Chemours

# Fayetteville Works Meeting with NCDEQ Division of Air Quality

November 7, 2017

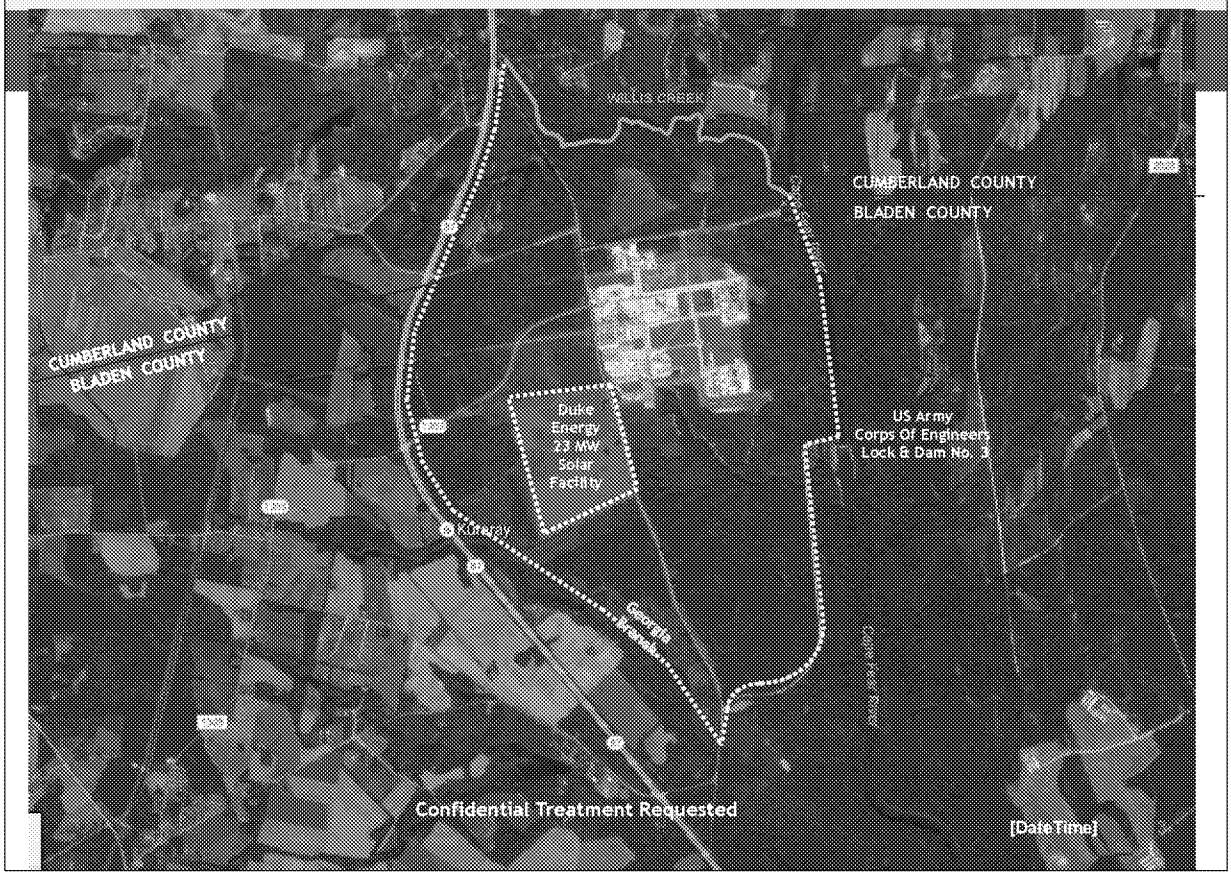
Note time!

Confidential Treatment Requested

# Agenda

- Air Emissions Reduction Efforts Already Undertaken
- Process Chemistry
- Emissions Chemistry
- Source Testing
- Air Emissions

# CHEMOURS COMPANY – FAYETTEVILLE WORKS

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# Air Emissions Reductions Already Undertaken

- Placed demister pad on the Division Stack to increase scrubber efficiency
- Raised pressure of ABR Feed Tank to reduce/eliminate venting
- Increased pressure of DAF ISO to reduce/eliminate venting
- Implemented LDAR program on AF lines that are not regulated to reduced leaks
- Upgraded tubing in Vinyl Ethers to reduce connections
- Replaced tubing with pipe in Vinyl Ethers to reduce potential for leaks
- Implemented process to isolate, investigate and correct when leaks are detected
- Implemented more sensitive helium leak detection program in HFPO
- Added lined pipe and low emission valves to HFP

# Process Chemistry

- Discussion of process chemistry and various products/campaigns raw materials, intermediates, and final products.



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# Fluoromonomers (FPS) / Nafion™ Membrane (IXM) Process Flow

CBI Redacted



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# Process Streams to be Tested

The following process streams are vented to the Division Waste Gas Scrubber (NCD-Hdrl):

- HFPO Refining
- VEN Crude Ether Process
- VEN Condensation
- Refined VE Process

The following processes are vented to the VE South Waste Gas Scrubber (NCD-Hdr2):

- Refining
- Condensation
- Agitated Bed Reactor

The following processes are vented to the PPA Waste Gas Scrubber (ACD-A1):

- AF Column Reboiler
- Purification
- 902 and 903/905 Processes

(Note that other emissions sources include process stack and fugitive emissions)

# Emissions Chemistry

- DAQ Question: Based on the expected chemicals emitted, what occurs in the atmosphere? Convert to other compounds?
  - Acid Fluoride, in general, when exposed to moisture in the atmosphere or sampling train, will be hydrolyzed and converted to the corresponding carboxylic acid
  - Current LC/MS/MS analysis will detect and quantify dimer acid (dimer acid fluoride, dimer acid salt will be converted to dimer acid in the stack sampling train)
  - The above will also apply to most other organic acid fluoride or acid salt

# Source Testing for C3 Dimer Acid

- Current Status
  - New sample nozzles and platforms installed on two of the stacks during plant annual shut down to prepare for stack testing – 3rd stack has existing nozzles
  - Draft protocol developed and sent to DAQ on October 31
- Chemours and its consultants have developed analytical methods to sample and test for C3 Dimer Acid
- The sampling and testing are intended to quantify C3 Dimer Acid emissions from the three stacks to the atmosphere
  - Will also include Dimer Acid Fluoride as transformed to C3 Dimer Acid
  - Reasons for initial focus on C3 Dimer Acid include
    - Industrial hygiene method already developed for extracting from air
    - Detections in on-site and off-site groundwater
- The total air flow measured will not differentiate between building exhaust and scrubber exhaust

# Source Testing

- Protocol
  - Test locations:
    - Division Waste Gas Scrubber Stack (NEP-Hdr1)
    - VE South Waste Gas Scrubber Stack (NEP-Hdr2)
    - PPA Waste Gas Scrubber Stack (AEP-A1)
  - Method: Modified Method 0010 sampling, LC/MS/MS analysis following sample prep
  - Test Lab: Test America

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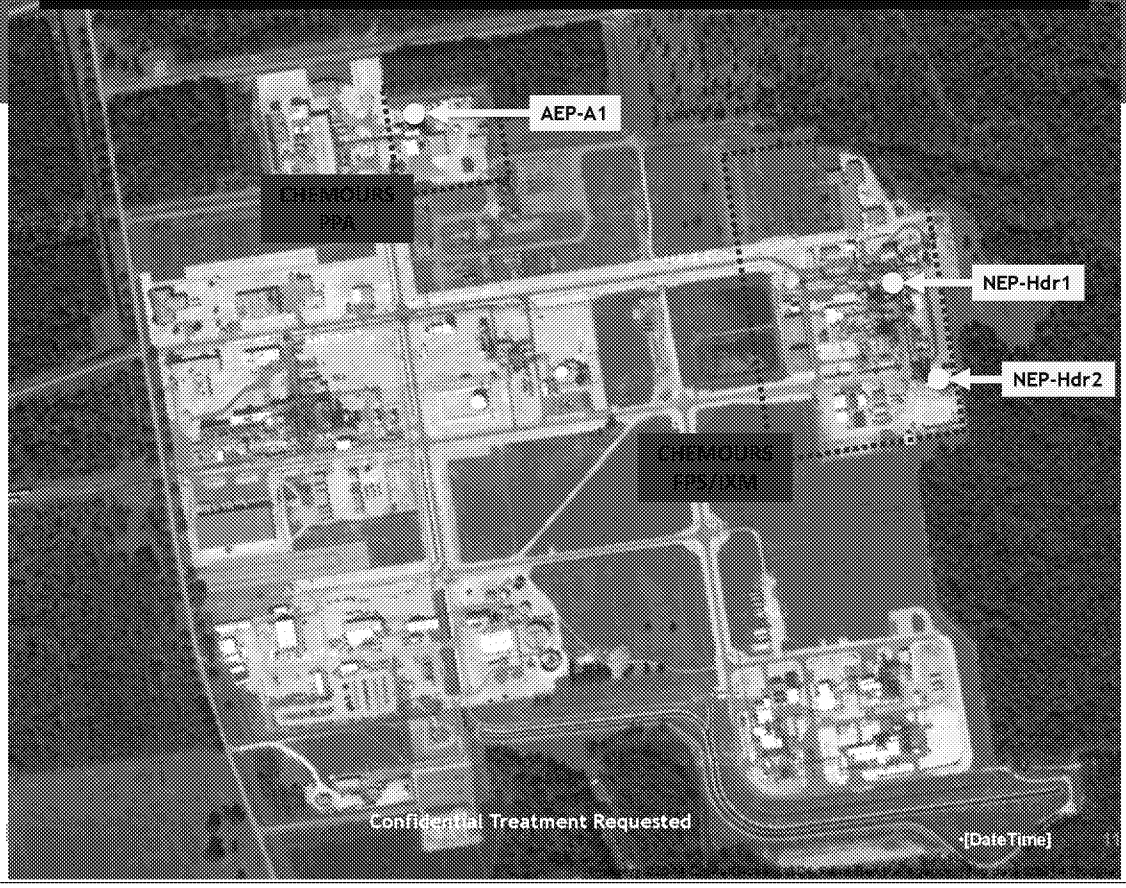
AEP-A1
CHEMOURS
PPA
NEP-Hdr1
NEP-Hdr2
CHEMOURS
EPS/DXM
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# Source Testing

- Path Forward
  - Develop final approved protocol with DAQ – November
  - Test America to finish developing procedures for sample extraction and analysis - November
  - Schedule and perform stack tests
    - Shakedown test – limited runs, PPA stack – November/December
    - Actual Stack Tests
      - PPA Waste Gas Scrubber Stack - December or after shakedown data received
      - Division Stack - January 2018 – PPVE campaign ends January 31
      - VE South Waste Gas Scrubber Stack - Next scheduled PPVE campaign will be mid-2018
  - Review results – draft report
  - Final Report

# Stack Sampling and Analysis for Other Compounds

- Testing for further compounds would require method development, for which accepted sampling methods do not yet exist
  - Any such methodological development will be coordinated with DAQ and with information being obtained from other media.
  - Any protocol will involve the following participants:
    - Stack Sample Collection – Chemours, Weston and Test America
    - Laboratory Analysis – Test America

# Air emissions

- Emissions data
  - Discussion on the compounds that are reported in AEI reports

# Emissions Table

CALENDAR YEAR: 2016

| FW Compound | Requested Compound | Requested CASRN | Emitted Compound | Emitted CASRN | lb/year | lb/day | lb/hr |
|---|---|---|---|---|---|---|---|
| TAF 0 | $C_3HF_5O_3$ | 674-13-5 | $C_3F_6O_2$ | 690-43-7 | 24 | 0 | 0 |
| MTFE | $C_4HF_7O_3$ | 377-73-1 | $C_4F_8O_2$ | 425-38-7 | 5 | 0 | 0 |
| | $C_5HF_9O_3$ | 863090-89-5 | $C_5F_{10}O_2$ | 863008-50-8 | Not believed this was an air emission | | |
| C3 Dimer Acid Fluoride | $C_6HF_{11}O_3$ | 13252-13-6 | $C_6F_{12}O_2$ | 2062-98-8 | 591 | 5 | 0 |
| C3 Dimer Acid | $C_6HF_{11}O_3$ | 13252-13-6 | $C_6HF_{11}O_3$ | 13252-13-6 | 3 | 0 | 0 |
| C3 Dimer Acid NH4 | $C_6HF_{11}O_3$ | 13252-13-6 | $C_6F_{11}O_3$ $NH_4$ | 62037-80-3 | 2 | 0 | 0 |
| | $C_7HF_{13}O_3$ | 174767-10-3 | n/a | n/a | Not believed this was an air emission | | |
| | $C_8HF_{15}O_3$ | 174767-06-7 | $C_8HF_{16}O_2$ | 38012-77-0 | Not believed this was an air emission | | |
| TAF 4 | $C_7HF_{13}O_7$ | 39492-91-6 | $C_7F_{14}O_6$ | 21703-49-1 | 74 | 0 | 0 |
| TAF 3 | $C_6HF_{13}O_6$ | 39492-90-5 | $C_6F_{14}O_5$ | 21703-47-9 | 269 | 1 | 0 |
| TAF 2 | $C_5HF_9O_5$ | 39492-89-2 | $C_5F_{10}O_4$ | 21703-45-7 | 594 | 2 | 0 |
| TAF 1 | $C_4HF_7O_4$ | 39492-88-1 | $C_4F_8O_3$ | 21703-43-5 | 912 | 3 | 0 |
| PSEPVE | $C_7HF_{13}O_5S$ | 29311-67-9 | $C_7HF_{14}O_4S$ | 16090-14-5 | 6,096 | 39 | 2 |
| Hydro-PSEPVE | $C_7H_2F_{14}O_5S$ | 749836-20-2 | $C_7HF_{15}O_4S$ | 75549-02-9 | 0 | 0 | 0 |
| E-1 | $C_3HF_{11}O$ | 3330-15-2 | $C_3HF_{11}O$ | 3330-15-2 | 0 | 0 | 0 |
| COF2 | $CF_2O$ | 353-50-4 | $CF_2O$ | 353-50-4 | 3,316 | 12 | 1 |
| | $CF_2$ | n/a | n/a | n/a | Not believed this was an air emission | | |
| PFOS | $C_8HF_{17}O_3S$ | 1763-23-1 | n/a | n/a | Not believed this was an air emission | | |
| PFOA | $C_8HF_{15}O_2$ | 335-67-1 | n/a | n/a | Not believed this was an air emission | | |
| MMF | $C_4H_3F_3O_3$ | 69116-71-8 | $C_4H_3F_3O_3$ | 69116-71-8 | 29 | 1 | 0 |
| PEVE | $C_4F_8O$ | 10493-43-3 | $C_4F_8O$ | 10493-43-3 | 1,273 | 66 | 3 |
| PMVE | $C_3F_6O$ | 1187-93-5 | $C_3F_6O$ | 1187-93-5 | 14,188 | 5,481 | 228 |
| PPVE | $C_5F_{10}O$ | 1623-05-8 | $C_5F_{10}O$ | 1623-05-8 | 2,229 | 36 | 2 |
| RSU | $C_2F_4O_2S$ | 677-67-8 | $C_2F_4O_2S$ | 677-67-8 | 6 | 0 | 0 |
| E-2 | $C_8HF_{17}O_2$ | 3330-14-1 | $C_8HF_{17}O_2$ | 3330-14-1 | 12,141 | 76 | 3 |
| EVE | $C_9H_3F_{13}O_4$ | 63863-43-4 | $C_9H_3F_{13}O_4$ | 63863-43-4 | 1,579 | 12 | 1 |
| HFPO | $C_3F_6O$ | 428-59-1 | $C_3F_6O$ | 428-59-1 | 45,607 | 156 | 7 |
| | $C_6F_{11}O_3K$ | 67118-55-2 | $C_6F_{11}O_3K$ | 67118-55-2 | Not believed this was an air emission | | |

# Conclusion

- Questions
- Next Steps