

Governor's Energy Policy Council

Staff Research Brief

Output Based Regulations

What is it?

An output-based air quality regulation (OBR) regulates emissions in relation to the energy output of a process (e.g., electricity generation or steam production) rather than the material inputs used in the process (e.g., fuel burned). OBRs use units of measure such as pounds of pollutant emitted per megawatt-hour generated (lbs/MWh) or pounds of pollutant emitted per unit of steam generated, rather than pounds of pollutant emitted per unit of fuel burned (lbs/MMBtu) or pollutant concentration (ppm).

Why is it relevant to State Energy Strategy for Georgia?

OBRs encourage the use of more efficient equipment and processes in electricity generation and steam production and the use of renewable fuels. OBRs also encourage deployment of clean distributed generation and Combined Heat and Power (CHP) by providing a market-based economic benefit.

Most environmental regulations for power generators and boilers have historically established emission limits based on heat input or exhaust concentration. These input-based limits do not account for the pollution prevention benefits of efficient processes and therefore do not encourage the use of more efficient power generation methods. For example, under an input-based regulatory system, the primary way for a facility to comply is to install combustion and post-combustion pollution control technologies, such as low-NO_x burners, scrubbers and selective catalytic reduction units. Under an output-based regulatory system, a facility can also consider efficiency upgrades, such as increasing combustion efficiency, increasing turbine efficiency, recovering useful heat, and reducing losses associated with operating the affected unit (e.g., operation of fans, pumps and motors). Output-based regulations allow energy efficiency and renewable energy to compete more equitably with emission control methods to reduce emissions.

Fuel conversion efficiency as a compliance strategy offers additional advantages. First, this pollution prevention measure reduces emissions of all products of combustion (such as CO₂ and air toxics), not just the target pollutant of the particular regulatory program. Second, OBRs can create an incentive for renewable energy and energy efficiency projects when used in conjunction with cap-and-trade air quality programs. When Georgia implements a cap-and-trade system, the Georgia Environmental Protection Division (EPD) must allocate allowances to all affected units. (One allowance typically permits the release of one ton of a given pollutant, such as NO_x.) Under an output-based system, renewable energy projects and some energy efficiency projects are eligible to receive allowances because they produce electricity or avoid the need for electricity production. Because wind, solar or biomass electricity projects need fewer or no pollution allowances, they could sell the allowances through the trading system and earn supplemental income, decreasing statewide pollution at a lower cost to all participating parties.

How is it implemented?

Three steps are required to design an output-based emission standard:

- *Develop the Output-Based Emission Limit.* Emissions and energy output data that were measured simultaneously are used to develop the emissions limit. If not available, states can convert input-based emissions data or existing emission limits to an output-based equivalent using unit conversions and an energy efficiency benchmark.
- *Specify Compliance Measurement Methods.* OBRs require monitoring of electrical, thermal and mechanical outputs. These outputs are already monitored at most facilities for commercial purposes, and the methods are readily available.
- *Specify How to Calculate Emission Rates for Combined Heat and Power (CHP) Units.* To account for the pollution prevention benefits of CHP, output-based regulations must specify a method to account for both the thermal and electric output of the CHP process.

Are there costs involved with implementation? If so, what are they?

The selection of an energy efficiency benchmark is an important policy decision, because processes with efficiency below the benchmark must control emissions to a greater degree than those exceeding the benchmark. This is especially true when regulating existing sources, which have fewer efficiency options. The feasibility and cost of compliance options must be considered in these cases.

Are there relevant federal and/or regional policies or projects that impact this issue?

Output-based regulation is a newer practice for power and steam applications, creating uncertainties for implementation. Input-based regulations were used in early Clean Air Act rules because heat input data were more readily available than energy output data. Subsequently, compliance tests were based on heat input, and energy output data generally were not collected and reported. Similarly, when cap and trade programs were initiated with the 1990 Clean Air Act Amendments, annual heat input of each power plant determined its emission allowance. Nevertheless, output-based standards are not a new concept within the Clean Air Act. Output-based standards in the form of mass emitted per unit of production have been used for new source performance standards (NSPS) in many industries, including primary aluminum, wool fiberglass, asphalt roofing and glass manufacturing. Also the national emission standards for hazardous air pollutants use output-based standards for iron and steel, brick and structural clay, and other state and federal rules.

The use of output-based environmental regulations is now growing, and experience with state and EPA rulemakings provide the following successful examples for rule development and implementation:

- *The output-based approach that EPA used to revise the electric utility boiler NSPS.* This action reflected a major change in approach for the NSPS and provided an efficiency-based rationale for transitioning to output-based regulation.
- *A model rule for output-based standards for small electric generators.* This rule is a good example of an output-based emission limit program with recognition of the thermal output of CHP.
- *EPA guidance on how to allocate emission allowances for the NO_x SIP call based on energy output.* The guidance provides a thorough discussion of how output-based allocation can be applied.

- *The new EPA cap and trade programs.* The Clean Air Interstate Rule for ozone and fine particulate matter and the Clean Air Mercury Rule allow states to determine the method for allocating allowances. The EPA model rules incorporate examples of output-based allocation, including CHP units.