Oregon EFSC's

Carbon Dioxide Emission Standards

In 1997, the Oregon Legislature enacted a standard for emissions of carbon dioxide (CO_2) 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 CO_2. 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 CO_2 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 CO_2 per kilowatt-hour of net electric generation (lb. CO_2/kWh). For nongenerating facilities, the rate is 0.504 pounds of CO_2 per horsepower-hour (lb. CO_2/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 CO_2 emissions standards for base-load power plants that primarily operate on a fossil fuel other than natural gas.

The Council's CO_2 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 CO_2 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 CO_2 emissions standard for a base load, natural gas-fired power plant ("base load gas plant") is a net emissions rate of 0.675 lb. CO_2/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. CO_2/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 CO_2 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 CO_2 per million Btu of natural gas fuel, 5,773 Btu/kWh was converted to CO_2/kWh and the net emissions standard was set at 0.675 lb. CO_2/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 CO_2 emissions standard for a non-base load power plant, regardless of fuel, is a net emissions rate of 0.675 lb. CO_2/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 CO_2 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 CO_2 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 CO_2 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 CO_2 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 CO_2 emissions in an additive fashion for simplicity. First, the Council calculates gross CO_2 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 CO_2 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 CO_2 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 CO_2 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 CO_2 emissions based on actual measured emissions, as an alternative to calculating emissions from hours of operation. The amendment allows the operator to report actual CO_2 emissions consistent with any mandatory CO_2 emissions reporting required by the Oregon Department of Environmental Quality or the United States Environmental Protection Agency. If a facility reports its actual CO_2 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 CO_2 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 CO_2 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 CO_2 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 CO_2 emissions through cogeneration alone. The Council will evaluate the reduction of net CO_2 emissions from cogeneration and determine the likely reductions over 30 years. If the Council credits an applicant with CO_2 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 CO_2 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. CO_2/hp-hr. This is equivalent to the power plant standard of 0.675 lb. CO_2/kWh.

In applying this standard, the Council estimates the total CO_2 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 CO_2 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 CO_2 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.

Summary	
Base-load gas plant:	
Net emissions rate:	0.675 lb. CO_2/kWh, with verification of emissions rate during the first year of operation
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. CO2/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 CO_2 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 CO_2 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 CO_2 reduction credits in another regulatory setting.

Monetary Path

Applicants may elect to pay a standard dollar amount per ton of CO_2 as a way to meet the standard. The amount is established by administrative rule and is currently $1.90 per short ton of CO_2. The Council may, by rule, adjust the monetary offset rate based on empirical evidence of the actual cost of CO_2 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 CO_2 standard. The monetary path allows an applicant to avoid having to prove the predicted quantity of CO_2 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_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_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/.