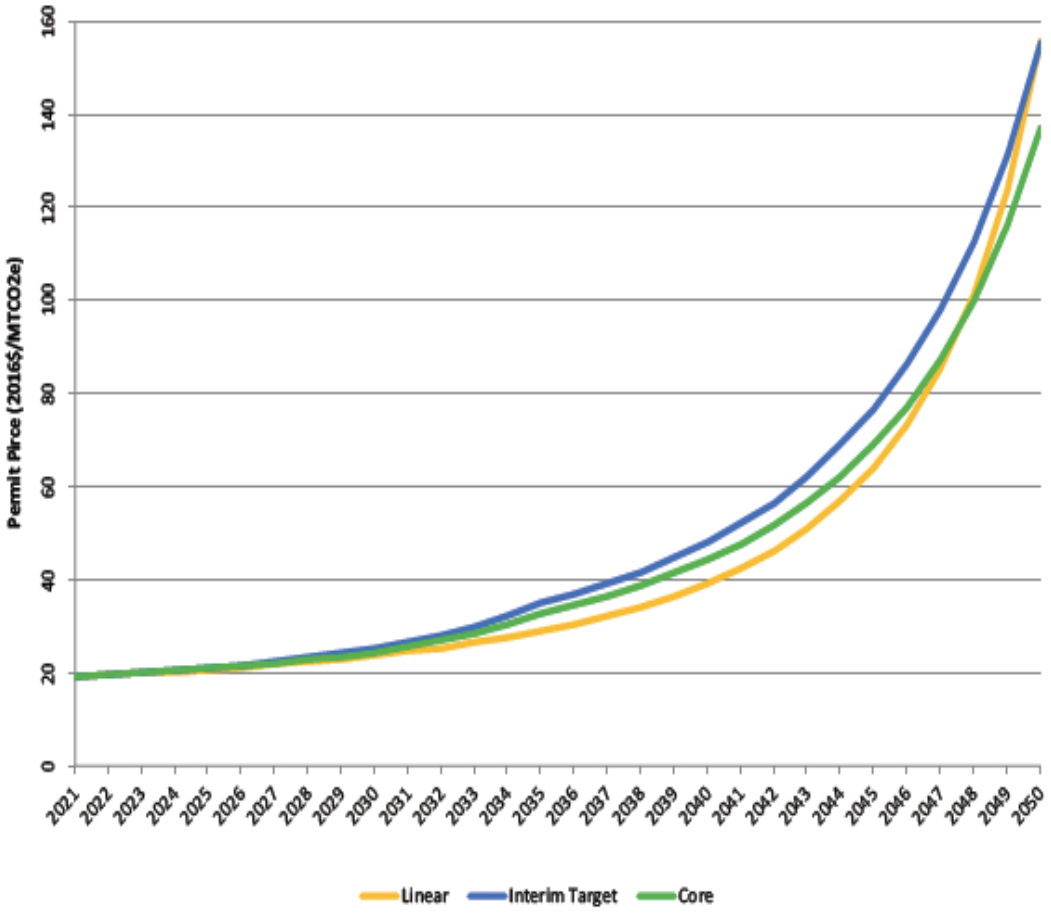
Figure 4: Forecasted GHG Allowance Prices



Were FTI's forecasted prices of $84/ton in 2035 and $464/ton in 2050 plausible? FTI described their forecasted impacts as "consistent with the modeling of other 2050 goals", and "analogous" to a 2013 study by/for the National Association of Manufacturers (NAM), which *assumed* (i.e., did not derive) a $1,000/ton carbon tax, more than twice the level forecasted by FTI.[5] FTI's claims of consistency and analogy cannot be evaluated due to the lack of evidence.[6] The E3 study in 2017 *assumed* carbon prices of $32/ton and $89/ton in 2035, using forecasts by the California Air Resources Board (CARB) of the auction floor price and the reserve trigger price in California; E3 did not evaluate 2050.[7] In 2019, BEAR used forecasted allowance prices from the Western Climate Initiative (WCI), reported in their Figure 4.8.[8]

[5] FTI, p. 6, including note 14. These claims were supported by reference to only one source. See footnote 6 here.
[6] The single reference provided by FTI was a URL that is no longer functioning; based on the results of a variety of search parameters, the cited NAM study is not publicly available.
[7] See p. 10 of the E3 Memorandum appended to the DEQ 2017 report to the legislature.
[8] The curves reflect different assumed trajectories of emission reductions.

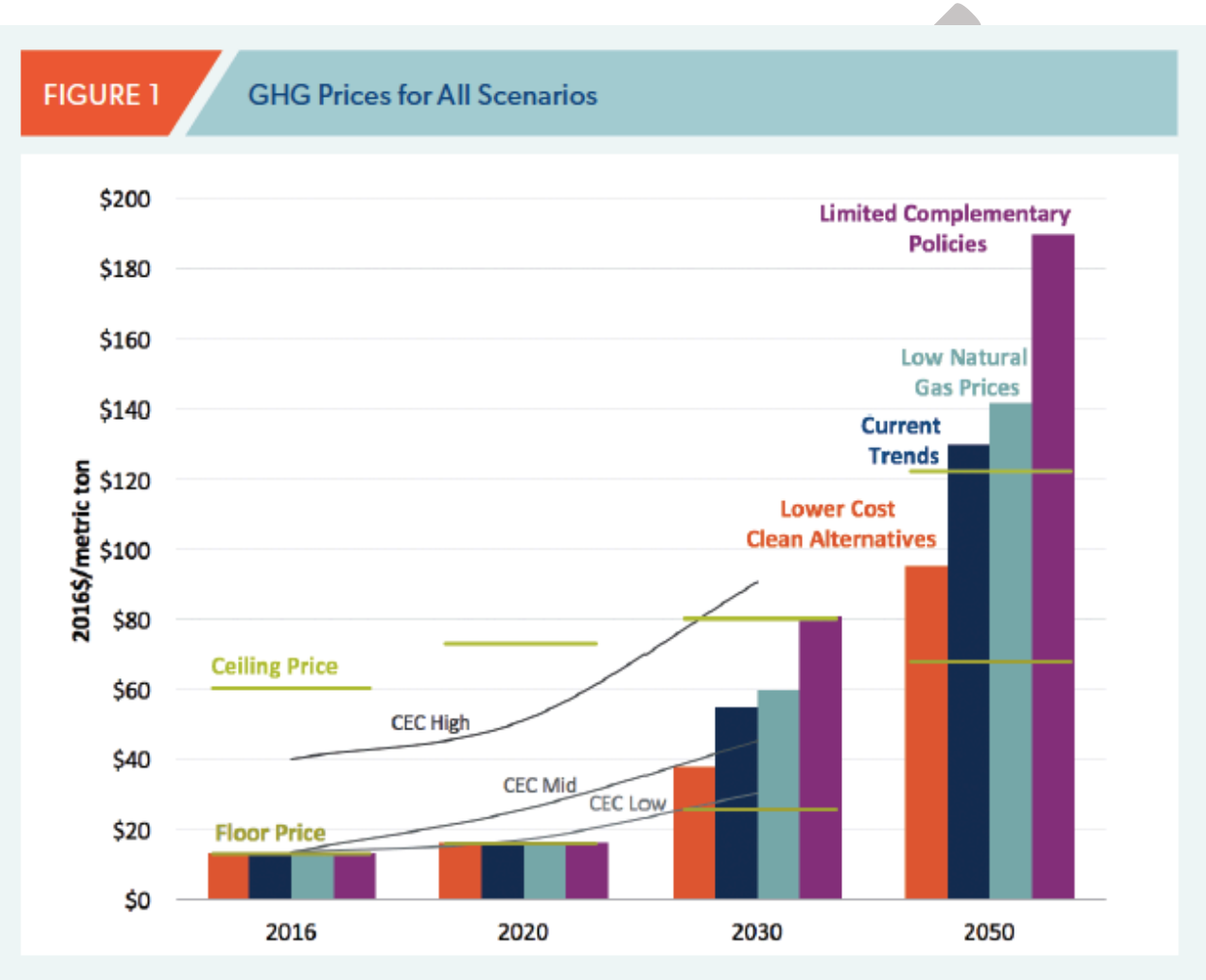
Figure 4.8: Estimated Permit Prices Rise Slowly Until Nearly 2040



BEAR's Figure 4.8 points to forecasted allowance prices of about $155/ton by 2050, one-third of the level projected by FTI. We certainly have conflicting forecasts.

To help evaluate these differences, we can turn to other, arguably neutral, forecasts of California allowance prices from 2017 and 2018, which are relevant because of linkage and banking in cap-and-trade programs, discussed in the next section. "Neutral" here means "not prepared on behalf of any interest group." *First*, a study by The Brattle Group of the California

cap-and-trade market reported prices between $35/ton and $80/ton in 2030, rising to a range of $95/ton to $190/ton in 2050.[9]



Second, economists at UC/Berkeley, UC/Davis and Stanford forecasted allowance prices between $40/ton and $60/ton in 2030, close to the range reported by Brattle and noticeably lower than FTI's forecasts for that year.[10] *Third*, 2018 was the first year that consumer-owned utilities

[9] "The Future of Cap-and-Trade Program in California: Will Low GHG Prices Last Forever?", December 2017. Brattle's study was not conducted on behalf of any client. https://brattlefiles.blob.core.windows.net/files/11768_the_future_of_cap-and-trade_program_in_california_final_12.4.17.pdf

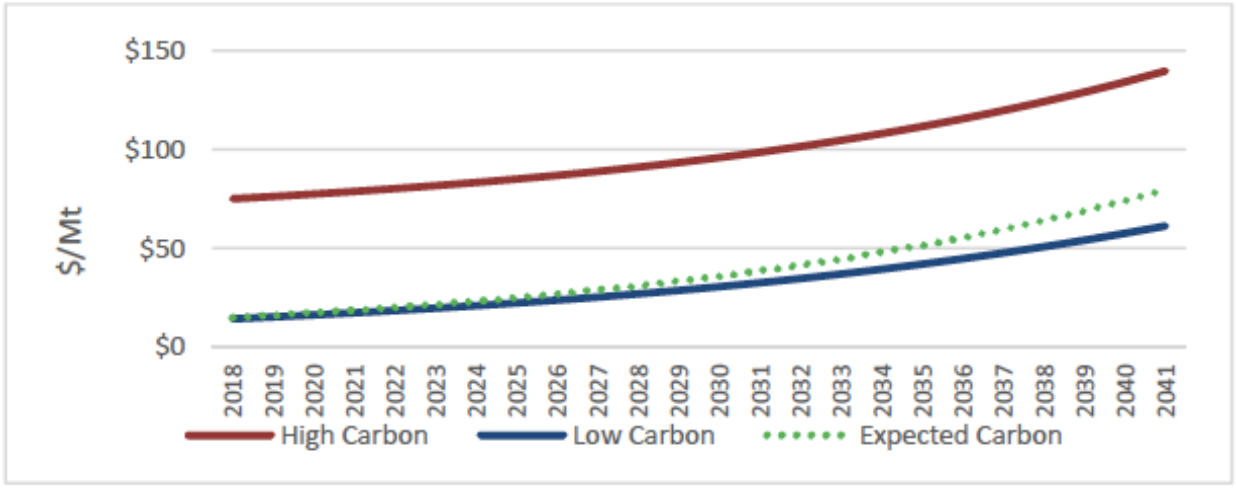
[10] Borenstein, S., Bushnell, J., and Wolak, F., "California's Cap-and-Trade Market Through 2030: A Preliminary Supply/Demand Analysis", Energy Institute at Haas, WP 281, July 2017, Table 2. http://deep.ucdavis.edu/uploads/5/6/8/7/56877229/deep_wp016.pdf Seven "probability-weighted" prices were reported in this range, depending on various assumptions. These prices are in $2015.

in California were required to file Integrated Resource Plans with the California Energy Commission. Anaheim's IRP included stress tests, including high carbon prices, derived from forecasts prepared by the California Air Resources Board (CARB) to evaluate the performance of the resource portfolio proposed as a guide for future decisions.[11]

> The Variable Portfolio outperformed the other portfolios under both expected conditions and stress tested conditions, such as extreme heat, extreme carbon pricing, extreme fuel price volatility, and extreme high or low energy efficiency, solar penetration and electric vehicle penetration. (p. 12)
>
> A high carbon price forecast was developed using a $60 increase from the floor price, as discussed in the rulemaking for Post-2020 allowance allocation approved by the CARB on July 27, 2017. A low carbon price scenario was developed using the floor price. (p. 90)[12]

Anaheim's forecasts of carbon prices, based on CARB forecasts, are shown in their Graph 42.

Graph 42: Stressed Carbon Prices



[11] Anaheim Public Utilities, *2018 Integrated Resource Plan*, http://www.anaheim.net/DocumentCenter/View/20943/2018-Integrated-Resource-Plan. "The long-term resource planning process introduces many assumptions and each of them may deviate from the original assumptions. A modeling 'stress test' is introduced to ensure the optimal portfolio outperforms the alternatives under all scenarios." (p. 25)

[12] Anaheim cited the California Air Resources Board (CARB): "See Table 13 Estimated Range of Cap-and-Trade Allowance Price 2021–2030 of the CARB California's 2017 Climate Change Scoping Plan, https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf. The Estimated Cap-and-Trade Reserve Price was $56.7 above the Floor Price. For planning purposes, this IRP uses $60 above the floor price for stress testing." The CARB 2017 Scoping Plan was released in November 2017.

As can be seen, Anaheim's forecasted "*high* stress carbon price" was under $150/ton in 2041, compared with FTI's *point forecast* of about $200/ton (observed in Figure 4 above), which was itself more than twice Anaheim's *expected* carbon price in that year (comparing FTI's Figure 4 and Anaheim's Graph 42).[13] Based on comparisons against arguably neutral sources, FTI's forecasted allowance prices were implausibly high, perhaps strikingly so, and thus led to a biased assessment that overstated the negative economic impacts of cap-and-trade on GDP and employment in Oregon. Even with this bias, FTI's impact estimates were close to zero, as shown above in Table 1 above. If more realistic allowance prices had been used by FTI, the economic impacts would have been smaller and might have even disappeared.

A second problem revealed by comparing FTI and the other studies is false precision. Any planning or forecasting exercise is subject to assumptions and thus uncertainty. The standard approach to incorporating uncertainty is to change the assumptions regarding critical inputs, rerun the models, and report the results. Different input assumptions will yield different results, which are normally used to create a *range* of estimated or forecasted impacts. Price ranges reported by the three studies cited above show the uncertainty that is normal in any forecasting exercise. Price ranges provide important information beyond point estimates. A wide range tells us that there is a lot of uncertainty about the point estimate, which should be taken into account when making policy decisions. In contrast, FTI provided only *point forecasts* for each year, and FTI's forecasted carbon price in 2050 was almost 2.5 times as high as the *top* of the range reported by Brattle, and more than *four times* the bottom of Brattle's range.[14] FTI did not report any uncertainty surrounding its forecasts of carbon prices, employment or GDP. Given the small percentage changes in economic activity forecasted by FTI and its upwardly biased forecasts of

[13] The source of the "expected" price curve in Anaheim's Graph 42 is not clear.
[14] Brattle, p. 13.

carbon prices, using reasonable carbon price forecasts might yield forecasts of GDP and employment that show no economic effects at all of a cap-and-trade program in Oregon.

Linkage and Banking in Allowance Markets

The actual California allowance market provides an important benchmark for any study of the potential Oregon allowance market due to linkage. "Linkage" refers to the ability to use carbon allowances purchased *outside* Oregon for compliance *in* Oregon. California's cap-and-trade system also allows "banking": the ability to take actions today to reduce GHG emissions and save the unneeded allowances for later use, perhaps when allowance prices have risen due to increased scarcity under cap-and-trade. Finally, based on CO_2 emissions, the California carbon market is about ten times as big as Oregon's potential carbon market.[15] Linkage to a much larger market should keep Oregon's allowance prices close to California's. FTI explicitly (but inexplicably) excluded both forms of *allowance trading*: geographical linkage and inter-temporal banking, even though SB 1574 explicitly allowed linkage.[16]

Linkage and banking provide flexibilities that help reduce the expected cost of compliance. This has recently been shown in the case of Colorado (emphases added).[17]

> The analysis demonstrates that cap-and-trade programs that provide flexibility in *when and where* emissions reductions are achieved increase the cost-effectiveness of cap-and-trade programs and deliver climate-related and local health benefits to Colorado that exceed various measures of program cost. Program measures that provide such *flexibility across time and space* include … *linking* the program to existing or new multi-state initiatives, and allowing for the use of *banking* (and/or borrowing) of allowances over time.

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[15] Oregon's CO2 (not GHG) emissions in 2017 were about ten percent of California's. See https://www.eia.gov/environment/emissions/state/.

[16] Section 9(5) of SB 1574 allowed the Environmental Quality Commission to "pursue linkage agreements" with other states or countries. In contrast, see FTI, pp. 15 (row labeled 16) and 18 ("modeled Oregon as Oregon").

[17] Hafstead, M., "Decarbonizing Colorado", Resources for the Future, Report 20-06, July 2020, p. 1. https://www.rff.org/publications/reports/decarbonizing-colorado-evaluating-cap-and-trade-programs-to-meet-colorados-emissions-targets/

In contrast, FTI's "Oregon-only" approach blocked trading with the much larger allowance market in California.[18] Blocking linkage created an upward bias in forecasts of allowance prices, because all state-compliant emission reductions were forced by FTI to take place in Oregon, *even if cheaper options might exist outside the state*. This is similar to deliberately building a house using only parts manufactured in the state where the house is sited, ignoring cheaper parts that could be imported from neighboring states or even countries. Any economic model of forecasted housing costs that prohibits the import of construction materials would yield misleading results, like those of FTI regarding cap-and-trade.

Consider an industrial user of natural gas in Oregon faced with three choices: (a) reducing GHG emissions by making changes at a cost of $30/ton (e.g., new carbon scrubbers on smokestacks); (b) buying an Oregon-only allowance at a price of $35/ton, thus paying someone else in Oregon to reduce emissions; or (c) buying a California allowance at a price of $25/ton, paying someone else in California to reduce their emissions.[19] The least cost solution in this example is (c): buy the California allowance and do not install scrubbers in Oregon, because someone in California can spend less money and still reduce GHG emissions by the same amount (in tons/year). Ignoring linkage forces an Oregonian to spend $30 instead of buying the California allowance for $25, thus overstating the economic impact on Oregon. If the circumstances were reversed and California prices floated above Oregon's, allowance holders in Oregon would seek buyers in California and California buyers would look for allowances in Oregon, again helping prices converge.

[18] FTI stated that the E3 study for the DEQ also did not model linkage. However, E3 used a forecast of *California* allowance prices to model economic impacts in *Oregon*, so this statement is at best misleading. Using California allowance prices to model impacts in Oregon *explicitly assumes* linkage, because forecasted California carbon prices were used to conduct impact analysis in Oregon.

[19] With linkage, there should be no difference between the price of an Oregon allowance and a California allowance, but "regulatory friction" (slight differences in language) could cause prices to separate.

Second, FTI assumed that *intertemporal trading* could not occur: unused allowances in a given year could not be "banked" for compliance in future years.[20] For example, if the relevant allowance price in 2020 is $20/ton, and the forward price in the allowance market is $50/ton in 2030, a decision to reduce GHG emissions this year should take into account the future market value of the saved allowances, if unused allowances can be banked today for later compliance. Expectations of rising allowance prices create an incentive to reduce emissions today and bank the allowances, putting *downward* pressure on future allowance prices and reducing future economic impacts.[21] This is especially true if the supply of allowances in the market is programmed to fall over time to meet GHG reduction goals. Ignoring intertemporal trading created another upward bias in forecasts of allowance prices.

Ignoring both linkage and banking may have caused FTI's forecasts of allowance prices to far exceed those of contemporary, neutral analyses. Other assumptions may also have been built into FTI's models to cause relatively high forecasted allowance prices, leading to biased forecasts of negative economic impacts. The bottom line is that the FTI study is not helpful to the debate over cap-and-trade (or cap-and-reduce) in Oregon, and should be set aside in favor of a new, transparently developed, deliberately neutral analysis.[22]

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[20] See FTI, pp. 15 and 17 (stating "allowance banking not modeled"). In contrast, see https://www.scientificamerican.com/article/california-to-extend-cap-and-trade-system-to-2050/ and https://www.c2es.org/content/california-cap-and-trade/.

[21] Allowance banking was used by some utilities in California in the mid-2010s in anticipation of the end of free, allocated allowances in 2020. Banked allowances offered a "bridge" from the end of free allowances to some future date when the need for carbon allowances will fall anyway due to increasing RPS obligations.

[22] A recent analysis of thirty years of carbon taxes in Europe found no evidence of adverse effects on GDP or employment, given the design of the tax and rebate system. Metcalf, G. and Stock, J.H., "The Macroeconomic Impact of Europe's Carbon Taxes", August 27, 2020; https://www.rff.org/publications/working-papers/macroeconomic-impact-europes-carbon-taxes/#:~:text=Focusing%20on%20European%20countries%20that,and%20total%20employment%20growth%20rates.

November 13, 2020

VIA ELECTRONIC FILING

Department of Environmental Quality
Office of Greenhouse Gas Programs
700 NE Multnomah Street, Suite 600
Portland, Oregon 97232

RE: NW Natural Comments – DEQ Cap and Reduce Upcoming Modeling

NW Natural ("NW Natural" or "we") appreciates the opportunity to provide replies to the questions posed by the Department of Environmental Quality (DEQ) relative to the upcoming analytical work to be completed by ICF to help inform development of the Cap and Reduce program. This modeling work will help inform the Cap and Reduce Rules Advisory Committee (RAC) and the Environmental Quality Commissions as the agency pivots to formal rulemaking to implement Executive Order 20-04 ("EO.") To reiterate our previous comments, NW Natural strongly supports the development of effective programs to address the existential crisis of climate change. This guided our support of proposed Cap and Invest legislation, HB 2020 and SB 1530. We are working vigorously to decarbonize our pipeline by 2050. It is critical that DEQ design a Cap and Reduce program in a way that complements and accelerates the work already underway. We also agree that it is critical that impacted communities are meaningfully engaged in program design and commend DEQ for designing an inclusive, transparent process.

In an effort to be concise, our comments are organized by topic and address the important issues we see relative to questions posed by DEQ and the role the analytical modeling will play in informing Cap and Reduce design:

Inclusion of expected impact of SB 98 - For the natural gas utility sector the expected impact of Senate Bill 98's (SB 98) provisions for renewable natural gas should be included in the business as usual case. Oregon Public Utility Commission (OPUC) rulemaking regarding SB 98 is now complete, and while SB 98 and Cap and Reduce will work together in natural gas utility decarbonization, results are expected from SB 98 separate from the Cap and Reduce program. The emissions and customer bill impacts provided by NW Natural in the comments it submitted about the pre-rulemaking workshops considers the impacts of SB 98 as part of business as usual, and all estimates for potential Cap and Reduce program designed that were submitted represent what could be expected above and beyond SB 98 (i.e. do not include the impact of SB

98 as an expectation of Cap and Reduce). We are willing to submit the details of this work to DEQ so that the expected impacts of SB 98 are included in the business as usual case.

Non-Cap and Reduce EO 20-04 Impacts should be treated consistently in a potential "Business as usual plus" case – While we aren't clear exactly what is being contemplated as part of a potential "business as usual plus" case, if the idea is to include non-Cap and Reduce yet EO-related impacts, we consider this idea challenging (both analytically and from a public policy perspective) and potentially problematic. Given the coordination and interrelated nature of the Cap and Reduce program and other EO-driven initiatives, trying to include all non-Cap and Reduce impacts from the EO would likely present a modeling endogeneity problem. Even without the interrelation issue, similar to how the design and impact of the Cap and Reduce program are currently up in the air, the impacts of other EO 20-04 initiatives are also uncertain and will not be resolved in advance of this analytical work. Attempting to project the outcomes of these other processes seems beyond the scope of DEQs work specific to Cap and Reduce and could conflate the impact of Cap and Reduce with other programs spawned by the EO.

However, if DEQ does decide to conduct a "business as usual plus" case inclusive of non-Cap and Reduce impacts from the EO, it is appropriate to include the expected impact of all other EO driven initiatives. It would be inconsistent to include some non-Cap and Reduce EO driven initiatives but not others (e.g. including expected EO related changes to the Clean Fuels Program but not changes to utility resource planning that will also be considered by the Public Utility Commission over the next year or so).

Utility sector **historical** customer counts, energy use and emissions data - ODEQ's greenhouse gas inventory should serve as the source for historical emissions. Historical energy use in the Oregon utility sector (both electricity and natural gas) should come from the utility statistic books published annually by the Oregon Public Utility Commission, as this same data is used to calculate the emissions that is reported to DEQ by Oregon's utilities and in official financial reporting. End use breakdowns should come from the utilities' respective Integrated Resource Plans (IRPs), as they are developed in a transparent public process with stakeholder engagement that ultimately receives feedback from the OPUC.

Utility sector customer count, energy use and emissions **forecast** data - Utility specific forecasts of customer counts, energy use, the end use breakdown of that use, and emissions should come from each Oregon utility's most recent IRP (both electricity and natural gas).[1] The forecasts in the most recently filed IRPs are naturally Oregon-specific,[2] and far more precise than allocations from regional forecasts like those completed for national forecasts such as the

[1] NW Natural would be supportive of an exception to using utility specific IRP forecasts for small electric utilities that are not subject to OPUC regulation, as a regional or BPA forecast used in lieu for these utilities is not going to result in meaningful deviations from what emissions will end up being reported to DEQ.

[2] For example, the utility specific energy efficiency projections from Energy Trust of Oregon are directly included in the state's IRP forecasts, which is an important factor in developing the business as usual expectation.

US Energy Information Administration's Annual Energy Outlook (noting the intent of these forecasts is not to provide precise state-level forecasts). Perhaps more importantly, DEQ's GHG inventory appropriately collects utility specific emissions rather than basing emissions upon, for example, regional averages.[3] Using regional modeling without an careful and appropriate allocation to the utility level would lead to mismatches in emissions expectations in the modeling work with what would be actually be reported to DEQ where differences between regional averages and Oregon utilities exist (e.g. the emissions intensity of electricity in the broader Pacific Northwest is lower than it is on Oregon, particularly where there is overlap with natural gas utility service territory). Using utility specific IRP forecasts avoids all of these issues and aligns the forecasts with the reported emissions and the accounting protocols the Cap and Reduce program will use to determine progress in reducing emissions.

It is also important to document the assumptions that underpin the forecasts in the IRPs and how that might impact the emissions reduction scenarios to be analyzed. For example, the forecasts of Oregon's largest utilities IRPs assume no electrification of building loads. On the contrary, as utility load forecasts are generally based on historical data and trends, current forecasts implicitly or explicitly project forward the historical fuel mix with few exceptions (assumed incremental penetration of electric vehicles in the transportation sector being an important one).

Informing Program Scenarios – Assuming that by "program scenarios" DEQ means potential Cap and Reduce frameworks, we are most interested in the modeling work benefitting from a transparent process that allows for stakeholder engagement before the analysis is conducted and results are presented. This analysis will be both highly complex and highly important to policymakers, stakeholders, and utility ratepayers. We are appreciative of DEQ asking these questions in advance of completing the business as usual baseline analysis and feel Oregonians would benefit from continued stakeholder engagement in the development of the "program scenarios." This could be accomplished by a presentation from ICF to stakeholders about the data sources and assumptions that make up the business as usual case along with a proposal for the assumptions and analytical work they propose doing to evaluate program scenarios. Gathering stakeholder feedback via comments at this phase would help make the analysis better and ensure that the most relevant results for the rulemaking process are available to the RAC and EQC.

Beyond process related considerations, NW Natural believes that an estimate of the impact to natural gas utility customers' bills is an important input for the RAC and EQC to consider as it contemplates Cap and Reduce frameworks, and that this should be one of the outputs of the program scenarios work. It is noteworthy that this is not a typical output of most economic impact analyses, as the results are usually highly aggregated and do not capture highly-variable impacts on individual households and businesses. In the interest of the Oregon residents that

[3] Noting the exception of the emissions of electricity purchased on wholesale markets.

will ultimately be affected by Cap and Reduce, it will be important to separately assess and report the costs to residential, commercial, and industrial natural gas utility customers in sufficient detail, with special consideration for the low income and other impacted communities.

Also, NW Natural feels an analysis of building electrification is inappropriate in an analysis of the impacts of Cap and Reduce. EO 20-04 does not mention building electrification as part of the activities for consideration and there are no laws or administrative rules that are calling for building electrification. Therefore, any assumptions about the levels of building electrification going forward would be purely speculative. However, if an analysis along these lines is completed, it is essential that the net emissions impact of electrification be calculated based upon the emissions profiles of the specific electric utilities that would serve the electrified load. Additionally, this analysis would also need to assess the impact of building electrification on the capacity needs of electric utilities via a bottom up analysis assessing the peak contribution of new space heating load on Oregon's electric utilities. Building electrification has serious resource adequacy implications for Oregon's electric utilities and maintaining resource adequacy is called out as a priority of EO 20-04.

Thank you for the opportunity to provide these comments and we are open to further discussing providing any data that will help DEQ and ICF analyze the impact of different Cap and Reduce program designs on the majority of Oregonians who are natural gas utility customers. Additionally, we look forward to providing additional input as DEQ provides more information about the proposed analysis.

Sincerely,

/s/ Nels Johnson

Nels Johnson
NW Natural

cc: Colin McConnaha, DEQ
Nicole Singh, DEQ
Kristen Sheeran, Office of Governor Kate Brown

Northwest Pulp & Paper
ASSOCIATION

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Sent to: CapandReduce@deq.state.or.us

November 13, 2020
TO: Oregon DEQ
FR: Kathryn VanNatta, NWPPA
RE: Oregon Department of Environmental Quality
Modeling Study on Program Scenarios Questions

The comments of the Northwest Pulp & Paper Association (NWPPA) on the Oregon Department of Environmental Quality (DEQ) Modeling Study on Program Scenarios are below.

DEQ Question 1.
The business as usual case is generally meant to be representative of rules and regulations that are currently in effect to act as a baseline for gauging the effectiveness of additional program scenarios. For example, DEQ intends to account for the state's current Clean Fuels Program requirements. DEQ seeks input on any other state programs that should be included for the following sectors/topics:

- Transportation
- Natural gas
- Electricity
- Buildings
- Energy efficiency

NWPPA Comment 1.
The baseline for ICF modeling must be the greenhouse gas regulatory situation in Oregon as of March 9, 2020,the day before Oregon Executive Order 20-04 (Order 20-04) was enacted by Governor Brown. The baseline must be the same for every aspect of the Oregon economy including stationary sources holding air permits potentially regulated under Order 20-04, and transportation, natural gas, electricity, buildings and energy efficiency regulatory environments.

Any modeling results obtained from an arbitrary, capricious and speculative baseline would be inaccurate and unreliable for use in Oregon rulemaking and development of a Fiscal Statement.

NWPPA Discussion 1.
Accurate modeling is paramount for the results to be used in Oregon rulemaking and development of a Fiscal Statement under the Oregon Administrative Procedures Act. The modeling must choose one baseline date and accurately portray the regulatory situation on that date as the baseline. The modeling process cannot pick and choose what regulations are in the baseline or business as usual case from regulatory items contained within Order 20-04 or future "anticipated" rules that are not promulgated as of the baseline date. To pick and choose programs with unknown speculative regulatory parameters would be capricious and portray a false and misleading picture of Oregon's regulatory situation. Any results obtained from an arbitrary, capricious and speculative baseline would be inaccurate and unreliable for use in Oregon rulemaking and development of a fiscal statement.

DEQ Question 2.
There are a number of rules and regulations that have anticipated changes in the near future that could impact the business as usual case. For example, DEQ is trying to determine how best to incorporate expanded Clean Fuels Program requirements that DEQ is expected to begin work on in 2021. Should DEQ consider a "business as usual plus" case to represent the most likely changes to rules and regulations that may be expected in the near future? If yes, what other planned, proposed, or expected programs should DEQ consider?

NWPPA Comment 2.
The baseline, or 'business as usual case', for ICF modeling must be the greenhouse gas regulatory situation in Oregon as of March 9, 2020, the day before Order 20-04 was enacted by Governor Brown.

Any modeling results obtained from an arbitrary, capricious and speculative baseline would be inaccurate and unreliable for use in Oregon rulemaking and development of a fiscal statement.

NWPPA Discussion 2.
Accurate modeling is paramount for the results to be used in Oregon rulemaking and development of a Fiscal Statement under the Oregon Administrative Procedures Act. The modeling must choose one baseline date and accurately portray the regulatory situation on that date as the baseline. We suggest March 9, 2020 as the baseline date. The modeling process cannot pick and choose what regulations are in the baseline or business as usual case from regulatory items contained within Order 20-04 or future "anticipated" rules that are not promulgated as of the baseline date. To pick and choose programs with unknown and purely speculative future regulatory parameters would be arbitrary and capricious and portray a false misleading picture of Oregon's baseline regulatory situation.

DEQ Question 3.
DEQ collects greenhouse gas emissions data that will be used to inform the modeling. Other state agencies, such as the Oregon Department of Transportation, and other sources of publicly

available data, such as from the U.S. Environmental Protection Agency and U.S. Energy Information Administration may also be of interest to include in the analysis. Are there other data sources DEQ should consider for inputs to the model for the business as usual case? If yes, please provide the sources or let us know if you would like to provide data for consideration.

NWPPA Comment 3.
For their model, ICF must consider the following.
Carbon intensity of Oregon's purchased electricity/energy and carbon intensity of self-generated energy for energy intensive and trade exposed (EITE) potentially regulated entities. ICF should explore all sources of generally accepted and quality data including data from potentially regulated EITE sources.

NWPPA Discussion 3.

For accurate modeling of potential carbon emission leakage to other jurisdictions with higher energy carbon intensity – the carbon intensity of Oregon's potentially-regulated stationary sources for both electrical supply and self-generated energy supplies must be included in the model to portray an accurate accounting of potential greenhouse gas leakage of potential sources within the energy/emission intensive and trade exposed sectors as reinforced by the *Oregon Sectoral Competitiveness under Carbon Pricing, Final Report December 2018*, prepared for the Oregon Carbon Policy Office study by Vivid Economics[1].

DEQ Question 4.
What information or results from the modeling of program scenarios would you find most useful?

NWPPA Comment 4.
Comment 4.1. NWPPA's top priority for modeling results is the accurate portrayal of potential carbon emissions leakage to higher carbon emitting areas and socio-economic effects of job loss and local (city- and county-level) revenue loss in rural areas of all aspects of Oregon's vertically integrated forest products supply and manufacturing chain.

Comment 4.2. NWPPA believes the modeling must fully encompass the integrated and compounding economic effects of policies that impact fiber supply and manufacturing operations within the forestry sector. These effects have been illustrated by the unique challenges of year 2020-2021 for the Oregon forest products industry:

a. The vertical integration of Oregon's forest products industry between pulp and paper, solid wood manufacturing, timber harvest and transportation with consideration of the reduced transportation and greenhouse gas benefits of a very localized supply chain.

[1] https://www.vivideconomics.com/wp-content/uploads/2019/08/Oregon-Industrial-Sector-Competitiveness-Under-Carbon-Pricing-1.pdf (downloaded Nov. 5, 2020)

b. The reduced efficiency of manufacturing facilities and transportation from government regulation during the COVID-19 pandemic and recovery.
c. The overlay of the devasting economic effects of the 2020 wildfires to: Oregon's timber landowners; economic harm to the logging sector through loss of equipment from fire; and, localized forest products manufacturing through loss of fiber supply.

Comment 4.3. The ICF modeling must address the interconnected possible leakage from closure and relocation of energy intensive trade exposed (EITE) entities like forest products facilities within the forest products supply chain and the loss of associated state and local taxes including the economic multiplier effects in the rural counties/cities/communities where forest product harvesting and manufacturing facilities are located.

NWPPA Discussion 4.

Pulp, paper and paperboard (NAICS 322) is recognized as an EITE sector

Prior Oregon studies have generally characterized the pulp, paper and paperboard sector as a prominent EITE sector facing potential challenges and risks of leakage. *See* the Vivid Economics study *Pulp Paper and Paperboard*[2], that discusses the competitive difficulties associated with high energy needs for manufacturing commodities for sale in a world-wide market. See also Vivid Economics report, *Oregon Competitiveness and Carbon Leakage: Indirect Emissions and Impact Memorandum prepared for the State of Oregon CPO, December 2018.*[3]

EITE pulp, paper and paperboard facilities are generally located in rural areas and rural areas face increased risk of economic harm from facility closures

The *Oregon Carbon Policy Office, CONSULTANT REPORT, Oregon's Cap-and-Trade Program (HB2020): An Economic Assessment***,** prepared for Kristen Sheeran, Director, Oregon CPO, by Berkeley Economic Advising and Research (BEAR)[4] cites the 2017 *FTI Report* prepared for Associated Oregon Industries which addresses EITE challenges including high compliance costs, competitive difficulties, and dependence on export activities.

The BEAR Report concludes on page 31 that EITE's require special consideration to thrive. NWPPA believes that as ICF models the regulatory scenarios, ICF must quantify the greenhouse gas leakage potential to higher carbon emitting areas and also consider the rural geographical location of forest products EITE facilities.

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[2] https://www.vivideconomics.com/wp-content/uploads/2019/08/Oregon-Industrial-Sector-Competitiveness-Under-Carbon-Pricing-1.pdf (pp. 149-156, Pulp, Paper and Paperboard Sector, downloaded Nov. 5, 2020)

[3] https://www.oregon.gov/gov/Documents/Oregon%20Competitiveness%20Indirect%20Impacts%20Memo%20FINAL.pdf (Downloaded Nov. 13, 2020)

[4] https://www.oregon.gov/gov/Documents/CPO_BEAR_HB2020_Economic_Assessment.pdf (*See* pages 14, 18 and 31 downloaded Nov. 5, 2020)

> While EITE enterprises are of course essential to their owners, employees, and local communities, they comprise a modest share of the state's GDP (Figure 4.9). This suggests that we should look for complementary policies that can take account of their adjustment needs without sacrificing the overall economic and environmental benefits of cap-and-trade. This reasoning is a primary justification for HB2020's permit allocation rules to EITE sectors.

Thank you for the opportunity to comment on the Oregon DEQ Quality questions for ICF modeling on program scenarios. I can be contacted at 503-805-8511 to answer any questions.

November 13, 2020

Office of Greenhouse Gas Programs
Department of Environmental Quality
700 NE Multnomah St.
Suite 600
Portland, OR 972321

RE: Cap and Reduce Projection Study

Dear DEQ Office of Greenhouse Gas Programs:

Thank you for the opportunity to provide comments on the initial inputs and assumptions to be considered in the modeling for the cap and reduce projection study. We write as co-leads of the Renew Oregon Coalition cap and reduce table. Our comments are organized below under the four specific questions DEQ has posed.

1. ***The business as usual case is generally meant to be representative of rules and regulations that are currently in effect to act as a baseline for gauging the effectiveness of additional program scenarios. For example, DEQ intends to account for the state's current Clean Fuels Program requirements. DEQ seeks input on any other state programs that should be included for the following sectors/topics:***
    - ***Transportation***
    - ***Natural gas***
    - ***Electricity***
    - ***Buildings***
    - ***Energy efficiency***

In addition to the current Clean Fuels Program requirement of 10% reduction in average carbon intensity from 2015 levels by 2025, DEQ should include the following rules, regulations, and laws currently in place in the business as usual case:

- Renewable Portfolio Standard and "Coal to Clean"
- Current residential and commercial building codes (see DCBS-BCD)
- Oregon's current appliance efficiency standards (see ODOE)
- Zero emission vehicle goals [See SB 1044 (2019)]

As DEQ knows, the Governor's Executive Order on climate change signed in March - EO 20-04 or the Oregon Climate Action Plan (OCAP) - includes directives to expand a number of existing programs and create new ones including the cap and reduce program. Many of the rules and regulations stemming from OCAP are still to be determined. As a result, it does not fit neatly into a business as usual scenario. At the same time, OCAP is on the books and has significant implications for Oregon's emissions trajectory moving forward. Therefore, DEQ should find a

way to incorporate OCAP's expected changes in another scenario - like a "business-as-usual plus" scenario contemplated in the next question.

2. ***There are a number of rules and regulations that have anticipated changes in the near future that could impact the business as usual case. For example, DEQ is trying to determine how best to incorporate expanded Clean Fuels Program requirements that DEQ is expected to begin work on in 2021. Should DEQ consider a "business as usual plus" case to represent the most likely changes to rules and regulations that may be expected in the near future? If yes, what other planned, proposed, or expected programs should DEQ consider?***

DEQ should include a "business as usual plus" case to represent changes expected from the Governor's Executive Order on climate change signed in March 2020 - EO 20-04 or the Oregon Climate Action Plan (OCAP). OCAP represents the most comprehensive climate action to date in Oregon and includes a number of climate directives for state agencies to meet over the coming years. While implementation of OCAP is just beginning, it will influence the trajectory of emissions in Oregon for years to come.

The question then becomes what exactly to include from OCAP in this "business as usual plus scenario." There are specific directives in OCAP as well as a general directive that may result in a number of actions still to be determined. In addition, some of the directives have a specific date for implementation or multiple dates over a span of years, while others do not have any specific date. And, some of the directives provide a floor for action, but the action could ultimately be more ambitious. These are all variables that make it challenging to decide what to include.

Here's what we suggest: Include the directives that have specific goals and timelines laid out in OCAP. These include:

- The Clean Fuels directive of 20 percent below 2015 by 2030, and 25 percent below 2015 levels by 2035
- The food waste reduction directive of reducing food waste by 50 percent by 2030
- The building energy efficiency goal for 2030 for new residential and commercial construction which "shall represent at least a 60 percent reduction in new building annual site consumption of energy, excluding electricity used for transportation or appliances, from the 2006 Oregon residential and commercial codes." The minimum of 60 percent should be what is used in the modeling even the goal might ultimately be set higher, as it is unknown what the higher number might be.

These directives are concrete in terms of timing and ultimate goal - just like our current Clean Fuels target. Beyond these, there may be more conjecture and assumptions needed. To the extent DEQ is able to incorporate more OCAP actions (e.g. expected appliance efficiency standard upgrades) any assumptions made should be reasonable and clear. Ultimately, the

most solid picture of the components of OCAP and their impacts on the future trajectory of emissions should be provided.

Obviously cap and reduce is a key part of OCAP as well, but given the focus of the study on different cap and reduce program scenarios, we assume cap and reduce will be modeled outside of the "business as usual plus" case to show the impact of the different cap and reduce program scenarios.

3. ***DEQ collects greenhouse gas emissions data that will be used to inform the modeling. Other state agencies, such as the Oregon Department of Transportation, and other sources of publicly available data, such as from the U.S. Environmental Protection Agency and U.S. Energy Information Administration may also be of interest to include in the analysis. Are there other data sources DEQ should consider for inputs to the model for the business as usual case? If yes, please provide the sources or let us know if you would like to provide data for consideration***.

We do not have additional data sources to recommend or provide other than to say that DEQ should use the best available data that allows for meaningful analysis and results. California, the Regional Greenhouse Gas Initiative, and other states and organizations have been looking at the benefits of reducing emissions from many of the same sources of emissions that the cap and reduce program would cover, so to the extent those analyses provide insight into data sources and methods, DEQ may want to consider those.

4. ***What information or results from the modeling of program scenarios would you find most useful?***

It sounds like DEQ is already planning on the modeling addressing:

- Forecasted greenhouse gas emissions
- Air quality and public health co-benefits
- Economic effects on regulated entities, businesses, consumers, and Oregon's economy

These overall categories of information are important and will be useful. A couple specific items to note under these categories are:

- Regarding forecasted greenhouse gas emissions, it would be helpful to see cap and reduce program scenarios that reflect a high level of ambition for the program. This would include scenarios that incorporate both the 2035 and 2050 state greenhouse gas reduction goals, require and incentivize earlier reductions, and potentially go above and beyond the minimum state goals.

- Regarding air quality and public health co-benefits, in addition to identifying the benefits, it would be helpful to have a dollar number associated with those benefits. If there is a

way to also model the cost of inaction in less ambitious scenarios, that would also be helpful information to understand the trade-offs of the program scenarios.

- Regarding economic effects, it is not clear if DEQ will also be assessing positive effects in addition to potential costs. For example, the study that Berkeley Economic Advising and Research (BEAR) did on the cap and invest legislation identified a growth in jobs as part of the program.[1] Assessing job creation and other positive economic effects should be part of the work and results of this study.

Beyond the above specifics:

- DEQ should look for ways to incorporate equity considerations into the models and outputs. For example, the ability to understand how the air quality benefits or economic effects are distributed among different communities and populations could help inform program choices.

- A "business as usual plus" scenario as we outlined in question #2 above will be particularly helpful in understanding the role of the Governor's Executive Order in helping us reach our state's greenhouse gas reduction goals as well as how much more may need to be done.

- Having a way to understand how each action included in the scenarios contributes to reducing emissions would be helpful. For example, for each of the items that are included in the "business as usual" scenario or the "business as usual plus scenario," knowing what wedge of emissions reductions they represent would allow everyone to better understand how all of the individual pieces fit together in achieving our goals.

- Finally, it is important to note that the scenarios should be compared to and focused on achieving the overall state greenhouse gas reduction goals set out in the Governor's Executive Order. This will allow us to understand how far we can get with existing efforts and how much more needs to be done to achieve our goals.

Thank you again for the opportunity to comment.

Sincerely,

Zachariah Baker
Climate Solutions
Renew Oregon Cap and Reduce Table Co-Lead

Don Sampson
Affiliated Tribes of Northwest Indians
Renew Oregon Cap and Reduce Table Co-Lead

[1] https://www.oregon.gov/gov/Documents/CPO_BEAR_HB2020_Economic_Assessment.pdf

changes to rules and regulations that may be expected in the near future? If yes, what other planned, proposed, or expected programs should DEQ consider?

- Modeling the impacts of anticipated, near-future changes can provide useful information. However, it is important to note that such a sensitivity case would be a supplemental analysis, and would not substitute for a BAU based on rules and regulations that are currently in effect. EDF recommends that this analysis be characterized as a policy case sensitivity, allowing the DEQ and stakeholders to understand how the cap & reduce policy scenarios interact with complementary policies under consideration.
- Modeling likely policies—such as the E.O. 20-04's clean fuels, food waste, and new construction energy efficiency directives, which have specified targets for ambition and timelines for implementation—can provide important perspective on the amount of emissions reductions that the cap and reduce program will ultimately be responsible for. A range of supplemental analyses may be useful for providing such insight. In the context of evaluating backstop emissions control policies (which is what the Cap & Reduce program will be serving as), modeling typically accounts for the impacts of complementary policies that affect emissions, and then assumes that the "cap" program will be responsible for driving the remaining emission reductions needed to meet overall targets. Modeling the cap and reduce program should involve a similar approach, where the cap & reduce budget is calibrated to ensure that the cumulative emission reductions consistent with achieving the executive order targets is achieved. The likely "complementary" policies to the backstop cap can be appropriately modeled as sensitivities in the policy cases, helping demonstrate the range of reductions that the cap & reduce program may ultimately be responsible for.
- It would also be helpful to do an additional sensitivity scenario that would explore how choices that agencies might make in implementing EO 20-04 could affect results depending on the level of ambition of those choices. This full picture would provide a better understanding of costs, benefits, and opportunities from increasing the ambition of the cap and reduce program.

3. DEQ collects greenhouse gas emissions data that will be used to inform the modeling. Other state agencies, such as the Oregon Department of Transportation, and other sources of publicly available data, such as from the U.S. Environmental Protection Agency and U.S. Energy Information Administration may also be of interest to include in the analysis. Are there other data sources DEQ should consider for inputs to the model for the business as usual case? If yes, please provide the sources or let us know if you would like to provide data for consideration.

- EDF has found the EIA Annual Energy Outlook (AEO) to be a valuable source of information. In the past, we've used the high oil & gas supply case to reflect lower natural gas prices; these prices from the high oil & gas supply case have trended closer to

real world prices. It would be useful to run sensitivity analyses with the high oil & gas supply case to see its natural gas prices impact results and to demonstrate a "range" of possible business-as-usual trajectories. We've found that gas prices is often the most valuable input to vary

- The National Renewable Energy Laboratory (NREL)'s Annual Technology Baseline (ATB) provides a set of technology cost and performance data. The NREL ATB could be a useful data source, particularly for prices related to renewable energy.
- EDF also recommends that the DEQ not over-estimate the emissions-lessening impacts associated with COVID-19 in any BAU scenarios. While it is critical to understand the range of uncertainty, early indications are that emissions are already rebounding even faster than experts initially expected. In a recently-distributed research note, the Rhodium Group found the world's largest economies are beginning to return to pre-pandemic emission levels in industry, electric power, and transportation.[1] By July, power generation in the U.S. had fully recovered to 2019 levels. Scientists have noted the significant difference between stopping all activity versus instituting critical structure changes, and point to the quick rebound after the 2009 recession as countries poured vast resources into reviving economies. Emissions in China are back to pre-pandemic levels. Most problematically, cities that have reopened in China and Europe are seeing a surge in vehicle traffic[2] and experts are warning that transportation emissions in particular are likely to spike relative to prior, pre-pandemic levels as more Americans get back in their cars instead of relying on public transportation—a structural shift that could take years to reverse. It's valuable to understand the uncertainty from a CoVid-19 sensitivity, but this should not inform the calibration of the emissions budget necessary under the policy cases.

4. What information or results from the modeling of program scenarios would you find most useful?

- EO 20-04's emission reduction targets are an important reference point for developing scenarios. All scenarios modeled should ensure that the cap is calibrated to at minimum meet a cumulative reduction budget consistent with a linear trajectory towards the executive order targets. DEQ may also wish to provide references to even more ambitious targets, for example net-zero emissions within covered sectors by 2050.
- Modeling should include the impact of different program scenarios on levels of cumulative emissions. It is possible to meet the EO's 2030 and 2050 targets with

[1] Rivera, A., Pitt, H., Larsen, K., Young, M. Road to Recovery? Tracking the Impact of COVID-19 on the World's Major Economies. *Rhodium Group.* (2020). https://rhg.com/research/covid-energy-impacts-major-economies/

[2] Newburger, E. CDC wants people to drive solo to avoid coronavirus, sparking fear over more congestion and emissions. *CNBC*. (2020). https://www.cnbc.com/2020/06/04/cdc-guidance-against-mass-transit-sparks-fears-of-congestion-emissions.html

different outcomes for cumulative emissions, based on how yearly budgets are set and how early action is incentivized. It would be useful to see how different pathways to meeting the EO's targets result in different levels of cumulative emission reductions, given the critical importance of the cumulative metric for greenhouse gas pollution.

- The program scenarios should include at least one scenario that sets a cap that covers, at a minimum, emissions associated with all transportation fuels, residential natural gas and heating oil, all electric power generated in Oregon, and all greenhouse gas emissions from industrial operations. The cap should (at minimum) decline consistently from the January 2022 start date of the program, linearly, consistent with meeting the 2030 target while accommodating any major emission reductions already in the pipeline such as announced coal retirement dates. The scenario should enable compliance through a DEQ-issued "credit" or an "allowance" (total compliance instruments issued would be equivalent to the emissions budget) that is equivalent to one ton of co2e, and allow flexible emissions trading between compliance entities. Compliance with any "credits" from outside of the DEQ-issued instruments should be from sources *outside* of capped sectors, and be limited to a small percentage of compliance instruments (ie, 4-6%). There should be no payment option for non-compliance. The scenario should assume the opportunity to bank allowances for future compliance, but not borrow from future compliance years.
- If the DEQ is contemplating excluding any of the above sectors from a comprehensively-designed program, it is important that DEQ compare abatement costs for any scenario with reduced coverage to the broader-coverage scenario.
- DEQ should also evaluate a compliance scenario where Oregon sources can comply with cap & reduce program requirements by using emissions allowances from other state programs, i.e. California.
- The model outputs should include greenhouse gas emissions (cumulative reductions as well as emissions in specific years), cost/ton of co2e reduced, description of sectoral changes, criteria pollution emission reductions, and quantified benefits of both carbon and criteria pollutant reductions. It is important that the modeling study models broad coverage across all scenarios, and provide economy-wide results.
- Equitable distribution of costs and benefits is also a critical priority for the cap and reduce program, so understanding the distributional effects of modeled scenarios is crucial. Modeling could also include an assessment of benefits from any investments that are made as part of the cap and reduce program by evaluating program options where all compliance instruments are not directly allocated to firms, but instead value is captured for reinvestment priorities or households.

Thank you for your consideration. We look forward to continued engagement

Sincerely,

Erica Morehouse
Senior Attorney, Environmental Defense Fund
emorehouse@edf.org

And

Kjellen Belcher
Senior Analyst, Environmental Defense Fund
kbelcher@edf.org

From: Shauna McKain-Storey
Sent: Friday, November 13, 2020 4:56 PM
To: CapandReduce
Subject: Comment on this program

Hello:

I would like to express my appreciation for Oregon State government and the DEQ taking action to study and hopefully take meaningful action to ameliorate climate change through Cap and Reduce. To me, the most important aspect is forecasting and reducing greenhouse gas emissions, although studying health factors are also important to citizens like me who have asthma or other closely linked health conditions. It will be valuable to project and try to mitigate negative effects of regulations on businesses and consumers, but it is vitally important to consider (and communicate to all) the ultimately much greater cost to our economy if action to reduce the effects of climate change is not taken as soon as possible.

I appreciate the present difficulty, during this pandemic, of communicating the need for action on this matter. Many, but not enough, people understand the urgency of the ongoing climate crisis and its increasingly catastrophic effects. I hope that more efforts to educate Oregon's citizens about this issue are forthcoming.

Thank you,

Shauna McKain-Storey

From: Tim Miller
Sent: Wednesday, November 11, 2020 4:50 PM
To: CapandReduce
Cc: Matthew Davis,; Zach Baker
Subject: Input for Cap and Reduce Modeling Study
Attachments: Chart for Quantification of Early Emissions Reductions (Autosaved).xlsx

DEQ Cap and Reduce Team:

Attached is a description of a potential approach for quantifying a preference for emissions reductions that occur earlier versus later in the program. The simple accompanying spreadsheet is also attached. I'm providing this for your consideration as an input for the modeling study, or for other program design considerations.

While I am affiliated with a number of groups involved in advancing and informing climate policy, I'm offering this as a concerned citizen without affiliation.

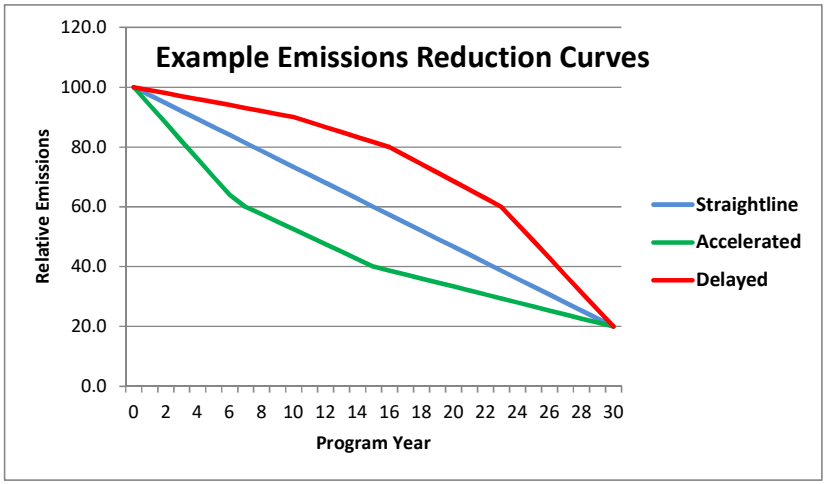
I would be happy to discuss this approach if you or the ICF team or others have any questions.

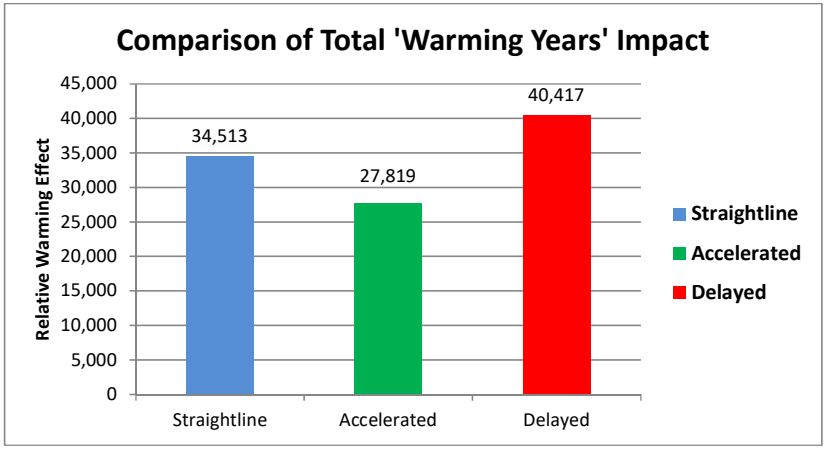
Thank you!

Tim Miller

Tim Miller
Board Member and Former CEO
Direct 503.490.3014

	Emissions			Warming Effect (Emissions x Program Years in Atmosphere)		
Year	Straightline	Accelerated	Delayed	Straightline	Accelerated	Delayed
0	100.0	100.0	100.0	3,000	3,000	3,000
1	97.3	94.0	99.0	2,823	2,726	2,871
2	94.7	88.0	98.0	2,651	2,464	2,744
3	92.0	82.0	97.0	2,484	2,214	2,619
4	89.3	76.0	96.0	2,323	1,976	2,496
5	86.7	70.0	95.0	2,167	1,750	2,375
6	84.0	64.0	94.0	2,016	1,536	2,256
7	81.3	60.0	93.0	1,871	1,380	2,139
8	78.7	57.5	92.0	1,731	1,265	2,024
9	76.0	55.0	91.0	1,596	1,155	1,911
10	73.3	52.5	90.0	1,467	1,050	1,800
11	70.7	50.0	88.3	1,343	950	1,678
12	68.0	47.5	86.7	1,224	855	1,560
13	65.3	45.0	85.0	1,111	765	1,445
14	62.7	42.5	83.3	1,003	680	1,333
15	60.0	40.0	81.7	900	600	1,225
16	57.3	38.7	80.0	803	541	1,120
17	54.7	37.3	77.1	711	485	1,003
18	52.0	36.0	74.3	624	432	891
19	49.3	34.7	71.4	543	381	786
20	46.7	33.3	68.6	467	333	686
21	44.0	32.0	65.7	396	288	591
22	41.3	30.7	62.9	331	245	503
23	38.7	29.3	60.0	271	205	420
24	36.0	28.0	54.3	216	168	326
25	33.3	26.7	48.6	167	133	243
26	30.7	25.3	42.9	123	101	171
27	28.0	24.0	37.1	84	72	111
28	25.3	22.7	31.4	51	45	63
29	22.7	21.3	25.7	23	21	26
30	20.0	20.0	20.0	0	0	0
				34,513	27,819	40,417





Convex vs Straightline	Convex vs Concave
17%	45%
more warming effect	more warming effect