Date: April 13, 2018  
To: Oregon Energy Facility Siting Council (EFSC)  
From: Jason Sierman, Energy Policy Analyst  
Todd Cornett, Siting Division Administrator  

Subject: Agenda Item I (Action Item) Rulemaking: Phase 2 Updates to Carbon Dioxide (CO₂) Standards for the April 27, 2018 Council Meeting  

Summary of Request  
Authorize staff to issue official public notice of a public comment period and rulemaking hearing for this rulemaking project, with the condition that staff cannot issue public notice until after it receives and considers all input from the Rulemaking Advisory Committee (RAC).  

Overview  
At its December 14-15, 2017 Council meeting, the Council set the scope for Phase 2 of its rulemaking project to update its CO₂ standards; appointed a RAC for this second phase; and set the scope and purpose of the RAC.  

The administrative rules promulgating the Council’s CO₂ standards are collectively located in Chapter 345, Division 24 –beginning at OAR 345-024-0500 and ending at 345-024-0720. Within this set of rules, the Council identified three specific issues to address through rulemaking in 2017 (the three issues are numbered below). Phase 1 addressed two of the 3 issues and that rulemaking is now complete (see the summary below for more details). Phase 2 is addressing the third issue, an evaluation and potential modification of the CO₂ emissions standards. Phase 2 began in 2017 and will conclude in 2018.  

Phase 1 - Updates to CO₂ Standards (Complete and Effective 10/23/17):  
1) New monetary offset rate under OAR 345-024-0580 is now $1.90 per ton of CO₂  
2) CO₂ equivalency weights for methane and nitrous oxide under OAR 345-024-0620 are respectively now 25 and 298 pounds of CO₂.  

Phase 2 - Updates to CO₂ Standards (In Process):  
3) Evaluate and update the CO₂ emissions standards under:  
   • OAR 345-024-0570 Modification of the Standard for Base Load Gas Plants,  
   • OAR 345-024-0550 Standard for Base Load Gas Plants,  
   • OAR 345-024-0590 Standard for Non-Base Load Power Plants, and  
   • OAR 345-024-0620 Standard for Nongenerating Energy Facilities  

Purpose of Phase 2 Rulemaking Project  
The main purpose of the Phase 2 rulemaking project is for the Council to determine if the most efficient combined cycle combustion turbine (CCCT) operating in the U.S. has a more efficient
heat rate than the heat rate the existing standard is based on. According to OAR 345-024-0570, if the Council finds the most efficient stand-alone CCCT, natural gas-fired energy facility that is commercially demonstrated and operating in the United States has a net heat rate less than 6,995 Btu per kilowatt hour higher heating value adjusted to ISO conditions, then it may modify the CO$_2$ emissions standards and reset the standards to 17% below the most efficient heat rate it finds.

**Purpose and Function of the CO$_2$ Emissions Standards**

The purpose of the Council’s CO$_2$ emissions standards are two-fold. The first purpose is to encourage applicants proposing a fossil-fueled energy facility to build the most efficient facility possible, thereby directly reducing the gross amount of CO$_2$ emitted from fossil-fueled energy facilities sited within the Council’s jurisdiction. The second purpose is to reduce the net amount of greenhouse gasses (GHGs) attributable to fossil-fueled energy facilities sited within the Council’s jurisdiction. The Council’s standards accomplish these two purposes by:

1) Setting standards for the net CO$_2$ emissions rate for CO$_2$ emitting energy facilities sited within Council jurisdiction; and

2) Requiring site certificate applicants that propose a facility subject to the standards to offset that energy facility’s gross CO$_2$ emissions by the amount that facility’s gross CO$_2$ emissions exceed the set standards for the net CO$_2$ emissions rate. As further described below, there are three pathways to compliance with this rule, but to date, all applicants have complied with the standard by making monetary offset payments to a qualified organization (The Climate Trust).

This design requires applicants to offset those gross CO$_2$ emissions that exceed the set standards, and is intended to provide an incentive for applicants to directly reduce CO$_2$ emissions by proposing efficient energy facilities that emit CO$_2$ at rates as close to the set standards as possible.

As specified under ORS 469.503(2) and OAR 345-024-0500 through -0720, the Council’s current CO$_2$ emissions standards set the net CO$_2$ emissions rate at 0.675 lb. CO$_2$/kWh for CO$_2$ emitting energy facilities within EFSC jurisdiction.\(^1\) Energy facilities subject to these standards may emit CO$_2$ at a net rate below 0.675 lb. CO$_2$/kWh without needing to offset those CO$_2$ emissions any further, and any emissions above the net rate of 0.675 lb. CO$_2$/kWh must be offset via one of the compliance pathway options outlined in rule.

ORS 469.503(2) and OAR 345-024-0500 through -0720 also specify the means by which energy facilities subject to the CO$_2$ standards are allowed to offset CO$_2$ emissions. The specified means are commonly called the compliance pathways. The statute and rules limit the compliance pathways to any combination of the following three options:

1) the applicant or a third party agrees to provide funds in an amount deemed sufficient to produce the reduction in CO$_2$ emissions necessary to meet the applicable CO$_2$ standard
(this third option is deemed the “Monetary Path Payment Requirement” under OAR 345-024-0710).

2) the applicant or a third party implements CO₂ offset projects approved by the Council; and

3) the facility sequentially produces electrical and thermal energy from the same fuel source, and the thermal energy will be used to displace another source of CO₂ emissions that would have otherwise continued to occur.

To date, all energy facilities subject to the Council’s CO₂ standards have complied with the standards through the monetary path, either singularly or in combination with other options, to meet the CO₂ standards. The amount of funds required by the monetary path is calculated by multiplying the tons of CO₂ reduction required to meet the applicable CO₂ standard by the “monetary offset rate,” which is specified under OAR 345-024-0580. Currently the monetary offset rate is $1.90 per ton of CO₂ emissions.

See Attachment A for a more detailed summary of how the CO₂ standards function.

History of Updates and Current Need to Update
In 1997, ORS 469.503(2)(a) established the initial CO₂ emissions standard for base load gas plants at 0.70 lb. CO₂/kWh. The statute requires the CO₂ emissions standard to be set at 17% below the most efficient gas plant operating in the United States. The initial standard was derived from a benchmark gas plant with a heat rate of 7,200 BTU/kWh. A heat rate is a measure of how efficient a thermal power plant is. It considers how much fuel energy, measured in British Thermal Units (BTUs), is used to produce 1 kilowatt-hour (kWh) of electricity. A heat rate can also be expressed in terms of an efficiency percentage. For example, the 1997 benchmark gas plant with a heat rate of 7,200 BTU/kWh was roughly 47% efficient.

The 1997 standard of 0.70 lb. CO₂/kWh was derived from 7,200 BTU/kWh by using the conversion factor of 117 pounds of CO₂ per million BTU of combusted natural gas fuel. The conversion yields 0.8424 lb. CO₂/kWh, and 0.70 lb. CO₂/kWh represents a 17% reduction from 0.8424 lb. CO₂/kWh.

ORS 469.503(2)(a) and OAR 345-024-0570 authorize the Council to modify the emissions standard for base load gas plants through rulemaking any time the Council finds sufficient evidence that the efficiency of a natural gas fired CCCT has improved relative to the benchmark heat rate (the benchmark heat rate is specified in OAR 345-024-0570). This authority gives the Council the ability to ensure that the net CO₂ emission rates of CO₂ emitting energy facilities sited within Council jurisdiction remain 17% below the CO₂ emission rate of the most efficient gas plant operating in the U.S. at any given time.

In January 2000, the Council found that the most efficient gas plant operating in the U.S. had a heat rate of 6,955 BTU/kWh (~49% efficiency). Based on this finding, the Council took action to
modify its CO\textsubscript{2} standards by updating the benchmark heat rate to 6,955 BTU/kWh, calculating a 17% reduction (5,773 BTU/kWh), and converting that 17% reduction from 5,773 BTU/kWh to 0.675 lb. CO\textsubscript{2}/kWh. The 2000 rulemaking modified the CO\textsubscript{2} standard for base load gas plants to 0.675 lb. CO\textsubscript{2}/kWh and modified the standards for non-base load power plants and nongenerating energy facilities to the equivalent of 0.675 lb. CO\textsubscript{2}/kWh.

The standards have not been updated in the 18 years since 2000. Yet, over that same time period, the power industry has experienced continuous improvements in power plant efficiency. In other words, the Council’s CO\textsubscript{2} emissions standards are likely out of date and, if not modified to reflect the most efficient current technology, could eventually allow an applicant to propose an energy facility that would not be required to offset a portion of its CO\textsubscript{2} emissions at all. If a proposed fossil-fueled energy facility is not required to offset its CO\textsubscript{2} emissions at all, the two-fold purpose of the Council’s CO\textsubscript{2} emissions standards would no longer be met.

**Authority to Update the Standards**

ORS 469.503(2)(a)\textsuperscript{2} and OAR 345-024-0570\textsuperscript{3} dictate how the emission standard for base load gas plants is set and authorize the Council to modify the standard for base load gas plants if it finds that the efficiency of a natural gas fired CCCT has improved relative to the benchmark heat rate (the benchmark heat rate is specified in OAR 345-024-0570). OAR 345-024-0610\textsuperscript{4} and OAR 345-024-0640\textsuperscript{5} authorize the Council to modify the standard for non-base load power plants and the standard for nongenerating energy facilities, but require both of these standards to remain equal to the standard for base load gas plants. OAR 345-024-0510\textsuperscript{6} requires the Council to consider and balance at least thirteen principles, set in rule, in adopting new CO\textsubscript{2} standards for fossil-fueled power plants\textsuperscript{7}.

**Applicability of New CO\textsubscript{2} Emissions Standards**

If the Council approves new CO\textsubscript{2} emissions standards, they would be applicable to:

- Unbuilt fossil-fueled energy facilities receiving a site certificate after the effective date of the rulemaking.
- Unbuilt fossil-fueled energy facilities receiving an amendment to a site certificate to extend its construction deadlines after the effective date of the rulemaking.
- Built or unbuilt fossil-fueled energy facilities receiving an amendment to a site certificate after the effective date of the rulemaking that adds new CO\textsubscript{2} emitting equipment or alters the operation of existing CO\textsubscript{2} emitting equipment included in the original site certificate.
- Facilities with express terms and conditions in its site certificate that require the application of new CO\textsubscript{2} standards under certain scenarios.

**Evaluation Process and Request to Issue Official Public Notice of Rulemaking**

Staff is currently evaluating the CO\textsubscript{2} emissions standards according to the 4-step process below. Based on the preliminary results of this evaluation, staff requests that the Council authorize staff to issue official public notice of a public comment period and rulemaking hearing for this rulemaking project with the condition that staff cannot issue official public notice until after it
receives and considers all input from the RAC (see steps 1-3 of the evaluation process outlined below). Official public notice will be accompanied by staff’s proposed rule language consisting of new numerical values that would reset the three CO₂ standards to net CO₂ emission rates lower than what currently exist. Staff’s proposed rule language will conform to OAR 345-024-0610 and OAR 345-024-0640 by recommending a new standard for non-base load power plants and a new standard for nongenerating energy facilities that is equal to any new standard recommended for base load gas plants.

Staff’s evaluation process:

1) Staff has made preliminary findings in its search to find the heat rate of the most efficient natural gas-fired CCCT power plant that is commercially demonstrated and operating in the U.S., shared its preliminary findings with the RAC, and is currently receiving input on the preliminary findings from the RAC;
   • See the next page for staff’s preliminary findings.

2) Staff has conducted an analysis that considers and balances the thirteen principles listed under ORS 469.503(2)(b) and OAR 345-024-0510, shared this analysis with the RAC, and is currently receiving input on this analysis from the RAC;
   • See Attachment B for staff’s analysis of the 13 principles.

3) Staff will consider all input received from the RAC, including any evidence presented of other heat rates of natural gas-fired power plants operating in the U.S., including input on staff’s analysis of the listed 13 principles under ORS 469.503(b) and OAR 345-024-0510, and including input on staff’s analysis of the fiscal impacts of this rulemaking as required by ORS 183.333 and 183.335. After receiving input from the RAC, staff may identify a heat rate different than its preliminary finding, may modify its analysis of the 13 principles and may modify its fiscal impact analysis.
   • See Attachment C for staff’s analysis of the fiscal impacts.

4) After considering all input, staff will present the Council with a summary of the results of staff’s evaluation and a summary of the input received from the RAC. Staff’s presentation will occur at the same Council meeting as the rulemaking hearing, and will include a recommendation to the Council that the new CO₂ emissions standard for base load gas plants, non-base load power plants and nongenerating energy facilities should all be modified in accordance with the Council’s rules.

Official public notice will occur after step 3 and before step 4. Official public notice will inform people of the date and time for a rulemaking hearing in front of the Council at a regularly scheduled EFSC meeting. The hearing will provide an opportunity for the Council and staff to hear oral comments, and written comments may be submitted any time after the notice is issued and before the end of the rulemaking hearing.
Approved Rulemaking Process:
At its January 19, 2017 Council meeting, the Council approved a rulemaking process with early public participation for this rulemaking project. The approved rulemaking process is outlined below:

EARLY PUBLIC PARTICIPATION
* = EFSC Meeting
bold = optional

Start
Council Approves Pub. Part. Process* ☒
Rulemaking Advisory Committee (RAC) ☒
Staff Draft of Proposed Language ☐
Council Authorization to File Notice* ☒
Staff Issues Official Public Notice ☐
Public Comment Period ☐
Rulemaking Hearing* ☐
Hearing Officer Report ☐
Council Adopts Final Rule Language* ☐

Finish
Staff Files Final Rule Language ☐

Estimated time 4 – 6 months

Preliminary Findings
Staff has made a preliminary finding that the most efficient CCCT power plant operating in the U.S. is the Grand River Energy Center in Chouteau, OK. This plant has a tested net heat rate of 6,333 Btu per kilowatt hour higher heating value adjusted to ISO conditions.

<table>
<thead>
<tr>
<th>Grand River Energy Center</th>
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<tbody>
<tr>
<td><strong>Owner</strong></td>
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<td><strong>Location</strong></td>
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<td><strong>First Year of Commercial Operation</strong></td>
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<td><strong>Approx. Cost to Build</strong></td>
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<td><strong>Turbine Make &amp; Model</strong></td>
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<tr>
<td><strong>Nominal Capacity</strong></td>
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<tr>
<td><strong>Tested HHV Net Heat Rate</strong> (adjusted to ISO conditions)</td>
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http://www.grda.com/electric/facilities/grand-river-energy-center/
Summary of RAC Input to Date

RAC Meeting #1 - January 24, 2018
The purpose of this meeting was to give the RAC an overview of how the CO₂ standards function and an overview of the rulemaking project very generally. The overview included an outline of staff’s evaluation process as described earlier in this staff report on page 5. There were a few general questions about how the CO₂ standards function, but since it was only an introductory meeting there was nothing for the RAC to offer substantive comments on.

RAC Meeting #2 - March 21, 2018
The purpose of this meeting was to share the preliminary findings of staff’s search to find the most efficient CCCT power plant operating in the U.S. and to hear input on these preliminary findings. As in the first meeting, there were a few general questions about how the CO₂ standards function. There were also a few substantive questions about how heat rates are tested, how tested heat rates are adjusted to standard conditions, and what kind of tested heat rates the Department has found thus far.

RAC Meeting #3 – May 15, 2018
Time: 10 am – 12 pm PST
Location: Meitner Conference Room, Oregon Dept. of Energy
550 Capitol St. NE, Salem, OR 97301  Parking Info
Call-in: 877-873-8017
Passcode: 799345
Web Conference for AT&T Connect iMeeting:
https://connect9.uc.att.com/service32/meet/?ExEventID=8799345

See Attachment D for a list of RAC entities.

Next Steps
Staff will meet with the RAC for the third time in May to hear input on staff’s preliminary findings of its search for the most efficient CCCT power plant operating in the U.S., hear input on staff’s analysis of the 13 principles, and hear input on staff’s analysis of the fiscal impacts of this rulemaking. The results of this RAC meeting are unknown at this time, and the opportunity for a fourth RAC meeting has not been ruled out.

If staff determines the input heard from the RAC at the May RAC meeting is sufficient and a fourth RAC meeting doesn’t occur, staff will consider all the input received and evaluate whether the preliminary most efficient heat rate of 6,333 Btu/kWh remains the most appropriate to include in proposed rule language as the basis for resetting the CO₂ standards.

After proposed rule language is determined, staff will issue the proposed rule language along with the official public notice indicating the official public comment period and the date and time of the rulemaking hearing that will take place in front of the Council at a regularly scheduled EFSC meeting.
References

1 Base load gas plants and non-base load power plants within EFSC jurisdiction are responsible for reducing their CO₂ emissions to meet a 0.675 lb. CO₂/kWh emissions standard; nongenerating facilities within EFSC jurisdiction are responsible for reducing their CO₂ emissions to meet a 0.504 lb. CO₂/hph emissions standard (the horsepower-hour equivalent to 0.675 lb. CO₂/kWh).

ORS 469.503(2) If the energy facility is a fossil-fueled power plant, the energy facility complies with any applicable carbon dioxide emissions standard adopted by the council or enacted by statute. Base load gas plants shall comply with the standard set forth in subsection (2)(a) of this section. Other fossil-fueled power plants shall comply with any applicable standard adopted by the council by rule pursuant to subsection (2)(b) of this section. Subsections (2)(c) and (d) of this section prescribe the means by which an applicant may comply with the applicable standard.

Continued from ORS 469.503(2)
(a) The net carbon dioxide emissions rate of the proposed base load gas plant shall not exceed 0.70 pounds of carbon dioxide emissions per kilowatt hour of net electric power output, with carbon dioxide emissions and net electric power output measured on a new and clean basis. Notwithstanding the foregoing, the council may by rule modify the carbon dioxide emissions standard for base load gas plants if the council finds that the most efficient stand-alone combined cycle, combustion turbine, natural gas-fired energy facility that is commercially demonstrated and operating in the United States has a net heat rate of less than 7,200 Btu per kilowatt hour higher heating value adjusted to ISO conditions. In modifying the carbon dioxide emission standard, the council shall determine the rate of carbon dioxide emissions per kilowatt hour of net electric output of such energy facility, adjusted to ISO conditions, and reset the carbon dioxide emissions standard at 17 percent below this rate.

(b) The council shall adopt carbon dioxide emissions standards for other types of fossil-fueled power plants. Such carbon dioxide emissions standards shall be promulgated by rule. In adopting or amending such carbon dioxide emissions standards, the council shall consider and balance at least the following principles, the findings on which shall be contained in the rulemaking record:
(A) Promote facility fuel efficiency;
(B) Promote efficiency in the resource mix;
(C) Reduce net carbon dioxide emissions;
(D) Promote cogeneration that reduces net carbon dioxide emissions;
(E) Promote innovative technologies and creative approaches to mitigating, reducing or avoiding carbon dioxide emissions;
(F) Minimize transaction costs;
(G) Include an alternative process that separates decisions on the form and implementation of offsets from the final decision on granting a site certificate;
(H) Allow either the applicant or third parties to implement offsets;
(I) Be attainable and economically achievable for various types of power plants;
(J) Promote public participation in the selection and review of offsets;
(K) Promote prompt implementation of offset projects;
(L) Provide for monitoring and evaluation of the performance of offsets; and
(M) Promote reliability of the regional electric system.

OAR 345-024-0570 Modification of the Standard for Base Load Gas Plants:
The Council may by rule modify the carbon dioxide emissions standard for base load gas plants in OAR 345-024-0550 if the Council finds that the most efficient stand-alone combined cycle, combustion turbine, natural gas-fired energy facility that is commercially demonstrated and operating in the United States has a net heat rate of less than 6,955 Btu per kilowatt hour higher heating value adjusted to ISO conditions. In modifying the carbon dioxide emission standard, the Council shall determine the rate of carbon dioxide emissions per kilowatt hour of net electric output of such energy facility, adjusted to ISO conditions and reset the carbon dioxide emissions standard at 17% below this rate.
4 OAR 345-024-0610 Modification of the Standard for Non-Base Load Power Plants:
The Council may by rule modify the carbon dioxide emissions standard for non-base load gas plants in OAR 345-024-0590 so that the standard remains equivalent to the standard for the net carbon dioxide emissions rate of a base load gas plant, subject to the principles described in OAR 345-024-0510.

5 OAR 345-024-0640 Modification of the Standard for Nongenerating Energy Facilities:
The Council may by rule modify the carbon dioxide emissions standard for nongenerating energy facilities in OAR 345-024-0620 so that it remains equivalent to the standard for the net carbon dioxide emissions rate of a base load power plant.

6 OAR 345-024-0510 Principles for the Adoption of New Standards for Fossil-Fueled Power Plants:
The council shall adopt carbon dioxide emissions standards for fossil fueled power plants by rule. In adopting or amending such carbon dioxide emissions standards, the Council shall consider and balance at least the following principles. In the rule-making record, the Council shall include findings on these principles:
(1) Promote facility fuel efficiency;
(2) Promote efficiency in the resource mix;
(3) Reduce net carbon dioxide emissions;
(4) Promote cogeneration that reduces net carbon dioxide emissions;
(5) Promote innovative technologies and creative approaches to mitigating, reducing or avoiding carbon dioxide emissions;
(6) Minimize transaction costs;
(7) Include an alternative process that separates decisions on the form and implementation of offsets from the final decision on granting a site certificate;
(8) Allow either the applicant or third parties to implement offsets;
(9) Be attainable and economically achievable for various types of power plants;
(10) Promote public participation in the selection and review of offsets;
(11) Promote prompt implementation of offset projects;
(12) Provide for monitoring and evaluation of the performance of offsets;
(13) Promote reliability of the regional electric system.

7 ORS 469.503(2)(e)(B)(D) “Fossil-fueled power plant” means a generating facility that produces electric power from natural gas, petroleum, coal or any form of solid, liquid or gaseous fuel derived from such material.

8 OAR 345-024-0610 Modification of the Standard for Non-Base Load Power Plants:
The Council may by rule modify the carbon dioxide emissions standard for non-base load gas plants in OAR 345-024-0590 so that the standard remains equivalent to the standard for the net carbon dioxide emissions rate of a base load gas plant, subject to the principles described in OAR 345-024-0510.

9 OAR 345-024-0640 Modification of the Standard for Nongenerating Energy Facilities:
The Council may by rule modify the carbon dioxide emissions standard for non-base load gas plants in OAR 345-024-0620 so that the standard remains equivalent to the standard for the net carbon dioxide emissions rate of a base load gas plant.
Oregon EFSC’s
Carbon Dioxide Emission Standards

In 1997, the Oregon Legislature enacted a standard for emissions of carbon dioxide (CO₂) from base load electric generating plants fueled by natural gas (HB 3283). In addition, the legislation authorized the Oregon Energy Facility Siting Council (EFSC or “the Council”) to adopt carbon dioxide emissions standards for other fossil-fueled power plants. This landmark legislation was the first of its kind in the United States. Since 1997, the Council has adopted standards for carbon dioxide emissions from base-load gas plants, non-base load power plants, and nongenerating energy facilities that emit CO₂. Applicants for site certificates for the types of energy facilities that are subject to a carbon dioxide standard and certificate holders submitting requests for amendments that implicate a carbon dioxide standard must demonstrate compliance with the applicable standard.

The statutory authority for the CO₂ standard is found in ORS 469.503. The standards and applicable rules are found in the Oregon Administrative Rules, Chapter 345, Division 24.

For base load gas plants and non-base load plants, the current standard is a net emissions rate of 0.675 pounds of CO₂ per kilowatt-hour of net electric generation (lb. CO₂/kWh). For nongenerating facilities, the rate is 0.504 pounds of CO₂ per horsepower-hour (lb. CO₂/hp-hr). The standard for base load gas plants applies only to natural gas-fired plants. The standards for non-base load plants and nongenerating facilities apply to all fuels. As described below, the rules allow for hybrid configurations that combine base load with non-base load operation. The Council has not set CO₂ emissions standards for base-load power plants that primarily operate on a fossil fuel other than natural gas.

The Council’s CO₂ emission rules are divided into specific standards for each of the three categories of facilities. The major differences among the standards are in how the rules account for the capacity factors and variations in the operation of the facilities. The discussion below will address first how the Council forecasts and tracks the gross and net CO₂ emissions for each of the categories of facilities. Then it will explain methods of compliance with the standards: greenhouse gas (GHG) offset projects and the monetary path.

Note: The following discussion distinguishes between an applicant for a site certificate and a certificate holder. These are stages in the process of building an energy facility. Applicants have to demonstrate that a proposed facility meets the applicable standard in order for the Council to grant a site certificate. Certificate holders have to comply with site certificate conditions related to the standard as they construct and operate their facilities.

Specific Standards for Generating Facilities

Base Load Gas Plants

The CO₂ emissions standard for a base load, natural gas-fired power plant (“base load gas plant”) is a net emissions rate of 0.675 lb. CO₂/kWh of net electric power output. The Council’s definition of a natural gas-fired facility allows up to 10 percent of the expected annual energy use to be provided by an alternative fuel (typically, distillate fuel).

Oregon statute established the initial standard for base load gas plants at 0.70 lb. CO₂/kWh. Statute allows the Council to modify this standard so that the net emissions rate remains 17 percent
below the most efficient baseload gas plant operating in the United States. Statute specifies principles the Council must “consider and balance” when making changes to the standard or when adopting new standards for other types of fossil-fueled power plants.

In January 2000, the Council modified the CO₂ standard for base load gas plants. At that time, the most efficient operating base load plant had a net heat rate of 6,955 Btu/kWh (HHV). As specified in statute, the modified standard was set at 17 percent lower than 6,955 Btu/kWh (5,773 Btu/kWh). Using an emissions rate of 117 pounds of CO₂ per million Btu of natural gas fuel, 5,773 Btu/kWh was converted to CO₂/kWh and the net emissions standard was set at 0.675 lb. CO₂/kWh.

The standard provides an incentive for site certificate applicants to propose a facility that has the lowest heat rate possible – that is, a highly efficient power plant using state-of-the-art technology. Building a more efficient plant would go partway in meeting the standard, but the design of the standard itself inherently precludes turbine manufacturers from ever offering technologies that could meet the standard solely through efficiency. To make up the difference, an applicant must meet the net emissions standard through carbon dioxide offsets.

**Non-Base Load Power Plants**

The CO₂ emissions standard for a non-base load power plant, regardless of fuel, is a net emissions rate of 0.675 lb. CO₂/kWh of net electric power output.

**Power Augmentation**

The Council rules account for power plant technologies that allow a base load gas plant to be operated in both a base load manner under base load conditions (continuous energy generation approximating maximum capacity) and a non-base load manner where the same plant increases its capacity for short periods when needed to meet the demand of peak loads. The technology is called power augmentation, and it turns a base load gas plant into a hybrid plant. Power augmentation technologies, such as duct burning, increase both the capacity and the heat rate of the plant.

The Council’s rules allow these types of plants to meet separate standards for the two modes of operation. The power augmentation mode of operation must meet the non-base load rules, whereas the base load mode of operation must meet the base load gas plant rules. There are two major differences between the rules for the two types of plants: 1) the annual hours of operation and 2) the one-time reporting requirement for base load versus the periodic (5-yr) reporting requirements for non-base load. These are explained below.

**Estimating and Verifying CO₂ Emissions**

The rules account for the different operational characteristics of base load and non-base load plants. Non-base load plants are peaking (or “load-following”) plants.

- **Base-Load Gas Plants without Power Augmentation**

  If a base load gas plant does not employ power augmentation technologies, the Council determines the gross CO₂ emissions that are reasonably likely to result from the operation of the facility based on the proposed design of the facility. The Council calculates gross CO₂ emissions by assuming a 100-percent capacity factor and a 30-year life of the plant, as specified in statute.
Other than the single “Year 1” test of the facility’s net heat rate on a new and clean basis, described below, the Council does not track the actual emissions of the operating plant. In other words, there are no future reporting requirements related to the CO₂ standards after the Year 1 heat rate test.

- **Base-Load Gas Plants with Power Augmentation**

  If a base load gas plant employs power augmentation technologies, the Council determines the gross CO₂ emissions in an additive fashion for simplicity. First, the Council calculates gross CO₂ emissions by assuming a 100-percent capacity factor and a 30-year life of the plant for the number of hours the plant operates in base load manner without using power augmentation. Council adds those emissions to the emissions calculated for the hours when the plant is using power augmentation (for a total of 8,760 hours annually). Second, the Council follows the non-base load procedure (described below) to calculate emissions for the hours the plant will operate with power augmentation.

- **Non-Base Load Power Plants**

  The Council determines the gross CO₂ emissions that are likely to result from the operation of the facility based on the proposed design of the facility and the average annual hours of operation. The applicant specifies the annual hours it proposes to operate the plant.

  The rules define a non-base load plant as a fossil-fuel generating facility that is limited by the site certificate to an average of not more than 6,600 hours of operation annually. This is a 75 percent capacity factor. The rules treat a facility that would operate more than 6,600 hours annually on average as a base-load plant at 100 percent capacity.

  As with base load gas plants, the rules specify a 30-year analysis period (i.e. the life of the facility in the approved site certificate or amendment to the site certificate) for determining gross emissions, unless an applicant requests a shorter operational life for the facility. The rules require testing on a new and clean basis during the first year of operation (i.e. the “Year 1” heat rate test), but allow modifications to the testing procedure for technical and operational considerations. The rules require that the results be adjusted for average local conditions during the times of the year when the facility intends to operate.

  The rules require a verification of the actual operation of the non-base load power plants to ensure that they meet the limitations on their hours of operation. Limitations on hours of operation are specified in the approved site certificate or approved amended site certificate. Every five years after the plant begins operation, the certificate holder must report to the Council the plant’s actual hours of operation. This is sometimes referred to as the “5-year operating hours true up.” If the actual emissions – calculated using the actual hours of operation and the heat rate on a new and clean basis – exceed the estimated emissions prorated for a 5-year period, the certificate holder must offset the excess emissions using the monetary path (described below).

  The rules apply the present value of the monetary path offset rate for the year in which the Council first granted the site certificate. If the plant’s emissions of CO₂ were less than the prorated amount in previous 5-year periods, the Council will credit the certificate holder with the “unused” emissions to determine the net amount of emissions the certificate holder must possibly offset in future reporting periods.
In addition to requiring the certificate holder to offset excess emissions from previous operations, the rules require the Council to recalculate the estimated emissions for the facility based on the average hours of operation during the 5-year period in which it exceeded its limitation on hours of operation. The Council will estimate emissions for the years remaining in the deemed 30-year life of the plant. The certificate holder must also offset these additional estimated emissions at the present value of the monetary path offset rate. The rules look only at the previous 5-year period when calculating future emissions. There is no credit for earlier 5-year periods in which the plant may not have operated at the full capacity allowed by the site certificate.

The purpose of these rules is to remove the incentive for an applicant to propose fewer hours of operation than are likely to occur so as to avoid having to provide full offsets prior to beginning construction, when the plant will actually operate as a base load power plant. If the average annual hours of operation ever exceed 6,600, the rules require the Council to treat the facility as a base load plant operating 8,760 hours annually for the remainder of the 30 years.

In 2009, the Council amended the definition of a “non-base load power plant” to best account for fossil fueled facilities that are designed to operate at variable load in response to the variable output from renewable generation such as wind or solar generating facilities. Under the amended definition, the annual hours of operation may be determined by dividing the actual annual electric output of the facility (megawatt-hours) by the facility’s nominal electric generating capacity (megawatts). The Council amended the CO₂ emissions standard for non-base load power plants (OAR 345-024-0590) to allow the operators of variable power generating plants to report and offset CO₂ emissions based on actual measured emissions, as an alternative to calculating emissions from hours of operation. The amendment allows the operator to report actual CO₂ emissions consistent with any mandatory CO₂ emissions reporting required by the Oregon Department of Environmental Quality or the United States Environmental Protection Agency. If a facility reports its actual CO₂ emissions rather than its hours of operation, the Council must still determine whether the quantity of those emissions exceed the estimated emissions prorated for a 5-year period. If actual emissions exceed the estimated emissions, the certificate holder must offset the excess emissions using the monetary path (described below).

**New and Clean Basis**

The Council will specify site certificate conditions to ensure that a generating plant does not exceed its estimated CO₂ emissions on a “new and clean basis.” In rules, the definition for the phrase “new and clean basis,” includes test conditions and allows for flexibility of testing procedures for non-base load plants or power augmentation. The rules require a 100-hour test that the facility must conduct during its first year of operation (i.e. the “Year 1” heat rate test). The rules allow the certificate holder to use the commercial acceptance test to meet this requirement. If the Year 1 test results in a net heat rate higher than the heat rate upon which the facility originally estimated its lifetime emissions, then the facility’s new estimated lifetime emissions will exceed the amount it has previously accounted for and provided offset payments for. In this scenario, the certificate holder must offset that quantity of excess emissions. However, if the Year 1 heat rate test results in a net heat rate lower than the heat rate upon which the facility originally estimated its lifetime emissions, there is no refund.
Flexibility

The Council determines compliance with the CO₂ standard based on the proposed design of the facility, but it may be years before the facility is built. The rules give the certificate holder flexibility in selecting equipment and defining certain operational parameters at the time it decides to build the facility. The rules allow a certificate holder to certify the final heat rate and capacity of the facility based on its contract with suppliers. The certificate holder can vary these elements within limits specified in the rules and the site certificate.

Reducing CO₂ Emissions through Cogeneration

An applicant for a generating facility may meet the CO₂ emissions standard through cogeneration that will offset fossil fuel emissions that would have otherwise occurred. It is possible for an applicant to meet the standard and offset all excess CO₂ emissions through cogeneration alone. The Council will evaluate the reduction of net CO₂ emissions from cogeneration and determine the likely reductions over 30 years. If the Council credits an applicant with CO₂ offsets from cogeneration, the site certificate will include conditions that guarantee the certificate holder provides the estimated emission reductions.

Specific Standards for Nongenerating Facilities

Although many types of nongenerating facilities may fall under the Council’s jurisdiction, the most likely application of the CO₂ standard will be for compressors at underground natural gas storage facilities. Therefore, the standard is expressed as a rate of emissions per horsepower hour: 0.504 lb. CO₂/hp-hr. This is equivalent to the power plant standard of 0.675 lb. CO₂/kWh.

In applying this standard, the Council estimates the total CO₂ emissions from the facility to determine the appropriate schedule for increments of emission offsets that the certificate holder should provide. To account for the high variability in the workload of a compressor, the rules do not require the certificate holder to provide offsets according to a one-time estimate of gross CO₂ emissions. The rules also allow the Council to determine that the life of the facility may be less than 30 years.

The certificate holder must provide a certain amount of offsets in advance. These offsets make up an offset credit account that the certificate holder may then draw down based on actual emissions. The Council sets the schedule for providing offsets by considering the potential gross emissions and the need to provide offsets in amounts sufficient to develop effective offset projects.

The Council may require the certificate holder to provide offsets in any increment of the estimated total offsets needed. In any case, if the facility emits a cumulative quantity of CO₂ that draws the credit account down below a threshold limit (specified in the site certificate) before the end of the facility’s analysis period, the certificate holder must replenish it with additional offsets up until the end of the analysis period (i.e. the life of the facility in the approved site certificate or amendment to the site certificate. The applicable offset rate is the present value of the offset rate in effect on the date the Council issued the site certificate.

<table>
<thead>
<tr>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base-load gas plant:</td>
</tr>
<tr>
<td>Net emissions rate:</td>
</tr>
</tbody>
</table>
### Annual hours of operation:
- **Constant; set in statute at 8,760 hours (100% capacity)**

### Time-frame for analysis:
- **Set in statute at 30 years**

### Non-base load power plant:
- **Net emissions rate:** 0.675 lb. CO$_2$/kWh for all fuels, with verification of emissions rate during the first year of operation (i.e. the Year 1 heat rate true up) and accounting every five years (i.e. the 5-year operating hours true ups) for emissions based on reported hours of operation and the new and clean emissions rate.
- **Annual hours of operation:** Variable; up to 6,600 hours (75% capacity)
- **Time-frame for analysis:** 30 years, unless the Council specified a shorter period.

### Nongenerating energy facilities:
- **Net emissions rate:** 0.504 lb. CO$_2$/horsepower-hour.
- **Annual hours of operation:** Variable; the Council specifies the amount of offsets the certificate holder must provide to an offset credit account prior to beginning construction, and then, if necessary, the certificate holder replenishes the offset credit account based on actual emissions as directed by the Council.
- **Time-frame for analysis:** 30 years, unless the Council specifies a shorter period.

### Meeting the CO$_2$ Standard through Greenhouse Gas (GHG) Offset Projects

An applicant has two alternatives for meeting a CO$_2$ standard:

1. The applicant may implement GHG offset projects directly or through a third party; or
2. The applicant may use the “monetary path.”

Statute defines an “offset” as an action that will be implemented by the applicant, a third party or a qualified organization to avoid, sequester or displace GHG emissions. The future tense of the definition limits offset projects to new projects. There are no limitations on the geographic location or types of offset projects.

### Applicant-Sponsored Offset Projects

An applicant may propose offset projects that it or a contracted third party will implement. The Council will determine the quantity of GHG emissions reductions reasonably likely to occur from each project. To do so, the Council must consider:

1. The certainty that the predicted quantity of GHG emissions reduction will be achieved by the offset project.
2. The ability of the Council to determine the actual quantity of GHG emissions reduction resulting from the offset project, based on the measuring, monitoring, and evaluation the applicant proposes.
3) The extent to which the reduction of GHG emissions would occur in the absence of the offset project.

The rules specify the information that an applicant must provide. They also provide specific criteria the Council must consider and the findings that the Council must make in order to determine that a proposed offset project meets the standard.

The Council’s evaluation of applicant-sponsored offset projects may ultimately take place as part of a quasi-judicial, contested case proceeding, which is part of the process for reviewing every application for a site certificate. NOTE: If the CO₂ standards are applied through an amendment to a site certificate, the contested case is not an automatic part of the Council’s evaluation process. With or without a contested case, the Council will adopt site certificate conditions to ensure that the proposed offset projects are implemented; however, the Council cannot require that the applicant guarantee that it will achieve the predicted CO₂ offsets from these projects. The rules require the site certificate holder to begin to implement the offset projects before beginning construction of the energy facility. Statute prohibits the Council from allowing credit for offsets that have already been allocated or have been awarded CO₂ reduction credits in another regulatory setting.

**Monetary Path**

Applicants may elect to pay a standard dollar amount per ton of CO₂ as a way to meet the standard. The amount is established by administrative rule and is currently $1.90 per short ton of CO₂. The Council may, by rule, adjust the monetary offset rate based on empirical evidence of the actual cost of CO₂ offsets and by making a finding that meeting the standard through the monetary path will be economically achievable for natural gas-fired power plants. Oregon statute, however, provides that the Council may not adjust the rate by more than 50 percent (increase or decrease) during any two-year period. The Council last adjusted the monetary offset rate in October 2017.

If an applicant elects to use the monetary path, the Council will determine the amount of emission reduction needed to meet the standard and will calculate the amount of offset funds the certificate holder must provide to a “qualified organization.” The certificate holder must provide a bond or letter of credit for the required amount before beginning construction of the energy facility. The rules require the bond or letter of credit to equal the present value of the calculated offset funds based on the rate in effect at the time the Council granted the site certificate.

When the certificate holder has provided the funds specified in the site certificate conditions in the manner required, it will have fulfilled its primary obligation toward meeting the applicable CO₂ standard. The monetary path allows an applicant to avoid having to prove the predicted quantity of CO₂ offsets from specific projects, gives the certificate holder certainty about what it will cost to comply with the standard, and allows the certificate holder to avoid having to develop and manage offset projects itself.
Site Certificate Holder’s Financial Responsibilities under the Monetary Path

The certificate holder is responsible for two types of payments under the monetary path:

1) The offset funds, which are calculated at $1.90 per short ton of CO\textsubscript{2} emissions in excess of the standard.

2) Selection and contracting funds.

The selection and contracting funds compensate the qualified organization for its cost of selecting and contracting for the implementation of offsets. To the extent these funds are not needed for administrative functions, the qualified organization may also use these funds to purchase offsets. The selection and contracting funds are additional to the offset funds and are comparable to costs the certificate holder would have incurred directly, had the certificate holder opted to comply with the CO\textsubscript{2} standard by implementing offset projects on its own.

The selection and contracting funds are equal to 10 percent of the first $500,000 of offset funds and 4.286 percent of the offset funds above $500,000. A base load gas plant must pay a minimum of $50,000 unless the Council specifies a lesser minimum. In the site certificate, the Council may specify a minimum amount that other fossil-fueled power plants or nongenerating facilities must pay. The Council will specify in the site certificate how a certificate holder must disburse funds to the qualified organization. The certificate holder must pay the selection and contracting funds to the qualified organization prior to beginning construction of the facility. The certificate holder must pay the total offset funds to the qualified organization upon request when the qualified organization notifies the certificate holder that it has a contract to implement an offset project. Once a certificate holder has provided offset funds, the rules do not permit a refund.

Use of Offset Funds

The qualified organization must use at least 80 percent of the offset funds for contracts to implement offsets directly. The rules define offsets as any action that will avoid, sequester, or displace GHG emissions. The qualified organization may use up to 20 percent of offset funds for monitoring, evaluation, administration and enforcement of contracts to implement offsets. The rules also require a qualified organization to obtain the offsets in a timely manner and to regularly report its activities to the Council.

Qualified Organization

The monetary path relies on a “qualified organization” to implement offset projects. Statute sets the qualification criteria for an independent, non-profit organization that may administer the monetary path (ORS 469.503(2)(e)(K)). Neither statute nor the Council’s rules name or establish a specific organization.

To be a “qualified organization,” an organization must meet several criteria, including that it be exempt from federal taxation under section 501(c)(3) of the Internal Revenue Code. The qualified organization’s decisions on the use of offset funds must be made by a decision-making body composed of three members appointed by the Council, three members appointed by an environmental nonprofit organization, and one member appointed by applicants for site certificates that are subject to the monetary path. A certificate holder that has provided funds to the qualified organization holds a non-
voting seat on the board when the qualified organization is selecting and contracting for projects with the certificate holder’s funds.

**The Climate Trust**

The Climate Trust, an independent nonprofit created in 1997, is currently the only qualified organization recognized by the Council. It was formed in accordance with the legal criteria above, and its board membership meets the requirements of the law. It is incorporated in Oregon and has federal nonprofit 501(c)(3) tax status.

For information about The Climate Trust, contact: The Climate Trust, 65 SW Yamhill Street, Suite 400, Portland, OR 97204 (telephone: 503-238-1915) or visit the website at [http://www.climatetrust.org/](http://www.climatetrust.org/).
Oregon Department of Energy
Analysis of 13 Principles for
Amending the Carbon Dioxide (CO2) Standards

Overview
ORS 469.503(2)(a) and OAR 345-024-0570 give the Council the authority to reset the Council’s carbon dioxide (CO2) emissions standard for base load gas plants. ORS 469.501(1)(o) and OAR 345-024-0610 give the Council the authority to reset the Council’s CO2 emissions standards for non-base load power plants. ORS 469.503(2)(b) and OAR 345-024-0640 give the Council the authority to reset the Council’s CO2 emissions standard for nongenerating energy facilities. OAR 345-024-0610 and -0640 require the CO2 standards for non-base load power plants and nongenerating energy facilities to be equivalent to the CO2 standard for base load gas plants.

OAR 345-024-0570 Modification of the Standards for Base Load Gas Plants
The Council may by rule modify the carbon dioxide emissions standard for base load gas plants in OAR 345-024-0550 if the Council finds that the most efficient stand alone combined cycle, combustion turbine, natural gas fired energy facility that is commercially demonstrated and operating in the United States has a net heat rate of less than 6,955 Btu per kilowatt hour higher heating value adjusted to ISO conditions. In modifying the carbon dioxide emission standard, the Council shall determine the rate of carbon dioxide emissions per kilowatt hour of net electric output of such energy facility, adjusted to ISO conditions and reset the carbon dioxide emissions standard at 17 percent below this rate.

Under the above authority and in compliance with the above statutes and rules, the Department has identified what could be the most efficient combined cycle, combustion turbine (CCCT) natural gas-fired energy facility operating in the U.S. The Grand River Energy Center in Chouteau, Oklahoma has a tested higher heating value (HHV) net heat rate adjusted to ISO conditions of 6,333 Btu per kilowatt hour (kWh). (a summary of the test data is not available yet, but will be attached to the staff report to EFSC for the April, 27 EFSC meeting if it is received in time)

Since 6,333 Btu/kWh is less than the existing benchmark heat rate of 6,955 Btu/kWh (called out in OAR 345-024-0570, see above), the Department recommends the Council adopt 6,333 Btu/kWh as the new benchmark heat rate in OAR 345-024-0570 and use 6,333 Btu/kWh to reset the carbon dioxide (CO2) emissions standard for base load gas plants in OAR 345-025-0550. To reset the base load CO2 standard, 6,333 Btu/kWh must first be reduced by 17% to 5,256 Btu/kWh. Then 5,256 Btu/kWh must be multiplied by 0.000117 lbs. CO2/Btu to convert the heat rate into an emissions rate. This conversion yields an emissions rate of 0.615 lbs. CO2/kWh.

Therefore, in compliance with the above statutes and rules, the Department recommends the CO2 emissions standard for base load gas plants be reset to 0.615 lbs. CO2/kWh, and the standards for non-base load power plants and nongenerating energy facilities be reset to that
equivalent. The standard for non-base load power plants would be reset to 0.615 lbs. CO2/kWh, and the standard for nongenerating energy facilities would be reset to 0.459 lbs. CO2/hp-hr [the horsepower hour (hp-hr) equivalent of 0.615 lbs. CO2/kWh]. The current rate for base load and non-base load plants is 0.675 lbs./kWh and the current rate for nongenerating facilities is 0.504 lbs. CO2/hp-hr.

13 Principles
OAR 345-024-0510 specifies 13 principles [also specified in ORS 469.503(2)(b)] that the Council must consider and balance in adopting or amending CO2 emissions standards for fossil-fueled power plants:

OAR 345-024-0510 Principles for the Adoption of New Standards for Fossil-Fueled Power Plants
The Council shall adopt carbon dioxide emissions standards for fossil-fueled power plants by rule. In adopting or amending such carbon dioxide emissions standards, the Council shall consider and balance at least the following principles. In the rule-making record, the Council shall include findings on these principles:

(1) Promote facility fuel efficiency;
Pursuant to statute and rule, the proposed CO2 emissions standards are 17 percent lower than the emissions rate of the most efficient natural gas-fired CCCT operating in the U.S. Ensuring the standard is set modestly below the most efficient technology available and operating helps drive the development of more fuel efficient plants because the more efficient a plant is, the less CO2 emissions that plant must offset to meet the standard. Fuel efficiency is the most direct and most certain way to reduce CO2 emissions.

(2) Promote efficiency in the resource mix;
Depending on load growth, fuel costs, and the retirement of aging power plants in Oregon, the proposed CO2 emissions standards may promote an increase in the percentage of high efficiency natural gas-fired power plants sited in Oregon relative to other conventional thermal power plants sited in Oregon. The proposed CO2 emissions standards are not predicted to promote an increase or decrease in the percentage of non-conventional energy facilities sited in Oregon. In 2000, natural gas was around 8 percent of the regional mix. As of January 2018, natural gas is around 14% of the regional mix.

(3) Reduce net carbon dioxide emissions;
Indirectly reducing the net CO2 emissions from fossil-fueled energy facilities sited in Oregon is the main function of the existing CO2 emissions standards. The proposed standards will continue to indirectly reduce the net CO2 emissions of future fossil-fueled energy facilities sited in Oregon by requiring those facilities to reduce their net greenhouse gas emissions to meet or beat the applicable CO2 standard. The proposed CO2 emissions standards may also directly reduce the gross CO2 emissions from future fossil-fueled energy facilities sited in Oregon by encouraging developers to build the most efficient energy facility possible. Facilities have three compliance pathways to reduce their net greenhouse gas emissions: 1) Monetary Pathway, where facilities
pay The Climate Trust to procure greenhouse gas offset projects; 2) Self-Implementation Pathway, where facilities procure or implement their own greenhouse gas offset projects; and 3) Cogeneration Pathway, where new facilities are designed to displace greenhouse gas emissions that would have otherwise occurred but for the energy supplied by the new facility. To date, all site certificate holders have complied via the monetary pathway. Carbon dioxide is just one of many greenhouse gases that may be reduced through greenhouse gas offset projects.

(4) **Promote cogeneration that reduces net carbon dioxide emissions;**
The proposed CO2 emissions standards do not affect cogeneration as an option for an offset.

(5) **Promote innovative technologies and creative approaches to mitigating, reducing or avoiding carbon dioxide emissions;**
The proposed CO2 emissions standards do not affect the opportunity for a developer to comply via the Self-Implementation Pathway or the Cogeneration Pathway that already exist, where developers can propose to implement innovative technologies and creative approaches to mitigating, reducing or avoiding CO2 emissions, including offset projects that are more cost-effective than relying on the monetary path. Also, the Monetary Pathway does not limit the types of greenhouse gas offset projects a qualified organization (The Climate Trust) may procure.

(6) **Minimize transaction costs;**
The proposed CO2 emissions standards do not affect the Monetary Pathway that already exists, a pathway that presents an opportunity for a developer to minimize transaction costs by allowing compliance through a single transaction, i.e. providing the required offset funds to a qualified organization.

(7) **Include an alternative process that separates decisions on the form and implementation of offsets from the final decision on granting a site certificate;**
Continued use of the existing Monetary Pathway fulfills this principle.

(8) **Allow either the applicant or third parties to implement offsets;**
The proposed CO2 emissions standards do not affect the Self-Implementation Pathway that already exists.

(9) **Be attainable and economically achievable for various types of power plants;**

**Table 1**
Table 1 compares the excess emissions (in short tons) of the two most efficient facilities the existing and proposed standards are based upon if those facilities were built in Oregon with a nominal generating capacity of 370 MW. The left column shows the excess emissions of the River Road Generating Plant in Vancouver, WA (the facility upon which the existing standard is based), if that facility were constructed in Oregon under the existing standard. The right column shows the excess emissions of the Grand River Energy Center in Chouteau, OK (the facility upon which the proposed standard is based), if that facility were constructed in Oregon under the proposed standard.
By design, and contrary to intuition, resetting the CO2 standards to a lower net emissions rate based upon the most efficient technology currently in operation (effectively decreasing the threshold limit for a facility’s net CO2 emissions) actually has the net effect of decreasing, not increasing, the excess quantity of CO2 emissions a highly efficient power plant would need to account for in order to comply with the CO2 standards. This decrease is shown in Table 1.

The decrease in the excess quantity of CO2 emissions that a highly efficient power plant must account for under a lower CO2 standard arises from the fact that as plants become more efficient, the 17 percent reduction of the emissions rate of the most efficient power plant operating in the U.S. (i.e. how the standard is reset) becomes a smaller and smaller absolute reduction.

Assumptions:
The assumption of 370 MW is for illustrative purposes only. The assumption of annual operating hours of 8,760 (a 100% capacity factor) and 30 years of operation are specified in rule.

| Table 1 Under the Proposed Standard - Excess Emissions Decrease for Plants Sited in Oregon with the Most Efficient Technology |
|---------------------------------------------------------------|-----------------|-----------------|
| Then (Yr. 2000) River Road Existing Standard | Now (Yr. 2018) Grand River Proposed Standard |
| A | Heat Rate - Most Efficient Technology (Btu/kWh) | 6,955 | 6,333 |
| B | CO2 Emissions Rate (lbs. CO2/Btu of Natural Gas) | 0.000117 | 0.000117 |
| C (=A*B) | Gross CO2 Emissions Rate (lbs. CO2/kWh) | 0.8137 | 0.7410 |
| D | EFSC Standard - Net CO2 Emissions Rate (lbs. CO2/kWh) | 0.675 | 0.615 |
| E (=C-D) | Excess CO2 Emissions Rate (lb. CO2/kWh) | 0.1387 | 0.1260 |
| F | Lifetime Plant Output (million kWh) 370 MW Plant * 8,760 hours * 30 years | 97,236 | 97,236 |
| G (=F*C) | Lifetime Gross CO2 Emissions (million lbs.) | 79,121 | 72,052 |
| H (=G/2000) | Lifetime Gross CO2 Emissions (million short tons) | 39.56 | 36.03 |
| I (=F*E) | Lifetime Excess CO2 Emissions (million lbs.) | 13,487 | 12,252 |
| K | Net Decrease Between Standards (million short tons) | | (0.61) |
Table 2 shows the excess emissions (in short tons) of two facilities under the proposed standard. The left column shows the estimated excess emissions of a hypothetical, less efficient, natural gas-fired power plant sited in Oregon under the existing standard. The right column shows the estimated excess emissions of the same hypothetical, less efficient, plant if it were sited under the proposed standard rather than the existing standard.

**Assumptions:**
The assumptions of a nominal capacity of 370 MW and a design heat rate of 6,688 Btu/kWh are for illustrative purposes only. The assumption of annual operating hours of 8,760 (a 100% capacity factor) and 30 years of operation are specified in rule.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Under the Proposed Standard - Excess Emissions Increase for Plants Sited in Oregon With Less Efficient Technology</th>
<th>Then (Yr. 2013) Less Efficient Plant Under Existing Standard</th>
<th>Now (Yr. 2018) Less Efficient Plant Under Proposed Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Heat Rate (Btu/kWh)</td>
<td>6,688</td>
<td>6,688</td>
</tr>
<tr>
<td>B</td>
<td>CO2 Emissions Rate (lbs. CO2/Btu of Natural Gas)</td>
<td>0.000117</td>
<td>0.000117</td>
</tr>
<tr>
<td>C</td>
<td>Gross CO2 Emissions Rate (lbs. CO2/kWh)</td>
<td>0.782</td>
<td>0.782</td>
</tr>
<tr>
<td>D</td>
<td>EFSC Standard - Net CO2 Emissions Rate (lbs. CO2/kWh)</td>
<td><strong>0.675</strong></td>
<td><strong>0.615</strong></td>
</tr>
<tr>
<td>E</td>
<td>Excess CO2 Emissions Rate (lbs. CO2/kWh )</td>
<td>0.107</td>
<td>0.167</td>
</tr>
<tr>
<td>F</td>
<td>Lifetime Plant Output (million kWh) 370 MW Plant @ 8,760 hours @ 30 years</td>
<td>97,236</td>
<td>97,236</td>
</tr>
<tr>
<td>G</td>
<td>Lifetime Gross CO2 Emissions (million lbs.)</td>
<td>76,039</td>
<td>76,039</td>
</tr>
<tr>
<td>H</td>
<td>Lifetime Gross CO2 Emissions (million short tons)</td>
<td>38.02</td>
<td>38.02</td>
</tr>
<tr>
<td>I</td>
<td>Lifetime Excess CO2 Emissions (million lbs.)</td>
<td>10,404</td>
<td>16,238</td>
</tr>
<tr>
<td>J</td>
<td>Lifetime Excess CO2 Emissions (million short tons)</td>
<td><strong>5.20</strong></td>
<td><strong>8.12</strong></td>
</tr>
<tr>
<td>K</td>
<td>Net Increase Between Standards (million short tons)</td>
<td><strong>+ 2.92</strong></td>
<td><strong>+ 2.92</strong></td>
</tr>
</tbody>
</table>
Table 3
Table 3 shows an estimate of the cost of compliance for two facilities under the proposed standard. The column on the left shows the cost of compliance for the Grand River Energy Center (the highly efficient plant the proposed standards are based upon) if that plant were to be sited in Oregon with a nominal generating capacity of 370 MW under the proposed standard. The column on the right shows the cost of compliance for a hypothetical, less efficient, 370 MW natural gas-fired plant sited in Oregon under the proposed standard.

Assumptions:
As in Tables 1 and 2, the assumption of a nominal capacity of 370 MW and a design heat rate of 6,688 Btu/kWh are for illustrative purposes only. The assumption of annual operating hours of 8,760 (a 100% capacity factor) and 30 years of operation are specified in rules.

<table>
<thead>
<tr>
<th>Table 3 EFSC Compliance Costs Under Proposed Standards</th>
<th>Grand River Energy Center</th>
<th>Less Efficient Power Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Excess Tons CO2 (million tons over 30 years)</td>
<td>6.13 (see Table 1)</td>
<td>8.12 (see Table 2)</td>
</tr>
<tr>
<td>B Offset Fund Rate ($/ton CO2)</td>
<td>$ 1.90</td>
<td>$ 1.90</td>
</tr>
<tr>
<td>C (=A*B) Offset Funds Required ($ million)</td>
<td>$ 11.647</td>
<td>$ 15.428</td>
</tr>
<tr>
<td>D Contracting and Selection Funds</td>
<td>$ 0.53</td>
<td>$ 0.64</td>
</tr>
<tr>
<td>E Total Monetary Path Requirement ($ million)</td>
<td>$ 12.17</td>
<td>$ 16.12</td>
</tr>
</tbody>
</table>
Table 4
Table 4 shows an estimate of the siting, construction and operating costs of a representative 370 MW gas-fired CCCT power plant over 30 years. The left column shows the plant operating 7,884 hours per year (90% capacity factor). The right column shows the plant operating 5,256 hours per year (60% capacity factor). The cost data is from the 7th Power Plan from the Northwest Power and Conservation Council (NWPCC) and has been converted from $2012 to $2018 for illustrative purposes.

Assumptions:
The assumption of a nominal capacity of 370 MW is for illustrative purposes only. The assumption of a 90% annual operating capacity factor for base load operation (EFSC rules classify plants operating more than 75% of total operating capacity as base load) is used to reflect a typical plant’s availability inclusive of maintenance and unplanned outages. The assumption of a 60% annual operating capacity factor for the plant under non-base load operation (EFSC rules classify plants operating less than 75% of total operating capacity as non-base load) is for illustrative purposes only. The assumption of a 30 year operating life is specified in rule.

<table>
<thead>
<tr>
<th></th>
<th>NWPCC Construction and Operating Costs</th>
<th>Base Load Operation</th>
<th>Non-Base Load Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Nominal Capacity (MW)</td>
<td>370</td>
<td>370</td>
</tr>
<tr>
<td>B</td>
<td>Life of Plant (Years)</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>C</td>
<td>Operating Capacity Factor</td>
<td>90%</td>
<td>60%</td>
</tr>
<tr>
<td>D</td>
<td>Annual Hours of Operation (Hours/Year)</td>
<td>7,884</td>
<td>5,256</td>
</tr>
<tr>
<td>E</td>
<td>Levelized Cost of Electricity (LCOE)* in 2018 dollars ($/MWh)</td>
<td>$65.75 @ 90%</td>
<td>$78.43 @ 60%</td>
</tr>
<tr>
<td></td>
<td>*Includes capital, fixed and variable O&amp;M, fixed and variable fuel using a median fuel price forecast, and BPA P2P Transmission.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Annual Cost* in 2018 dollars ($M/Year)</td>
<td>$191.8</td>
<td>$152.5</td>
</tr>
<tr>
<td>G</td>
<td>Lifetime Present Value Costs in 2018 dollars ($B, Billions of Dollars) PV @ 4% discount rate for 30 years</td>
<td>$3.317</td>
<td>$2.637</td>
</tr>
<tr>
<td>H</td>
<td>Cost of Construction (2018 $M/MW)</td>
<td>$1.262</td>
<td>$1.262</td>
</tr>
<tr>
<td>I</td>
<td>Construction Cost in 2018 dollars ($M, Millions of Dollars)</td>
<td>$466.9</td>
<td>$466.9</td>
</tr>
</tbody>
</table>
Table 5 shows the likely costs of compliance with the proposed CO2 standards via the Monetary Pathway for the facilities identified in Table 4.

NOTE: Unlike the assumption of a 90% annual operating capacity factor for the base load operation used in Table 4 for estimating construction and operating costs, compliance costs are calculated using an annual operating capacity factor of 100% because EFSC statutes and rules specify a 100% capacity factor for base load operation.

<table>
<thead>
<tr>
<th>Table 5 EFSC Compliance Costs for Most Efficient Technology</th>
<th>Base Load Operation</th>
<th>Non-Base Load Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity Factor Used for Compliance</td>
<td>100%</td>
<td>60%</td>
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<tr>
<td>Lifetime Excess CO2 Emissions (million short tons)</td>
<td>6.13 (See Table 1)</td>
<td>3.68</td>
</tr>
<tr>
<td>Total Monetary Path Requirement ($M)</td>
<td>12.17 (See Table 3)</td>
<td>7.32</td>
</tr>
</tbody>
</table>

Table 6 shows the likely compliance cost via the Monetary Pathway as a percentage of the present value of life-cycle plant costs and as a percentage of construction cost for the two power plant classifications in EFSC rules, base load and non-base load. The estimates of plant construction and operating costs are from Table 4 and the estimates of compliance costs are from Tables 3 and 5. The compliance cost for the less efficient non-base load plant is calculated for this table only, and is not present in any other tables in this document.

<table>
<thead>
<tr>
<th>Table 6 Economic Feasibility of Proposed Standard in 2018 dollars</th>
<th>Base Load (370 @ 90%) Less Efficient Plant</th>
<th>Base Load (370 @ 90%) Most Efficient Plant</th>
<th>Non-Base Load (370 @ 60%) Less Efficient Plant</th>
<th>Non-Base Load (370 @ 60%) Most Efficient Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monetary Path as % of Lifetime Present Value Costs (including fuel)</td>
<td>16.12M / 3.32B 0.49%</td>
<td>12.17M / 3.32B 0.37%</td>
<td>9.68M / 2.64B 0.37%</td>
<td>7.32M / 2.64B 0.28%</td>
</tr>
<tr>
<td>Monetary Path as % of Construction Cost</td>
<td>16.12M / 466.9M 3.45%</td>
<td>12.17M / 466.9M 2.61%</td>
<td>9.68M / 466.9M 2.07%</td>
<td>7.32M / 466.9M 1.57%</td>
</tr>
</tbody>
</table>

In the range of cases studied, the costs for a power plant to comply with the proposed CO2 standards are less than 0.5 percent of the total costs to site, construct, and operate a 370 MW CCCT plant for 30 years. The Department estimates the cost impact of the proposed standard would not be so large as to force the development of EFSC jurisdictional fossil-fueled energy facilities outside of Oregon. The Department recommends that the Council conclude that the proposed standard therefore is attainable and economically achievable.
(10) **Promote public participation in the selection and review of offsets;**
The proposed CO2 emissions standards do not affect public participation in the review of offset projects a developer proposes to the Council.

(11) **Promote prompt implementation of offset projects;**
The proposed CO2 emissions standards do not affect the certificate holder’s responsibility to begin offset projects or to make offset funds available to the qualified organization prior to beginning construction; nor does it affect the requirements on the qualified organization to contract for projects within a specified time.

(12) **Provide for monitoring and evaluation of the performance of offsets;**
The proposed CO2 emissions standards do not affect monitoring and evaluation of the performance of offsets.

(13) **Promote reliability of the regional electric system.**
The proposed CO2 emissions standards are not likely to affect regional reliability of the electric system. The proposed standards are economically achievable, as discussed in principle (9) above. Therefore, if the reliability of the regional system required a plant to be developed in Oregon, the proposed standards would not prevent that. However, the Department knows of no electric reliability problem that can be resolved only by building a power plant in Oregon rather than another Northwest state.

**Recommendation**
The Department recommends that the Council find that most efficient CCCT natural gas-fired power plant operating in the U.S. is the Grand River Energy Center in Oklahoma. Based on this finding, and after the Council considers and balances the 13 principles under 345-024-0510 and makes findings on these 13 principles, the Department also recommends that the Council adopt the proposed changes to OAR 345-024-0550, 345-024-0570, 345-024-0590 and 345-024-0620 that modify and reset the CO2 standards. These proposed changes include:

- 345-024-0570 - Replacing 6,955 Btu/kWh with 6,333 Btu/kWh;
- 345-024-0550 - Replacing 0.675 lbs. CO2/kWh with 0.615 lbs. CO2/kWh
- 345-024-0590 - Replacing 0.675 lbs. CO2/kWh with 0.615 lbs. CO2/kWh
- 345-024-0620 - Replacing 0.504 lbs. CO2/hp-hr with 0.459 lbs. CO2/kWh.
The purpose of the Council’s CO2 emissions standards is two-fold. The first purpose, the efficiency purpose, is to encourage applicants proposing a fossil-fueled energy facility to build the most efficient facility possible, thereby directly reducing the gross amount of CO2 emitted from fossil-fueled energy facilities sited within the Council’s jurisdiction. The second purpose, the offset purpose, is to indirectly reduce the net amount of greenhouse gases (GHGs) attributable to fossil-fueled energy facilities sited within the Council’s jurisdiction.

ORS 469.503(2)(a) and OAR 345-024-0570 authorize the Council to reset the emissions standard for base load gas plants through rulemaking any time the Council finds that the efficiency of a combined cycle, combustion turbine (CCCT), natural gas-fired energy facility that is commercially demonstrated and operating in the United States has improved relative to the benchmark efficiency specified in OAR 345-024-0570. This authority gives the Council the ability to ensure that the net CO2 emissions rates of CO2 emitting energy facilities sited within the Council’s jurisdiction remain 17% below the CO2 emissions rate of the most efficient gas plant operating in the U.S. at any given time. OAR 345-024-0610 and OAR 345-024-0640 also authorize the Council to modify the standard for non-base load power plants and the standard for nongenerating energy facilities. These rules require both the standard for non-base load power plants and the standard for nongenerating energy facilities to remain equal to the standard for base load gas plants. OAR 345-024-0510 requires the Council to consider and balance at least thirteen principles, set in rule, in adopting new CO2 standards for fossil-fueled power plants.

In January 2000, the Council found that the most efficient gas plant operating in the U.S. had a heat rate of 6,955 Btu/kWh (~49% efficiency). Based on this finding, the Council took action to reset its CO2 standards and reset the benchmark heat rate in OAR 345-024-0570 to 6,955 Btu/kWh. The Council reset the CO2 standards to their current values of 0.675 lbs. CO2/kWh for base load gas plants and non-base load power plants and 0.504 lbs. CO2/hp-hr for nongenerating energy facilities by calculating a 17% reduction from 6,955 Btu/kWh (5,773 Btu/kWh), then converting 5,773 Btu/kWh to 0.675 lbs. CO2/kWh by multiplying 5,773 Btu/kWh by a conversion factor of 0.000117 lbs. CO2/Btu. There are 0.746 kWh per 1 hp-hr, and 0.675 lbs. CO2/kWh multiplied by 0.746 kWh/hp-hr equals 0.504 lbs. CO2/hp-hr.

The standards have not been updated in the 18 years since 2000. Yet, over that same time period, the power industry has experienced continuous improvements in power plant efficiency. In other words, the Council’s CO2 emissions standards are likely out of date and, if not reset to reflect the most efficient current technology, could eventually allow an applicant to propose an energy facility that
would not be required to offset a portion of its CO2 emissions at all. If a proposed fossil-fueled energy facility is not required to offset its CO2 emissions at all, the two-fold purpose of the Council’s CO2 emissions standards would no longer be met.

Documents Relied Upon:
(Placeholder for tested heat rate data, data not yet received and available)

Fiscal and Economic Impact:
The proposed amendments would decrease each of the three CO2 emissions standards by roughly 8 percent. The Oregon Department of Energy (ODOE) estimates this decrease would continue to allow the siting, construction, and operation of fossil-fueled energy facilities to be economically achievable. The impact the proposed 8 percent decrease would have on the overall costs of siting, constructing, and operating a fossil-fueled energy facility would be small. To illustrate the magnitude of impact the proposed 8 percent decrease to the CO2 emissions standards would have relative to the total cost to site, construct and operate a fossil-fueled energy facility, we can compare what it would cost a new hypothetical energy facility to comply with the existing CO2 standards (using the existing monetary offset rate of $1.90/ton and the existing applicable CO2 emissions standard of either 0.675 lbs. CO2/kWh or 0.504 lbs. CO2/Btu) to what it would cost that same new hypothetical energy facility to comply with the proposed CO2 standards (using the existing monetary offset rate of $1.90/ton and the proposed applicable CO2 emissions standard of either 0.615 lbs. CO2/kWh or 0.459 lbs. CO2/Btu). Expressing compliance costs under the existing and proposed CO2 standards in terms of a percentage of the total cost to site, construct, and operate the facility for 30 years offers the best comparison.

Hypothetical base load gas plant
A hypothetical base load gas plant with a nominal generating capacity of 370 megawatts, an emission rate of 0.782 lbs. CO2/kWh (6,688 Btu/kWh heat rate), and operating 7,884 hours per year (90% operating capacity) for 30 years.

The estimated cost to comply with the existing CO2 standard of 0.675 lbs. CO2/kWh would be $10.34 million dollars and the estimated cost to comply with the proposed CO2 standard of 0.615 lbs. CO2/kWh would be $16.12 million dollars. Compliance cost estimates are based on calculation methods specified in rule and statute.

The estimated total cost to site, construct and operate the facility for 30 years is around $3.32 billion dollars. Cost estimates to site, construct and operate the facility are based on data from the 7th Power Plan from the Northwest Power and Conservation Council.

The cost to comply with the existing CO2 standard as a percentage of the total cost to site, construct, and operate the facility for 30 years is 0.31% ($10.34M / $3.32B). The cost to comply with the proposed CO2 standard as a percentage of the total cost to site, construct, and operate the facility for 30 years is 0.49% ($16.12M / $3.32B).

Hypothetical non-base load gas plant
For a hypothetical non-base load gas plant with a nominal generating capacity of 370 megawatts, an emission rate of 0.782 lbs. CO2/kWh (6,688 Btu/kWh heat rate), and operating 5,256 hours per year (60% operating capacity) for 30 years.

The estimated cost to comply with the existing CO2 standard of 0.675 lbs. CO2/kWh would be $6.21 million dollars and the estimated cost to comply with the proposed CO2 standard of 0.615 lbs. CO2/kWh would be $9.68 million dollars. Compliance cost estimates are determined based on calculation methods specified in rule and statute.

The estimated total costs of siting, constructing and operating the facility is around $2.64 billion dollars. Cost estimates to site, construct and operate the facility are based on data from the 7th Power Plan from the Northwest Power and Conservation Council.

The cost to comply with the existing CO2 standard as a percentage of the total cost to site, construct, and operate the facility for 30 years is 0.24% ($6.21M / $2.64B). The cost to comply with the proposed CO2 standard as a percentage of the total cost to site, construct, and operate the facility for 30 years is 0.37% ($9.68M / $2.64B).

Hypothetical nongenerating fossil-fueled energy facility
For a hypothetical nongenerating fossil-fueled energy facility with a nominal compressor capacity of 10,000 horsepower, an emission rate of 0.936 lb. CO2/hp-hr (8,000 Btu/hp-hr heat rate), and operating 3,000 hours per year for 30 years.

The estimated cost to comply with the existing CO2 standard of 0.504 lbs. CO2/kWh would be $406,296 dollars and the estimated cost to comply with the proposed CO2 standard of 0.459 lbs. CO2/kWh would be $448,619 dollars. Compliance cost estimates are determined based on calculation methods specified in rule and statute.
The total costs of siting, constructing and operating a nongenerating facility are difficult to quantify because the project scope of a nongenerating facility is not as predictable as the project scope for a base load or non-base load facility. Without a clear way to estimate these costs, the cost to comply with the existing and proposed CO2 standards as a percentage of the total cost to site, construct, and operate the facility for 30 years is not available.

Statement of Cost of Compliance:

1. Impact on state agencies, units of local government and the public (ORS 183.335(2)(b)(E)):
   The proposed amendments are not expected to impact state agencies or units of local government. The general public is also not expected to be impacted. Applicants for site certificates for fossil-fueled energy facilities would see an increase in compliance costs as a fraction of the total cost to site, construct, and operate the facility. A very rough estimate of what these increases may by is given above.

2. Cost of compliance effect on small business (ORS 183.336):
   a. Estimate the number of small businesses and types of business and industries with small businesses subject to the rule:
      Few, if any, small businesses would be subject to the proposed rule changes. EFSC rules apply to applicants for, and holders of, site certificates for large energy facilities as defined in ORS 469.300. Applicants for site certificates are usually large corporations or subsidiaries of large corporations. Nevertheless, a small business could become an applicant or certificate holder. The only industry or business affected by these rules are those related to developing, building or operating energy facilities. Because the proposed reset of the carbon dioxide emissions standards is not expected to significantly increase the costs to comply with the CO2 standards as a percentage of the overall cost to site, construct and operate a fossil-fueled energy facility, and because few, if any small businesses are applicants or certificate holders, the proposed rules are not expected to result in significant adverse impacts on small businesses.

   Furthermore, while it is possible for a site certificate holder to be a small business, as defined under ORS 183.336, the burden of any such small business to comply with all applicable siting standards prescribed in Oregon’s energy facility siting statutes and Council rules cannot be diminished in any way. Therefore, while the costs of compliance for an energy facility to meet Oregon’s applicable siting standards may vary depending on the type and location of a proposed facility, the costs of compliance will not vary depending on the type of business entity applying for a site certificate. Therefore, regardless of an applicant’s characterization as a small business or not, the Council could not reduce any significant adverse economic impact of the rule for potential small business applicants.

   b. Projected reporting, recordkeeping and other administrative activities required for compliance, including costs of professional services:
      None anticipated because few, if any, small businesses would be subject to the proposed rule changes.

   c. Equipment, supplies, labor and increased administration required for compliance:
      None anticipated because few, if any, small businesses would be subject to the proposed rule changes.

How were small businesses involved in the development of this rule?

Because there is no anticipated impact to small businesses, small businesses were not involved in the development of the proposed rule. However, small businesses and others will have the opportunity to comment on the proposed rule through the close of the public hearing and public comment period.

Administrative Rule Advisory Committee consulted? If not, why?:

Yes.
Oregon EFSC Rulemaking

Phase 2 – Updates to Carbon Dioxide Stds.
Rulemaking Advisory Committee (RAC)

List of entities appointed to the RAC for this rulemaking project.

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<thead>
<tr>
<th>NGO/Non-Profit</th>
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<tbody>
<tr>
<td>1</td>
<td>Columbia Riverkeeper</td>
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<tr>
<td>2</td>
<td>Green Energy Institute (GEI)</td>
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<tr>
<td>3</td>
<td>Industrial Customers of NW Utilities (ICNU)</td>
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<td>4</td>
<td>NW Energy Coalition (NWEC)</td>
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<td>5</td>
<td>Sierra Club</td>
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<td>6</td>
<td>350PDX</td>
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<td>7</td>
<td>Avangrid Renewables</td>
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<td>Calpine Hermiston Power</td>
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<td>NW &amp; Intermountain Power Producers Coalition (NIPPC)</td>
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<td>PacifiCorp</td>
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<td>12</td>
<td>Portland General Electric (PGE)</td>
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<td>Confederated Tribes of the Umatilla Indian Reservation (CTUIR)</td>
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<td>Confederated Tribes of Warm Springs</td>
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<td>16</td>
<td>Northwest Power and Conservation Council (NWPCC)</td>
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<td>17</td>
<td>Oregon Department of Environmental Quality (DEQ)</td>
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<tr>
<td>18</td>
<td>Oregon Global Warming Commission (OGWC)</td>
</tr>
</tbody>
</table>

(A few EFSC members may also be present at RAC meetings, along with ODOE staff)