Clean Power Plan Regulatory Frameworks

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Overview

- Specific GHG Reduction Measures:

  Imposition vs. Influence

- 3 Choices
  - Mass- vs. Rate-Based Emission Limit
  - Direct Emission Limit vs. Portfolio Approach
  - Single-State vs. Multi-State

Resources

- State Plan Considerations TSD (SPCTSD): http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule-state-plan-considerations
- Translation of the Clean Power Plan Emission Rate-Based CO2 Goals to Mass-Based Equivalents TSD: http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule-translation-state-specific-rate-based-co2
- Projecting EGU CO2 Emission Performance in State Plans TSD: http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule-projecting-egu-co2-emission-performance

Resources

- Western Resource Advocates Carbon Reduction Credit White Paper: http://www.westernresourceadvocates.org/energy/Carbon%20Reduction%20Credit%20Program.php
- Enhancing Compliance Flexibility under the Clean Power Plan: A Common Elements Approach to Capturing Low-Cost Emissions Reductions: http://nicholasinstitute.duke.edu/climate/publications/enhancing-compliance-flexibility-under-clean-power-plan-common-elements-approach
- WIEB Project: Modular Approach to Multi-state Compliance with 111(d) in the West: http://westernenergyboard.org/2015/04/spsc-webinar-on-the-modular-approach-to-multi-state-compliance-with-111d-in-the-west/

Mass-Based Standard

- Rate (lbs/MWh) x *Generation* (MWh) = Emissions (lbs)
  - Divide by 2000 to get tons or 2204.62 to get metric tons
- EPA RTM TSD Method:
  - Generation =
    - 2012 Affected EGU Generation +
    - "At-Risk" Nuclear Generation +
    - 2012 RE Generation

Mass-Based Standard

- EPA RTM TSD Method (cont'd)
  - I.e. denominator in adjusted baseline rate:

$$\frac{(\text{Coal Gen} \times \text{Coal ER}) + (\text{OG Gen} \times \text{OG ER}) + (\text{NGCC Gen} \times \text{NGCC ER}) + \text{Other Emissions}}{\text{Coal Gen} + \text{OG Gen} + \text{NGCC Gen} + \text{Other Gen} + Nuclear\ Gen_{uc+ar} + RE\ Gen_{2012}}$$

  - Arizona in 2029:

$$\frac{702\ lbs\ CO2\ per\ MWh \times 55{,}687{,}627 MWh}{2204.62\ MT/lb} = 17{,}733{,}961$$

  - TSD presents only an example; not prescriptive.

Mass-Based Standard

- Possible to comply by reducing generation
  - Example: Plant with 3 coal-fired EGUs generating 1,000,000 MWh/year each

	Actual	Goal
Rate (lbs CO2/MWh)	2,000	702
Emissions (MT CO2)	2,721,557	955,267

  - Shutting down 2 units brings plant into compliance:

$$2000\ lbs\ CO2\ per\ MWh\ \times 1{,}000{,}000\ MWh\ \times \frac{1\ MT}{2204.62\ lbs}$$
$$= 907{,}186\ MT$$

Mass-Based Standard

- Options for reducing emissions/generation:
  - RE (any form, including existing hydro)
  - EE (EM&V not required)
  - ***New NGCC***
    - Unless included in emissions cap (optional)
  - *Any* measure that reduces emissions by an affected EGU assists in compliance
- Limited potential for influence

Rate-Based Standard

- Emission Limit expressed in same terms as interim and final goals:

  Emissions (lbs CO2)/Generation (MWh)

- *Not* possible to comply solely by reducing generation

$$\frac{Emissions}{Generation} \Rightarrow \frac{Emissions}{Generation}$$

Rate-Based Standard

- Rate adjustment through RE/EE credits required
  - For *all* coal-fired plants
  - For all FF EGUs in AZ and other states where goal rate < NGCC Rate
- Adjustment Methods (SPCTSD § IV)
  - Add avoided MWh of FF generation to denominator:

$$Rate = \frac{EGU\ Emissions}{EGU\ Gen + RE + EE}$$

Rate-Based Standard

- Adjustment Methods (cont'd)
  - Subtract avoided CO2 emissions from numerator:

$$Rate = \frac{EGU\ Emissions - (Rate \times (RE + EE))}{EGU\ Gen}$$

Where Rate could be:

- Average rate in pool, region or state (FF or total)
- Marginal rate in pool, region or state (FF or total)
- Rate-based limit for EGU
- Rate-based goal for state

Rate-Based Standard

- WRA Approach: Carbon Reduction Credits
  - Each generator would receive one carbon reduction credit for each pound of CO2 per megawatt-hour that its emission rate was less than the standard in that year, multiplied by the output in that year.
  - Facilities that emit CO2 at a rate greater than the standard for that year would have a credit deficiency.
  - "Zero emission resources" (i.e. RE and EE) would also receive credits
  - Formula:

$$CRCs = (State\ Goal - EGU\ Rate) \times EGU\ Gen \times 1\ {}^{CRC}/_{lb}$$

  - Facilities with deficits would have to secure credits from EGUs with rates below state goal (could include NGCC) or zero emission resources

Rate-Based Standard

- Are emissions or generation "avoided"?
  - EGU taking credit for RE or EE need not reduce generation to reduce rate
  - WRA White Paper (at 10):

"Under EPA's proposal and this program, even if a specific high-emission generator in a state is not curtailed, it is still possible to achieve compliance by providing additional low-emission resources or energy efficiency to the system. Because of the nature of electricity and the overall inability to store power, supply will equal demand. This means that when renewables are producing energy, or efficiency is providing savings, even if not associated with ramping down a particular generator in a particular state, there will be less generation than otherwise, somewhere on the system."

- Rules will have to identify (i) options that may be used as credit to reduce an EGU's rate or negative CRC balance and (ii) EM&V methods for those options
- Substantial potential to influence

Direct Limit vs. Portfolio Approach

- Direct Emission Limit:
  Affected EGU Compliance = Statewide Compliance
- Portfolio:
  - EPA:

"*In general, a portfolio approach is distinguished from an emission limit approach by the fact that achievement of the full level of required emission performance for affected EGUs specified in the plan is not ensured through the application of direct emission limits that apply to affected EGUs.*

A portfolio approach would include both direct emission limits that apply to affected EGUs and other indirect measures that avoid EGU CO2 emissions. "

SPCTSD at 9.

  - ADEQ or another entity takes responsibility for RE/EE programs, including EM&V

Single-State vs. Multi-State

- Proposed 40 CFR 60.5745(a)(1)(i): Single weighted average rate required for rate-based states submitting multi-state plan
- Problem: States with higher rates unlikely to want to develop plan with states, like Arizona, that have very low rates
- Solutions:
  - Modular or Common Elements Approach
    - E.g. Recognize EE credits from out of state as long as they meet certain criteria
    - Could require reciprocity
  - WRA proposal includes system for interstate trading of CRCs