

2024 UPIISC Annual Workshop Introduction

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University of Pittsburgh

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National Energy Technology Lab.

Date: November 12th, 2024



*Cathedral of Learning
University of Pittsburgh*



2024 UPIISC Annual Workshop

GOALS

The goals of the workshop are to increase awareness of existing on-going research and collaborations with University of Pittsburgh and regional stakeholders in the following areas:

1. Development of novel sensor technologies as solutions to infrastructure sensing needs;
2. Regional collaboration to promote workforce development in the emerging sensor area for near-term R&D capability needs and future deployment and commercial needs;
3. Engagements with industry and stakeholders, regarding sensor technologies and related technology transfer;
4. Team and collaboration partnerships capable of responding to funding agencies' and industry's call for sensor technologies.

**Voice of Industry and
Government Stakeholders**

**Technology Maturation
and Technology Transfer**

**Workforce
Development**

SCOPE

2024 UPIISC Annual Workshop

The workshop particularly seeks to focus on the following areas:

1. Multiple sensing platforms with spatially distributed sensing capability (e.g. optical fiber sensing, passive wireless sensors, electrochemical sensors, chip sensors)
2. Spanning sensor technology development areas from fundamental principles of sensor materials to prototypes in field validations, prototypes in field validations,

IMPACT

The workshop seeks to promote intelligent infrastructure sensing for the following impacts:

1. Predictive monitoring before infrastructure failures occur (structural, electrical, etc.)
2. Mitigation of green-house gas emissions,
3. Enabling large-scale H₂ transportation,
4. Supporting needs for a robust and resilient electricity and natural gas transportation and delivery system,
5. Early detection of environmental contamination.

2024 UPIISC Annual Workshop

STEERING COMMITTEE MEMBERS

The steering committee is a group of prominent scientists and leaders that were carefully selected to represent key segments and application areas of critical importance to the UPittISC objectives. The advisory group provides the faculty and leadership team with insights about emerging needs and trends within relevant industries and across various agencies.

Tony Lindsay, GTI, Managing Director, tlindsay@gti.energy

Jeremy Gill, Duquesne Light Company, Managing Director, jgill@duqlight.com

Susan Maley, Electric Power Research Institute, Program Manager, smaley@epri.com

C. Ravi, Aquatech, ravic@aquatech.com

Kalyan Sharma, Ansys, Manager, kalyan.sharma@ansys.com

Robert Lieberman, Lumoptix, President, rlieberman@lumoptix.com

Gary Choquette, Pipeline Research Council International (PRCI), gchoquette@prci.org

Arvind Tiwari, GE Vernova, Program Manager, Arvind.tiwari1@ge.com

Natural Gas, Oil, & H₂ Transport & Storage



Electricity Grid Transport & Storage

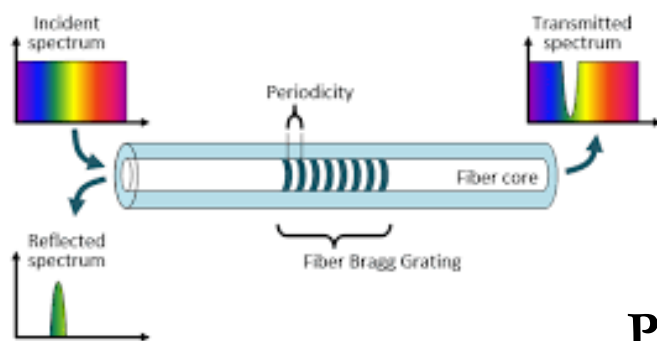


Conventional & Renewable Generation

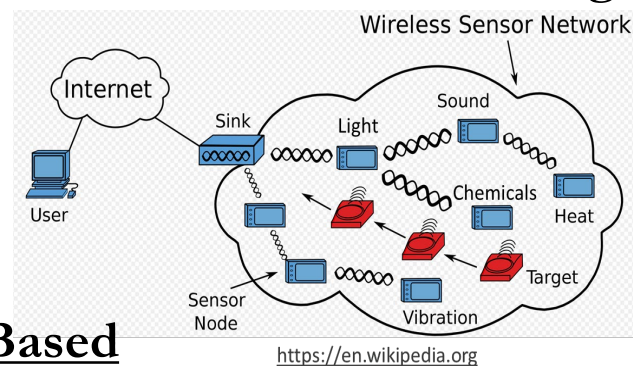


Mission: UPIISC Seeks to Pursue Research and Innovation, Workforce Development, and Technology Transfer in the Area of Critical Infrastructure Sensing and Monitoring

Optical Fiber Sensing

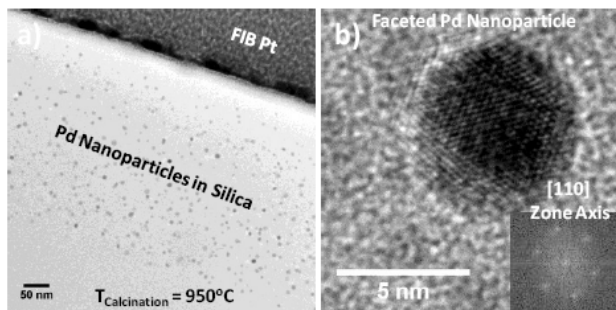


Passive Wireless Sensing

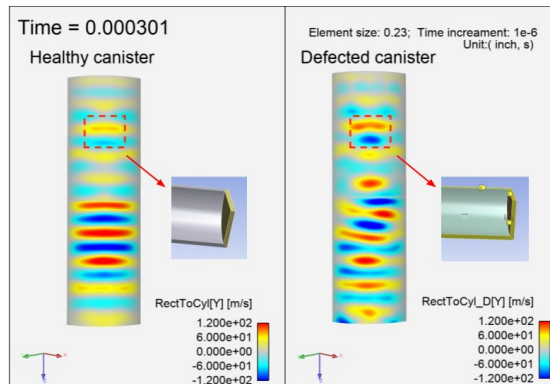


Physics Based

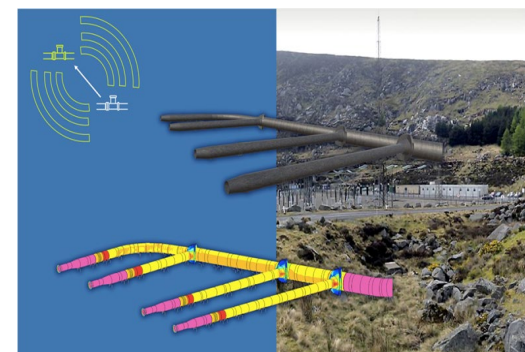
Novel Sensing Materials



Machine Learning & AI

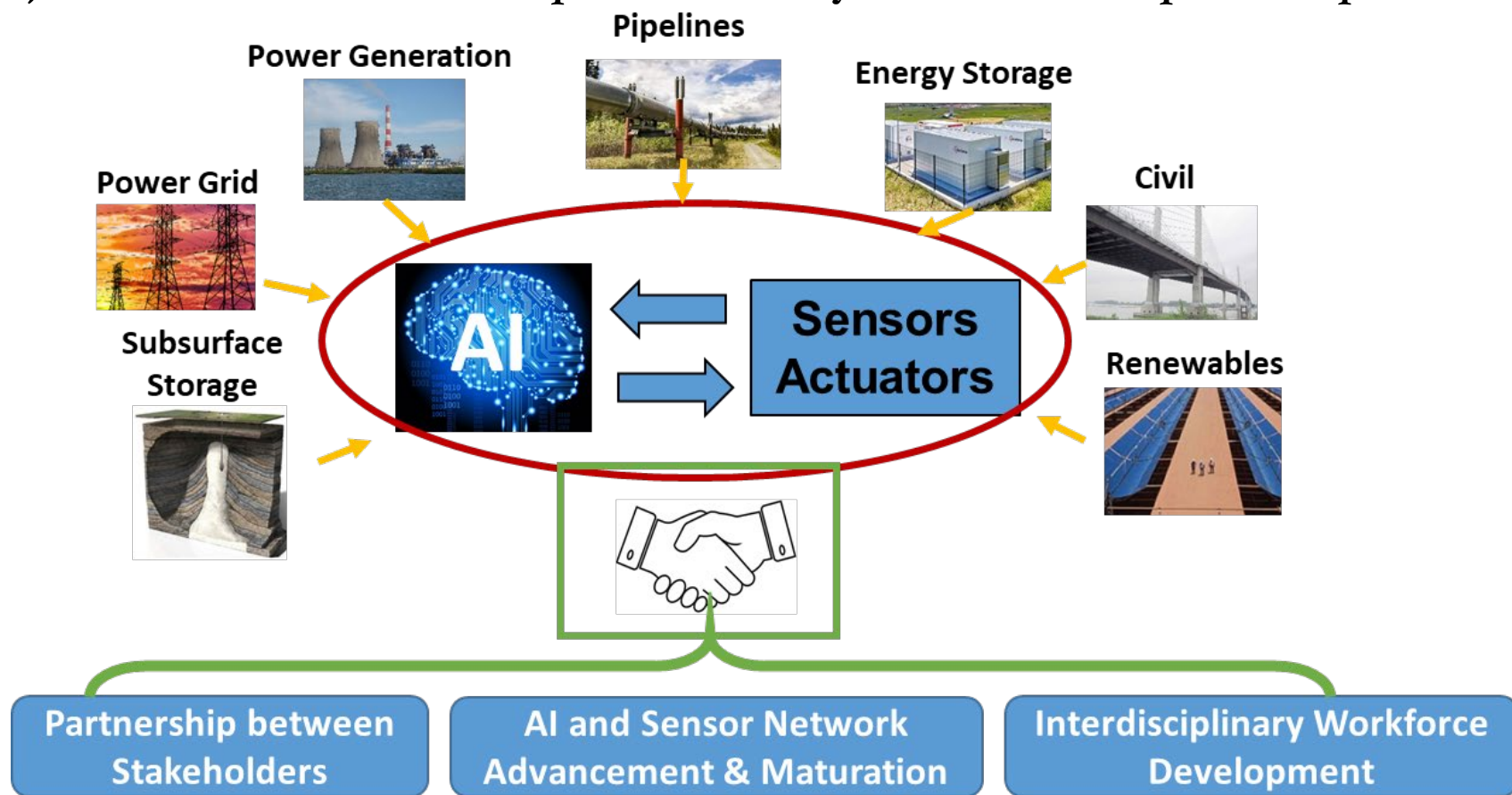


Digital Twin Models



Enabling Technologies: UPIISC Scope Encompasses all Aspects of Critical Infrastructure Sensing Spanning Enabling Technology, Hardware, Communications, Data, and Analytics.

Objective of UPIISC Workshop : Community and Partnership Development



University, Lab, Industry, and Government Partnerships are Necessary to Maximize Impact

2022 UPISC Inaugural Workshop : August 2022



UPISC UNIVERSITY OF PITTSBURGH
INFRASTRUCTURE SENSING
COLLABORATION WORKSHOP

UPISC Inaugural Workshop
August 2022

Energy Innovation Center

www.engineering.pitt.edu/UPISC

75 Registered Attendees

Strong Feedback and Dialogue
Encouraged Annual Offering as Well as
Action Items Into the Future

Highly Successful Initial Workshop Held in 2022 Confirmed the Need and Opportunity

UPIISC

UNIVERSITY OF
PITTSBURGH
INFRASTRUCTURE
SENSING

COLLABORATION WORKSHOP



2022 UPIISC Inaugural Workshop : August 2022



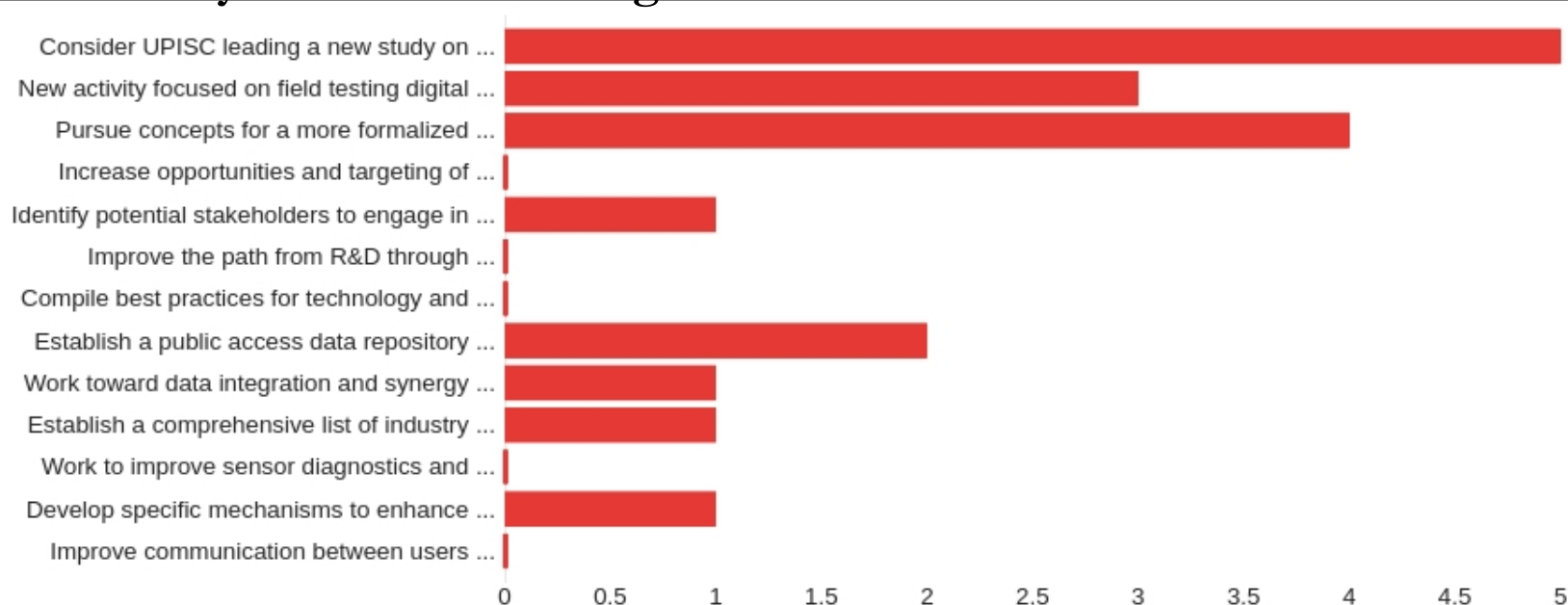
Examples of Organizations in Attendance at 2022 UPIISC Workshop

Key Prioritized Action Items from 2022 UPIISC Workshop

1. Consider UPIISC leading a new study on this topic (National Academy?)
2. New activity focused on field testing digital twins (data normalization, experimental facilities, etc.)
3. Pursue concepts for a more formalized collaboration (center, major proposals, etc.)
4. Increase opportunities and targeting of workforce training in universities.
5. Identify potential stakeholders to engage in the future
6. Improve the path from R&D through commercialization and technology transfer.
7. Compile best practices for technology and knowledge dissemination and adoption.
8. Establish a public access data repository to collect and share information among stakeholders
9. Work toward data integration and synergy standardization across infrastructure segments
10. Establish a comprehensive list of industry needs
11. Work to improve sensor diagnostics and reliability, potentially even self-diagnosing sensors.
12. Develop specific mechanisms to enhance collaboration of industry, academia, government, others.
13. Improve communication between users and developers.

Discussed “Top Three” in December 2022 Steering Committee Meeting

UPIISC Survey Results of Steering Committee “Action Item” Recommendations



1. Consider UPIISC initiating a new study on this topic (e.g. National Academy study)
2. Pursue concepts for a more formalized collaboration (i.e. an industry consortium)
3. New activity focused on field testing digital twins and distributed sensors

Subsequent “Top Three” Vote to Determine Prioritized Next Steps with UPIISC

2023 UPISC Annual Workshop : Overall Statistics



1. Approximately 80 Attendees
2. Extremely Positive Feedback
3. Robust Poster Session
4. Industry, Government (Local and Federal), Academic Participation
5. Additional Progress and Refinement of Actions

2024 Revised Action Items Prioritized By the UPIISC Steering Committee

➤ Prioritized Action Items from 2023

1. Consider UPIISC initiating a new study on this topic
2. Pursue concepts for a more formalized collaboration
3. New activity focused on field testing digital twins / sensors

Note: Blue highlighted items below were carried forward from 2023 action items and updated based on steering committee discussion and 2023 workshop outcomes.

➤ Updated Action Items for 2024

1. Plan and execute a National Academies Member-Led Workshop in Collaboration with UPIISC 2024
2. Establish a formal participation agreement with partners and formalize a "Consortium"
2. Establish a pilot project within the City of Pittsburgh and SW PA region with stakeholders

2024 UPIISC Annual Workshop : Overall Statistics

1. Agenda and Invited Speakers Organized by UPIISC Steering Committee
2. Close Collaboration Between NETL and U. Pitt. for Organization
3. National Academy of Engineering Member-Led Workshop (New in 2024!)
4. >120 Registered Guests for In-Person Attendance (No Remote Option)
5. ~20 Technical Posters from U. Pitt. and NETL Students and Researchers
6. Sponsored by Internal U. Pitt. Funds for 2024 – Thank you!
(Swanson School of Engineering, Office of Senior Vice Chancellor for Research)

UPISC

UNIVERSITY OF
PITTSBURGH
INFRASTRUCTURE
SENSING

COLLABORATION WORKSHOP



2024 UPISC Annual Workshop Registered Attendee Organizations



Carnegie Mellon University



NATIONAL ACADEMIES
Sciences
Engineering
Medicine



GE VERNOVA



GTI ENERGY



University of
Pittsburgh

Dietrich School of Arts and Sciences

~120 Registered Attendees From More than 35 Organizations!

2024 UPIISC Annual Workshop : Key Themes for Workshop

1. National Academy of Engineering : Plenary Session (11/12)

- Increase Awareness of UPIISC Initiative and Goals
- Highlight Importance of Regional – State – Federal Considerations
- Emphasize Synergy Across Sectors (Energy, Transportation, Civil, etc.)
- Incorporate Policy and Federal Programs Into Workshop Program



2. 2024 UPIISC Workshop Morning Session (11/13)

- NAE Perspective & NETL / Pitt Updates on Sensor Research
- Quantum Sensing and Applications for Infrastructure Sensing



3. 2024 UPIISC Workshop Afternoon Session (11/13)

- Crosscutting : Analytics, Digital Twins, Silicon Photonics, Cybersecurity
- Industry Panel on Sensing Across Infrastructure Sectors



2024 UPIISC Annual Workshop : Day 1 Agenda

Time	Activity
1:00 p.m.	Welcome Remarks
1:05 p.m.	Workshop Overview, Background, and Objectives University of Pittsburgh: Prof. Paul Ohodnicki, RK Mellon Faculty Fellow in Energy National Energy Technology Laboratory: Dr. Ruishu Wright, Technical Portfolio Lead
1:30 p.m.	Plenary Panel: National, State, and Regional Perspectives on Infrastructure Sensing Moderator: Rory Cooper, National Academy of Engineering Member DOE: Jared Ciferno, Program Manager PennDOT: Derrick Herrmann, Chief, Transformational Technology City of Pittsburgh: Jacque L. Rowden, Assistant Director CMU Safety 21: Karen Lightman, Executive Director
2:30 p.m.	Coffee and Networking Break

Note : Photographer will take an image during the 2:30PM break.

2024 UPIISC Annual Workshop : Day 1 Agenda

Time	Activity
3:00 p.m.	<p>Plenary Panel: Synergies and Opportunities in Infrastructure Sensing Across Sectors Moderator: Dr. Robert Lieberman, National Academy of Engineering Member</p> <p>DOE ARPA-E: Robert Ledoux, Program Director DOT: Christopher Atkinson, Deputy Director DOE ARPA-E: Emily Kinser, Program Director S&B USA Construction: Grant Ervin, Vice President of External Affairs OFS: Regina Pynn, Market Manager, Industrial Sensing and Networking</p>
4:00 – 4:30 p.m.	<p>Facilitated Discussion: Collaboration Across Sectors to Address Both Regional and National Needs</p>
4:30 – 5:30 p.m.	<p>Networking Social Hour and Light Refreshments Including Guided Laboratory Tours of the Energy Innovation Center</p>

Note : Tours will be available during the social hour if interested.

2024 UPIISC Annual Workshop : Day 2 Agenda

Time	Activity
8:00 a.m.	Registration and Networking
8:30 a.m.	Welcome Remarks and Introduction to the Workshop (Objective, Scope, Steering Committee)
8:40 a.m.	University of Pittsburgh and National Energy Technology Laboratory Welcome Comments National Energy Technology Laboratory: Dr. Sean Plasynski, Acting Principal Deputy Director University of Pittsburgh: Robert Cunningham, Vice Chancellor for Research Infrastructure
9:00 a.m.	NAE Speaker: The National Academies Perspective on Infrastructure and Sensing National Academy of Engineering: Dr. Robert Lieberman, National Academy of Engineering Member
9:30 a.m.	Infrastructure Sensing Technology Overview Presentations (U. Pitt. and NETL) National Energy Technology Laboratory: Dr. Ruishu Wright, Technical Portfolio Lead University of Pittsburgh: Prof. Paul Ohodnicki, RK Mellon Faculty Fellow in Energy
10:15 a.m.	Coffee and Networking Break

2024 UPIISC Annual Workshop : Day 2 Agenda

Time	Activity
10:30 a.m.	Invited Industry Speaker: State-of-Art in Sensing, Data, Analytics, and Digital Twins Turbine Logic: Christopher Perullo, Director of Engineering
11:00 a.m.	Panel on Quantum Sensing and Related Technologies for Infrastructure (Dr. Wright Moderator) Industry, University and National Lab Perspective DOE ARPA-E: Ryan Chaban, ARPA-e Fellow DOE ARPA-I: Prachi Vakharia, Strategic Advisor for Infrastructure Oak Ridge National Laboratory: Warren Grice, Distinguished Research Scientist University of Pittsburgh: Gurudev Dutt, Associate Professor Quantum Catalyzer (Q-Cat): Connor Hart, CTO
12:00 p.m.	Logistical Announcements / Lunch / Networking Break

2024 UPIISC Annual Workshop : Day 2 Agenda

Time	Activity
1:00 p.m.	Invited Industry Speaker: Informing Infrastructure Resiliency and Reuse Strategies with Artificial Intelligence (AI), Digital Twins, and Data-Driven Solutions National Energy Technology Laboratory: Jennifer Bauer, Geo-data Scientist
1:30 p.m.	Invited Industry Speaker: Networks and Systems of Digital Twins for Infrastructure Sensing Ansys: Kalyan Sharma, Manager, Model-Based Engineering
2:00 p.m.	Invited Industry Speaker: AIM Photonics and On-Chip Photonics Manufacturing and Design AIM Photonics: David Haramé, Chief Operating Officer
2:30 p.m.	Coffee Break

2024 UPIISC Annual Workshop : Day 2 Agenda

Time	Activity
2:45 p.m.	<p>Keynote Industry Speaker: Cybersecurity and Infrastructure Sensing</p> <p>Idaho National Laboratory: Emma Stewart, Fellow</p>
3:45 p.m.	<p>Panel on Synergies in Need and Opportunity Across Infrastructure Segments (Dr. Ohodnicki Moderator)</p> <p>National Rural Electric Cooperative: Meredith Miller, Principal Data Scientist Duquesne Light Company: Russel Profaizer, Director, Advanced Grid Systems University of Pittsburgh: Alessandro Fascetti, Roberta Luxbacher Faculty Fellow City of Pittsburgh: Eric Setzler, Chief Engineer NI-Source and Natural Gas Fuel Supply: Timothy Leksell, Measurement & Regulation Technical Trainer</p>
4:45 p.m.	Looking to the Future and Next Steps
5:00 p.m. – 6:30 p.m.	Technical Poster Session with a Social Hour and Light Refreshments

Note : Technical poster session is an opportunity for detailed technical dialogue.

Thank you for taking the time to join us today!

Any questions, comments, or discussion?