# Air Emissions Permitting Considerations for an Integrated Gasification Combined Cycle (IGCC) Unit Potentially Located in the State of Delaware

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NRG is considering installation of an integrated gasification combined cycle (IGCC) electric generating unit at the existing Indian River Power Plant Site.

- Project will create construction and full time jobs
- Improve electric grid reliability
- Help stabilize electric rates
- Provide cleaner electric generation

IGCC is viewed by many as the most efficient, cleanest power generation technology available today that is capable of using coal fuel. Relative to a conventional pulverized coal unit, an IGCC plant:

- has lower emissions of nitrogen oxides
- has lower emissions of sulfur dioxide
- has lower emissions of mercury
- has lower emissions of particulate matter
- better facilitates the reduction/capture of CO2 emissions

Even though IGCC is s relatively clean technology, emissions still exist and will be subject to regulatory limitations.

DNREC's Air Quality Management Section (AQM) was invited today to provide some discussion of the regulatory requirements that may be applicable to a new IGCC unit.

No comprehensive IGCC plant description or application has been submitted to AQM to date.

Identification of applicable regulatory provisions will be dependent upon:

- Plant configuration
- Fuel mix
- Use of supplementary fuels
- Heat input capacities

Once initiated, the permitting process is likely to be a challenge:

- very few coal-derived fueled IGCC units have been permitted to date in the US (few examples, little direct experience)
- more modern plant configurations will likely have some different regulatory provisions than existing units.
- thorough knowledge of the appropriate IGCC technology as well as the regulations will be required of the permitting staff.

Example of NSPS complication:

- If combustion turbines and fired heat recovery boilers burn >75% synthetic coal gas (rolling 12-month basis), the new Subpart Da for steam generating units is applicable to the fired heat recovery boilers AND the combustion turbines.

- If fired heat recovery boiler utilizes <75% (rolling 12-month basis) synthetic coal gas, then it is subject to Subpart KKKK.

- If combustion turbines utilize <75% (rolling 12-month basis) synthetic coal gas, then they are subject to Subpart KKKK.

Until actual submittals are made, identification of applicable requirements is somewhat speculative. There are general areas of certain applicability, such as:

- New Source Performance Standards (NSPS)
- Prevention of Significant Deterioration of Air Quality (PSD)
- Emissions Offsets
- Coastal Zone Act
- Clean Air Interstate Rule
- Delaware's proposed multi-pollutant regulation

# Standards of Performance for New Stationary Sources, Subpart Da

Applicable to IGCC combustion turbines and fired heat recovery boilers firing >75% synthetic coal gas (heat input basis) on a rolling 12 month basis.

NOx limits

- 0.50 lb/MMBTU heat input, 30-day rolling average
- 1.0 lb/MWh, 30-day rolling average with no supplementary fuel firing, or burning less than 50% heat input from liquid fuels during the averaging period
- If 50% or more heat input from supplementary liquid fuels, NOx limit is 1.5 lb/MWh on 30-day rolling average, weighted on the proportion of gross energy generated if supplementary fuel not used during entire 30-day period

# NSPS Subpart Da (continued)

SO2 Limits – 1.4 lb/MMBTU heat input OR 5% of the potential combustion concentration (95% reduction). Both are rolling 30-day average basis.

Mercury Limits – 20 x 10^(-6) lb/MWh on a rolling 12-month basis

Opacity Limits – 20%, 6-minute average basis, except one 6-minute average per hour of not more than 27% opacity.

# NSPS Subpart Da (continued)

Particulate Limits

– 0.14 lb/MWh OR 0.015 lb/MMBTU of heat input.

- An alternative limit is 0.03 lb/MMBTU AND 99.9% reduction, based on the results of a performance test of particualte emissions compared to ash content of fuel burned on a mass basis.

# Standards of Performance for New Stationary Sources Subpart KKKK

- Applicable to combustion turbines and fired heat recovery steam generators not regulated under Subpart Da.
- NOx limit for new combustion turbine not firing natural gas is 15 PPM at 15% O2, OR 1.2 lb/MWh.
- NOx limit for heat recovery boiler operating independent of the combustion turbines is 54 PPM at 15% O2, or 0.86 lb/MWh
- SO2 limit is 0.90 lb/MWh, OR, burn no fuel that contains potential sulfur emissions in excess of 0.060 lb SO2/MMBTU heat input.

# Clean Air Interstate Rule (CAIR)

- CAIR applicable to new IGCC units, including the cap-and-trade program for annual and ozone season NOx and annual SO2 mass emissions.
- Initial allocations from new unit set aside, would have to purchase on the market if set aside was insufficient.
- After baseline of five years, unit would receive allocations based on heat input levels. Would require re-allocation for all DE units to remain within the mass caps.
- Ozone Transport Commission (OTC) is working on a CAIR+ program that could require an accelerated allowance surrender rate than required under the federal CAIR program.

# Delaware's Proposed Multi-Pollutant Regulation

New IGCC unit would be subject to the proposed regulation's mercury emissions provisions.

Mercury emission rate limit for Phase I (2009-2012) 0f 1.0 lb/TBTU heat input (or 80% reduction) and a Phase II (2013 and beyond) limit of 0.6 lb/TBTU (or 90% reduction).

Subject units are allocated annual mercury mass emissions caps, not a cap-and-trade program.

Phase I (2009 – 2012) has a new unit set aside of 5% (about 7 lb/yr) and Phase II (2013 and beyond) has a new unit set aside of 3% (about 2 lb/yr).

# Regulations Governing Delaware's Coastal Zone

Put in place to provide industry some flexibility while promoting improvement of the coastal zone environment.

Not an AQM program, but may impact a new units air emissions.

Affected new sources must conduct environmental studies and prepare an impact report. Report must be submitted to DNREC for approval prior to permit issuance.

Affected new sources must propose a project to offset emissions from the new source, demonstrating that the proposed project is more beneficial than the negative impact caused by the new source. DNREC approval is required.

There are requirements for public notification and the conduct of public hearings.

# Requirements for Preconstruction Review, Emissions Offset Provisions

For and IGCC unit in Sussex county, these provisions would apply to NOx emissions.

Provides requirements for the lowest achievable emission rate (LAER) emissions control technology for NOx emissions.

Offset requirements are specified, with a 1.15 to 1 required offset ratio.

Offsets must be real and federally enforceable. Baseline is the lower of actual or allowable emissions.

Permit applications must include analysis of alternative sites, sizes and environmental control techniques that demonstrate the benefits of the proposed source outweigh the environmental and social cost of the new source.

# Requirements for Preconstruction Review, Prevention of Significant Deterioration of Air Quality (PSD)

- The Indian River Power Plant is currently a major source for the primary air pollutants particulate, sulfur dioxide, carbon monoxide, nitrogen oxides, PM10, and PM2.5.
- PSD provisions are applicable each pollutant for which the new unit would be a major source and each pollutant that it would cause a significant increase in emissions.
- New source must meet best available control technology (BACT) for each pollutant subject to regulation under the Clean Air Act that the unit has the potential to emit in significant amounts.
- Impact analysis is required using modeling to demonstrate that the new source will not cause or contribute to violation of any ambient air quality standard in any control region or any applicable maximum allowable increase over baseline pollutant concentration in any area.

# Requirements for Preconstruction Review, Prevention of Significant Deterioration of Air Quality (PSD) (continued)

- Ambient air quality analysis is required for the area impacted by the new source, generally including one year of continuous ambient air quality monitoring. Analysis used to determine if new source's emissions will cause or contribute to causing violation of applicable standards or maximum allowable increases.
- Following construction, new source may be required to determine the effect emissions from the source have on ambient air quality.
- Provisions are included for public notification and comment as part of the permit application review process.