

FINAL Minutes of October 12, 2023 Ethylene Producers' Environmental and Sustainability Sub-Committee Meeting

Following are the minutes of the October 12, 2023 Ethylene Producers' Environmental and Sustainability Sub-Committee Meeting, held in person at the ExxonMobil Spring Campus and via Zoom.

Present (In Person):

Ralph Crivello, LyondellBassell
James Kendall, ExxonMobil Engineering and Technology Company
Dan Lutz, Ineos
Nicole Roper, Shell Oil Products Company
Thilo von Trotha, Linde Inc.
Mark Ulrich, Linde Inc.

Present (Zoom):

Troy Boley, Spectrum Environmental Solutions, LLC
Shelby Browning, Eastman Chemical
Dora Lopez-Camponuevo, University of Oklahoma (AIChE Environmental Division)
Isa Mbaraka, Dow
Andrés Muñoz Gandarillas, Neste
Dick Siegel, R&B Consulting Services (AIChE Environmental Division)
Shweta Singh, Purdue University (AIChE Environmental Division)

Absent:

Ted Heron, The Catalyst Group
Jacob Hilbrich, Chevron Phillips
Allyson Ledet, NOVA Chemicals
Patti Long, Eastman
Arijit Pakrasi, Edge Engineering and Science
Robert Sams, Shin-Tech
David Smalley, BASF
Jason Trembly, Ohio University (AIChE Environmental Division)

EMHC Campus Safety

Before commencing the meeting, James Kendall outlined emergency procedures for the ExxonMobil Campus.

Anti-Trust Statement

The meeting began at 10:30 am with James Kendall reading the Ethylene Producers' Committee (EPC) anti-trust statement:

No activity of the committee shall involve the exchange, collection, or dissemination of information among competitors for the purpose of bringing about or attempting to bring about an understanding or agreement, written or oral, formal or informal, express or implied, among competitors, with regard to costs, prices, pricing methods, terms or conditions of sale, distribution, production quotas or other limitations on either the timing or volume of production or sales, or allocation of territories or customers.

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Sub-Committee Membership

Shweta Singh from Purdue University has joined the subcommittee as a representative from the AIChE Environmental Division.

Agenda

The meeting agenda was published in advance and is included below:

1. Reading of Anti-Trust Statement [10:32 AM]
2. Sub-committee membership update [10:34 AM]
3. Discussion on AIChE Environmental Division and Interfaces with Sub-Committee [10:35]
4. Review of August 10, 2023 meeting action items [10:50 AM]
5. Update on joint session on flare operation under EMACT [11:10 AM]
6. Discussion of Potential Topics for 2024 Environmental and Sustainability Session [11:15 AM]
7. Discussion of 2024 Schedule and Circular Economy/Decarbonization Session [11:30]
8. Review of Action Items [11:40 AM]
9. Important Date Reminders
 - Jun 20, 2023 – Session and Session Charis Due in Confex
 - Jun 22, 2023 – Call for abstracts opens
 - Oct 25, 2023 – Call for abstracts closes
 - Dec, 2023 – Papers accepted or rejected
 - Jan, 2024 – Program goes live
 - Mar, 2024 – Paper submission closes
 - Mar 24-28, 2024 – Spring Meeting – New Orleans, LA
10. Adjourn [12:00 PM]

Discussion on AIChE Environmental Division and Interfaces with Sub-Committee

James requested that Dick, Shweta, or Jason briefly review the Environmental Division Programming Leadership Team's work with the seedlist of questions:

- Spring Meeting vs. Annual Meeting and typical volume of work from the ED for each
 - Spring Meeting 2024 sessions planned
 - Annual Meeting 2023 sessions planned
- Structure of ED Programming Leadership Team, including frequency of rotation and total membership
- How abstracts move from an ED led session into other sessions (and how we might move topics from an EPC session into the ED sessions).

Dick Siegel presented ED approach to programming history including how they arrived at the approach used today.

Background on ED Structure:

- Originally AIChE had 4 meetings a year, eventually consolidating to 3 (Spring, Summer, Annual). In this format the ED was a significant presence in the Summer session. When AIChE shifted to two meetings a year, more of ED focus has been on the annual meeting.
- The ED Executive Committee includes 17 members with a much stronger presence from academia than industry.
- The ED includes 7 subgroups, each with a chair that could be contacted for help soliciting papers in that subgroup's area.

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- The ED Programming Leadership Team includes 3 members:
 - Programming Chair (tenure of 2 years) – currently filled by Jason Trembly who will rotate out after this annual meeting
 - Programming Vice Chair – currently filled by Shweta Singh who will rotate into the Chair role.
 - Richard Siegel – who provides institutional knowledge and continuity to the team
- The Spring meeting includes a large presence from industry, including the Ethylene Producers Committee. EPC and similar organizations often have sessions with an environmental focus, which creates a strong draw for participants and often reduces attendance at ED sessions in the Spring Meeting.
- The current attendance at ED sessions in the Spring Meeting may result in the ED shifting focus to the Annual Meeting only and no longer running sessions at the spring meeting.
- Building greater synergies between the sessions was one of the reasons ED members were added to the EPC subcommittee. There is opportunity to better use these ties.

Background on ED Sessions and Paper Selection

- ED runs ~24 sessions in the Annual Meeting, and 2-4 sessions in the Spring Meeting
- Some topical conferences are run by ED (predominantly at the annual meeting)
- The ED does not actively solicit papers to the same extent as the EPC subcommittee. The division receives abstracts through Confex and:
 - If there is critical mass to run the session, then abstracts are accepted for presentation
 - If there are excess abstracts, the overflow options can be offered a spot at the poster session
 - Abstracts are also moved into the general pool
 - It would be rare to try and place an abstract into another session

The group discussed ways to better use our ties to the ED to improve the offering at the Spring Meeting. Nicole Roper asked where in the EPC would Environmental and Social Justice (ESJ) issues would be presented. The team discussed that ESJ considerations multiple areas could be of significant value to the EPC Conference:

- Permitting
- H2 hubs
- License to operate
- Recent litigation

In this discussion members highlighted that the right authors for a paper are not necessarily in our organizations (or readily contacted). For example, some of these topics could be presented by an engineer in EPA. The members of our sub-committee who sit on the ED Programming Leadership Team likely have the right connections to solicit papers in topic areas.

Dick proposed that a joint session between EPC and ED could provide broader content, while also showing a commitment to the session.

The team agreed to add a topic to the December agenda to discuss potential papers that could be solicited for the 2025 session where our members on the ED have the right contacts to make those

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papers a reality. Dan Lutz agreed to bring to the December meeting brief summaries of litigation in Texas to facilitate identifying areas where the subcommittee could consider soliciting papers.

Review of the Aug 10, 2023 meeting action items

Action items from the August 10 meeting were reviewed in detail.

James Kendall: Send the entire subcommittee guidance on abstract submissions. **DONE.**

Mark Ulrich: After receiving guidance on abstract submissions from James Kendall reconnect with Adam Greene and provide this guidance copying both James Kendall and Isa Mbaraka as session chair and co-chair. **DONE.** Adam Greene has responded favorably and is confirming he will have support to travel to the conference should the abstract be selected.

James Kendall: Investigate if ExxonMobil could present a paper on developing projects. **DONE.**

Andrés Muñoz Gandarillas: Investigate if Neste could present a paper on developing project. **DONE.** The abstract has been received and was discussed later in the meeting.

Ralph Crivello: Continue to progress an abstract for the potential LyondellBassell on H2 firing. **DONE.** Ralph verified that the abstract is complete, travel has been approved, and the presenters are excited for the opportunity. A plan for content to present has been proposed and requires further approvals.

Troy Boley: Contact Joe at Tricord about submitting an abstract on fenceline monitoring under the new proposed rule. **DONE.** Troy verified Joe plans to present a summary paper on fenceline monitoring as proposed.

James Kendall: Send a request to the subcommittee for a co-chair volunteer for the proposed combined session with the operations subcommittee on flare operation. **DONE**

Combined Operations Subcommittee Session on Flare Operation

Troy Boley has volunteered to co chair the session with Dan Euhus.

Discussion of Potential Topics for 2024 Environmental and Sustainability Session

As of Oct 3, 2023 no papers are currently in Confex

Papers solicited by the committee include:

1. Inflation Reduction Act: Navigating Murky Waters of Compliance and Incentives (Adam Greene, Carbon Policy Advisor, Worley and Shawn Daray, Associate, Jones Walker LLP)
2. Accuracy of GHG emissions data reporting (Ev Ashworth, Principal, ALG)
3. Hydrogen Firing and Emissions Sensitivity – Commercial Data (TBD Author, LlyondellBassell)
4. Regulatory Impact on Feceline Monitoring Withing Proposed Rule (Joe Ibenez, Tricord)
5. Fenceline Monitoring in Context of Near Neighbors(Troy Boley, Troy Boley, Spectrum Environmental Solutions)
6. Combining Renewable Feedstocks, Electrificaiton and Carbon Capture: Large-scale CO2 Reduction for Olefin Production (Dr. Torben Hoefel, Linde and Andrés Muñoz Gandarillas, Neste)

Each paper was briefly discussed.

J. L. Kendall
November 10, 2023

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Because Troy will be co-chair of the Flare Operation session, he will not be submitting an abstract to present on Fenceline Monitoring in Context of Near Neighbors.

The abstract for the Linde/Neste paper was reviewed by the team. The only comment was to consider re-ordering the title to "Combining Carbon Capture, Electrification, and Renewable Feedstocks" to match the idea of reducing Scope 1, Scope 2, and Scope 3 emissions.

The only unsolicited paper currently in Confex is "Efficient Flue Gas NOx Removal: Eliminating SCR System Fouling". The abstract for this paper was read. The group agreed the content appears consistent with the aim of our session.

Nicole suggested another paper could be solicited on "Environmental AI". The tool uses capabilities similar to Chat GPT to search for environmental information. An example was efficient search of the TCEQ's website to rapidly identify information available on a particular stack in a particular plant. Because the paper has recently been presented, it's possible they could submit an abstract with a 2 week deadline.

Discussion of EPC 2024 Schedule and Circular Economy/Decarbonization Session

The Environmental and Sustainability Session is planned for Wednesday 8am-11am, opposing the Plant Operations Session.

The Technology Sub-committee will have a "Circular Economy/Decarbonization" session, currently scheduled for Thursday 8:00-11:00. Chuck Politio is the session chair with Humera Rafique as the co-chair.

For context, below are the abstracts submitted for the 2023 session Abstracts. I've highlighted in bold the papers presented in one of two special sessions run by the Technology Sub-Committee. I've asked the session chairs to propose mechanisms to consider exchanging abstracts among the sessions that are not within the same sub-committee.

Circular Naphtha from Waste Plastic Pyrolysis Co-Cracking in a Steam Cracker Unit – First Steps to the Future. D. Molina, C. Cardoso, and A. S. Almeida

Sustainability for the Ethylene Industry – Hummingbird ® Can be the Answer. A. Simpson

Hydrogen/Ammonia Firing. D. McKenzie and C. Strupp

Oxyfuel Combustion. G. Guvelioglu and M. O'Sullivan

OCM & Steam Cracker Integration. M. A. Laurin

Emissions Reduction with Lummus External Air Preheat and Compact SCR. B. Zhou, A. S. Carrillo, and X. Li

Electrification of Steam Cracking – STR-eTM. R. Jibb, A. Carrillo

Low Carbon Intensity Ethylene Overview. S. Slome

Renewable Hydrocarbons As Feedstock for Olefins Production – from Drop-in to Commercial Application in Steam Crackers. J. Jamieson, H. Schmaderer, G. Schmidt, A. E. Munoz G., and S. U. Aravindakshan

Decarbonization: A Complex Puzzle. G. Franceschetti

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Practical Flue Gas Carbon Capture at Steam Crackers. T. Hoefel, A. Laugwitz, and M. Anas

Blue Hydrogen Firing or Flue Gas Carbon Capture? Tailored Options for Steam Cracker CO₂ Elimination. T. Hoefel, T. Haselsteiner, and D. Maher

Sustainability Benefits Using Hybrid Models. P. Nair and A. Majumdar

Electrification of Steam Cracker Furnaces – Technology Demonstration and the Route to Commercialization. M. Zullhuber, M. Hofstaetter, and R. Kemper

Review Technology and Operational Issues for Utilizing High Hydrogen Containing Fuels in Ethylene Furnaces and Process Heaters. R. Narayan and S. Narayan

Waste Plastic Pyrolysis Oil: Challenges and Solutions. S. R. Pinappu and S. Murugesan

Operational Based Petrochemicals Decarbonization System. A. Ilyas and M. Dias

PureStep – Circular Plastic. Pure Business. J. Malan

Energy Efficient Olefin-Paraffin Separations with Optiperm™ Membrane System. K. J. Pennisi, J. Wargo, and R. Somich

Full Machine Electrification of a Grass Roots Ethylene Plant. H. Reyneke, T. Hoefel, and G. Kracker

The team discussed the most helpful way to coordinate with the Technology Subcommittee. James proposed requesting abstracts from the Technology Sub-committee Chair and Co-Chair after the submission deadline to enable consideration of trading papers. There may be papers they are considering rejecting that would be ideal in the Environmental and Sustainability Session.

Review of Action Items

James Kendall: Include in December agenda discussion of potential papers that could be solicited for the 2025 session where our members on the ED have the right contacts to make those papers a reality.

Dan Lutz: Bring to the December meeting brief summaries of litigation in Texas to facilitate identifying areas where the subcommittee could consider soliciting papers.

Nicole Roper: Contact Jet regarding Environmental AI about the potential to present a paper at the Spring Meeting and submitting an abstract by the Oct 25 deadline. **DONE**

Important Date Reminders

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Adjourn

The meeting was adjourned at 11:58 am.