Geosyntec consultants

CPES Energy, Environment & Economic Development Conference

March 17, 2014

Greenhouse Gas Permitting Rule and Power Plant New Source Performance Standards

Geosyntec.com

engineers | scientists | innovators

Geosyntec consultants

Presentation Topics

- Impacts of US EPA Tailoring Rule
- GHG Best Available Control Technology (BACT)
- Power Plant New Source Performance Standards (NSPS)

Geosyntec consultants

How We Got Here - GHG Regulatory History

- Massachusetts vs. EPA -2007 - US Supreme Court case decided 5-4 in which twelve states and several cities force the Agency to regulate carbon dioxide and other greenhouse gases (GHG) as air pollutants.

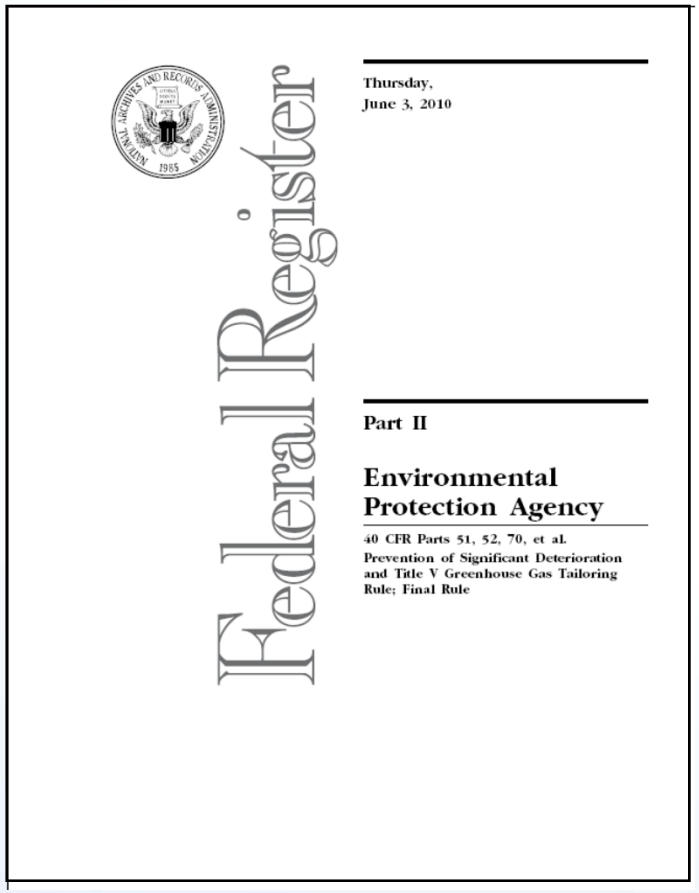
- US EPA proposes and finalizes Endangerment Finding (…cause(s) or contribute(s) to air pollution which may reasonably be anticipated to endanger public health or welfare) issued under § 202(a)(1) related to motor vehicles

- US EPA promulgates Final GHG Emissions Standards for light duty vehicles – GHGs become a regulated air pollutant under CAA

- US EPA promulgates Final PSD and Title V GHG Tailoring Rule - June 2010

Geosyntec consultants

GHG Tailoring Rule



Impacts

- PSD pre-construction permitting for GHG emissions
- BACT for GHG Emissions
- Title V Operating Permits
- Six GHGs treated as One PSD or Title V Regulated Pollutant
- Thresholds expressed as Tons CO_2e – Note: 40 CFR Part 98 GHG Reporting Rule Uses Tonnes

Geosyntec consultants

Greenhouse Gases

- **GHG covered:**

  Carbon dioxide (CO_2)

  Methane (CH_4)

  Nitrous oxide (N_2O)
  Hydrofluorocarbons (HFCs),
  Perfluorocarbons (PFCs),

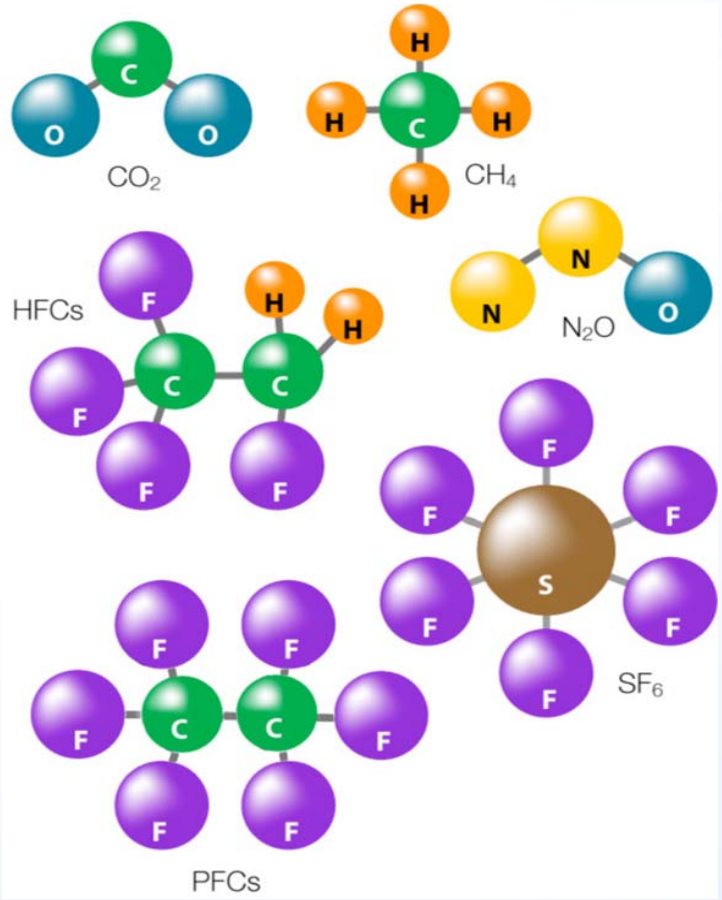
  Sulfur hexafluoride (SF_6)

- **All converted to CO_2 equivalent emissions using Global Warming Potentials (GWP)**

  CO_2 = 1

  CH_4 = 25

  N_2O = 310



Geosyntec consultants

Permitting Thresholds

Pollutant	Title V	PSD	PSD Significance Level
PM_{10}	100	100 or 250	15
PM	NA	100 or 250	25
SO_2	100	100 or 250	40
NO_x	100	100 or 250	40
CO	100	100 or 250	100
Ozone/VOC	100	100 or 250	40
Lead	100	100 or 250	0.6
HAP	10 - individual 25 - combination	Not regulated under PSD.	
GHG (no Tailoring)	100	100 or 250	Any increase.
GHG (with Tailoring)	100,000	100,000	75,000

Geosyntec consultants

Impacts Without and With Tailoring Rule

- **PSD Permitting**
  - **Without Rule -** *82,000 permitting actions per year* – **($1.5 billion)**
  - **With Rule -** *1,600 permitting actions per year* – **($36 million)**
- **Title V Operating Permits**
  - **Without Rule -** 6 million sources would have needed Title V operating permits - **($21 billion)**
  - **With Rule -** *15,500 sources will need Title V operating permits* – **($69 million)**

Geosyntec consultants

PSD Applicability

PSD applicability determinations are based on both mass and CO_2e emissions

- Applies if <u>mass</u> emissions exceed the statutory thresholds (e.g., 100/250 tpy for *new* sources), ***<u>and</u>***
- _CO_2e emissions exceed the Tailoring Rule threshold (100,000 tpy for *new* sources)
- (75,000 tpy for modifications)

Geosyntec consultants

Title V Applicability Threshold

Title V Operating Permit Applicability

- Sources with CO_2e PTE $\geq$ 100,000 tpy
- Applicable requirements may include those resulting from permitting actions, e.g., PSD BACT
- 40 CFR Part 98 GHG Reporting Rule is not an applicable requirement

Example 195 MMBtu/hr natural gas boiler

Geosyntec consultants

Biogenic GHG Emissions Recent Developments

- Biogenic carbon dioxide emissions -

  …resulting from the combustion or decomposition of biologically-based materials, (e.g., all types of wood, ethanol, landfill waste, manure, etc.) other than fossil fuels.

- US Court of Appeals for the DC Circuit vacated EPA's 2011 deferral of GHG biogenic emissions from being included in permitting applicability determinations.
- DC Circuit has effectively postponed its "vacatur" decision until 30 days after US Supreme Court decides Utility Air Regulatory Group case challenging the Tailoring Rule.

Geosyntec consultants

GHG Best Available Control Technology (BACT)

- **US EPA's "PSD and Title V Permitting Guidance for Greenhouse Gases" provides framework for GHG BACT**
  - Heavy reliance on energy efficiency
  - Add-on controls must be considered, including CCS for large sources
  - No "Redefining" the source
- **US EPA guidance documents also released for seven sectors with more specific discussions of how to address BACT**
  - Sector guidance documents are aimed at what should be considered as opposed to what is BACT, i.e. information source
  - EGUs, ICI Boilers, Pulp & Paper, Refining, Iron & Steel, Cement, Nitric Acid Production
- **US EPA website**
  - http://www.epa.gov/nsr/ghgpermitting.html

Geosyntec consultants

GHG BACT Considerations for Combustion Sources

- Use of energy efficient technology
- CCS for large GHG sources
- Combined heat and power (CHP)
- Low carbon fuels
  - combustion of natural gas produces lower CO_2 emissions than other fossil fuels - ~ 30% less than oil, and ~45% less than coal (on a lb/MMBtu basis).
- Good combustion practices
  - Optimization of combustion efficiency through initial tuning, annual tune-ups, instrumentation and controls, and regular PM.

Geosyntec consultants

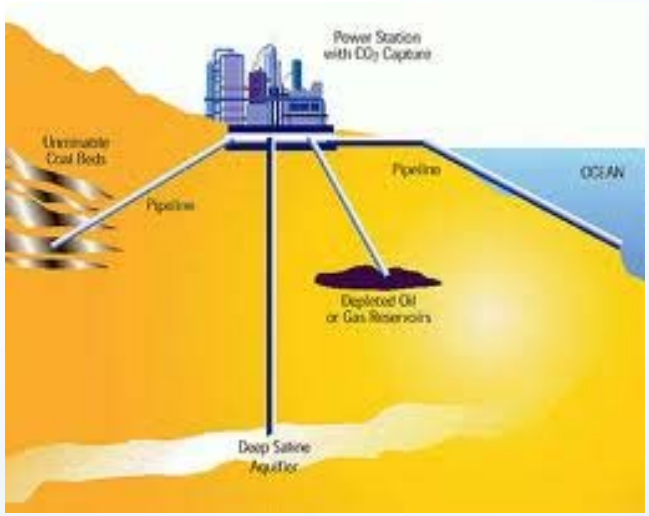
GHG BACT Considerations for Combustion Sources (cont'd)

- **Energy efficiency**
  - Latest technologies with advanced efficiency
  - Co-generation that produces thermal energy and electricity
  - Options that reduce emissions by improving the utilization of thermal energy and electricity that is generated and used onsite
  - Capture and re-use of waste heat in flue gas
  - New burner designs and air balance system to increase fuel combustion and heat transfer efficiency.
- **Catalytic oxidation**
  - Primarily designed to reduce CO emissions but will also reduce methane (CH_4) emissions to a lesser extent (reportedly less that 0.05 percent)

Geosyntec consultants

Carbon Capture and Storage (CCS)

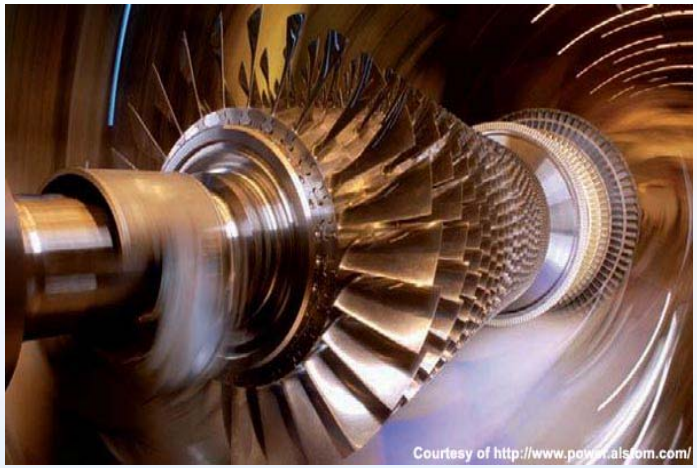
- CCS involves the capture and/or compression, transport and storage of CO_2
- Commercially-available solvent-based CO_2 capture systems exist but at pilot and demonstration-scale
- CCS not suitable for low-purity, low concentration CO_2 streams.
- Need access to pipeline and permanent storage infrastructure
- Environmental permitting of pipeline and storage structures
- Comparison of BACT $/ton costs is difficult



Geosyntec consultants

Recent Trends in GHG BACT Determinations for Combustion Sources

- Numerical emission limitations, e.g., output based emission limit = lb CO_2e /MW-hr net
- CO_2e limits should be stated on a 12- month rolling total basis (recent decisions include lb/hour limits)
- GHG BACT emission limit needs to cover SSM events
- GHG mass emission limit for aux boiler, emergency generators, etc. (e.g., lb/MMBtu)



Geosyntec consultants

Power Plant New Source Performance Standards

Under Clean Air Act

- Section 111(b) covers new sources
- Section 111(d) covers existing sources

Power Plant NSPS Schedule

NSPS for New Sources -

- Proposed 2012
- Re-proposed in 2013
- US EPA to issue final this year

NSPS for Existing Sources -

- 2014 Proposed Guidelines
- 2015 Final Guidelines
- 2016 State Plans Due

§ 111(b) NSPS for New Sources - Definition

"A standard for emissions of air pollutants which reflects the degree of emission limitation achievable through the application of the **best system of emission reduction**, which (taking into account the cost of achieving such reduction and any non-air quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated."

Geosyntec consultants

Proposed Limits for New Sources

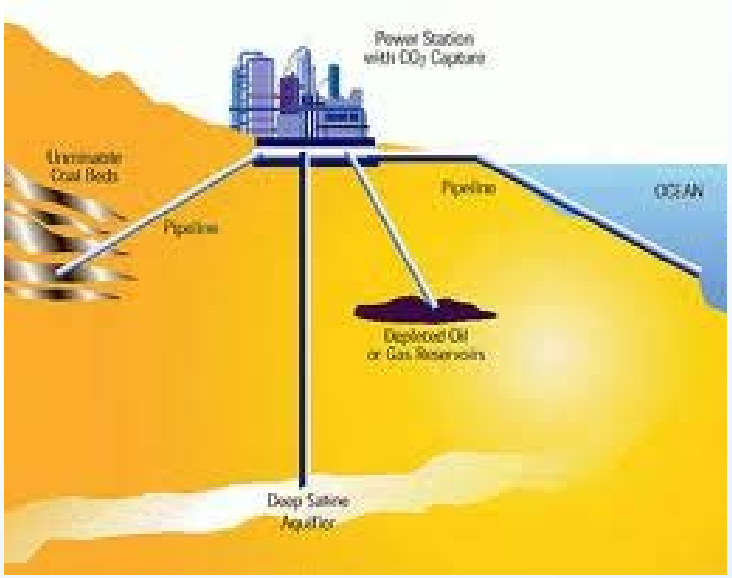
Natural Gas	Proposed limit		Coal/IGCC Proposed Limits	Averaging period
Small < 850 MMBtu/hr	1,100 lb CO_2 / MWh		1,100 lb CO_2 / MWh	12 months
Large > 850 MMBtu/hr	1,000 lb CO_2 / MWh		1,000-1,050 lb CO_2 / MWh	84 months

Geosyntec consultants

NSPS GHG Reduction Methods

“Best system of emission reduction”

- For Natural Gas: Combined Cycle Plant
- For Coal/IGCC: Partial CCS



Geosyntec consultants

§ 111(d) NSPS for Existing Sources

"The Administrator shall prescribe regulations . . . under which **each State shall submit to the Administrator a plan** which establishes standards of performance for any existing source for any air pollutant for which air quality criteria have not been issued . . . but to which **a standard of performance under this section would apply if such existing source were a new source**, and provides for the implementation and enforcement of such standards of performance."

NSPS Considerations for Existing Sources

Variety of Approaches on the table -

- Energy efficiency
- Coal to gas conversions
- “Beyond the fenceline” EE/RE programs
- SIP will be unique to State’s energy mix and economy

Geosyntec consultants

Concluding Remarks

- GHG Permitting Rule has not had nor will likely have a widespread impact on New England power companies and facilities *
- NSPS for new sources likewise will not have a widespread impact on New England power companies and facilities
- NSPS for existing sources will pose more of a concern as its relates to implementing compliance programs

*outcome on how biogenic CO_2 emissions are accounted for may change this

Geosyntec consultants

Parting Thoughts – What You Should Be Doing Now

- Include CO_2e permitting strategy as part of Capital Projects planning
- Stay current on GHG BACT determinations
- As applicable, monitor US EPA's position regarding biogenic CO_2 emissions
- Monitor NSPS rulemaking
- Track ramifications of UARG Supreme Court Decision

Geosyntec consultants

Peter H. Anderson
Geosyntec Consultants
978-339-3898
panderson@geosyntec.com