Greenhouse Gas Permitting Training

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US EPA-Region III
GHG Overview
PSD Permitting for Sources of GHGs

- GHGs are pollutants that trap heat in the atmosphere and are associated with climate change.

- Under EPA rulemaking, GHGs are a single air pollutant defined as the aggregate group of the following six gases:
  - Carbon dioxide (CO₂)
  - Methane (CH₄)
  - Nitrous oxide (N₂O)
  - Sulfur hexafluoride (SF₆)
  - Hydrofluorocarbons (HFCs)
  - Perfluorocarbons (PFCs)
Key Sources of GHGs

- Carbon Dioxide (CO₂)
  - Fuel combustion
- Methane (CH₄)
  - Oil and gas production
- Nitrous oxide (N₂O)
  - Fuel combustion
- Sulfur Hexafluoride (SF₆)
  - Magnesium production
  - Electrical Transmission
Key Sources of GHGs (cont’d)

- Hydrofluorocarbons (HFCs)
  - HFC manufacture
  - Semiconductor manufacturing
- Perfluorocarbons (PFCs)
  - Aluminum production
  - Semiconductor manufacturing
CO2 Equivalency

- CO₂ equivalent (CO₂e) aggregate emissions of GHGs based on relative global warming potential (GWP)
- CO₂e = (mass of the GHG) x (its GWP)
- Current GWPs:
  - CO₂: 1
  - CH₄: 21
  - N₂O: 310
  - SF₆: 23,900
  - HFCs: 140 to over 11,700
  - PFCs: 5,210 to 9,200

(Ratios may be revised. Set in Table A-1 of the GHG reporting rule. Subpart A of 40 CFR Part 98.)
Applicability:
Applicability: GHG’s vs. Traditional Pollutants

- Keys to determining applicability:
  
  - Is the source emitting a pollutant that is “subject to regulation”?
  
  - Is it a “major stationary source”?
  
  - Will the proposed new construction or modification result in a significant “net emissions increase”
Determining Applicability for Traditional Pollutants

Consider the following:

- Existing major source of NOx
- Undergoing modifications with net increases of:
  - 60tpy NOx
  - 50tpy SO\textsubscript{2}
  - 90tpy CO

Pollutants “subject to regulation”?
Major Stationary Source?
Significant “net emissions increase”?
“Tailoring Rule”

- Tailoring rule covers applicability of PSD and Title V to GHG emissions
- *Does not change the basic applicability processes!*
- Does incorporate a way to determine if emissions are in an amount that make GHGs a “regulated NSR pollutant”, based on level of CO$_2$e emissions
- Consequently, applicability determined in two step process that evaluates:
  - Whether CO2e emissions are over “regulated NSR pollutant” thresholds
  - Whether mass emissions are over the PSD thresholds
“Subject to Regulation”

- The Tailoring Rule does not establish thresholds in the traditional PSD sense

- Thresholds in the tailoring rule only define whether the GHG’s emitted by a stationary source are a regulated NSR pollutant
## Applicability: Traditional Pollutants vs. GHG’s

<table>
<thead>
<tr>
<th></th>
<th>Traditional (e.g. SO$_2$)</th>
<th>GHG’s</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1) Subject to Regulation</strong></td>
<td>&gt;0 tpy</td>
<td>&gt;75,000/100,000 tpy CO$_2$e (depending on date)</td>
</tr>
<tr>
<td><strong>2) Major Stationary Source</strong></td>
<td>100/250 tpy</td>
<td>100/250 mass based</td>
</tr>
<tr>
<td><strong>3) Major Modification</strong></td>
<td>&gt;40 tpy</td>
<td>&gt;75,000 CO$_2$e $\textit{and}$ 0 tpy mass based</td>
</tr>
</tbody>
</table>
GHG Applicability and the “Tailoring Rule”

- Application of PSD to GHGs implemented in steps or phases.

- Applicability criteria Phase-I n:
  - Step 1 between January 2, 2011 and June 30, 2011
  - Step 2 on or after July 1, 2011
Introduction to PSD GHG Applicability

- As stated earlier, Tailoring Rule does not change basic applicability process
- Incorporation of GHGs into definition of regulated NSR pollutant does mean:
  - There are calculations and thresholds for both $\text{CO}_2e$ and mass
  - $\text{CO}_2e$ sum used to determine if emissions are of a regulated NSR pollutant
  - Mass based sum used to determine if major source or major modification
PSD Applicability Criteria for New Sources of GHGs

January 2, 2011 to June 30, 2011

- New source is otherwise subject to PSD for another regulated NSR pollutant, and

- GHG PTE is:
  - Equal to or greater than 75,000 TPY CO$_2$e, and
  - Greater than 0 TPY mass basis

Note: All thresholds are expressed in short tons (2,000 lbs)!
PSD Applicability Criteria for New Sources of GHGs (cont’d)

On or after July 1, 2011:

- Source is otherwise subject to PSD for another pollutant and GHG PTE is:
  - Equal to or greater than 75,000 TPY CO$_2$e, and
  - Greater than 0 TPY mass basis

  OR

- Source has GHG PTE equal to or greater than:
  - 100,000 TPY CO$_2$e and
  - 100/250 TPY mass basis
PSD Applicability Criteria for Modified Sources of GHGs

January 2, 2011 to June 30, 2011

- Modification is otherwise subject to PSD for another regulated NSR pollutant, and
- GHG emissions increase and net emissions increase are:
  - Equal to or greater than 75,000 TPY CO$_2$e, and
  - Greater than -0- TPY mass basis
PSD Applicability Criteria for Modified Sources of GHGs

On or after July 1, 2011
- Modification is subject to PSD under Step 1 of the Tailoring Rule

OR BOTH
- Source PTE for GHGs is equal to or greater than:
  - 100,000 TPY CO$_2$e and
  - 100/250 TPY mass basis
- Modification GHG emissions increase and net emissions increase:
  - Equal to or greater than 75,000 TPY CO$_2$e, and
  - Greater than 0 TPY mass basis

OR
- Modification alone has GHG emissions equal to or greater than
  - 100,000 TPY CO$_2$e, and
  - 100/250 TPY mass basis
Four Applicability Conditions for Modifications of Major Sources

- For a modification, four conditions must exist in order to trigger PSD:
  1. CO$_2$e emissions increase equals or exceeds 75,000 TPY CO$_2$e
  2. “Net emissions increase” of CO$_2$e equals or exceeds 75,000 TPY
  3. GHG mass emissions increase exceeds 0 TPY
  4. “Net emissions increase” of GHGs (on a mass basis) over the contemporaneous period exceeds 0 TPY
Determining Applicability for GHG’s

Consider the following:

- Existing major source of only GHG’s (after July 1, 2011)
- Undergoing modifications with net increases of:
  - 60tpy NOx
  - 50tpy SO₂
  - 90tpy CO
  - 74,000tpy CO₂e
- Subject to PSD?
- No! Because the modification does not include an emissions increase of >75,000tpy, GHG’s are no longer “subject to regulation” and this is no longer a major stationary source.
Determining GHG Emissions

- Determine sum of the 6 GHG pollutants on mass basis
- Determine sum of 6 GHG pollutants on CO₂e basis
- All emissions of GHGs:
  - Includes biogenic sources***
  - Beyond the reporting rule
- No consideration of off site emissions impacts for applicability
- Use best available data. Data quality hierarchy:
  - Performance tests on similar units;
  - Mass balances;
  - Vendor data and guarantees;
  - Test data from EPA;
  - AP-42 factors;
  - Factors from literature
GHG Emission Estimation Resources


- Establishes GHG reporting requirements for most sectors
- Basic approaches can be used to estimate emissions for PSD
- Includes procedures for estimating GHG emissions from the largest source categories
GHG Emission Estimation Resources (cont’d)

- ENERGY STAR Industrial Sector Energy Guides and Plant Energy Performance Indicators (benchmarks)
  www.energystar.gov/epis
- US EPA National Greenhouse Gas Inventory
  http://epa.gov/climatechange/emissions/usinventoryreport.html
- EPA’s Climate Leaders Protocols
  http://www.epa.gov/stateply/index.html
GHG Emission Estimation Resources (cont’d)

- EPA’s Voluntary Partnerships for GHG Reductions:
  - Landfill Methane Outreach Program (http://www.epa.gov/lmop/)
  - CHP Partnership Program (http://www.epa.gov/chp)
  - Green Power Partnership (http://www.epa.gov/greenpower)
  - Coalbed Methane Outreach Program (http://www.epa.gov/cmop/index.html)
  - Natural Gas STAR Program (http://www.epa.gov/gasstar/index.html)
GHG Emission Estimation Resources (cont’d)

- SF Emission Reduction Partnership for the Magnesium Industry

- PFC Reduction/Climate Partnership for the Semiconductor Industry
  - [www.epa.gov/highgwp/semiconductor-pfc/index.html](http://www.epa.gov/highgwp/semiconductor-pfc/index.html)
Certain biogenic CO$_2$ sources not in references:
- Wastewater
- Fermentation processes

Sources are still responsible for these emissions and need to propose methods.

Permitting authorities need to review the methods to determine their appropriateness.
GHG Applicability Flow Charts
Applicability Criteria for New Sources of GHGs

<table>
<thead>
<tr>
<th>Permits issued from January 2, 2011, to June 30, 2011</th>
<th>Permits issued on or after July 1, 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSD applies to GHGs, if all of these conditions are met:</td>
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</tr>
<tr>
<td>• The source is otherwise subject to PSD (for another regulated NSR pollutant)</td>
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</tr>
<tr>
<td>• The source has a GHG PTE equal to or greater than:</td>
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</tr>
<tr>
<td>o 75,000 TPY CO$_2$e</td>
<td>o 75,000 TPY CO$_2$e</td>
</tr>
<tr>
<td>OR</td>
<td>OR</td>
</tr>
<tr>
<td>• Source has a GHG PTE equal to or greater than:</td>
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</tr>
<tr>
<td>o 100,000 TPY CO$_2$e, and</td>
<td>o 100/250 TPY mass basis</td>
</tr>
</tbody>
</table>
# Applicability Criteria for Modifications at Existing Sources of GHGs

<table>
<thead>
<tr>
<th>Existing Sources of GHGs</th>
<th>PSD Applies to GHGs, if:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Modification is otherwise subject to PSD (for another regulated NSR pollutant), and has a GHG emissions increase and net emissions increase:</td>
</tr>
<tr>
<td></td>
<td>o Equal to or greater than 75,000 TPY CO$_2$e, and</td>
</tr>
<tr>
<td></td>
<td>o Greater than -0- TPY mass basis,</td>
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</tr>
<tr>
<td></td>
<td>o Greater than -0- TPY mass basis</td>
</tr>
<tr>
<td></td>
<td>OR BOTH:</td>
</tr>
<tr>
<td></td>
<td>- The existing source has a PTE equal to or greater than:</td>
</tr>
<tr>
<td></td>
<td>o 100,000 TPY CO$_2$e and</td>
</tr>
<tr>
<td></td>
<td>o 100/250 TPY mass basis</td>
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<td>- Modification has a GHG emissions increase and net emissions increase:</td>
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<td></td>
<td>o Equal to or greater than 75,000 TPY CO$_2$e, and</td>
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</tr>
<tr>
<td></td>
<td>OR BOTH:</td>
</tr>
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<td></td>
<td>- The source is an existing minor source for PSD, and</td>
</tr>
<tr>
<td></td>
<td>- Modification alone has actual or potential GHG emissions equal to or greater than:</td>
</tr>
<tr>
<td></td>
<td>o 100,000 TPY CO$_2$e, and</td>
</tr>
<tr>
<td></td>
<td>o 100/250 TPY mass basis</td>
</tr>
</tbody>
</table>

1. Will the permit be issued on or after January 2, 2011 but before July 1, 2011?
   - NO
   - YES

2. Will the permit be issued on or after July 1, 2011?
   - YES
   - NO

3. Is this a new stationary source subject to PSD for a regulated NSR pollutant other than GHGs?
   - YES
   - NO

4. Determine the new source’s potential to emit (PTE) in tons per year (TPY) for each of the 6 GHG pollutants (CO₂, CH₄, N₂O, HFCs, PFCs and SF₆) taking into account enforceable limits.
   - Go to next page

GHG emissions are not subject to PSD as part of this permit review.

NOTE: If a minor source construction permit is issued before July 1, 2011, which does not contain synthetic minor limitations on GHG emissions AND the source or modification has a PTE of GHG emissions that would trigger PSD on or after July 1, 2011, then the minor source must begin actual construction before July 1, 2011 or seek a permit revision to include a minor source limit for the GHG emissions; otherwise a PSD permit for GHGs will be required.
GHG Applicability Flow Chart:
New Sources (January 2, 2011 through June 30, 2011) (cont’d)

1. From prior page

2. Calculate the GHG emissions on a CO₂ equivalent (CO₂e) basis using the global warming potential factors applied to the mass of each of the 6 GHG pollutants.

3. Are the potential GHG emissions equal to or greater than 75,000 TYP?

   - NO: GHG emissions are not subject to PSD as part of this permit review.

   - YES: GHG emissions are subject to PSD as part of this permit review.

*The mass-based emission threshold of zero TYP has been excluded from this flow chart because any new source that meets the 75,000 TYP CO₂e requirement would automatically exceed that mass-based rate.*
GHG Applicability Flow Chart:
New Sources (On or after July 1, 2011)

1. Will the permit be issued on or after July 1, 2011?
   - YES
   - NO

   2. Determine the new source's potential to emit (PTE) in tons per year (TPY) for each of the 6 GHG pollutants (CO₂, CH₄, N₂O, HFCs, PFCs, and SF₆) taking into account enforceable limits.

   3. Calculate the GHG emissions on a CO₂ equivalent (CO₂e) basis using the global warming potential factors applied to the mass of each of the 6 GHG pollutants.

   4. Are the potential GHG emissions on a CO₂e basis equal to or greater than 100,000 TPY?
      - YES
      - NO

      If earlier, see New Source Flow Chart in Appendix A.

      Go to next page
GHG Applicability Flow Chart: New Sources (On or after July 1, 2011) (cont’d)

5 Calculate the total GHG emissions on a mass basis.

Are the potential GHG emissions on a mass basis less than 1% TPI (or 100 TPI if the new source is in a listed category)?

YES

NO

6 Are the potential GHG emissions equal to or greater than 75,000 TPI?

YES

NO

7 Is this a new stationary source subject to PSD for a regulated NGR pollutant other than GHGs?

YES

NO

*The mass-based emission threshold of more TPI has been excluded from this flow chart because any new source that meets the 75,000 TPI CO2e requirement would automatically exceed that mass-based test.
GHG Applicability Flow Chart: Existing Sources (January 2, 2011 through June 30, 2011)

1. Will the permit be issued on or after January 2, 2011 but before July 1, 2011?
   - NO
   - See Existing Source Flow Chart in Appendix D
   - YES

2. Will the permit be issued on or after July 1, 2011?
   - NO
   - GOHS emissions are not subject to PSD as part of this permit review
   - YES

3. Is this modification subject to PSD permitting for a source or new source for any of the 6 GHG pollutants (CO2, CH4, N2O, HFCs, PFCs and SF6)?
   - NO
   - GOHS emissions are not subject to PSD as part of this permit review
   - YES

4. Determine the past actual (historical) emissions in tons per year (TPY) for units that are part of the modification for each of the 6 GHG pollutants.
   - For new units, the past actual emissions are zero.

5. Determine the future projected actual emissions (or PTE) in TPY for units that are part of the modification for each of the 6 GHG pollutants.
   - For new units that are not like-kind replacements, future actual emissions are always the PTE.

NOTE: If a source commenced constructio prior to Jan 2, 2011, which does not contain synthetic natural gas emissions or GOHS emissions and does not require modifications on a TPY of GOHS emissions that would trigger PSD on or after July 1, 2011, then the source must begin actual construction before July 1, 2011.

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GHG Applicability Flow Chart: Existing Sources (January 2, 2011 through June 30, 2011) (cont’d)
GHG Applicability Flow Chart: Existing Sources (January 2, 2011 through June 30, 2011) (cont’d)
GHG Applicability Flow Chart: Existing Sources (January 2, 2011 through June 30, 2011) (cont’d)
GHG Applicability Flow Chart: Existing Sources (On or after July 1, 2011)

START

1. Will the permit be issued on or after July 1, 2011?
   YES
   NO
   2. In this modification, subject to the plan permitting for a regulated VOC or pollutant other than GHGs?
      NO
      YES
      3. Determine the potential to emit (PTE) for the existing source(s) before the modification, for each of the 6 GHG pollutants: CO₂, CH₄, N₂O, HFCs, PFCs and SF₆. Determine the mass based sum. Correct the emissions of GHG pollutants in their CO₂e emissions, using the global warming potential factor, applied to the mass of each of the 6 GHG pollutants and sum the CO₂e emissions.

3. Are the potential GHG emissions equal or greater than both 100,000 TPT (CO₂e and 25C TPT total) or a mass based?
   YES
   NO
   4. Determine the past actual (baseline) in tons per year (TPY) for each of the GHG pollutants: CO₂, CH₄, N₂O, HFCs, PFCs and SF₆. (For new source, the past actual emissions are zero.)

4. Are GHG emissions of the modification equal or greater than both 100,000 TPY (CO₂e and 25C TPY total) or a mass based?
   YES
   NO
   5. GHS emissions are subject to RPS in part of this permit
      NO
      YES
      GHS emissions are subject to RPS in part of the permit review.
GHG Applicability Flow Chart:
Existing Sources (On or after July 1, 2011)
GHG Applicability Flow Chart:  
Existing Sources (On or after July 1, 2011)

1. Previous year

2. Is the CO₂e net of the increase over 50,000 TFP CO₂e?
   - NO
   - YES

3. Contemporaneous netting analysis is required. Identify all contemporaneous credible increases and decreases in emissions for each of the 6 GHG pollutants on a mass basis. (Credible decreases are only those that have not been relied upon in prior PSD review and will be practically achievable by the time construction begins)

4. For each credible activity or event, determine the increase or decrease in emissions for each of the 6 GHG pollutants.

5. Sum the increases and decreases, including the increases and decreases from the proposed modifications, for each of the 6 GHG pollutants on a mass basis.

6. Calculate the net GHG emissions on a mass basis.

7. Are the net GHG emissions on a mass basis over 50 TFP?
   - NO
   - YES

8. Go to next year

9. GHG emissions are not subject to PSD as part of this permit review.
GHG Applicability Flow Chart: Existing Sources (On or after July 1, 2011)