Shell Chemical Appalachia LLC
Shell Oil Company
One Shell Plaza
910 Louisiana Street
Houston, TX 77002

August 15, 2016

Krishnan Ramamurthy, Air Chief
Air Quality Program
Pennsylvania Department of Environmental Protection
Rachel Carson State Office Building
400 Market Street
Harrisburg, PA 17101

RE: **Updated Request for Approval of Interprecursor Offset Trading between VOC and NOx for the Construction of the Shell Chemical Appalachia LLC - Petrochemicals Complex**

Dear Mr. Ramamurthy:

By letter of April 27, 2016, Shell Chemical Appalachia LLC (Shell) requested approval of interprecursor offset trading between VOC and NOx. This request was further supported by Shell's letter of May 10, 2016, which provided supplemental modeling results that supported the original request. In response to these submittals, on August 3, 2016 Shell received an email from the Department requesting that the prior submittals be revised to address questions raised by the Department/EPA. This letter provides the requested updated/revision by combining the information provided in the prior two submittals and addressing the questions.

On June 18, 2015, the Pennsylvania Department of Environmental Protection (PADEP) issued Plan Approval Permit #04-00740A (Plan Approval) for Shell Chemical Appalachia LLC's (Shell) proposed petrochemicals complex. Section C, Condition #037 of the permit requires Shell to secure 620 tons of volatile organic compound (VOC) emissions reduction credits (ERCs). Air shed modeling performed to evaluate the effectiveness of VOC and NOx controls has concluded that the air shed in western Pennsylvania where the proposed facility will be located is NOx-limited (i.e., reducing NOx emissions from the air shed in western Pennsylvania results in equivalent or greater decreases in the ozone level than do reductions in VOC).[1,2,3] As a result, in accordance with 25 Pa. Code § 127.206(o), with this letter Shell is requesting PADEP and EPA provide written approval for the use of interprecursor NOx ERCs in place of VOC ERCs to comply with the Section C, Condition #037 offset requirement of the Plan Approval.

In support of this request this letter provides the following information:

- Source Information,
- Emissions Offsets/Credits, and
- Ozone Transport Region (OTR) Air Shed Modeling Results and Conclusions

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[1] OTC Modeling Committee, "OTC Modeling Related to the Effectiveness of VOC and NOx Controls," 2012.
[2] Vinciguerra Tim, Emily Bull, Timothy Canty, Hao He, Eric Zalewsky, Michael Woodman, Sheryl Ehrman, Russell Dickerson, "Expected Ozone Benefits from EGU NOx Reductions." http://slideplayer.com/slide/8518941/
[3] Underhill, Jeff, Jeffrey.Underhill@des.nh.gov, May 3, 2016, message to Phillip May (may@rtpenv.com), Sent 10:10 AM, [Accessed May 3, 2016], NOTR Airshed Modeling Results.

Source Information

The objective of the proposed project is to convert ethane into ethylene and then to convert ethylene into linear, low-density polyethylene (LLDPE) and high-density polyethylene (HDPE) pellets that can be shipped to plastic manufacturing facilities. The LLDPE and HDPE manufacturing processes begin with the pyrolysis of ethane to ethylene using large pyrolysis furnaces. The ethylene in the pyrolysis gas exiting the furnaces is then separated and purified prior to being converted into LLDPE and HDPE pellets. The feedstock ethane for the proposed project is a product of shale gas production in Pennsylvania and neighboring states. A number of utilities are required to support the production processes including: steam, electricity, process water, cooling water, wastewater treatment, tanks, flares, storage and loading operations. A natural gas-fired combustion turbine combined cycle cogeneration plant will produce the steam and electricity needed to support the production processes. To support the other utility needs of the production processes, the project includes cooling towers, a wastewater treatment plant, storage tanks and silos, loadout facilities, emergency use engines, and VOC control systems (i.e., thermal incinerators and flares).

The project site, which was previously occupied by Horsehead Corporation's zinc production facility,[4] adjoins the Ohio River in Potter and Center Townships in Beaver County. Beaver County, which is included in the Pittsburgh-Beaver Valley designation area,[5] is designated as nonattainment for ozone.[6,7] An air quality plan approval application for the proposed project was submitted to PADEP in May 2014 and an update to the application was submitted in February of 2015. In response to these actions, on June 18, 2015, PADEP issued the Plan Approval.

The proposed project is a major facility for NOx and VOC and located in an area designated as nonattainment for ozone. As a result, the project is subject to the nonattainment NSR requirements at 25 Pa. Code § 127.201 for NOx and VOC. Per 25 Pa. Code § 127.205, the project is required to offset the potential to emit of the project with ERCs in accordance with 25 Pa. Code § 127.210. This requirement is implemented through Condition #037 in Section C of the Plan Approval.

Emissions Offsets/Credits

Condition #037 in Section C of the Plan Approval requires Shell to secure NOx and VOC ERCs, 400 and 620 tons, respectively. To comply with this requirement Shell has to date secured the NOx and VOC ERCs summarized in Table 1 (see Attachment A).[8] As shown, a total of 107 tons of VOC ERCs and 1110.6 tons of NOx ERCs have been secured. All of the secured NOx and VOC ERCs were obtained from within the Pittsburgh-Beaver Valley designation area and all of

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[4] The Horsehead facility included a coal-fired power plant, zinc smelters, process equipment, and supporting utilities needed to support the recycle and produce zinc from ore.

[5] The Pittsburgh-Beaver Valley designation area comprises the following counties: Allegheny, Armstrong, Beaver, Butler, Fayette, Washington, and Westmoreland.

[6] See 40 CFR § 81.339.

[7] In addition, all of Pennsylvania is designated nonattainment for ozone because it is a part of the Northeast Ozone Transport Region (NOTR) that was defined in the 1990 Clean Air Act Amendments.

[8] Attachment A contains the approval letters from PADEP indicating registry and ownership of the ERCs listed in Table 1.

Table 1. Shell Chemical Appalachia LLC – Petrochemical Complex Ozone Precursor ERC Summary

Description	Expiration Date	ERC Origin Location[1]	VOC (Tons)	NO_X (Tons)
ERCs Required by Plan Approval			620	400
ERC Locations				
• G.F. Wheaton Power Plant	9/11/21	Beaver County	9	899.6
• Monaca Zinc Smelter	4/26/24	Beaver County	64	211
• First Energy Armstrong Unit 1	8/31/22	Armstrong County	10.18	--
• First Energy Mitchell Unit 3	10/4/23	Washington County	13	--
• First Energy Armstrong Unit 1	7/21/22	Armstrong County	10.82	--
Total ERCs Secured			107.00	1,110.6

[1] In accordance with 40 CFR 81, the Pittsburgh-Beaver Valley designation area includes the following counties: Allegheny, Armstrong, Beaver, Butler, Fayette, Washington, and Westmoreland.

the NOx ERCs were secured from emissions units that previously occupied the proposed projects future location. Thus, the ERCs that will be used to meet the Section C Condition #037 offset requirement have been secured from the same designation area (i.e., Pittsburgh-Beaver Valley). As a result, the ERCs meet the statutory requirement at Section 173(c)(1) because they were generated within the same nonattainment area as follows:[9]

> *The owner or operator of a new or modified major stationary source may comply with any offset requirement in effect under this part for increased emissions of any air pollutant only by obtaining emission reductions of such air pollutant from the* ***same source or other sources in the same nonattainment area****,* [emphasis added] *except that the State may allow the owner or operator of a source to obtain such emission reductions in another nonattainment area if (A) the other area has an equal or higher nonattainment classification than the area in which the source is located and (B) emissions from such other area contribute to a violation of the national ambient air quality standard in the nonattainment area in which the source is located.*

Similarly, the location of the ERCs will meet the requirement in the Pennsylvania SIP at 25 Pa. Code § 127.208(10) and federal nonattainment NSR rule at section IV of appendix S to 40 CFR part 51 as follows:

> 25 Pa. Code § 127.208(10)
>
> *(10) An owner or operator of a facility shall acquire ERCs for use as offsets from an ERC generating facility located within the same nonattainment area.*
>
> Section IV of Appendix S to 40 CFR Part 51
>
> IV.A, Condition 4. *The emission offsets will provide a positive net air quality benefit in the affected area (see Section IV.D. below). Atmospheric simulation modeling is not necessary for volatile organic compounds and NO_X. Fulfillment of Condition 3 and Section IV.D will be considered adequate to meet this condition.*

[9] The Horsehead facility is not technically a part of the same "facility" as defined at 25 Pa. Code § 121.1 but the location of the two facilities (i.e., Horsehead and proposed Shell Appalachia facility) is the same.

> Condition 3. *Emission reductions (offsets) from existing sources[5] in the area of the proposed source (whether or not under the same ownership) are required such that there will be reasonable progress toward attainment of the applicable NAAQS.*[10] . . .
>
> Section IV.D. *Location of offsetting emissions. The owner or operator of a new or modified major stationary source may comply with any offset requirement in effect under this Ruling for increased emissions of any air pollutant only by obtaining emissions reductions of such air pollutant from the same source or other sources in the same nonattainment area,* [emphasis added] . . .

Use of the ERCs generated by facilities within the Pittsburgh-Beaver Valley designation area ensures that the requirement to obtain offsets from the same nonattainment area is met.

The definition of "regulated NSR pollutant" at 25 Pa. § Code 121.1 states that VOC and NO_x are precursors to ozone in all ozone nonattainment areas. Per the ERC general requirements at 25 Pa. Code § 127.206(o), with approval by the Department and EPA, interprecursor offset trading is allowed (i.e., use of NOx, an ozone precursor, in place of VOC, an ozone precursor, for purposes of netting or offsets).[11] As a result, due to the availability of NOx ERCs at the same location as the proposed project, Shell is requesting to use NOx ERCs to comply with the Section C Condition #037 VOC offset requirement in Section C of the Plan Approval.

All of the NOx ERCs that Shell is requesting approval to use as interprecursor offsets have been certified by PADEP and as noted above have been registered to Shell.[12] Inclusion of the ERCs in the registry indicates that the information needed to ensure that the requirements of 25 Pa. Code § § 127.206—127.208 (relating to ERC general requirements; creditable emissions decrease or ERC generation and creation; and ERC use and transfer requirements) have been met. By letter of April 11, 2016, in accordance with the Section C Conditions #037 and #038 Shell submitted a modification application to incorporate the ERCs presented in Table 1 into the plan approval.[13]

OTR Air Shed Modeling Results and Conclusions

The rate of ozone production can be limited by either VOC or NOx. In general, ozone formation using these two precursors is reliant upon the relative sources of hydroxide (OH) and NOx. When the rate of OH production is greater than the rate of NOx production, indicating that NOx is in short supply, the rate of ozone production is NOx-limited. In this situation, lowering the current and future NOx emissions more effectively reduces the ozone concentration than lowering emissions of VOC. When the rate of OH production is less than the rate of production of NOx, ozone production is VOC-limited. When this occurs, lowering the VOC emissions most effectively reduces ozone formation. Between the NOx- and VOC-limited extremes there is a transitional region where ozone is nearly equally sensitive to each species. However ozone is relatively insensitive to marginal changes in both NOx and VOC in this situation. In urban areas with a high population concentration, ozone is often VOC-limited. Ozone is generally NOx-limited in rural areas and downwind suburban areas.[14]

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[10] The discussion in this paragraph is a proposal, but represents EPA's interim policy until final rulemaking is completed.

[11] Similar language allowing for interprecursor trading is found in the federal nonattainment NSR regulations at section IV.A, condition 3 of appendix S to 40 CFR part 51, which states *"Emission reductions (offsets) from existing sources in the area of the proposed source (whether or not under the same ownership) are required such that there will be reasonable progress toward attainment of the applicable NAAQS."*

[12] http://files.dep.state.pa.us/Air/AirQuality/AQPortalFiles/Permits/erc/ERC_PA_Report.pdf

[13] In accordance with 25 Pa. Code §127.206a and 208, Conditions #037 and #038 set out the general ERC requirements and transfer requirements, respectively.

[14] https://www3.epa.gov/ttnecas1/regdata/RIAs/2-ozoneriachapter2.pdf

Recently completed air shed modeling demonstrates that western Pennsylvania is NOx-limited with respect to the formation of ground level ozone. The following discussion provides additional details related to that modeling.

In a 2012 presentation, modeling performed by the OTC Modeling committee considered the impact on ozone formation of doubling the OnRoad NOx versus doubling OnRoad VOC emissions. The results of that analysis are presented in slides 5 and 6 of Attachment B, respectively. As shown in slide 5, when OnRoad NOx emissions are doubled, the ozone levels in Beaver County, which is located in western Pennsylvania along the Ohio border, are predicted to increase 5 to 10 ppb. When the OnRoad VOC emissions are doubled, as shown in slide 6, the ozone levels in western Pennsylvania are predicted to decrease by 1 to 5 ppb. Based on these results, it can be concluded that the formation of ozone in Beaver County is NOx-limited (i.e., reducing NOx emissions from the air shed results in equivalent or greater decreases in the ozone than does reductions in VOC). This result is consistent with an earlier study performed by U.S. EPA which showed that in general, NOx controls applied in the Northeast Ozone Transport Region are more beneficial than VOC controls.[15]

The benefits of NOx reductions on ozone levels were also affirmed in a 2013 modeling study performed by a group of technical experts from The University of Maryland, the Maryland Department of Environment, and the New York State Department of Environmental Conservation. This study determined the expected impacts on ozone levels resulting from electric generating unit (EGU) NOx reductions across the multi-state area shown in slide 3 of Attachment C. As shown in slide 4, the evaluation considered scenarios ranging from increasing NOx to the worst case NOx rates between 2005-2012 (Scenario 3B) to the decreases associated with running the EGUs at the best rates (i.e., lowest rates) during the same period (Scenario 3A). All of the scenarios were compared to a 2018 Base Case, which was defined by the expected ozone levels resulting from predicted 2018 NOx emissions rates (slide 7). The Scenario 3A results, on the left side of slide 8, show predicted ozone concentrations in Western Pennsylvania between approximately the upper 60's and low 70's ppb. As shown on the right side of slide 8, the difference in ozone concentrations between the 2018 Base Case and those for Scenario 3A indicates a drop in the ozone level of approximately 3-5 ppb. This drop in ozone is a result of an EGU NOX reduction of 144,686 tons (see slide 13: 564,026 -419,340 tons). These results further support the conclusion that ozone formation in Beaver County is NOx-limited.

Attachment D presents the results obtained from rerunning three Pittsburgh area sensitivity model runs.[16] The reruns were performed using 2009 based emission inventories and 2002 meteorology with the CALGRID photochemical model. In each run, a target number of tons of anthropogenic emissions (i.e., 20 tons/day for NOx and 30 tons per day for VOC) were reduced from the 2009 inventory of sources located within a geographic box centered on Pittsburgh (see attachment). The yellow triangles in the attached slides indicate that the ozone level is reduced by one (1) and five (5) parts per billion (ppb), clear diamonds indicate no change (0), and green triangle indicated that the ozone level is increased by up to one (1) ppb. These results are consistent with the results of the other studies (see Attachments 2 and 3). More specifically, the results indicate that reducing NOx emissions (surface NOx, slide 1 or point source NOx, slide 2) results in a reduction in the local ozone level by up to 5 ppb and reductions in VOC do not move the model in a meaningful way (slide 3). There is one green triangle in the Pittsburgh area in the VOC model run. This is result is probably model noise rather than an indication that ozone goes up one (1) ppb.[17]

Based on the air shed modeling results summarized above, it can be concluded that the use of interprecursor NOx offsets in lieu of VOC offsets will ensure a greater level of progress toward attainment of the ozone standard than will the use of VOC offsets. As a result, in accordance with

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[15] The relative effectiveness of NOx and VOC strategies in reducing northeast U.S. ozone concentrations, Possiel, NC and Cox, WM, Water, Air, & Soil Pollution, ISSN 0049-6979, 01/1993, Volume 67, Issue 1-2, pp. 161 – 179.

[16] Underhill, Jeff, Jeffrery.Underhill@des.nh.gov, May 3, 2016, message to Phillip May (may@rtpenv.com), Sent 10:10 AM, [Accessed May 3, 2016], NOTR Airshed Modeling Results.

[17] Ibid.

25 Pa. Code § 127.206(o), Shell is requesting the Department and EPA approve the use of interprecursor NOx ERCs in place of VOC ERCs at a NOx:VOC ratio of 1:1 to comply with Plan Approval Permit #04-00740A Section C, Condition #037 offset requirement.

In accordance with this request, Shell proposes to used the currently secured ERCs as follows:

VOC ERCs:

- Per Condition #037 the required number of VOC ERCs is 620 tons.
- Use the currently secured 107 tons of VOC ERCs towards the Section C Condition #037 requirement.
- Based on a NOx:VOC interprecursor trading ratio of 1:1, use 513 tons of the currently secured NOx tons ERCs to meet the remainder of the Section C Condition #037 requirement.

NOx ERCs:

- Per Section C Condition #037 the required number of NOx ERCs is 400 tons.
- Use 400 tons of the remaining currently secured 597.6 tons of NOx ERCs to meet the Section C Condition #037 NOx ERC requirement.

If you have any questions or require additional information, please contact me at 281-731-3287 or jim.sewell@shell.com .

Sincerely,

H. James Sewell
Environmental Manager, Attorney-in-Fact
Shell Chemical Appalachia LLC

cc: Mark Gorog, PADEP, Southwest Regional Office
Phillip May, RTP Environmental Associates, Inc.

Attachments (4)

ATTACHMENT A

Approval Letters (PADEP) ERC
Registry and Ownership

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF AIR QUALITY

September 22, 2015

Mr. Edward J. Simpson
Vice-President, Commercial
Shell Chemical Appalachia LLC
One Shell Plaza
910 Louisiana
Houston, TX 77002-4916

RE: Shell Chemical Appalachia LLC, Beaver County, PA

Dear Mr. Simpson:

This is in response to your letter to the PA Department of Environmental Protection (DEP), received on September 2, 2015, requesting an ownership change for Group #1 ERCs consisting of 9.00 tons per year (tpy) of Volatile Organic Compounds (VOCs), 899.60 tpy of Nitrogen Oxide (NO_X), 1898.73 tpy of Sulfur Oxides (SO_X), 44.26 tpy of Particulate Matter-10 (PM10), 24.05 tpy of Particulate Matter-2.5 (PM2.5) and 64.20 tpy of Carbon Monoxide (CO) Emission Reduction Credits (ERC), expiring on September 11, 2021, and Group #2 ERCs consisting of 64.00 (tpy) of VOCs, 211.00 tpy of NO_X, 877.90 tpy of SO_X, 308.84 tpy of PM10, 34.10 tpy of PM2.5 and 21705.20 tpy of CO ERCs, expiring on April 26, 2024, currently held by Horsehead Corporation, Beaver County, Pennsylvania, to Shell Chemical Appalachia LLC, Beaver County, Pennsylvania. The Group #1 ERCs were created from the shutdown sources of two coal-fired Boiler Units # 034 and # 035 at the GF Wheaton Power Plant and the Group #2 ERCs at the Monaca Zinc Smelter (24 emission sources) of this facility, located at Monaca, Beaver County, PA.

The DEP has approved your request to change the ownership of the two groups of ERCs above, totally 73.00 tpy of VOCs, 1110.60 tpy of NO_X, 2776.63 tpy of SO_X, 353.10 tpy of PM10, 58.15 tpy of PM2.5 and 21769.40 tpy of CO. The DEP ERC Registry system shall be revised accordingly. These ERCs are now available for use by Shell Chemical Appalachia LLC in accordance with the requirements of 25 *Pa. Code* Chapter 127. Please note that these ERCs will expire as use as offset on September 11, 2021, and April 26, 2024, respectively, if they are not used and included in a permit prior to the expiration date.

If you have any questions or require additional information, please contact Stephen Todd by e-mail at steptodd@pa.gov or by telephone at 717.787.4325.

Sincerely,

Krishnan Ramamurthy, Chief
Division of Permits

cc: Mr. Ali Alavi, Horsehead Corporation
Mr. Mark Gorog, Southwest Regional Office, (DEP)
Mr. James M. Hensler, Horsehead Corporation
Mr. Jim Sewell, Shell Chemical Appalachia LLC

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

April 7, 2016

Mr. H. James Sewell
Attorney-in-Fact
Franklin Environmental Manager
Shell Chemical Appalachia LLC
300 Frankfort Road, (Shell Trailer)
Monaca, PA 15061

Re: Transfer of Emission Reduction Credits from FirstEnergy Solutions Corporation, PA to Shell Chemical Appalachia LLC, PA

Dear Mr. Sewell:

This letter is in reference to your letter received on November 13, 2015, requesting the Pennsylvania Department of Environmental Protection (DEP) to transfer a total of 140 tons per year (tpy) of Particulate Matter 2.5 (PM2.5) Emission Reduction Credits (ERCs) from FirstEnergy Solutions Corporation to Shell Chemical Appalachia LLC. The PM2.5 ERCs are created from two plants of FirstEnergy Solutions Corp. (FirstEnergy) (f.k.a. Allegheny Energy Supply Company, LLC). The 49 tpy of PM2.5 ERCs were created from the Armstrong Power Plant, Unit 1, Armstrong County, PA., which was shut down on August 31, 2012. The 91 tpy of PM2.5 ERCs are created from Mitchell Power Plant, Unit 3, Washington County, PA, which was shut down on October 4, 2013. These ERCs are to be used at Shell Chemical Appalachia's facility, Potter Township, Beaver County, PA.

The DEP is approving your request to transfer a total of 140 tpy of PM2.5 ERCs from FirstEnergy Solutions Corporation's facilities to the Shell Chemical Appalachia facility on April 8, 2016 and the ERC Registry system revised accordingly. These ERCs are now available for use at the Shell Chemical Appalachia LLC Petrochemical Complex, Potter Township, Beaver County, PA, in accordance with the requirements of 25 Pa. Code § Chapter 127 (relating to construction, modification, reactivation and operation of sources).

Under 25 Pa. Code § 127.206(f), the 49 tpy of PM2.5 ERCs generated from the shutdown of units, will expire on August 31, 2022, and the 91 tpy of PM2.5 ERCs will expire on October 4, 2023, if the ERCs are not included in a plan approval or operating permit prior to the expiration dates. It is our understanding that you are working with Southwest Regional Office for securing a plan approval which will incorporate these ERCs as used.

If you have any questions or require additional information, please contact Stephen Todd at Steptodd@pa.gov or telephone 717.787.4325.

Sincerely,

Krishnan Ramamurthy
Chief
Division of Permits

Enclosure

cc: Mr. Michael Jirousek, FirstEnergy Solutions Corporation
Mr. Jeremy Burnham, Shell Chemical Appalachia LLC
Mr. Jim Meehan, FirstEnergy Solutions Corporation
Mr. Mark Gorog, Southwest Regional Office (DEP)

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

March 24, 2016

Mr. H. James Sewell
Attorney-in-Fact
Environmental Manager
Shell Chemical Appalachia, LLC
One Shell Plaza, 910 Louisiana St.
Houston, TX 77002

Re: Transfer of Emission Reduction Credits from FirstEnergy Solutions Corporation, PA to Shell Chemical Appalachia, LLC, PA

Dear Mr. Sewell:

This letter is in reference to your letter received on November 13, 2015, requesting the Pennsylvania Department of Environmental Protection (DEP) to transfer a total of 34.00 tons per year (tpy) of Volatile Organic Compounds (VOCs) Emission Reduction Credits (ERCs) from FirstEnergy Solutions Corporation to Shell Chemical Appalachia, LLC. The VOC ERCs are created from two plants of FirstEnergy Solutions Corp. (FirstEnergy) (f.k.a. Allegheny Energy Supply Company, LLC). The 10.18 tpy of VOC ERCs were created from the Armstrong Power Plant, Unit 1, Armstrong County, PA., which was shut down on August 31, 2012. The 10.82 tpy of VOC ERCs were created from Armstrong Power Plant, Unit 2, Armstrong County, PA, which was shut down on July 21, 2012. The 13.00 tpy of VOC ERCs are created from Mitchell Power Plant, Unit 3, Washington County, PA, which was shut down on October 4, 2013. These ERCs are to be used at Shell Chemical Appalachia's facility, Potter Township, Beaver County, PA.

The DEP is approving your request to transfer a total of 34.00 tpy of VOCs ERCs from FirstEnergy Solutions Corporation's facilities to the Shell Chemical Appalachia facility on March 23, 2016 and the ERC Registry system revised accordingly. These ERCs are now available for use at the Shell Chemical Appalachia LLC Petrochemical Complex, Potter Township, Beaver County, PA, in accordance with the requirements of 25 Pa. Code § Chapter 127 (relating to construction, modification, reactivation and operation of sources).

Under 25 Pa. Code § 127.206(f), the 10.18 tpy of VOCs ERCs generated from the shutdown of units, will expire on August 31, 2022, the 10.82 tpy of VOCs ERCs will expire on July 21, 2022 and the 13.00 tpy of VOCs ERCs will expire on October 4, 2023, if the ERCs are not included in a plan approval or operating permit prior to the expiration dates. It is our understanding that you are working with Southwest Regional Office for securing a plan approval which will incorporate these ERCs as used.

If you have any questions or require additional information, please contact Stephen Todd at Steptodd@pa.gov or telephone 717.787.4325.

Sincerely,

Krishnan Ramamurthy
Chief
Division of Permits

Enclosure
cc: Mr. Mark Gorog, Southwest Regional Office (DEP)
Ms. Lauren Kisling, BGC Environmental Brokerage Services, L.P.
Mr. Cooper Marlowe, Sonoco Products Company

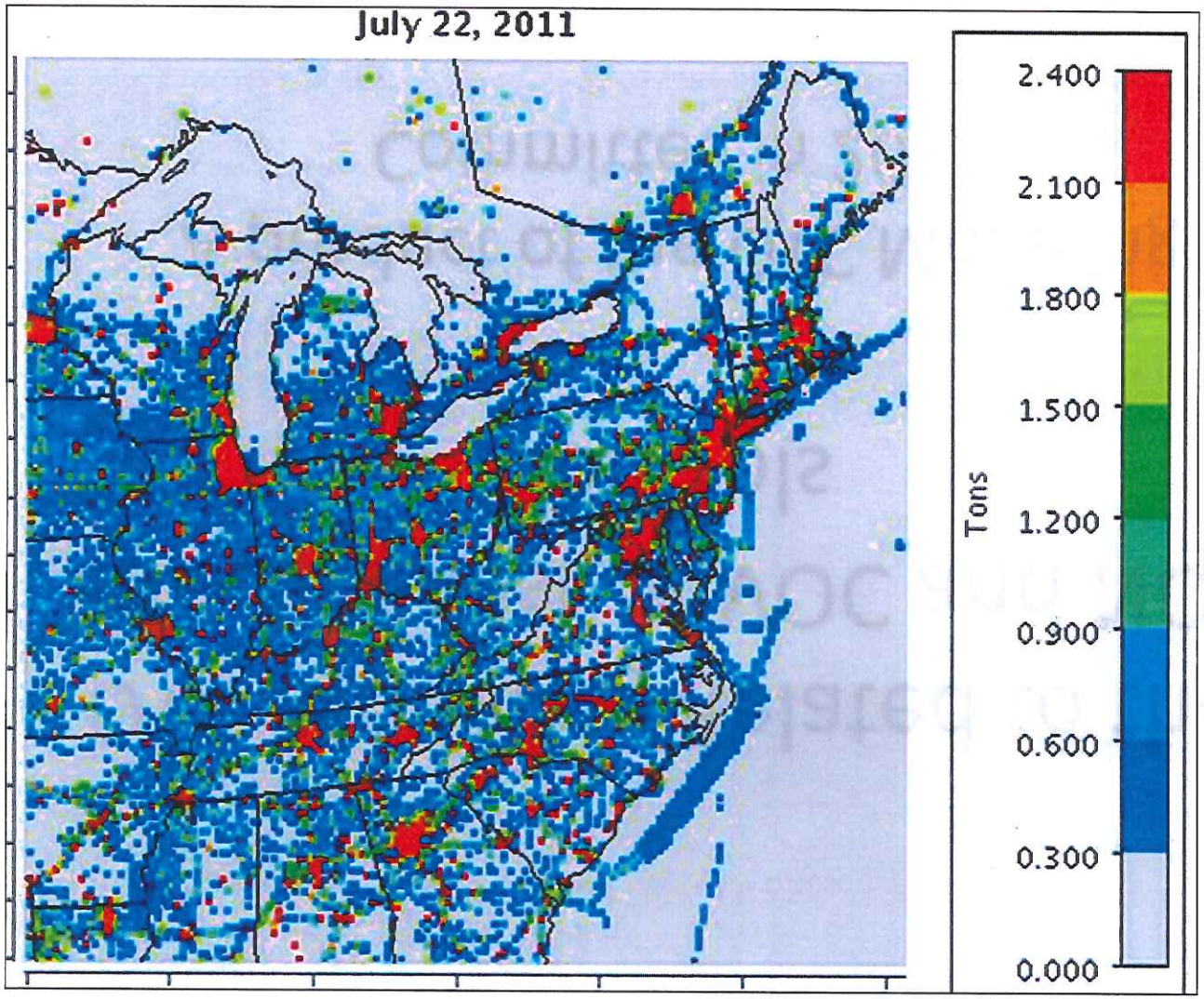
ATTACHMENT B

OTC Modeling Related to the Effectiveness of VOC and NOx Controls

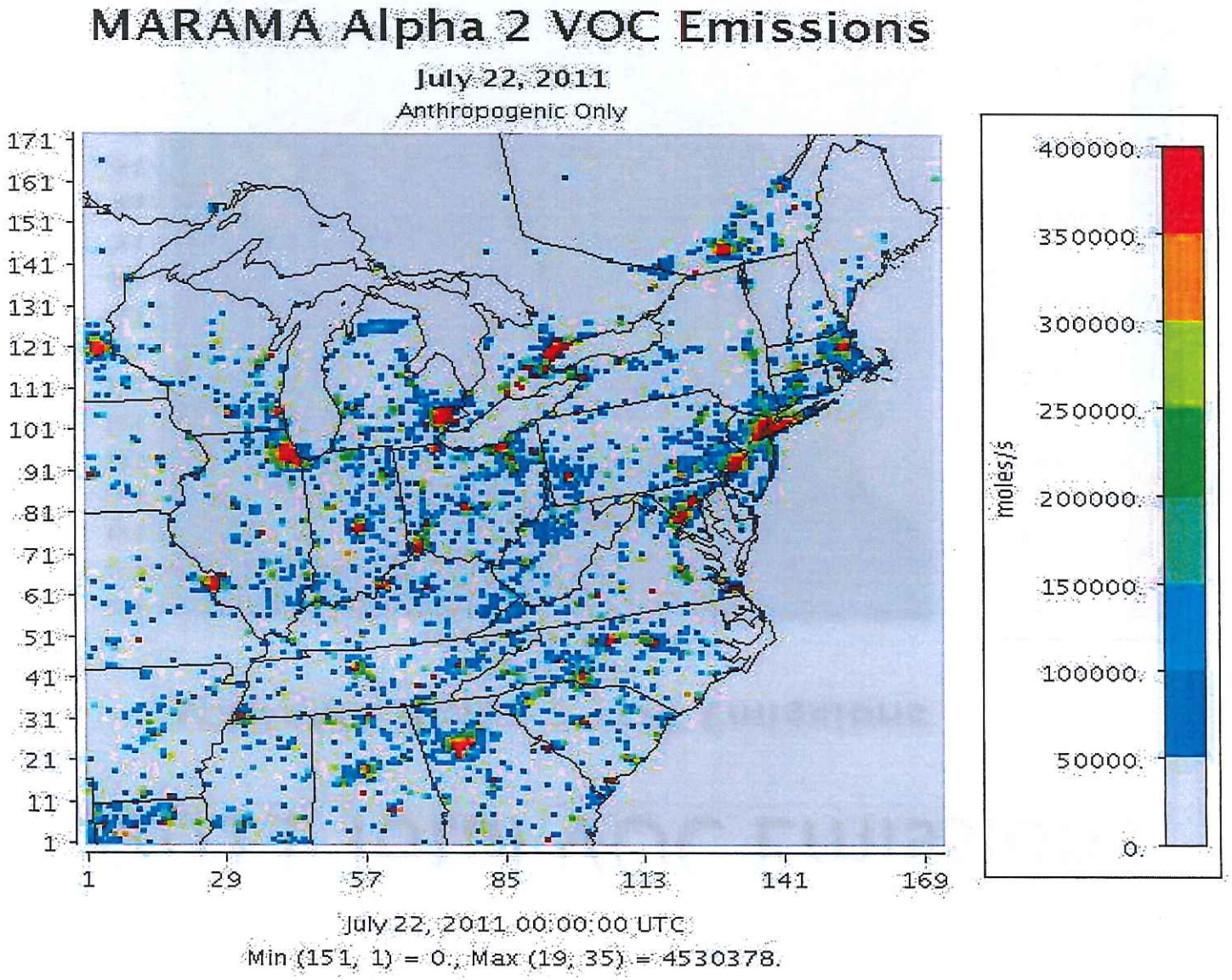
OTC Modeling Related to the Effectiveness of VOC and NOx Controls

A product of the OTC Modeling Committee in 2012

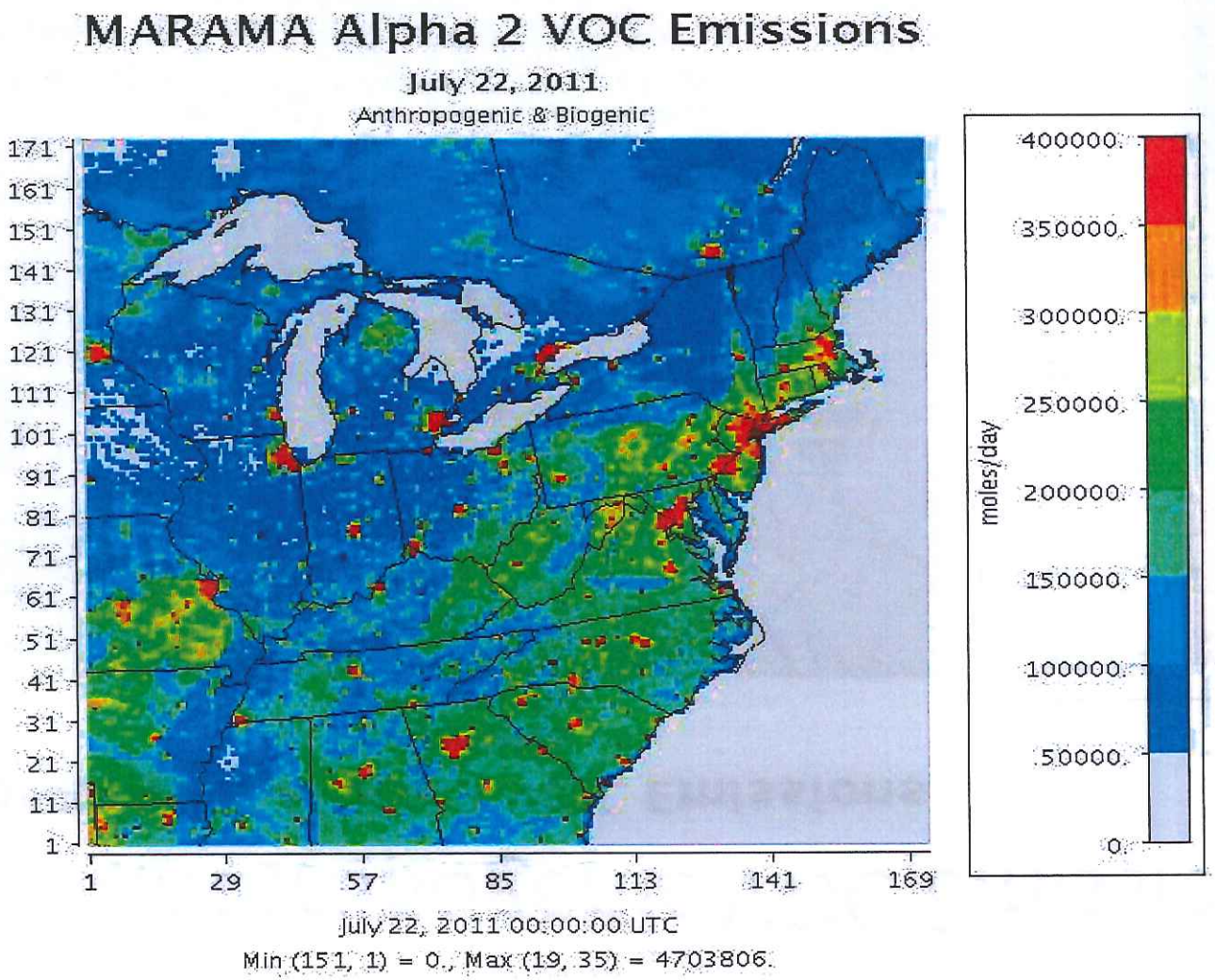
2011 Anthropogenic NOx Emissions



2011 Anthropogenic VOC Emissions

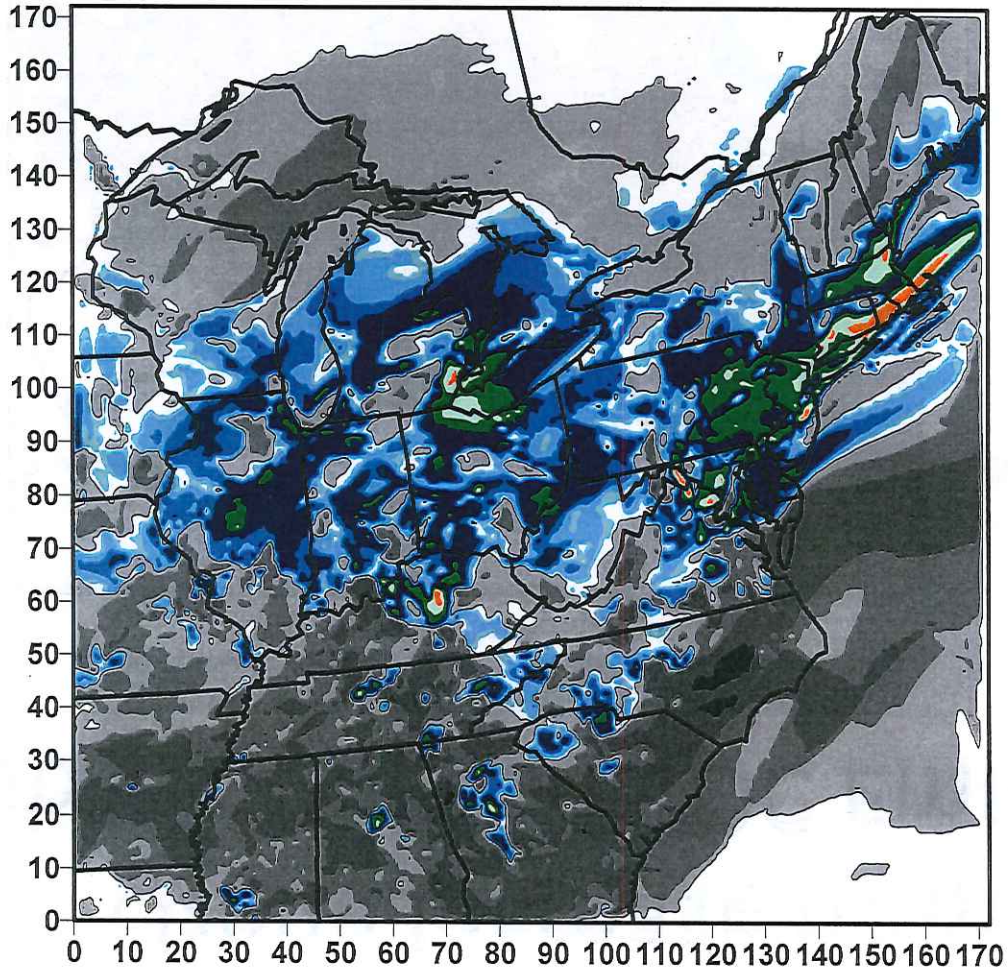


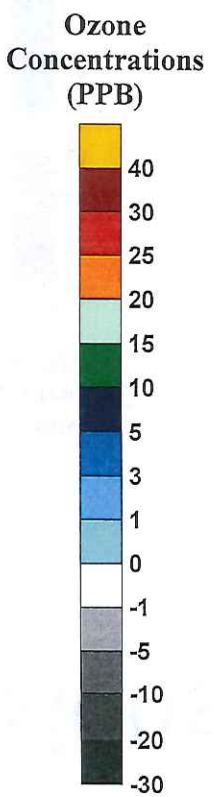
2011 Total VOC Emissions



Ozone Increase from Doubling OnRoad NOx Emissions

Maximum 8-Hour Ozone Difference Concentrations
2007 Base minus 2007 Base with 200% On-Road NOx
July 6-23, 2002 Modeling Episode

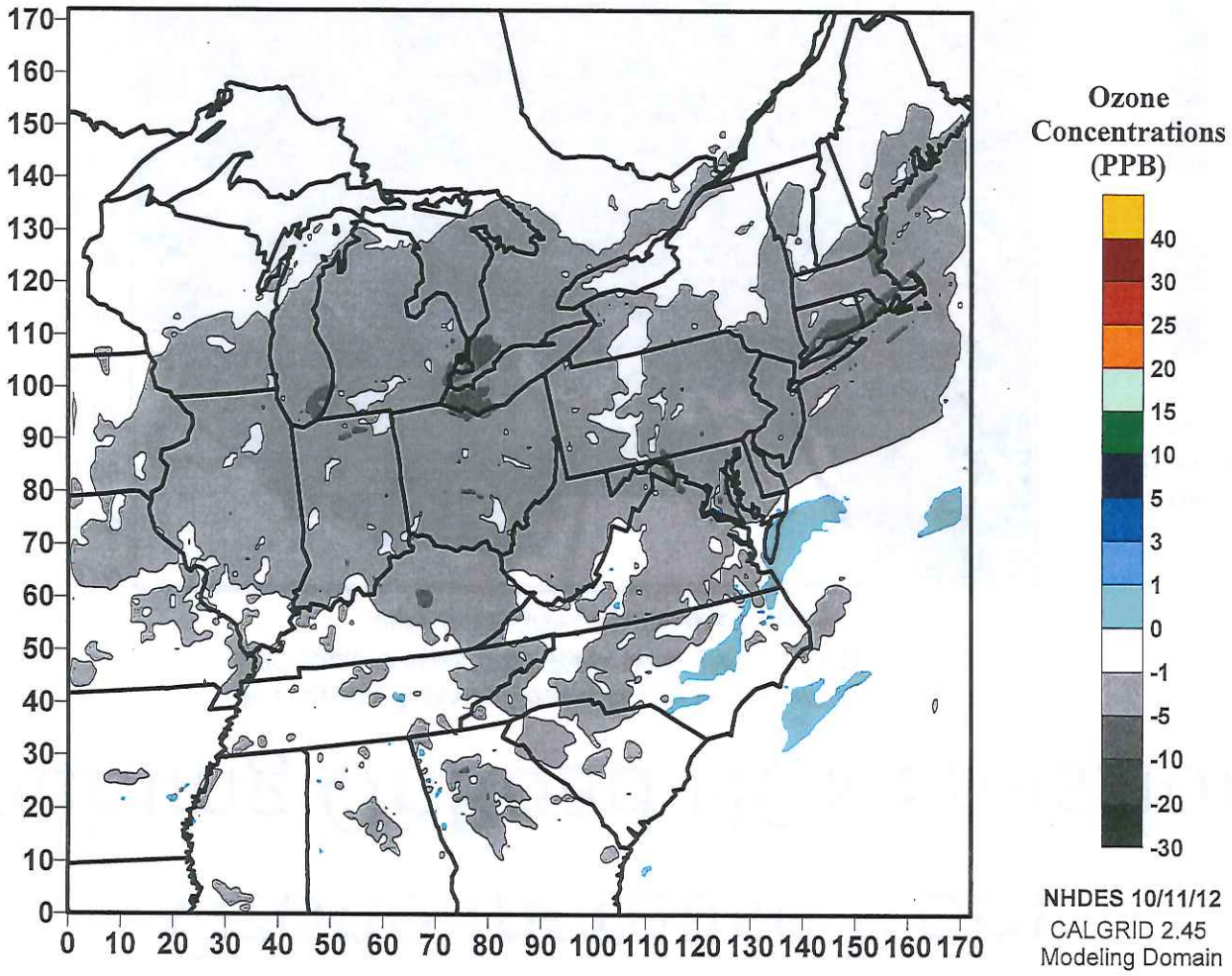




NHDES 10/11/12
CALGRID 2.45
Modeling Domain

Ozone Increase from Doubling OnRoad VOC Emissions

Maximum 8-Hour Ozone Difference Concentrations
2007 Base minus 2007 Base with 200% On-Road VOC
July 6-23, 2002 Modeling Episode



ATTACHMENT C

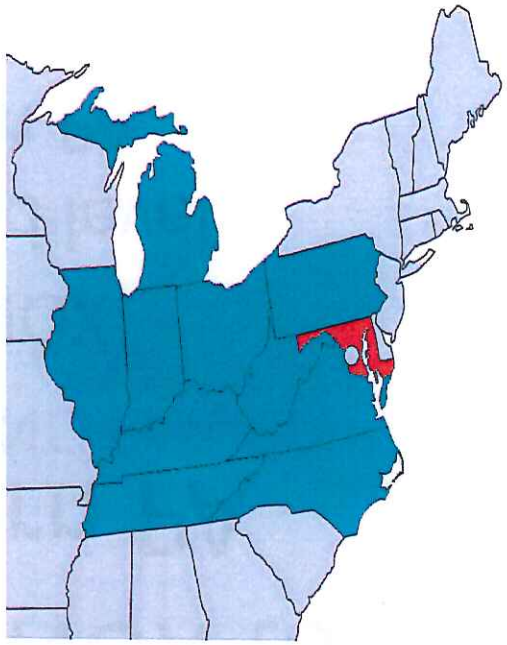
Interprecursor Trading of NOX to Control Ozone in Western PA

Interprecursor Trading of NOX to Control Ozone in Western PA

Show the impact of reducing NOX emissions on the predicted ground level ozone concentrations in Western PA.

July EGU NOx Reductions

- 2011 Baseline, 2018 Future Year
- July 2018 Sensitivity Runs
  - Representative of ozone season
- Evaluate ozone season CAMD data from 2005-2012

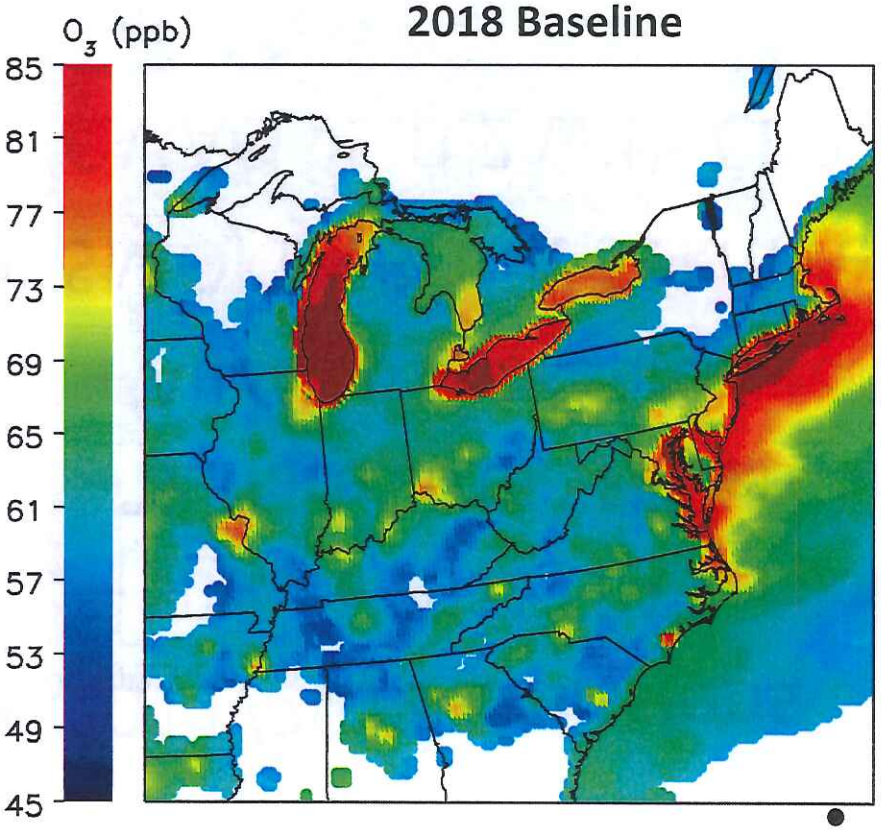


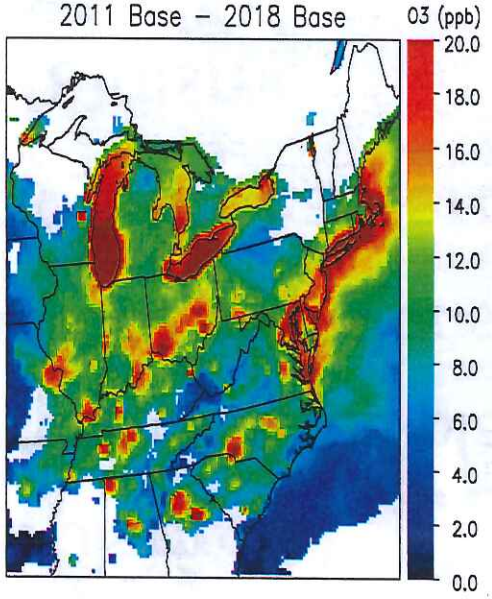
- Adjust 2018 EGU NOx from IPM 5.13 results for SCR/SNCR units in MD and surrounding states

Emissions and Models Used

- 2011/2018 Emissions
  - Surface 2011 EPA version 1 (ec platform)
  - Surface 2018 EPA version 1 future case (ed platform)
  - Added point sources to EPA surface emissions
- SMOKE v3.1 at 12km resolution for Eastern US
- CMAQ v5.0.2 with CB05 mechanism

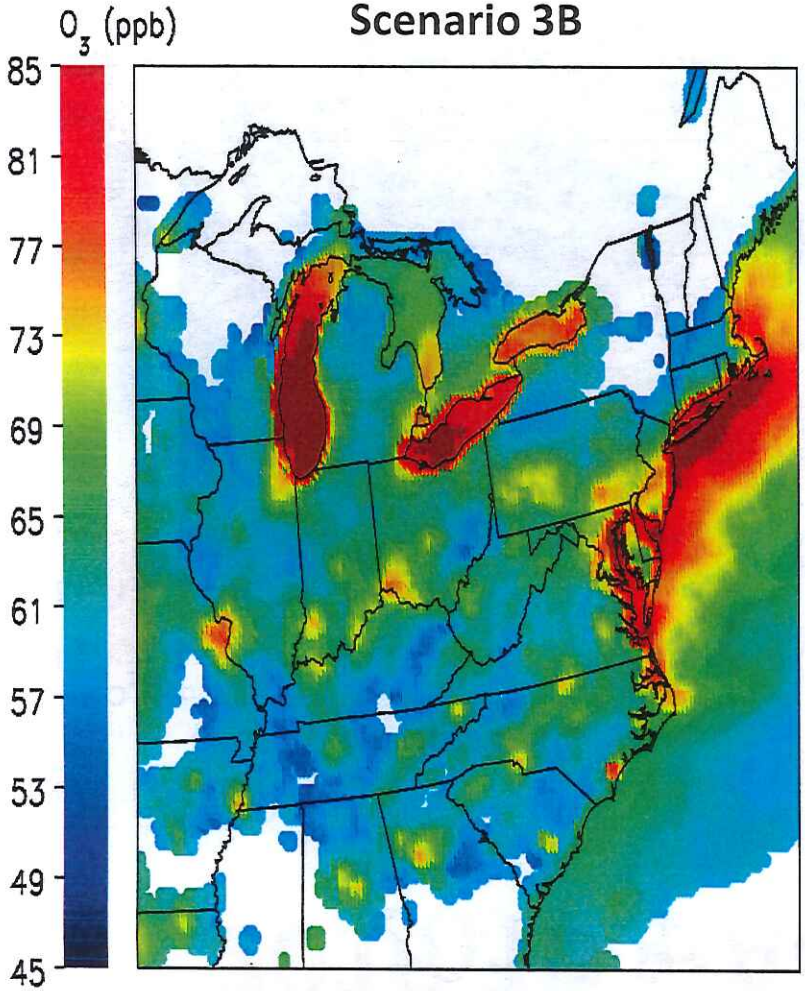
2018 Base

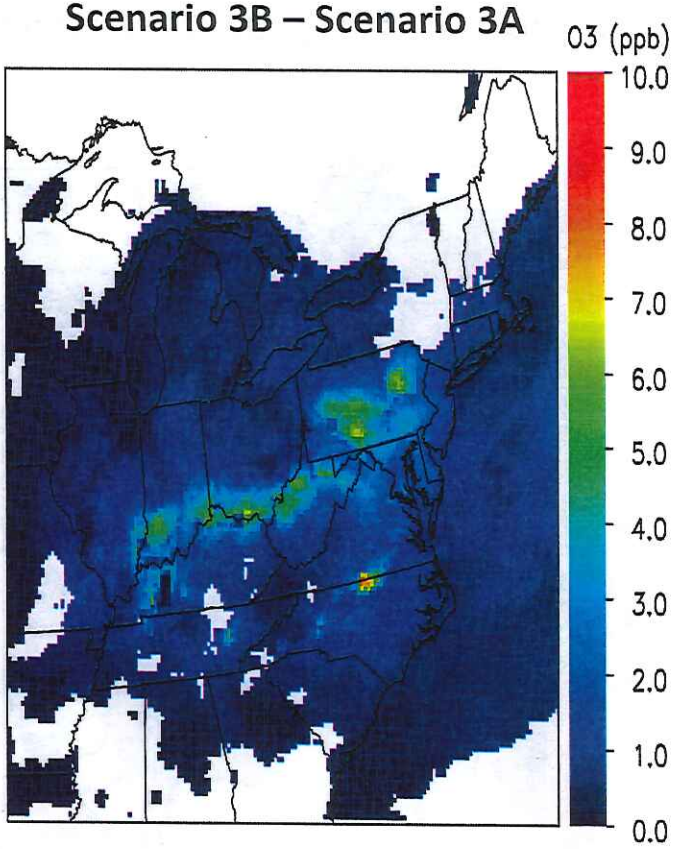




From 2011, large reductions from improvements across various sectors

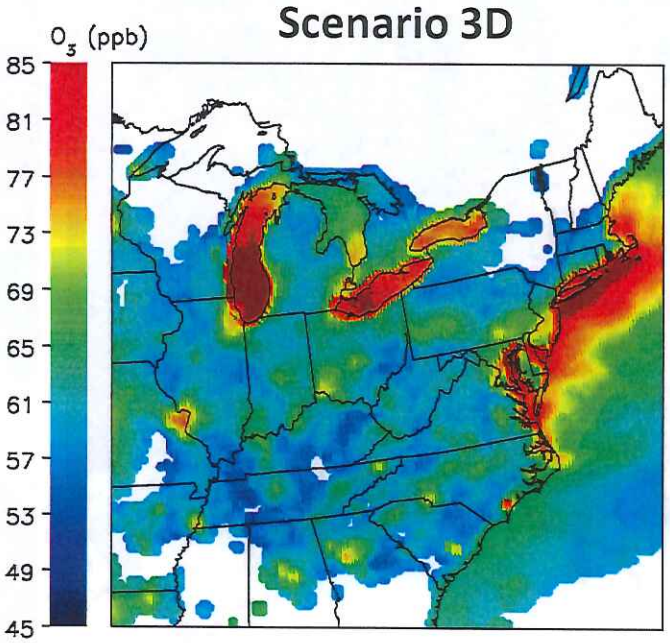
2018 3B – Worst Rates

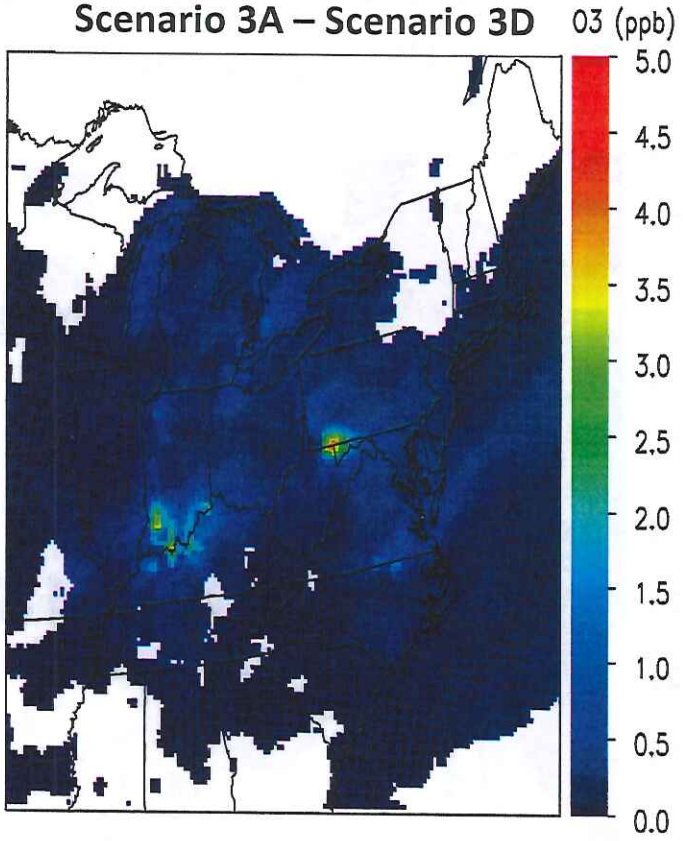




- Regions see 4-7 ppb difference between best and worst EGU rates

2018 3D – Added SCR Rates





- Can improve up to 2-4 ppb more with SCR on uncontrolled units

2011/2018 EGU NOx Emissions

ANNUAL EGU NOX [TONS]								
	State	EPA 2011	3B	3C	EPA 2018	3A	ATT-4	3D
MANEVU	MD	17,528	13,605	10,935	11,378	9,381	5,255	9,381
	PA	147,670	136,600	115,940	104,750	49,834	49,834	49,834
	VA	35,933	24,742	22,258	23,519	20,736	20,736	18,766
LADCO	IL	73,080	44,070	39,878	37,053	32,461	32,461	30,529
	IN	121,430	118,530	97,460	94,214	71,848	71,848	64,650
	MI	75,223	85,171	72,038	73,261	69,580	69,580	45,585
	OH	103,340	88,318	65,694	62,774	43,809	43,809	38,905
SESARM	KY	91,861	65,423	58,457	55,790	39,586	39,586	26,790
	NC	46,057	52,099	39,024	36,928	31,301	31,301	29,788
	TN	26,862	22,549	15,335	15,545	13,299	13,299	13,299
	WV	54,937	88,077	66,983	48,814	37,505	37,505	27,247
MANEVU		201,131	174,947	149,133	139,647	79,951	75,825	77,981
LADCO		373,073	336,089	275,070	267,302	217,698	217,698	179,669
SESARM		219,717	228,148	179,799	157,077	121,691	121,691	97,124
TOTAL		793,921	739,184	604,002	564,026	419,340	415,214	354,774

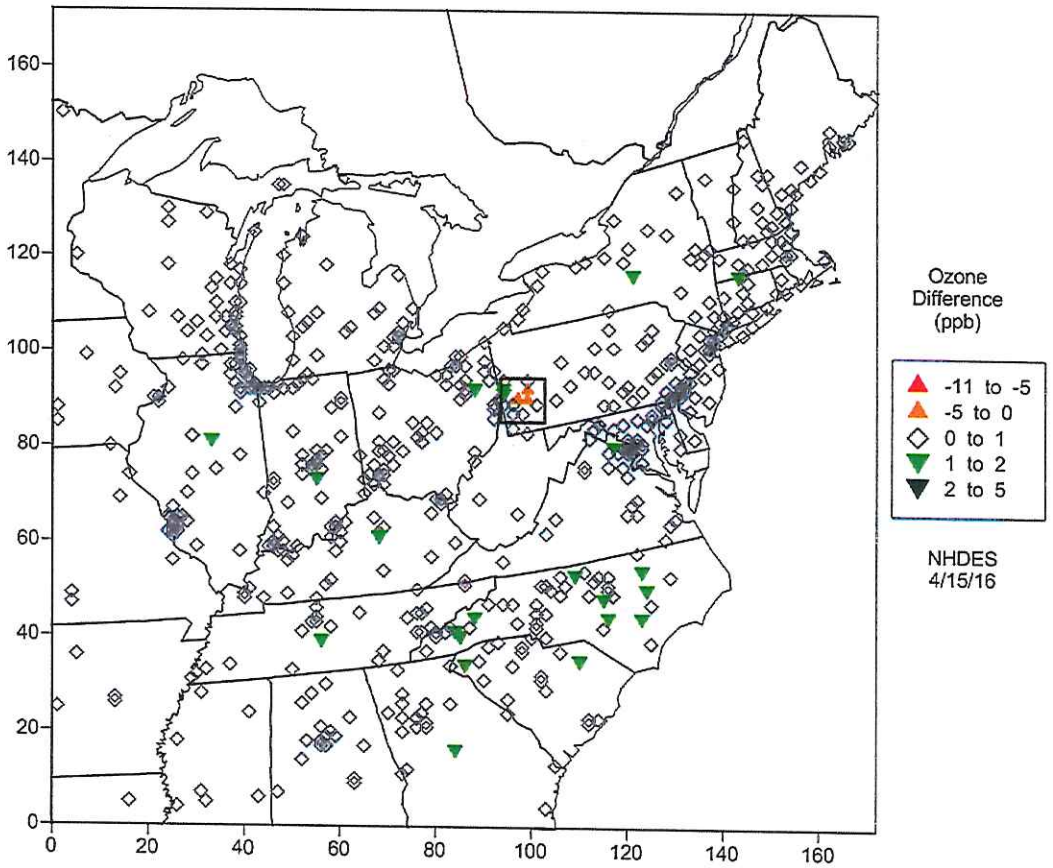
ATTACHMENT D

Results from Rerun of Three Pittsburgh Area Sensitivity Air Shed Model Runs

Maximum Predicted 8-Hour Ozone Difference Concentrations

2009 On the Books/On the Way Reducing 20 Tons per Day Surface NOx In the Pittsburgh Area

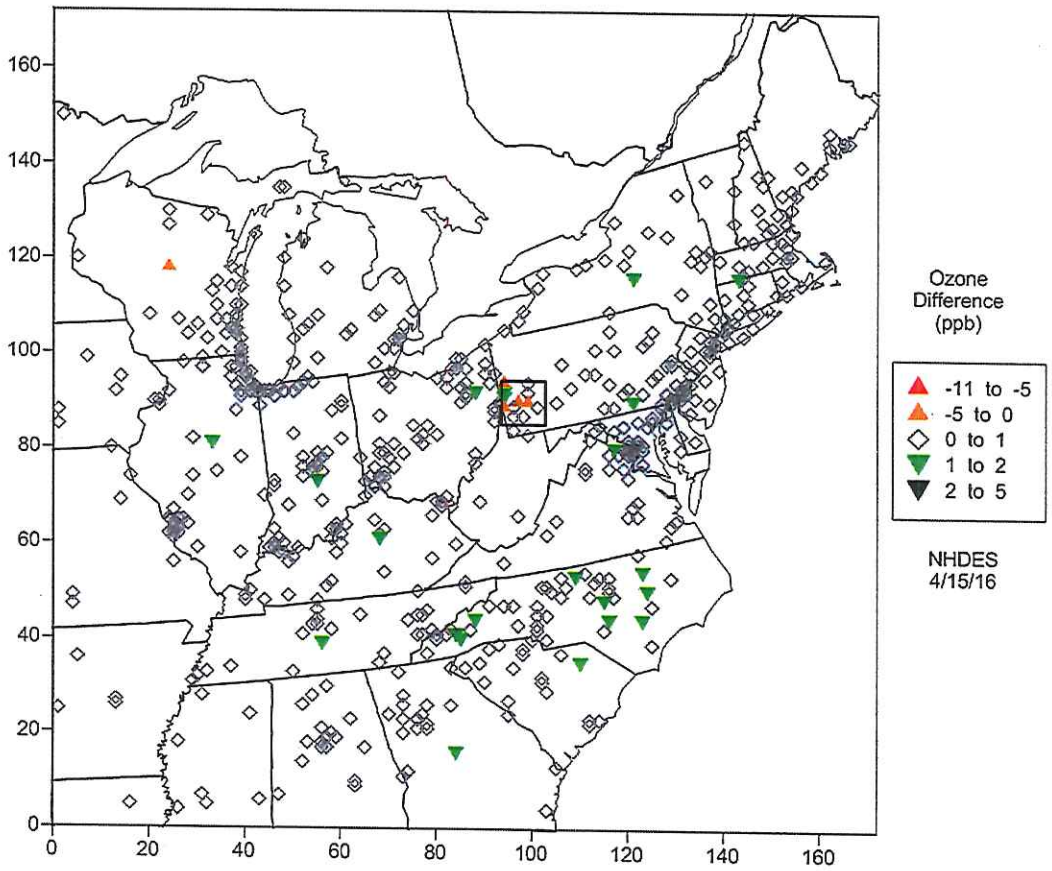
CALGRID 2.45 Modeling Domain, July 6-23, 2002 Episode



Maximum Predicted 8-Hour Ozone Difference Concentrations

2009 On the Books/On the Way Reducing 20 Tons per Day Point Source NOx In the Pittsburgh Area

CALGRID 2.45 Modeling Domain, July 6-23, 2002 Episode



Maximum Predicted 8-Hour Ozone Difference Concentrations

2009 On the Books/On the Way Reducing 30 Tons per Day VOC In the Pittsburgh Area

CALGRID 2.45 Modeling Domain, July 6-23, 2002 Episode