

U.S. DEPARTMENT OF TRANSPORTATION

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PIPELINE AND HAZARDOUS MATERIALS
SAFETY ADMINISTRATION

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PIPELINE LEAK DETECTION, LEAK REPAIR, AND
METHANE EMISSION REDUCTIONS PUBLIC MEETING

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THURSDAY, MAY 6, 2021

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The Pipeline and Hazardous Materials
Safety Administration met via Video
Teleconference, at 10:30 a.m. EDT, Sam Hall,
Meeting MC/Host, presiding.

PHMSA STAFF PRESENT

SAM HALL, Meeting MC/Host

KANDI BARAKAT, Moderator

STEVEN FISCHER, Meeting MC/Host

DAVID LEHMAN, Meeting MC/Host

ALAN MAYBERRY, Associate Administrator, Office
of Pipeline Safety

STEVE NANNEY, Senior Technical Advisor,
Engineering and Research

SAYLER PALABRICA, Meeting MC/Host

ROBERT SMITH, Senior R&D Program Manager

MASSOUD TAHAMTANI, Moderator

SENTHO WHITE, Moderator

ALSO PRESENT

JAY ALMLIE, Satelytics

DOUG BAER, Ph.D., ABB Inc.

DIANE BURMAN, National Association of Regulatory
Utility Commissioners

SEAN DONEGAN, Satelytics

DAMON EVANS, American Petroleum Institute

CARRIE GREANEY, Pipeline Research Council
International

MATTHEW GRIMES, Siemens Energy

RANDY KNEPPER, New Hampshire Public Utilities
Commission

STUART MITCHELL, ProFlex Technologies

ERIN MURPHY, Environmental Defense Fund

STUART RIDDICK, Ph.D., METEC

ERIK RODRIGUEZ, SoCalGas

FIRAT SEVER, Ph.D., QuakeWrap, Inc.

DIRK SMITH

SUSAN STUVER, Ph.D., Gas Technology Institute

PETE ROOS, Ph.D., Bridger Photonics

MARK UNCIPHER, Fiber Optic Sensing Association

BRIAN WHITE, Federal Energy Regulatory

Commission

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1 P-R-O-C-E-E-D-I-N-G-S

2 (10:30 a.m.)

3 MR. HALL: Good morning, Ladies and
4 Gentlemen, and welcome to Day 2, of the PHMSA
5 Pipeline Leak Detection Leak Repair, and Methane
6 Emissions Reductions Public Meeting.

7 My name is Sam Hall. I'm a Program
8 Manager, in PHMSA's Office of Pipeline Safety,
9 and I'm serving, as your Master of Ceremonies.
10 We thank you for your attendance and your
11 participation and, we extend a special thanks, to
12 our presenters.

13 I want to cover some housekeeping
14 items, for your consideration. All of the audio
15 is being handled, by AT&T. And you can see the
16 audio line prominently displayed on the slide, on
17 your screen, as well as, in the upper left-hand
18 corner of your screen.

19 We strongly encourage you to dial into
20 that line, if you're experiencing any issues with
21 your audio, through your computer. If you are
22 streaming the audio, through your computer,

1 Bandwidth issues can impact the quality of the
2 audio that you receive.

3 But, if you are dialed into that
4 conference line, and I assure you, we have plenty
5 of space for you to do that, your audio stream
6 should be flawless. So I do encourage, all, who
7 are attending, to dial into the conference line,
8 if you experience any audio problems, at all.

9 The AT&T Operator will provide
10 instructions, regarding how to make comments, at
11 the appropriate time. And, until that time, all
12 lines are muted.

13 If you wish to make a comment, with
14 your voice, over the course of today's
15 proceedings, you must be dialed into the
16 conference line.

17 You do not have an option to make a
18 comment with your voice, through the audio on
19 your, on your computers. We will not be allowing
20 you to unmute your speakers, or your microphones,
21 on your computers.

22 So if you wish to speak, you must be

1 dialed into the teleconference. Again that
2 teleconference line is in the upper left-hand
3 corner of your screen.

4 If you choose not to dial into the
5 teleconference line, you'll be able to hear the
6 proceedings, but you'll not be able to make a
7 comment, as I said, and in that case, you may
8 make comments in the Q&A box, on the lower, left
9 corner of your screen.

10 If you're having technical
11 difficulties, please, ask your question in that
12 same Q&A box, on the lower left of your screen,
13 and we'll try to help you, as quickly, as we can.

14 We do intend to adhere to the Agenda,
15 as strictly, as possible, today. We have not
16 scheduled any breaks. We're all, either, at
17 home, or in our offices, and are free to take
18 breaks, as we need to, so please take your breaks
19 on your own, as necessary.

20 The proceedings are being recorded,
21 and the recording of the meeting and a transcript
22 of the proceedings will be available, on the

1 meeting Website, where you registered, in
2 approximately ten business days.

3 The purpose of this two-day public
4 meeting is to engage stakeholders on gas pipeline
5 leak detection and leak repair issues, as an
6 important step in fulfilling the requirements of
7 Sections 113 and 114, of the PIPES Act of 2020.

8 During today's meeting, stakeholders,
9 including environmental and public safety groups,
10 federal and state governments and the pipeline
11 industry will have the opportunity to share
12 perspectives on improving gas pipeline leak
13 detection and repair.

14 Topics discussed will include the
15 scope of the current problem, as well as,
16 advanced technologies and practices to address
17 methane emissions from natural gas pipelines.

18 The Agenda, at the bottom of your
19 screen, is available for your reference and a
20 full Agenda is available at the meeting site,
21 where you registered for this meeting.

22 With that, it is now my pleasure to

1 introduce Alan Mayberry, the Associated
2 Administrator for Pipeline Safety, for some
3 introductory remarks. Go ahead, Alan.

4 MR. MAYBERRY: Thank you, Sam. Good
5 morning, everyone. I'm glad to see so many of
6 you back, for a second day, discussing pipeline
7 leak detection and repair and methane emission
8 reduction.

9 Yesterday, we averaged in the mid to
10 upper 300s, so very good turnout and, thank you,
11 very much, for participating. There were a lot
12 of positive -- there was a lot of positive dialog
13 and feedback, yesterday, you know, during our
14 panel discussions.

15 We heard a variety of perspectives on
16 how various stakeholders, including federal and
17 state safety regulators, advocacy groups,
18 pipeline operators and technology providers, how
19 they are addressing pipeline safety, leak
20 detection, and methane emissions, as well as,
21 their suggestions for policy-making.

22 Now, today, we have a full day and

1 we'll shift our focus to R&D and creating
2 incentives and also technology. But, I wanted to
3 reiterate that, addressing the opportunities
4 before us, requires consideration of a variety of
5 perspectives, methodologies, and implementation,
6 and it requires an all-hands-on-deck approach.

7 So thank you, all, for engaging and
8 participating in these discussions. Please, feel
9 free to contribute and ask questions, throughout
10 the presentation, as directed, by Sam.

11 Yesterday went very well and I'm eager
12 to see what today brings. So with that, I will
13 turn it back to Sam and, thanks, again, for being
14 here and participating. Thanks.

15 MR. HALL: Thank you, Alan. We'll
16 begin our first session of the day. It's my
17 pleasure to introduce Sentho White, Director of
18 Engineering and Research, who will provide a
19 presentation on PHMSA's leak detection and repair
20 research and development.

21 Ms. White, I'll turn it over to you
22 and I will have your slides up, momentarily.

1 MS. WHITE: Thank you, Sam. Good
2 morning, everybody. As Sam mentioned, I'm Senth
3 White, Director of the Engineering and Research
4 Division, at PHMSA's Office of Pipeline Safety.

5 I'd like to take this opportunity to
6 discuss PHMSA's Research and Development Program
7 and highlight a few success stories on research
8 projects PHMSA has funded, in the area of leak
9 detection.

10 Current and active leak detection
11 projects and PHMSA's future plans, in this topic
12 area. Next slide, please. In a recent message
13 from our Secretary, Pete Buttigieg, he said that,
14 we, at DOT, are the stewards of America's
15 infrastructure in so many ways and that means,
16 we're all, sort of, stewards of the climate.

17 DOT's Federal Government Research
18 Programs, such as PHMSA's Pipeline Safety
19 Research Program, are instrumental in advancing
20 innovation, technology development, and
21 breakthrough technology.

22 Federal Research Programs also provide

1 decision makers with knowledge and data, to
2 improve the safety, environmental protection, and
3 sustainability, of our transportation system.

4 PHMSA's Pipeline Safety Research
5 Program is committed to sponsoring research and
6 development projects, focused on providing near
7 term solutions for the nation's pipeline
8 transportation system that will improve safety,
9 reduce environmental impact, and enhance
10 reliability.

11 This also includes a commitment to the
12 Administration's priorities, through R&D
13 investments that promote safety, climate change,
14 economic recovery, and rebuilding and
15 transportation, as an engine for equity. Next
16 slide, please.

17 PHMSA's R&D Program is comprehensive
18 in its research strategy and awards research
19 through four subprogram areas, as shown, here,
20 starting at the top of the slide and working
21 down, the CAAP, also called the Competitive
22 Academic Agreement Program, was established in

1 2013, assumed as partners, with universities, to
2 fund research focused on those high-risk,
3 high-payoff solutions to pipeline integrity
4 challenges.

5 The CAAP exposes students to subject
6 matter common to pipeline engineering, to
7 encourage career placement within the pipeline
8 industry.

9 The research outcomes from CAAP are
10 intended to be handed off to, either, a small
11 business, such as through the Department's Small
12 Business Innovative Research Program, or, and
13 through follow-up research that can be performed,
14 through PHMSA's CORE Program, to develop more
15 mature research and technology development.

16 PHMSA participates in the Department's
17 Small Business Innovative Research Program, also
18 called SBIR. There are two types of SBIR award,
19 Phase 1 Award focuses on the feasibility and
20 validation of the theory, through lab
21 demonstrations.

22 And Phase 2 awards are by invitation

1 only and funded up to \$1 Million dollars, over 24
2 months, with the focus on prototype development
3 and a path to commercialization.

4 PHMSA's CORE Program funds research to
5 technology providers and research entities, to
6 develop ready-to-use pipeline safety solutions.
7 Essentially, those tools in the toolbox and these
8 projects run 12 to 36 months in duration and are
9 funded between \$250,000 up to \$1 Million dollars.

10 PHMSA also collaborates with several
11 federal agencies, including NIST, FRA, and a few
12 of the DOE labs, on pipeline safety research
13 projects. Next slide, please.

14 In 2002, Pipeline Safety Improvement
15 Act gave PHMSA the authority to establish an R&D
16 program. And, since then, we've received
17 technical direction and input, through different
18 vehicles that sponsor research-focused topic
19 areas and have received millions, in
20 appropriations, to perform pipeline safety
21 research.

22 As shown, in the table, PHMSA has

1 invested a total of \$160 Million dollars, in
2 federal funds, and approximately \$14 Million
3 dollars on 29 leak detection projects.

4 Additionally, since 2013, our CAAP
5 projects have involved over 200 students.

6 PHMSA's R&D Program, currently, has 71 active
7 projects and six, specifically, on leak
8 detection.

9 Information on PHMSA's R&D Program and
10 on all of our research projects can be found on
11 the two URL links, in the table, below. Next
12 slide, please.

13 The following three slides provides
14 recent examples of commercialized technologies
15 and informative decision making guidance,
16 resulting from our leak detection research
17 portfolio. Next slide, please.

18 This first tech transfer project
19 brought in the industry's ability to better
20 locate and quantify methane leaks in mobile
21 application, by measuring and establishing a
22 repair priority, based on leak rates versus

1 overall concentration.

2 The research was conducted, by
3 Physical Sciences, between September, 2015, and
4 March, 2018, and was commercialized, by Heath
5 Consultants, in December, 2018.

6 And, just to give some background,
7 many current natural gas leak survey tools that
8 are used, by the industry, identify pipeline
9 leaks by, either, measuring the local methane
10 concentration, typically, in parts per million,
11 or the concentration integrated over a line of
12 sight path, in parts per million, per meter, and
13 lack the ability to measure the leak rate from a
14 system.

15 By measuring a direct leak rate,
16 versus concentration, this helps the operator
17 prioritize repair. In current practice, leaks
18 exhibiting high gas concentration, are given
19 repair priority.

20 However, the concentration can vary,
21 depending on the wind speed and direction. A
22 small leak can lead to a locally high gas

1 concentration, when there is little wind to
2 disburse the gas and vice-versa.

3 Basing repair priority are leak rates,
4 rather than local concentration, could one,
5 enhance public safety, by identifying leaks that
6 are continuously emitting gas volume that are
7 potential explosion hazards, as well as,
8 environmentally harmful.

9 And, two, reduce overall leakage,
10 thereby, providing the economic benefit of
11 reducing the cost of lost gas, as well as, the
12 cost of a low-priority repair.

13 Physical Sciences and Health
14 Consultants conducted an R&D project to fill this
15 technology gap and advance the ability to detect
16 low-level leaks, by providing a direct measure of
17 the leak rate.

18 If research project integrated
19 advanced laser-based methane detection methods,
20 with novel deployment configurations and wind
21 measurement, to provide leak rate data, in a
22 matter of seconds, during routine, mobile leak

1 surveys.

2 Moreover, the technology was able to
3 measure, both, ethane and methane, during leak
4 surveys, to differentiate natural gas leaks from
5 other methane sources, such as bio gas.

6 I think it, probably, is about ten
7 percent of the natural gas composition, but isn't
8 present in bio gas. This provided the ability to
9 reduce false detections, during mobile surveys.

10 Geospatial map, with leak rate
11 measurements and the corresponding location were
12 also integrated into the technology, to provide
13 better visualization for the end user.

14 Many of the developed technologies and
15 lessons learned, from this project, have already
16 been implemented by Heath Consultants into its
17 commercial leak survey tool and has helped to
18 improve existing methodologies and development of
19 future leak rate sensors. Next slide, please.

20 The second tech transfer evaluated
21 improving the speed, efficiency, and
22 effectiveness of leak surveys, using a six-wing

1 aircraft. This aerial survey application is,
2 typically, used more often in rural environments
3 and can survey a wider area, more quickly, than
4 ground-based vehicle-mounted sensors.

5 The project was conducted between
6 September, 2015, and March, 2018, and was
7 commercialized in November, of 2018. The
8 Project's key technology advancement was the
9 increased sensor slot, or area of detection
10 capability.

11 The Ball Aerospace Team increased walk
12 width to approximately 300 meters, by increasing
13 laser power output, laser pulse repetition rates,
14 and aircraft-flown altitude.

15 This technology now enables efficient
16 area mapping of potential methane sources,
17 effectively doubling flight altitude and
18 increasing flock-width, by three times.

19 Aerial field demonstrations were
20 performed with operators that included area
21 mapping of natural gas storage facilities and
22 gas-gathering-type systems.

1 Ball Aerospace also performed a survey
2 of 400 to 500 miles of high-pressured natural gas
3 transmission pipelines. Next slide.

4 Finally, this third successful tech
5 transfer project, by NYSEARCH, validated a
6 methodology to quantify methane emissions rates
7 in a gas distribution system, particularly, for
8 lower-grade three, which is the lowest
9 severity-type leaks.

10 There are a growing number of
11 technology providers approaching local
12 distribution companies, with measurement
13 equipment that needs to be tested and validated,
14 to determine its efficacy of use, in the gas
15 distribution environment.

16 Local distribution companies,
17 currently, lack a standard test protocol, for
18 whether technologies are capable of quantifying
19 methane emissions.

20 The researchers selected three
21 technology providers to test and develop a
22 validation guideline. Each of the technology

1 provider's equipment with tested sequentially, at
2 different LDC host sites.

3 The validation process included a
4 comparison of the metered methane emission,
5 versus the quantified measurement, by the
6 equipment of the technology provider. This
7 demonstrated the actual accuracy, precision, and
8 certainty of the instrument.

9 The research results concluded that,
10 any technology provider's equipment to perform
11 methane emission quantification can be evaluated.
12 Furthermore, in using this new framework, the
13 actual accuracy, precision, and certainty of the
14 technology provider's measurement data can be
15 determined.

16 NYSEARCH identified that, potential
17 next step, for this validation test protocol,
18 could include collaborating with national
19 organizations, such as ASTM, or to prepare and
20 publish validation standards that would be
21 recognized, by LDC and potential technology
22 providers. Next slide.

1 Now, moving on to these next set of
2 slides, I'll describe PHMSA's current research
3 portfolio on leak detection. Next slide, please.
4 Currently, PHMSA is funding seven active research
5 projects, at universities and with research
6 entities.

7 We've invested \$2.5 Million, in
8 funding. Our current projects, include research
9 that evaluates improved leak rate estimation
10 models, portable technology to measure the
11 concentration of mercaptan in gas and improving
12 existing leak detection systems, by utilizing the
13 computational pipeline monitoring data and
14 machine learning to locate smaller leaks. Next
15 slide, please.

16 These next two slides illustrate the
17 seven recipients funding level and project
18 summaries of leak detection-related research
19 projects, in our active research portfolio.

20 I won't go through each project, but
21 encourage you to go to the URL, at the bottom of
22 the page, to find out more specifics about these

1 projects. Next slide, please. These next three
2 active projects --

3 (Simultaneous speaking.)

4 (Audio interference.)

5 MS. WHITE: Can you please mute your
6 phone?

7 Thank you. These next three active
8 projects, include research on combing multiple
9 sensor types on an unmanned aircraft platform,
10 evaluating ways to improve measurement of the
11 concentrations of mercaptan and improving leak
12 rate estimation model. Next slide, please.

13 So as we look towards the future, we
14 have a few R&D Initiatives we would like to
15 highlight that PHMSA will be undertaking. Next
16 slide.

17 Leak detection has been a
18 long-standing priority in PHMSA's research
19 portfolio and we are committed to continuing to
20 invest in research and support abatement of
21 methane releases and the Administration's climate
22 change initiative.

1 PHMSA has invested in a number of
2 research projects, related to UAS drones and we
3 plan to continue to expand our research
4 portfolio, to improve pipeline safety and
5 streamline certain aspects.

6 And, as an example, PHMSA has funded
7 specific research on UAS leak detection and
8 integrity threat monitoring, but we have, yet, to
9 fund a more comprehensive project.

10 So what would that look like? A more
11 comprehensive project could include utilizing UAS
12 technology, to monitor pipelines for leaks and
13 integrity threats, while also, providing a visual
14 of a pipelines following an emergency.

15 The research would look to determine
16 the ability of defensive platform to operate,
17 during adverse conditions. A large research gap
18 that has been identified, would be to investigate
19 how this UAS system could be utilized, given a
20 beyond visual line of sight waiver, allowing
21 operators to routinely monitor large swaths of
22 the right-of-way, with limited human involvement.

1 PHMSA is also considering research on
2 advanced systems that can help with more
3 real-time, or near real-time detection, such as
4 detection through satellite.

5 We have not funded satellite research,
6 in the past. We would look to address what is
7 the current, available technology and how it can
8 be utilized, to effectively monitor pipeline
9 right-of-ways.

10 In addressing research, related to
11 real-time applications, PHMSA has funded
12 distributive fiber optics systems enable pipeline
13 operators to continuously monitor their pipeline
14 system, for leaks.

15 We're also looking to fund research
16 that will assist PHMSA in meeting the
17 congressional mandate, to require the use of
18 advanced leak detection systems, such as
19 continuous leak detection. Next slide.

20 In addition to continuing to seek R&D
21 opportunities to advance leak detection
22 technologies, we also plan to seek input from

1 pipeline stakeholders, to inform our future R&D
2 strategy, including hosting a climate change and
3 alternative guild workshop, in fall, of 2021, and
4 planning for an R&D forum, in spring, of 2022.

5 We also have an open notice, on our
6 Website, where stakeholders can submit research
7 gap and ideas, for potential future R&D safety
8 topics. Next slide, please.

9 And, lastly, the success of PHMSA's
10 Pipeline Safety Research Program could not be
11 achieved, without the dedicated and hard work of
12 the R&D staff, listed here. And so I just wanted
13 to quickly acknowledge the great work that
14 PHMSA's R&D Team does every day, to contribute to
15 our safety mission. And, with that, I will hand
16 it back over to Sam. Thank you.

17 MR. HALL: Thank you, Senthoo. We'll
18 now transition to the first of two technology
19 research and development initiatives and panel
20 discussions. We'll have one panel discussion
21 before lunch and the second one after lunch.

22 The first panel will be moderated, by

1 Sentho White, Director of Engineering and
2 Research, who just spoke. Back to you, Sentho.

3 MS. WHITE: Thanks, Sam. And so as
4 Sam mentioned, I'll be the Moderator, for this
5 panel. And, during our panel presentations, we
6 plan to have Q&A for the vendors and
7 organizations, following the four presenters.

8 Each presenter will have 15 minutes to
9 present. And, just a quick note that, while
10 vendors will be presenting on their technology
11 stakes, this does not equate to any promotion, or
12 endorsement, by PHMSA, of any vendor, on their
13 respective technology.

14 Accordingly, PHMSA will not entertain
15 any questions, as to the capabilities of any
16 vendor technology, or the vendor's ability to
17 assist pipeline operators in meeting regulatory
18 requirements.

19 And, one additional thing. My
20 apologies, as, while all of our panelists, have
21 quite impressive bios, unfortunately, given the
22 tight time line to get through today's agenda, we

1 are, we're going introductory bio, for each of
2 the panelists.

3 And, with that, I would like to
4 introduce our first panelist, from PRCI, Carrie
5 Greaney will be presenting for PRCI, and PRCI
6 will be presenting on their greenhouse gas
7 emissions leak detection and repair research
8 portfolio. Handing it over to you Care, Carrie.

9 MS. GREANEY: Hi and good morning.
10 Does everybody hear me?

11 Can you hear me okay?

12 MR. HALL: Yes we can. Yes, we can.

13 MS. GREANEY: Okay, great. Okay, good.
14 Thanks. Hi, I'm Carrie Greaney, I'm a Program
15 Manager, at PRCI, Pipeline Research Council
16 International.

17 Today, I'm going to talk to you, a
18 little bit, about who PRCI is, for those that
19 don't know, and then, I'm going to go into a
20 discussion of a portion of our research and
21 development that, specifically, pertains to the
22 topic of this meeting, which, again, is methane

1 emission and leak detection and, and repair.

2 And, provide some additional
3 resources, specifically, for our project and
4 project results, since I'm not going to be able
5 to get into detail for everything, today, we only
6 have 15 minutes.

7 Great. So PRCI is a non-profit
8 research and development organization focused on
9 transition pipeline systems. Our mission, as you
10 can see, there, is to collaboratively deliver
11 relevant and innovative applied features to
12 continually improve the global energy pipeline
13 systems.

14 So when I -- when I think
15 collaboratively, provide research, any peer
16 review technical results, by subject matter
17 experts, which include our members, which you can
18 see, consists of the breakdown, there, which are
19 transmission operating companies and technology
20 providers, which are vendors, service providers,
21 equipment manufacturers, and other organizations.

22 But, we do, also, look to collaborate

1 with other R&D organizations and government R&D
2 programs, nationally and internationally, to
3 leverage resources and avoid redundancy in those
4 initiatives.

5 What you'll see, here, is that our
6 organization consists of several committees. I
7 have two slides, here, essentially. We have
8 eight technical committees.

9 The project that I plan to talk about,
10 more, today are highlighted there, for five of
11 our committees and, as you'll see, I've, I've
12 noted that we have, we have repair.

13 And then, the divide and kill
14 construction, underground operations and
15 monitoring where we look at leak detection for
16 liquids and gas, compressor pump station.

17 Looking at greenhouse gas emissions
18 mitigation, measurement looking at reducing loss
19 and unaccounted for and underground storage,
20 which, looking at general integrity, but again,
21 we, we've been highlighting more technology
22 specific to leaks and emission.

1 So PCRI's project focus is for
2 immediate impact to work on reducing emissions
3 and leaks in the areas of greatest impact, first,
4 so the largest of measures, which I think we
5 heard a lot about, yesterday.

6 I'm going to talk, first, about how we
7 can inform actions, by discussing the recently
8 completed work, which is our, kind of, one to
9 three years. We have previous work, but again,
10 I'll provide resources for those. And remission
11 reductions from facilities, pipeline leak
12 detection, underground storage and repair.

13 I mentioned, in our mission that,
14 we're looking to provide relevant and applied
15 research, which, to us, means that we're looking
16 for the results to deliver data to inform best
17 practices, provide software tools, or validate
18 accuracy, reliability, and robustness of
19 technologies, better being developed, or
20 available commercially for a successful
21 operational implementation.

22 So here's the breakdown on the

1 emissions practice that we have, several relevant
2 projects that, that the group may be interested
3 in, specifically, the greenhouse gas database, to
4 support emission factor improvement.

5 The second project there that came up
6 yesterday, during the EPA presentation, and that
7 was specifically a project, where we did data
8 mining on Subpart W data, to get back to EPA and,
9 and give them that, that input on improving the
10 emissions mitigation measure.

11 The next project that you -- that
12 might be of, of specific interest, again, is
13 looking at valve, valve leakage scoping. You
14 know, valve leakage is one of the largest areas
15 in which there, there's an ability to make
16 improvement, so that project began, looked at
17 evaluating options and feasibility on detecting
18 those leaks, quantifying them, and that -- for,
19 for those issues and repairs.

20 The first and fourth project are
21 looking at efficient design, which, again, when
22 you have the efficient design you're, you're

1 reducing emissions, overall.

2 That last project that you'll see
3 there, for compressor and pump stations, it's an
4 interesting one. It was looking at the,
5 specifically, the feasibility of, of, of using,
6 or recompressing the emissions, or exhaust, to
7 reduce the overall emissions, at compressor pump
8 stations.

9 All right. Next, I'm going to shift
10 gears, a little bit, to talk about gas leak
11 protection, you know, recently completed
12 projects. This is one that we highlighted in, it
13 was in partnership, with NASA's JPL.

14 It was done under surveillance and
15 operations which is a monitoring committee, which
16 looks at leak detection, liquids and gas, from
17 in-ground to fake applications.

18 (Audio interference.)

19 This project, itself, was a
20 partnership, again, like I said, with NASA JPL
21 and, and developed a hand-held and small UAV, or
22 drone quad-copter-style application or open, the

1 OPLS technology, which, was the, initially, part
2 of the Mars Rover.

3 It also included ethane detection,
4 which we, which was mentioned, again, yesterday,
5 during the Q&A, to avoid false positive rates,
6 due to the (audio interference).

7 This one will be considered kind of an
8 intermittent or non-24/7 monitoring and it's one
9 of the many that would be a double operator.

10 Also, I'll mention, since this came
11 up, yesterday, in regards to the UAV and drone
12 use, it is an increasing application, but they're
13 still not widely adopted, by operators in the
14 U.S., because of current FAA requirements, for
15 certification.

16 It can be done, but it's a long and
17 intense process. Certification is very specific
18 to the platform type and, areal detection,
19 regardless of platform, is highly impacted by
20 environmental dispersions.

21 So these types of technologies can be
22 very helpful, but would have to be mindful of

1 specific environmental and, and terrain
2 conditions, when looking to utilize these types
3 of technologies.

4 In our underground storage area, we
5 had a recent project that was done with Colorado
6 State's METEC facility. They're looking at
7 evaluating two commercially-available
8 technologies at a very, at a high level and what
9 the project found was, there was a bit of a
10 tradeoff between detection sensitivity and the
11 false/positive rates for underground storage use.

12 In general, the conclusions, again,
13 this project saw that the quantification, per
14 imagery, under the study that that would benefit
15 from additional work on algorithm, or machine
16 learning, to reduce that false/positive rate.

17 In repair, which -- and, I don't think
18 we've gotten into a lot, yet. We do have a
19 diverse mutual construction technical community
20 that focuses on repairs.

21 We have a very widely-used pipeline
22 repair manual. It fits editions, I think,

1 originally, from 2006, for liquids and natural
2 gas transmission pipe, metallic pipe.

3 And, again, it's something that's
4 widely used, but we know that there's a need for
5 an update, so it's currently going under a
6 seventh edition update, which would include the
7 composite repair best practices and guidance that
8 has recently come out of several projects,
9 specifically, looking at composite-type repair.

10 All right, so on to, kind of, what we
11 have going on in our current portfolio. New and
12 current projects that we have across the
13 technical committees are focused on emission
14 reductions and transmission facilities.

15 As well as, two projects that you'll
16 see, there, to gather information on state of the
17 art available technologies, for detecting and
18 quantifying greenhouse gas releases, or fugitive
19 leaks, as well as, for facilitating repairs,
20 without requiring blowdowns.

21 While there are some well-known
22 commercial technologies, these studies are

1 specifically end up collecting and informing best
2 available, as well as, identifying potentially
3 new technologies that are not quite commercial
4 and ready for validation in the old, or large
5 scale testing.

6 So again, the, all of these projects,
7 kind of, encompass those five technical
8 committees that that I mentioned, there. So as I
9 identify the next step, where, where we see
10 technologies ready for implementation, we, we
11 have continued data and demonstration studies
12 that that, we think that are needed.

13 There's also mentioned, during some of
14 the panels, yesterday, about that and,
15 specifically, on the left there, you'll see that,
16 they've identified six focus areas on the
17 greenhouse gas emission reduction that are
18 priority for PRCI.

19 What each of those topics have in
20 common, which you'll see, they're highlighted in
21 blue, on the right-hand side, is, is a common
22 challenge for successful application of the

1 technologies.

2 It's standardization of evaluating
3 detection quantification in broader field of
4 invalidation data. I, we, also, during the,
5 either, comments, or Q&A, session, yesterday,
6 this was mentioned.

7 There's really a need for protocol,
8 or, and, as I mentioned, standards to reliably
9 access sensor type to compare them, apples to
10 apples, and ensure that they're validated for
11 specific platform types and application types,
12 rather than just in small scale laboratory
13 situation.

14 Those field large scale validations
15 are, there's less frequent data associated with
16 that type of study, for many sensor types.

17 So I know I'm, kind of, blowing
18 through this, trying to be conscious of, of the
19 time that we were allotted. So I wanted to leave
20 everybody, with some additional resources,
21 engagement opportunities.

22 You'll see, under the compendiums,

1 there, those are all links to our catalog. And,
2 each of those compendium documents is actually
3 its own mini catalog of work that's been done, in
4 the past, and it's completed work.

5 So, you know, the, some of them are,
6 include those recent ones, which I've had
7 completed in the last one to three years and some
8 of them are, are even over the not informed of
9 studies.

10 Many of the newer products also have
11 on demand Webinars, so it, you know, if you
12 prefer to listen to a one hour Webinar, rather
13 than, you know, dive deep into the 300-page
14 document, for some of them, we, we do have those
15 available, for, for listening.

16 And, also, I'll mention our, our
17 research exchange. PRCI hosts an annual research
18 exchange and we welcome submissions of abstract,
19 for the conference, which a call will go out for
20 later this year.

21 I also want to talk about the
22 additional next steps, for communication and

1 sharing, which is our public research roadmap
2 that will be published, later this summer.

3 We're hoping that this will allow us
4 to show areas, across our committees and research
5 focus areas that would identify opportunities for
6 partnering with other organizations in Government
7 R&D programs that have similar identified
8 priorities and that's within the methane leak
9 detection repaired emissions, but also, in, in
10 other program areas and subject areas, as well.

11 So in closing, I just want to say,
12 thank you, for everybody's time, listening to the
13 much-abbreviated overview of what we have in this
14 area, and thank, thank you, for presenting us
15 with the opportunity to share what PRCI is doing,
16 at this time.

17 MS. WHITE: All right, thank you,
18 Carrie. And, we'll move to our next, second
19 panelist, and that is with GTI. And Susan Stuver
20 will be presenting for GTI and she will be
21 presenting on their methane detection and remote
22 sensing efforts.

1 DR. STUVER: Hi. Audio check, can you
2 all hear me, okay?

3 MR. HALL: We can, Susan, thank you.

4 DR. STUVER: Okay. Great, thanks.
5 All right. Hi, I'm Dr. Stuver, and I'm a Senior
6 Manager, at GTI. I, currently, lead a number of
7 various collaboratives that drive technology
8 innovation towards the mission mitigation
9 solutions.

10 So in other words, we want to advance
11 beyond just incremental R&D projects and create
12 new holistic solutions that support the energy
13 landscapes that we envision, of the future.

14 And GTI has been getting technologies
15 to the market, for about 80 years, or so and, as
16 technology has advanced, over the last eight
17 decades, it's really, really important that we
18 work together.

19 So GTI, either, leads or participates
20 in many collaborative and information sharing
21 platforms to, kind of, keep the communication
22 flowing.

1 And, I've only represented a couple of
2 groups, here, on this slide. There are many
3 more, such as public meetings, like these, that
4 we frequently engage in.

5 However, in the essence of time, I am
6 just going to focus on a couple of key
7 technologies, in the methane detection space and
8 we'll leave some of the collaborative discussions
9 for another day.

10 Okay. So I think, this slide nicely
11 summarizes the primary elements of what we do, in
12 the technology space. We spend a great deal of
13 time working towards solutions in technology
14 development, technology evaluation, modeling, and
15 proving methodologies for technologies used in a
16 lab and in field and, of course, collecting data
17 and field testing technologies, through
18 measurement campaign.

19 The columns with the pictures break it
20 down, down the right, even further. For example,
21 if we're focused on technology, itself, we may be
22 developing novel sensor types that can be

1 designed to detect emission sources, quantify
2 emission rates, analyze gases, or it's some
3 combination of the three.

4 We, also, investigate the performance
5 of methane sensors space on the platform, there
6 are six cubes, such as, is it on a handheld
7 device, is it on a vehicle, a robot, a drone, an
8 aircraft, or is it on satellite?

9 We, also, need to be aware that the
10 types of infrastructure being surveyed for
11 emissions, or being include with new technology,
12 will also have a bearing on the sensors that work
13 best, or the methods that need to be deployed,
14 for those sensors to work.

15 For example, a technology might work
16 great, for a leak investigation of a pipeline,
17 but it may not be ideal for measuring emissions
18 at a compressor station, or at a meter deck.

19 And this leads us to understanding, in
20 these cases, or our methods that might work best,
21 based on the objective of the user, the kinds of
22 sensors and platforms being used, as well as, the

1 types of assets being surveyed.

2 So this, kind of, sets the stage for
3 a couple of technology examples that I'm going to
4 share with you, just for some context. Okay. So
5 first off, here, we have a set of methane
6 detectors, for first responders.

7 And these are demonstration platforms
8 that we assembled, at GTI, but they contain,
9 basically, off-the-shelf components. And so just
10 to level set, we're defining a first responder,
11 here, as a, the first person, from the utility
12 that arrives on the scene, to make an assessment,
13 if there is a potential issue, like a leak.

14 Other first responders, like, like,
15 the fire department, may follow. And so these
16 are designed to give the first responder a tool
17 that allows them to monitor a wide area, with
18 just one person. So they don't have to be in
19 many places, at once.

20 What makes these different than some
21 of the other types of technology like that's on
22 the market, is that, these wirelessly connect to

1 any device that has Wi-Fi.

2 So you can see concentrations of
3 methane, at strategic locations, around the site.
4 You can, also, see if the remediation that you're
5 doing is making a difference and, more
6 importantly, other responders that arrive on the
7 scene and have an easy way to get into that mesh
8 network and see what's happening.

9 And we got a number of different
10 controlled-relief field campaigns to assess
11 performance of these sensors in, both, cold and
12 warm environments.

13 And the nice thing about this project
14 was that, we involved our manufacturer, at the
15 actual field campaign, so that engineering
16 feedback received, during the performance
17 testing, was directly fed to the manufacture, to
18 again incorporate refined design into the
19 product, which dramatically improved the
20 efficiency of the design.

21 So this technology is a slightly
22 different variation of the same concept.

1 Specifically, if a surveyor finds a hazardous
2 leak, say, on a, on a buried pipeline, they need
3 to stay with it, until the repair crew arrives.

4 And, additionally, they may have to go
5 back, like, daily, to see if the repairs worked.
6 These sensors are designed to stay behind, which
7 frees up the surveyor to go elsewhere, if needed.
8 And, as you can see, in the pictures, here,
9 they're designed to go on barholes.

10 The dome, at the top, is the antenna,
11 which can still work, even if it's covered with a
12 bit of things like sandy flow, or snow, and the
13 sensors and battery are actually in the stem and
14 are under ground. It's, also, designed to handle
15 a lot of weight, so they could be put in
16 something, like, manhole covers.

17 This slide shows, how the data is
18 pushed to a server, and then to a dashboard that
19 reflects this. The battery life can range, at
20 least, two weeks to six months, depending on your
21 desired data transmission rate.

22 So basically, if you can get by with

1 less readings, like, say, one reading every five
2 to six hours, it can go months, before you need
3 to deal with the battery.

4 And there are some devices already out
5 there that have modules, like these, but we found
6 them to be expensive and you need to purchase
7 their viewer bot, so you can't use whatever
8 device you want, to see the data.

9 And both the sensors I just showed,
10 were designed with open standards to avoid that,
11 that kind of lockdown. And you can walk up to
12 these sensors, with an App, on your phone, or
13 tablet, and then you can access the dashboard.

14 Okay, I wanted to touch on some of the
15 R&D that we're doing in the handheld sensor
16 stage. This is a hot topic. Lots of our
17 industry partners are interested in understanding
18 how different types of handheld sensors perform,
19 as this technology advances.

20 And so I'm just going to touch on a
21 couple of projects that we're doing in this
22 space. The first is how well sensors perform in

1 finding small leaks, with various obstructions
2 encountered in and around buildings, during leak
3 survey, while the other focuses on performance of
4 handheld sensors at gas-filled structures.

5 For example, some windows having
6 coatings on them that reduce the performance of
7 the sensors, if you're trying to, like, shoot a
8 laser through a window, to see how much gas might
9 be inside of a structure.

10 These two things, in the pictures,
11 here, were tested at different angles and at
12 different distances, from controlling leak point
13 that were stimulated at, both, indoor and outdoor
14 labs, located at GTI.

15 The new technologies were also
16 incorporated, with additional leak survey
17 instruments, so that we had a benchmark. The big
18 takeaway from this performance testing is that,
19 there's a tradeoff between beam size, so sensors
20 with center beams have improved accuracy, at long
21 distances, and can detect smaller leak sizes, but
22 they don't perform too well, when obstacles are

1 encountered.

2 And the lighter beams lose some
3 accuracy, at shorter distances, but they perform
4 better at indicating a leak, where there may be
5 very obstacles between the leak and the surveyor.

6 And, on a related note, we're also
7 testing a quantitative gas imager that claims to,
8 both, detect and quantify a leak in a single
9 instrument. And so maybe more to come on that,
10 we'll see how that performs, as testing shakes
11 out.

12 Okay, so along the lines of unmanned
13 platform, we're also testing technical robots
14 that can be used to enter a hazardous structure,
15 and these robots are tested on their ability to
16 perform, as a viable means of entering an unsafe
17 building, to measure methane concentrations.

18 We looked at, how well they could get
19 through the doors, climb over debris, climb
20 stairs, et cetera. We discovered that the
21 platforms perform pretty well. They were able to
22 enter structures right up to 100 feet away and

1 they could fairly, easily carry a variety of
2 methane sensors.

3 And we, also, have numerous studies
4 underway to test methane sensor performance on
5 drones. This is a DOT sensor study aimed at
6 predicting a drone platform that's ideal for
7 transmission pipeline leak protection and
8 pipeline integrity threat monitoring, in a single
9 platform.

10 And we're exploring the performance of
11 the system in a variety of (audio interference)
12 types that are difficult to access by motor
13 vehicle. A situation, for which drones would be
14 a useful alternative, when serving pipelines.

15 The performance testing includes large
16 scale field laboratory trials, as well as, field
17 campaigns, at operating sites, located in towns
18 and terrain, like, eco-forested areas, or
19 wetlands.

20 And we're, also, exploring air base
21 sensor solutions, for distribution line surveys
22 that combine GPS, or Global Positioning Systems,

1 with INS, which stands for Inertial Navigation
2 System, that provides orientation, velocity, and
3 position, and it also combines meteorological
4 sensors with FMCW LiDAR, which stands for
5 frequency-modulated-continuous-wave spectroscopy,
6 with light detection and ranging.

7 It's a bunch of big words, but it,
8 basically, is what gives you the 3D topography,
9 like, what you see, in that picture, up there.
10 It, also, has georegistered sensors for gas
11 mapping overlay capability that you can get in
12 real-time.

13 And this particular technology that
14 we're testing has been used quite a bit, by
15 upstream oil and gas producers, who have mounted
16 it to a six-wing aircraft. Their results there
17 were quite promising in, both, surveyed and
18 controlled relief field testing.

19 And so we're testing it, for its
20 performance for use in utility distribution
21 systems that have more complex surroundings,
22 like, busy streets and tall buildings, coupled

1 with much smaller leaks, a combination that had
2 limited leak surveys to ground base survey
3 platforms, like, vehicle mounted, or a handheld
4 platforms, in the past.

5 So it's the hope, with this technology
6 that it can, not only, find large leaks, but it
7 can also be able to find small underground leaks,
8 as well, in an urban environment, with real-time
9 mapping. And you're, actually, going to be able
10 to hear, I think, a bit more about this
11 technology, in the next panel.

12 Okay, so I want to move on, real
13 quickly, to some direct abatement technology.
14 This first piece of tech is called the Methane
15 Mitigation Thermal Electric Generator, or what we
16 call MMTEG, for short.

17 Sending it through a cooperative
18 agreement with the Department of Energy, National
19 Energy Technology Lab, or NETL, and it began back
20 in 2016.

21 So a pneumatic controller, are you,
22 all of our production and at facilities along gas

1 delivery systems, for a variety of reasons, but
2 it's usually to move liquids, at the wellhead, or
3 during gas separation, at gathering (audio
4 interference) stations.

5 Many pneumatic controllers are run
6 using natural gas and they vent regularly, or
7 they get stuck open and they vent even more. An
8 individual pneumatic controller may not emit very
9 much, but together they're among some of the
10 largest sources in production gathering and
11 processing.

12 And so this technology explores a way
13 to retrofit pneumatic controllers, such that
14 they're powered, by air, in a more cost-effective
15 way than your traditional instrument air systems,
16 you might see in the field.

17 It takes a small amount of gas in the
18 line, it combusts it, and it uses that heat to
19 charge the battery. A power store in the battery
20 is then used to run the small compressor, so that
21 air is used for pneumatic, versus natural gas.

22 And we're beginning full-scale pilot

1 testing and anticipate having a commercially
2 viable product, by year's end. We, also, have
3 been approached, by several manufacturers, who
4 are interested in (audio interference) for
5 processing plants, as well as, several oil and
6 gas majors, who would like to put systems, like
7 these, at their remote sites.

8 Okay, the last technology I'm going to
9 highlight is the linear compressor technology,
10 it's also funded by DOE NETL. So the natural gas
11 industry has about 10,000 compressors moving gas
12 through transmission system and storing it
13 underground, in high-pressure formation sites,
14 salt caverns.

15 And, decompression continued about 20
16 percent of the total emissions from the entire
17 value chain, costing about a billion dollars in
18 loss gas, every year, just a very large and
19 expensive store.

20 In fact, compressors leak, or vent, so
21 much that compressor stations have engineered
22 vents, to direct emissions out of compressor

1 buildings, to prevent the possibility of gas from
2 building up.

3 And it's, at that gas vent, where this
4 technology captures, compresses, and puts that
5 gas back in the line. And it's just a single
6 moving part and it's all sealed up, so it doesn't
7 leak, or vent.

8 There are other types of small crude
9 compressors on the market that do the same thing,
10 at separation tank, but those compressors are
11 only designed for a low-pressure off-gassing,
12 like, a 100, or so pounds, per square-inch, so
13 they're not suitable for taking low-pressure
14 vented gas and injecting it into a high-pressured
15 pipeline that can exceed something like several
16 thousand pounds, per square inch, whereas, this
17 technology can.

18 And, if you plan enough, in advance,
19 you can actually catch a blowdown, with a linear
20 compressor, and direct that gas back into the
21 line, as well.

22 The CORE technology has been

1 demonstrated and we should have a full scale
2 prototype in the next year, or so, continuous
3 (audio interference) compression with the
4 industrial scale deployment.

5 And that is about all the time I have,
6 so I'm going to wrap it up, there. Thank you,
7 all, very much, for your time, and I'll be around
8 for questions.

9 MS. WHITE: Thank you, Dr. Stuver.
10 Nice presentation. And I'd like to introduce our
11 third panelist, from METEC, and that is Stuart
12 Riddick.

13 And, METEC will be presenting on their
14 Upstream Pipeline Safety Inspection and Detection
15 Project. Handing it, handing it over --

16 DR. RIDDICK: I --

17 MS. WHITE: -- to you, Stuart.

18 (Simultaneous speaking.)

19 DR. RIDDICK: Thank you, very much.

20 Good morning, everyone. My name is Stuart
21 Riddick, I'm a Research Scientist, with Dan
22 Zimmerle's group, at METEC, as described, before.

1 I'm here to talk to you about the
2 Upside Project, which is a new project that we've
3 got to measure and to look at the Upstream
4 Pipeline Safety Inspection and Detection.

5 This is a collaborative -- oh, a
6 collaborative project, between Colorado State
7 University and the University of Texas at
8 Arlington and the, the PI, Dan Zimmerle and Kate
9 Smits, down in Arlington, and you can see, here,
10 we've got quite a big group of scientists and
11 grad students working on the project.

12 So the Upside Project objective, this
13 is, this is a project that somebody, by Mark
14 Martinez and Joy Irwin, Memorial Public Project
15 Fund that was -- that's run through the COGCC, so
16 the Colorado Oil and Gas Conservation Commission.

17 And, what we're interested in doing is
18 we're looking for leaks in the Upstream Pipeline
19 leakage, so that's flow lines to the well path
20 lines and the gathering lines, for the produced
21 gas and from the well pans to the compressor
22 stations, for example.

1 And the objection of the project, or
2 its investigative the -- and document,
3 currently, protection practices, for flow and
4 gathering lines, investigate the fact that there
5 are hydrocarbons and proves the understanding of
6 the existing and emerging leak detection methods
7 and develop recommendations, for flow and
8 gathering, gathering line monitoring.

9 Now, the difference between the
10 Upstream lines and something distribution network
11 is that this is preprocessing, so the gas doesn't
12 have mercaptan in it, so it's, it's more
13 difficult to detect on the, on the fly, so
14 walking past you wouldn't, necessarily, detect
15 it.

16 And, as it says there, it has heavier
17 hydrocarbons in it, so sometimes the leaks are
18 first detected, as a pool of oil comes up to the
19 surface, so relatively speaking, versus the
20 distribution lines, these are a bit more
21 difficult to detect and identify what's going on.

22 Now, the rationale behind this is

1 that, currently, there's no simple method to
2 estimate leakage rate from pipelines. So I -- a
3 difficult process and some, before, there, there
4 are a lot of technologies that measure high
5 concentrations, or their concentrations, but it
6 is the, the use of these concentrations to a
7 foreign emission rate that's quite difficult to
8 do.

9 Advanced instrumentations not
10 readily-available for routine field applications
11 and advanced instrumentation requires that they
12 skip the measurement processes.

13 They, both, got the problem that the
14 flow lines and gathering lines are very, very
15 long and, generally, in quite remote areas. So
16 the proposed -- the approach is to develop
17 something that's relatively easy to calculate the
18 emission, right, based on easily measured field
19 parameters the industry are already taken and
20 estimate well-enough to engage level of concern,
21 we'll see later in the presentation that relying
22 concentrations doesn't necessarily give you very

1 good understanding of the emission rate.

2 And, what we want to do is make this
3 approach applicable to a wide range of some
4 surface conditions and surface -- surface
5 conditions.

6 And so our overall plan is to use our
7 controlled release test beds, at METEC, and try
8 and characterize the size of concentration of the
9 3D plume, above the leak to the high-precision
10 ethane analyze it.

11 And then, once we've got this baseline
12 measurement, we can then investigate the
13 variability leak characteristics, caused by gas
14 composition, and it meets it again, we can, we
15 can add heavier hydrocarbons to our, our gas
16 being emitted and see what effect that has on
17 there.

18 Then, what we'd like to do is, we'd
19 like to take this -- or, what we're going to do
20 is take this out into the field and have a look
21 at the effect of different subsurface conditions,
22 so measure different soil types, and then,

1 lastly, to look at solution testing.

2 So we're going to be looking at four,
3 no more than four technologies, including some
4 that are industry standards and we're going to
5 test these, at METEC, given the normal flow rates
6 and, potentially, go out into the field and see
7 if we can detect some, some leaks from gathering
8 lines and be able to perform, find the emissions
9 from them.

10 I believe, the main idea is to develop
11 assessment tools, or guidance, on new methods of
12 detection and, perhaps, to inform current message
13 on best practices, or how they can best detect
14 leaks and in what conditions they may have to
15 change their, their current measurement
16 approaches.

17 So for those people that don't know
18 METEC, this is the METEC site and what we have a,
19 Dan likes to call this the Hollywood well pad.
20 I'm sure people have heard this before.

21 And this is an example of, I think,
22 we've got five well pads on here and these,

1 there's no oil and gas underneath these, these
2 are all fed from gas houses, with flows, gas
3 flows of known emission rates.

4 And these can be -- emissions can be
5 positioned anywhere, and one of, I think, it's
6 running up, between five and the thousand, 500
7 and 1,000 emission points.

8 And, if you come to METEC and you do
9 some ad hoc testing, you can ask, where you want
10 the, the emission rate to be and how large it is.

11 So if you're, you want to see the
12 effect of a condensate tank on the down-flow of
13 gas, we can release an emission rate, from the
14 top of the, the tanks that you see, there, on the
15 right-hand side, and you can drive around, in the
16 background, and see if you can estimate an
17 emission from that, from that release rate.

18 Now, for our -- what we're, currently,
19 doing, at METEC, is we're developing two new
20 tests. The rural tested, by which, it will be at
21 the top, left-hand side, of the screen, you see,
22 there, and the urban tested, is going to be

1 developed from the south -- that's the road to
2 the south side of METEC.

3 So we -- what we're going to have is
4 we're going to have a rural test bed which is
5 effectively very much for the Upside Project,
6 which is looking at emissions in undisturbed
7 environments from the subsurface, and we're going
8 to create leak points at three and six feet.

9 And we have an array of
10 instrumentation below the surface, on the
11 surface, and above the surface, in order to see
12 what the -- to investigate the methane plume
13 below the ground, how it appears on the surface,
14 and then if you were to be moving through it with
15 a detection solution, what you would actually
16 see.

17 And to compliment that we have an
18 urban test bed, which is made to represent an
19 urban and suburban environment with an asphalt
20 road that's going to be laid and underground
21 infrastructure, which mimics or simulates gas,
22 water, and communications lines, moving in the

1 environmental area, and in the environment.

2 So for the rural test beds, we've got,
3 as I said, we've got above-surface measurements.
4 These above-surface measurements will be at --
5 currently we're thinking at eight points, these
6 are the blue circles and the green circle, green
7 circles we're going to have measurement points
8 for the surface.

9 So this -- these are just going to
10 measure the standard concentration. And our aim
11 is to see how the plume, the 3D plume, changes,
12 as the -- as the environmental conditions change.

13 So if you have a very windy day and
14 you might see a very thin plume that isn't very
15 high, but if you see a, if you have a lot of
16 solar radiance and not much wind, what you're
17 going to see is you're going to see the plume
18 being lofted and not traveling very far.

19 So hopefully, we're going to capture
20 these images. And the way you these are
21 different from point source is we know from
22 experiments done before is that emissions from

1 the subsurface are emitted over an area.

2 So instead of a point source, you have
3 an area source, and we know from the ethane
4 migration project, which is a project we just
5 finished with UT Arlington, this area changes
6 relative to the environmental conditions.

7 This is just an image showing what the
8 subsurface measurements are going to be, so it's
9 3, 4, 6, 15, 60, and 90 feet from the emission
10 point, we're going to have five sensors below the
11 ground at different depths, and this is going to
12 enable us to see how quickly the gas moves
13 through the ground and the furthest extent of the
14 gas.

15 And this is just a picture of the --
16 what's going to happen at the, in the urban test
17 bed, so we're going to have three houses, which
18 are effectively garden sheds, which are going to
19 represent houses and aerodynamic obstructions and
20 we're going to see how the gas released at
21 different points is affected by these
22 obstructions.

1 So the experimental approach, we're
2 going to use long-term methane releases at the
3 urban and rural test beds, so as I say, long-term
4 releasing anywhere from three days to a week and
5 it's going to establish itself in the above
6 surface plume.

7 The release rates are going to range
8 from four to 300 standard cubic feet an hour.
9 And once the plume has reach steady state, so
10 we've done measurements before at METEC, and
11 between 12 and 24 hours, the plume -- reaches a
12 steady state.

13 And we're going to measure the above
14 surface plume, how it changes in the changing
15 environmental conditions, the surface
16 concentration and the below surface
17 concentration.

18 And we're going to repeat experiments
19 in different environmental conditions, such as
20 the meteorology, so you get wind speed, you've
21 got the stability of the air, you get
22 temperature, atmospheric pressure, the depth of

1 the release.

2 And, as I said before, the gas
3 composition to reflect the fact that we're
4 measuring flow lines and gathering lines, which
5 can re-condensate, as well as gas.

6 So our working hypothesis, from
7 previous work that we've done, is that flow line
8 gathering lines looking, you know, in Google
9 Maps, you see these are generally located in
10 rural areas.

11 On leveraging our previous -- our
12 previous work, we know that surface
13 concentration, and hence the surface emission,
14 changes with environmental conditions.

15 And the group have a paper in review
16 at the minute describing the ESCAPE model, which
17 is a dynamic process-based model that estimates
18 the surface concentration, or the changes in the
19 surface concentration, with changes in
20 environmental conditions.

21 And the top right panel there shows an
22 example of what happens if you look down on a

1 release, and so this release was one meter, or
2 three feet, below the surface, and the yellow
3 shows high concentration and that runs to percent
4 methane.

5 And then, as low, as little distance
6 as five meters from the surface we can see the
7 concentration at the surface, so that's measuring
8 the gas (audio interference) disappears down to
9 background.

10 So this gives us an idea of what one
11 might observe if you are on a walking survey if
12 you miss, or if you walk ten meters without
13 taking a measurement, you perhaps miss the
14 surface concentration that you're looking for to
15 detect the plume.

16 And these are very much affected by
17 the surface conditions, so if you're measuring --
18 here, we've got a measurement on the 21st of
19 March, last year, and the measurements were done
20 in cold, snow, and wind, and the surface
21 concentration was around 40,000 PTM.

22 However, the next -- or two days away,

1 Colorado being Colorado, it was hot and sunny,
2 and the concentration dropped below 10,000 PTM,
3 for exactly the same leak in exactly the same
4 position.

5 So you're almost halving the
6 concentrations that you identify at the center --
7 at the center of the -- or directly above the
8 leak, so that's the center of that square there.

9 So we can see here if you're doing a
10 walking survey that between two days, you've got
11 a detection of almost half, just purely on the
12 surface concentrations.

13 And what we're hoping is to, as I say,
14 to take this information and move it forward to
15 the leak detection solutions. And I think it can
16 demonstrate it best with what we -- what we have
17 here.

18 So this is looking side on in three
19 different situations. So we have windy
20 conditions, so when it's sunny and, sunny and
21 dull, you know, it doesn't matter, but when it's
22 windy, the gas will move quickly from the

1 surface, surface concentrations become --
2 smaller, and the plume is more difficult to
3 detect.

4 And this is especially true if you're
5 flying, for instance, a drone, and it's very
6 windy, the best place to measure if you're flying
7 a -- hoping to catch the gases measured by a
8 drone is to measure downwind of the leak and that
9 will be dependent on the wind speed.

10 If you have sunny, low conditions, the
11 gas generally will move vertically, and the
12 surface conditions will be much larger.

13 So in sunny, low wind conditions, you
14 might see something better if you were to fly
15 your drone through the plume, you're more likely
16 to detect something, or if you're doing it --
17 doing the ground survey.

18 But if you were to do a driving survey
19 and you were driving next to where you imagine
20 the pipeline would be, you may completely miss
21 the plume.

22 And in dull, low wind conditions gas

1 gets trapped at the surface. The surface
2 concentrations are much higher, so it's easier to
3 detect with a walking survey, but if you're
4 flying a drone through this, the plume might
5 actually be below where you're flying it.

6 So what we're trying to tease out here
7 is, you know, how can we, as atmospheric
8 scientists, help identify which is the best
9 method, given the best wind conditions or the
10 best atmospheric conditions, and we'll do this
11 with measurement as well as a bit of modeling, as
12 well.

13 So we're going to review leak
14 protection solutions, and if anyone is out there
15 and wants to get involved in this, in this
16 project, we'd love to hear from you.

17 We're going to perform literature
18 studies and identify the minimum quantification
19 limit and quantification ranges of several leak
20 detection solutions. Methods will include
21 industry standards, such as walking surveys with
22 gas sniffers, and if anyone's got a dog that

1 detects gas leaks that would be fantastic to do,
2 as well.

3 We expect to test no more than four
4 technologies during this project, and that's --
5 that's just in the proposal, and establish an
6 unbiased selection criteria to detect -- test
7 detection methods and technologies. And so we
8 obviously want to identify with industry partners
9 which technologies would be the most interesting
10 to test.

11 And that brings us to thanks to our
12 advisory boards, and we're working with industry
13 partners, such as ConEd, SoCalGas, PG&E, Western
14 Midstream, and DCP Midstream.

15 And we're also working with first
16 responders, such as Poudre Fire District and Fort
17 Collins and White Plains Fire District in New
18 York, and thanks obviously to the COGCC. And
19 we're also working with PHMSA as a regulator.

20 Thank you very much, and if you've got
21 any comments, or you'd like more information, if
22 you contact Dan Zimmerle or myself at Colorado

1 State, and we would love to hear from you. Thank
2 you very much.

3 MS. WHITE: Thank you, Stuart, for
4 your presentation.

5 DR. RIDDICK: All right.

6 MS. WHITE: And our -- yep. And our
7 fourth and last panel, at least for this
8 morning's session, is from QuakeWrap. Firat
9 Sever will be presenting on QuakeWrap's no-dig
10 leak repair technology. Handing it over to you,
11 Firat.

12 DR. SEVER: Good morning. Thank you,
13 Senthoo, for the introduction. Yes, again, my
14 name's Firat Sever, I'm the Pipeline Division
15 Manager at QuakeWrap.

16 And today I would like to do a brief
17 presentation on a new technology that we are
18 developing for trenchless or no-dig point repair
19 of gas transmission pipes.

20 Let's take a quick look at the
21 contents of the presentation. I would like to
22 start with giving you some background information

1 about QuakeWrap. The company has been in the
2 industry for decades and performing all kinds of
3 infrastructure rehabilitation.

4 And then we're going to move on to the
5 SuperLaminate Technology. That's the brand name
6 for the no-leak point repair system.

7 And after a brief introduction on
8 SuperLaminate, we're going to get to the
9 specifics of the U.S. DOT PHMSA Small Business
10 Innovation and Research Program that is, that has
11 been funding the SuperLaminate project for the
12 past year.

13 And then we're going to talk about the
14 next phase of that program, which is Phase II,
15 which is going to start in about a month or so.

16 QuakeWrap was founded in 1994 by
17 Professor Mo Ehsani, who is a retired professor
18 from the University of Arizona, where he
19 developed the first applications of using a
20 carbon fiber-enforced polymers to rehabilitate
21 bridges, mainly, after a major earthquake in
22 California in the '80s.

1 Then he founded the company, and upon
2 his retirement he shifted his entire focus to
3 QuakeWrap, and after that point the company has
4 seen steady growth. Now they have more than 60
5 employees in our construction arm, FRP
6 Construction.

7 We are proud of our innovations. The
8 company has more than 20 patents and six of which
9 are on pipelines. QuakeWrap also received a
10 congressional recognition about, for being a U.S.
11 exporter. That has contributed significantly to
12 the infrastructure safety around the globe.

13 In addition to myself, the key team
14 members of the SuperLaminate project include the
15 company president, Dr. Ehsani, Dr. Owen Yan, as
16 Technical Leader, Mr. Matt Winn, who's our lab
17 manager. Owen leads the land tests, and Matt
18 leads the testing protocol that we implement in
19 our R&D lab here for this project and others.

20 We are forming an Industry Advisory
21 Board that includes Mr. Jerry Rau, who was also
22 quite instrumental in Phase I, and introducing us

1 to the pipeline integrity industry.

2 In addition to Mr. Rau, there are four
3 others, highly-seasoned veterans of pipeline and
4 (audio interference) markets, from condition
5 assessment, engineering, and -- as well as
6 testing prospectives. We are constantly looking
7 for new advisory board members, particularly from
8 operators, so if anyone is interested, please
9 feel free to contact me anytime. Actually, there
10 are a couple of other pending members, as well.

11 So that industry feedback is quite
12 important for us, and that is essentially based
13 on a recommendation we received from Foresight
14 Science and Technology, as them being our
15 advisors on the commercialization side of things
16 in Phase I, and we are -- we are planning to
17 continue on working with them in Phase II, as it
18 has been quite fruitful to collaborate with them.

19 Throughout this workshop, there have
20 been many good presentations that laid out
21 extensive data on problems with pipelines and
22 leaks and methane emissions.

1 And I am -- we all understand that the
2 main focus of this workshop is reducing leaks on
3 methane emissions, but on the other hand, these
4 leaks, also -- and failures can be catastrophic.

5 The data from PHMSA suggests that
6 hundreds of people died over a period of 20 years
7 and, in addition, to billions of dollars spent on
8 mitigating efforts after pipeline failures.
9 Deterioration and corrosion of these pipelines,
10 to my understanding, is the second lead cause for
11 those failures.

12 There's potentially a large market for
13 pipeline rehabilitation and repairs, which has
14 been performed by conventional means, although it
15 -- use of advanced materials has taken place in
16 the oil and gas industry, but the overall method
17 is dig and replace, or dig and repair.

18 Large operators have been allocating
19 a good deal of money in their, for their capital
20 projects, which include a good deal of repairs
21 and rehabilitation in their -- for their
22 transmission pipes, as well as distribution

1 pipes.

2 And there are 300,000 miles of gas
3 transmission pipes in the USA. And that market,
4 by third-party studies, is expected, the pipeline
5 integrity market, is expected to grow at a rate
6 of about three percent.

7 So what actually is SuperLaminate? It
8 is a carbon fiber reinforced polymer lining
9 system. Carbon fiber is the strongest material
10 used in the construction or infrastructure
11 industry that enables making really thin
12 laminates as liners to rehabilitate pipelines and
13 other infrastructure.

14 SuperLaminate project started,
15 actually, about a decade ago with compressed and
16 pre-cured liners for point repairs, and that idea
17 was received well, by PSE&G of New Jersey, and it
18 has been used to span gaps and drip pots in gas
19 distribution systems.

20 However, that system, as we call, the
21 first wind fitch (phonetic) SuperLaminate has
22 mutations in terms of being deployed through --

1 for water mains, fire hydrants, or for launch
2 pads for gas transmissions mains because of the
3 unlimited flexibility.

4 As such a couple of years ago, we
5 started to entertaining the idea of using uncured
6 laminates. That is fabric saturated with resin,
7 so it -- which will be wrapped on a packer, the
8 ability to inflate and deflate and deploy to the
9 repair point, through, you know, traveling
10 through a fence in a pipeline.

11 And the concept is, again, launching
12 this assembly through launch pads in gas
13 transmission mains and utilizing a single access
14 point, multiple repairs can be performed by
15 taking the laminate to the repair points and then
16 inflating the packer and deflating. The
17 inflation and deflation part can be done with air
18 or steam, should an accelerated cure is sought.

19 We have been testing the system for
20 the past three years, and last year, those
21 testing efforts and proof of concept for PHMSA
22 SBIR project Phase I, was intensified and we

1 performed a high-pressure test on a 24-inch steel
2 pipe that was -- the wall of which was ground
3 down to 25 percent of the original wall
4 thickness, leaving only about two millimeters.

5 And we installed the SuperLaminate
6 system in the lab and pressurized it to 670 PSI,
7 and no apparent deformation or failure were
8 observed.

9 We also performed some chemical
10 resistance tests based on the feedback we
11 received from industry professionals through a
12 workshop we implemented at the initial phase of
13 the project.

14 We dissolved samples in -- into a 20
15 percent methanol solutions, so methanol was
16 regarded as a potentially harmful chemical to
17 this material that can be found in gas
18 transmission lines.

19 The exposure period was for 1,000
20 hours. The results were inconclusive. Some of
21 the samples did demonstrate some degradation in
22 terms of tensile strength.

1 So in Phase II of the Program we are
2 planning to implement longer term chemical
3 resistance tests, up to 10,000 hours, to get more
4 conclusive results, thereby determining whether
5 there's a need to improve the resin formula for
6 better chemical resistance.

7 The picture on the right here shows
8 what a lined pipe with SuperLaminate looks like.
9 It's hardly discernible. The laminate, after
10 it's cured and also compressed against the inside
11 interior of the pipe is of negligible thickness,
12 about a millimeter or maybe one-and-a-half
13 millimeters.

14 The edges are smooth, so there are no
15 concerns about reducing the cross section of the
16 pipe or impacting hydraulic capacity, or
17 conveyance capacity. And also pipe system repair
18 with SuperLaminate would accommodate cleaning and
19 inspection devices, as well.

20 So in Phase I, the proof of concept
21 was achieved by installing the liners and
22 pressurizing it and testing it. And the

1 technology assessments, we receive the technology
2 assessments from Foresight, which really
3 encouraging evaluations based on interviews
4 conducted with pipeline integrity professionals.

5 In Phase II, our main tasks will be
6 further in-house testing for chemical resistance,
7 third-party testing and certification to be
8 conducted by ABB Integrity, in Houston.

9 And deployment system design and
10 testing is another quite important task that we
11 are, we have been talking to (audio interference)
12 robotics firms in terms of (audio interference).

13 I apologize about the background
14 noise. So I moved close to a military airport
15 and I -- turns out that there are fighter planes
16 flying over me at this time.

17 So that Phase II part will include the
18 deployment design and testing at the robotics
19 firm. Commercialization efforts will be
20 intensified after a few months into Phase II, and
21 we are planning to continue on working with
22 Foresight, and we are expecting that it will be

1 more exciting in Phase II, as we get more close
2 to deploying the system for actual applications.

3 The design of the SuperLaminate system
4 in Phase I essentially was based on ASME's PCC2
5 Part 4, which is essentially written for external
6 wrapping of pipelines with composites, mainly
7 carbon fiber reinforced polymer. Based on the
8 test result we have received to date, we have
9 learned that that approach is actually a little
10 bit too conservative for SuperLaminate.

11 The main reason for that is the main
12 model failure, particularly for leaking pipes, is
13 separation from the host pipe, for external
14 repair, which is not -- which is not the case for
15 internal lining.

16 We utilized computational modeling
17 with the finite element method. And not only,
18 this method enables us to explore limit states
19 for failures, but also the distribution of
20 stress, strain, and deformation throughout the
21 pipe wall and the lining system, inside.

22 We completed a conceptual design for

1 the deployment system in Phase II, test protocol.
2 We're going to start building it a couple of
3 months into Phase II, and we are trying to fine
4 tuning the design and, also, in the contracting
5 phase with U.S. DOT Volpe, for the Phase II part.

6 And that system will, essentially,
7 mimic a launch pad with bends up to 90 degrees
8 and, again, working with a robotics firm, we will
9 perform some mock installations in our backyard
10 before we, you know, conclude that the system is
11 ready for an actual application.

12 The idea's also utilizing the launch
13 pads in tandem with cleaning and in line
14 inspection efforts, so that condition assessment
15 and repair potentially can be performed within a
16 short time frame.

17 Phase I commercialization efforts were
18 limited because we focused on testing and proof
19 of concept, however we did receive a quite useful
20 evaluation from Foresight Science and Technology,
21 with the feedback they received, from us and
22 industry professionals they made quite

1 encouraging statements.

2 Also state -- pointed out that this
3 technology could actually be disruptive and could
4 be -- the best evolution for certain type of
5 repairs in gas transmission pipes.

6 And I keep emphasizing gas
7 transmission lines. In fact, the technology's
8 applicable to -- gas transmission lines is our
9 main focus because a little bit larger pipe is
10 easier to accommodate the assembly, but there is
11 a great potential to reduce the deployment
12 assembly and use the same repair system for
13 distribution pipes as well.

14 Foresight also looked into competing
15 technologies, and there appears to be no
16 technology ready, on the market, to repair
17 long-range transmission line, transmission lines,
18 with that no-dig technology.

19 FRP Construction is QuakeWrap's
20 installation arm. It was founded about a decade
21 ago, and performed hundreds of projects on all
22 types of infrastructure.

1 And the reason why I'm emphasizing FRP
2 Construction is that it also -- having an
3 in-house installation capability gives us the
4 leverage to conduct the very first projects on
5 our own, where other contractors, which we'd
6 prefer to work with down the road, might be
7 reluctant to get into a new technology at -- that
8 might have high-level of liability issues.

9 So what's next is completing the Phase
10 II contracting with U.S. DOT Volpe, and we expect
11 that to happen probably around mid-June or end of
12 June time frame, and then Phase II will
13 officially start and, upon some further design
14 efforts, we're planning to start building the
15 test set up in a couple of months.

16 And then the third-party testing
17 center, of course, we would prepare and then a
18 team from QuakeWrap will travel to Houston to
19 install the system at the lab for third-party
20 testing, and those tests will run parallel to
21 each other, the deployment and mechanical
22 strength test, also including cracks and holes on

1 pipes, with respect to sealing leaks.

2 The overall commercialization efforts,
3 we expect them to intensify about three, four
4 months into Phase II when we have a better idea
5 about overall test protocol and how things are
6 rolling out at that point.

7 And the overall project, Phase II
8 project, is expected to take less than two years.
9 And at that point, our goal is to make the
10 technology ready for the first part of the
11 installation in the field.

12 I would like to, again, extend my
13 appreciation to U.S. DOT Volpe Center and PHMSA
14 for supporting the project. Our partners to
15 date, particularly Mr. Jerry Rau, who provided a
16 great deal of help in Phase I, in introducing us
17 to the pipeline integrity market in the oil and
18 gas industry.

19 And Dr. Sherry Borener of PHMSA, who
20 has been very supportive as our technical point
21 of contact. Also, Mr. Robert Smith and Chris
22 McLaren provided through the good feedback

1 throughout Phase I. With that, I'm going to
2 conclude my presentation. Thank you, again.

3 MS. WHITE: All right, thank you, Dr.
4 Server, and thank you for your presentation. And
5 just a big thank you for -- to all the
6 presenters, and I will turn it back over to Sam.

7 MR. HALL: Thank you. Ladies and
8 gentlemen, we are going to extend this session by
9 about ten minutes into the lunch break, so that
10 we can take question and answers, or questions,
11 so they can answer your questions.

12 We do have several calls -- several
13 questions in the Q&A box in the lower-left, and
14 if you wish to make a comment over the telephone
15 line, if you're dialed in, dial 1-0 on your
16 telephone and you'll be placed in the queue.

17 First question that came through was
18 from Mr. George Ragula. Let's see, for R&D being
19 performed by universities funded by PHMSA, what
20 is the mechanism for providing technical advisory
21 input from the industry?

22 MS. WHITE: Thanks, Sam, and --

1 (Simultaneous speaking.)

2 MS. WHITE: -- thank you.

3 DR. RIDDICK: Hi there, it's Stuart
4 Riddick here. I assume that's directed at me.
5 Just get in touch with either myself, Stuart
6 Riddick, or Dan Zimmerle.

7 If you just Google METEC, you should
8 be directed to all our contact information, METEC
9 and Colorado State University, you'll be directed
10 to all the -- all our contact information. It'll
11 give you an overview of the projects we're doing
12 as well.

13 So we've got a lot of different
14 projects there as well. So anything you would
15 like to get involved with, please get in touch
16 with us and we'll -- we'll get back to you as
17 soon as possible. Thank you very much.

18 MS. WHITE: Thanks, Stuart. And I --
19 and I'll follow up to that, as well. We're
20 currently exploring opportunities to assist
21 universities with partnerships with industry.

22 And on past CAAP solicitations, we've

1 encouraged universities to partner with pipeline
2 operators or industry providers to increase
3 research applicability to pipeline safety, and
4 our CAAP review criteria also includes
5 consideration of those partnerships.

6 So I encourage all attendees to go to
7 our website and -- where that actually provides
8 all of our research projects, including CAAP
9 projects. Thank you. Next --

10 (Simultaneous speaking.)

11 MR. HALL: All right, our next --
12 thank you, Senho. Our next question comes from
13 Lindsey Fitzgerald, and this is a question
14 directed to Carrie.

15 Can you speak more to what additional
16 research is needed for leak detection surveys,
17 identification, and quantification? Your
18 presentation briefly touched on it. What
19 specifically needs to be looked at, and why?

20 MS. GREANEY: Yeah. Thank you,
21 Lindsey, for that question. So I'm speaking
22 from, I guess, the perspective of the

1 transmission sector of the pipeline industry and
2 also from kind of our experience in trying to
3 complete some of these large scale testing
4 opportunities.

5 Typically, we've seen that the large
6 scale or field application has been limited
7 because they release the product and they're
8 done, relatively, in a singular technology
9 testing opportunity.

10 So standardized tests for
11 repeatability of detection, side-by-side
12 comparison of sensor type to understand
13 limitations or reliability of detection
14 quantification are kind of what we're looking to
15 do on a broad, more broad basis, to expand that
16 data set.

17 And, again, I'll say this is -- this
18 is especially true for pipeline right-of-way,
19 where we're looking at longer range, so kilometer
20 or miles of pipeline-type applications and, you
21 know, again, that might be true for what you saw
22 like the UAV methane detection.

1 Typically, we're seeing, kind of,
2 small areas for which we're doing the detection,
3 and we don't always get a true understanding of
4 how the application might be over long range
5 because of the beyond line of sight limitations
6 from the FAA.

7 But, again, those are some of the
8 types of specific projects that we've looked to
9 try to have expanded or done in a more
10 standardized manner, so that there's an
11 understanding if -- if there's universities or
12 there's other technology providers that are doing
13 research outside of PRCI, or within the
14 government, or joint industry groups, trying to
15 be able to compare the data sets, would be
16 helpful, as well.

17 Hopefully that answered the question
18 and if, if it didn't, you can follow up with me
19 directly, or you can follow up in the chat here,
20 as well. Thank you.

21 MS. WHITE: Thank you, Carrie. And
22 back to you, Sam.

1 MR. HALL: Paul Espenan asks how will
2 the impacts of your planned release be mitigated?
3 I believe this was directed to one of the
4 presenters, but I can't tell from the question
5 which one.

6 MS. WHITE: I believe that was to
7 Stuart at METEC.

8 DR. RIDDICK: Excuse me, how will --
9 I didn't really understand the -- how will the --

10 MR. HALL: How will the --

11 (Simultaneous speaking.)

12 DR. RIDDICK: -- mitigated?

13 MR. HALL: Yes, how will the impacts
14 of your planned release be mitigated? That's the
15 question, and I don't have further context.

16 DR. RIDDICK: The environmental impact
17 -- oh, I see there. Well, what we -- well, this
18 is -- this is effectively what we do at METEC, is
19 we release gases of known rates and they go into
20 the atmosphere.

21 And it's for the different
22 technologies in order to quantify them, so it's

1 proof of different methods. So the idea is
2 actually to detect it and not to mitigate it.

3 So that they're all controlled
4 releases over a short period of time. And
5 relatively speaking, they're -- they're quite
6 small emissions, so they're not actually
7 mitigated at all.

8 MR. HALL: All right, thank you for
9 that answer. That concludes the questions in the
10 Q&A box. Operator, do we have anyone queued in
11 the -- on the phone call?

12 OPERATOR: No questions from the phone
13 at this time.

14 MR. HALL: Okay. Senthoo, would you
15 like to close up the session? And then I can
16 provide some instructions for lunch.

17 MS. WHITE: Sure. Well, again, I just
18 want to say a big thank you to all of the
19 presenters, and please join us after lunch as we
20 continue our technology and R&D Initiatives
21 Panel, where Kandi Barakat will be moderating.
22 So again, thank you, all.

1 MR. HALL: All right, thank you. I'll
2 reiterate Senthos comments. Thanks to our
3 panelists, and certainly thanks to those of you
4 who have provided comments and questions.

5 At this time, we're going to break for
6 lunch. We appreciate your patience in letting us
7 run about ten minutes over for that question and
8 answer session.

9 We will -- the proceedings will resume
10 promptly at 12:45, so please be sure to come back
11 by then so as not to meet -- miss any of the
12 proceedings.

13 The web meeting and the conference
14 line will stay open, so there's no need to hang
15 up or reconnect, if you wish to just stay on the
16 conference. With that, enjoy your lunch and
17 we'll see you back at 12:45 p.m. Eastern.

18 (Whereupon, the above-entitled matter
19 went off the record at 12:07 p.m. and resumed at
20 12:45 p.m.)

21 MR. HALL: Ladies and gentlemen,
22 welcome back from your lunch. I hope you had a

1 good break.

2 I want to cover some quick
3 housekeeping items for those of you who may be
4 joining us for the first time.

5 All of the audio in this call is being
6 handled by AT&T. The AT&T operator will handle
7 all of the voice calls for you.

8 Audio is best through the AT&T line
9 and you can see the audio information, the
10 toll-free telephone number and the access code on
11 the welcome screen, as well as in the top-left
12 corner of your screen.

13 When the time comes for
14 question-and-answer and you wish to make a
15 comment with your voice, you must be dialed into
16 the teleconference. We are not activating
17 microphones on your computers, so if you wish to
18 make a comment with your voice, you must be
19 dialed in to the teleconference.

20 If you're not dialed in to the
21 conference call, you'll be able to hear the
22 proceedings through your computer speakers, but

1 you won't be able to make a comment, as I
2 mentioned.

3 And in that case, you are welcome to
4 make comments or ask questions in the Q&A box on
5 the lower-left corner of your screen.

6 If you're having any technical
7 difficulties, please ask your question in the Q&A
8 box on the lower-left of the screen, and we'll
9 address IT issues as quickly as possible.

10 We do intend to adhere to the agenda
11 as strictly as possible, and therefore we have
12 not scheduled breaks. So, please take breaks on
13 your own as necessary.

14 The proceedings are being recorded.
15 The recording and a transcript and the
16 presentations will be made available on the
17 meeting website where you registered, in
18 approximately ten business days.

19 It is now my pleasure to introduce
20 Kandi Barakat, Operations Supervisor in PHMSA
21 Engineering and Research Division, as the
22 moderator of our next session, which is the

1 second of two Technology and R&D Initiatives
2 Panel discussions. Ms. Barakat, go ahead.

3 MS. BARAKAT: Thank you, Sam. Good
4 afternoon and welcome to our second panel on leak
5 detection technology. It is my pleasure to be
6 here today to moderate this session.

7 Now, we will have four speakers. Each
8 presenter will have 15 minutes to present.

9 Following the presentation, we will have Q&A.

10 Please note that while vendors will be
11 presenting on their technologies today, this does
12 not equate to any promotion or endorsement by
13 PHMSA of any vendor on their respective
14 technologies.

15 Accordingly, PHMSA will not entertain
16 questions as to the capabilities of any vendor
17 technology, or the vendor's ability to assist
18 pipeline operators in meeting regulatory
19 requirements.

20 And while all the panelists have
21 impressive bios, we won't be able to share those
22 at this time, due to limited time.

1 Now, I would like to introduce our
2 first panelist, from Bridger Photonics, Dr. Pete
3 Roos, who will be presenting on Bridger Photonics
4 gas mapping LiDAR solutions. Dr. Pete, handing
5 it over to you. Thank you.

6 DR. ROOS: All right, thank you very
7 much. Thank you, Kandi, and sincere thanks to
8 PHMSA for the opportunity to speak, and call out
9 to Susan Stuver and GTI for the plug earlier.
10 Really appreciate that.

11 I'm excited to talk today. Our
12 company is Bridger Photonics. My name is Pete
13 Roos. I'm the President and CEO of Bridger
14 Photonics.

15 And what we do really well in our
16 company is develop advanced laser sensors and
17 analytics to solve impactful industrial
18 challenges.

19 Now, we've done that -- let's see if
20 I can get this pointer to work. There we go.
21 We've done that in the industrial metrology space
22 and I'll be describing how we're doing that for

1 the oil and gas industry as well.

2 Okay, we've developed gas mapping
3 LiDAR, which the goal is to make emissions
4 reduction simple.

5 What we do is we take this advanced
6 proprietary laser sensor and we stick it on the
7 underside of an aircraft, and we've also deployed
8 on drums, and we'll talk about that in a bit.

9 But we scan oil and gas infrastructure
10 throughout the entire natural gas (audio
11 interference). So, some of these slides at the
12 first, a lot of our businesses in the production
13 sector, so assume that, but we do a lot of
14 business in the transmission sector.

15 And finally, there's a large
16 announcement coming out, hopefully today, about
17 some partners in the distribution sector as well.
18 We're actually scanning entire metropolitan
19 basings from the air to uncover leaks in the
20 distribution sector as well. And I'll show you a
21 little bit about that.

22 So, what value do we bring? And

1 again, some of this is focused on the production
2 sector, but it applies equally as well to the
3 transmission and distribution.

4 While the plumes catch our eye and
5 attract our attention, as they should, so much of
6 the value that we bring in the production sector
7 is all these sites that don't have emissions.

8 Because those are sites that our
9 clients no longer have to visit with ground
10 crews. We typically save our clients between 60
11 and 90 percent of their ground crew visits. They
12 no longer have to visit those sites.

13 And when they do have to visit a site,
14 we provide extremely actionable data, and I'll
15 show you that in a second, to direct crews
16 straight to the source of the problem.

17 There it was, actually. Okay, somehow
18 it managed to do the animation. Great.

19 Okay, the second value we bring is
20 reduced emissions. In the production sector, we
21 use and we select a sensitivity that allows us to
22 catch greater than 90 percent of the emissions in

1 typical production basins.

2 And moreover, to be published,
3 third-party research shows that we're actually
4 catching more emissions. Think ground patrols
5 with OGI cameras in the production sector.

6 Now, this is a single study and it was
7 not a large sample-set, so -- that was Matt
8 Johnson's group up at Carleton University in
9 Canada. We're looking forward to actively doing
10 a much larger scale study to confirm that and
11 we're looking forward to those results.

12 This next value we bring is increased
13 safety. I mean, at the end of the day, everyone
14 wants our clients' crews to get home safely to
15 their families at night. So, obviously, number
16 one, we find leaks.

17 But then, because you don't have to
18 visit sites as often, we reduce field crew
19 exposure to onsite hazards and windshield time.

20 And finally, when you do have to visit
21 a site, again we provide advanced awareness for
22 you and your crews.

1 The final value we bring is
2 simplification to regulatory compliance. In the
3 transmission sector, we are used regularly for
4 compliance with PHMSA, both in the US and in
5 Canada, and more recently in 2020, a number of
6 operators submitted us as the first-ever
7 applications for Directive 060 Alt-FEMPS.

8 So, that's the alternative methods for
9 digital reduction in Canada. And just three
10 weeks ago, ExxonMobil announced that submitted us
11 as the first-ever alternate method for the EPA's
12 0000a regulation. So, we're active in regulatory
13 approval in all sectors.

14 Okay, this gives you an example of
15 actual data products. We typically work with our
16 clients to -- oftentimes our clients use some
17 sort of GIS software, whether it's as simple as
18 Google Earth or ArcGIS, and then sometimes even
19 our transmission clients literally take a pdf of
20 our imagery and check off every event that they
21 find.

22 And in addition, we provide

1 spreadsheets in Excel format. They're also very
2 useful.

3 Just to take you through our data
4 products, everything flows into satellite
5 imagery, whether it's through ArcGIS or Google
6 Earth, or it can flow through.

7 We also provide aerial photography
8 that's geo-registered at the time of our flight,
9 so you knew exactly the state of your assets at
10 the time of our flights.

11 We can identify equipment from the
12 aerial photography on your site. And then, of
13 course, we have the plume imagery, which is in
14 path-integrated gas concentration.

15 We have algorithms to backtrack to
16 drop a GPS pin, typically within 60 of the
17 emissions source. And then, we have extremely
18 accurate algorithms to calculate the emission
19 rate, or flow rate, of the emission event as
20 well.

21 In the end, the goal here is to
22 simplify the process of taking that information

1 in, and our hope is that anyone on this call
2 today could view our data and immediately know
3 where to send the crews to solve a problem, and
4 simplify that process to generating the work
5 order.

6 Last year we performed a number of
7 studies. We aggregated results from these
8 studies.

9 So, we were able to generate a
10 distribution of the percentage of emissions that
11 are caught in the Permian Basin. This was two
12 thousand site emissions distribution.

13 Percentage of emissions that are
14 caught as a function of the detection sensitivity
15 that wouldn't be needed to detect that percentage
16 of emissions.

17 And while I'm not showing the actual
18 emissions distribution here -- contact us if you
19 want to see that -- but here are the results.

20 At the far end, the satellite
21 companies are installing solar infrared
22 spectrometers. And they typically would catch

1 between ten and twenty percent of the emissions
2 that were caught from this study.

3 Now, you might say that's fairly low,
4 but man these satellites with solar IR cameras
5 serve a very valuable purpose, because they're
6 able to scan the entire basin, right now, I
7 believe, on the order of a few weeks, and
8 ultimately, when they increase their fleets,
9 they're going to be able to do that on the order
10 of a few days.

11 And so, they're able to catch these
12 large emissions very quickly. So, they have
13 great value.

14 And there are other technologies that
15 they compete with, but that's the general --
16 they're catching the super-emitters really
17 quickly, which is great value for emissions
18 reduction efforts.

19 All right, there are also folks that
20 take those same solar infrared cameras and put
21 them on aircraft. And these folks -- the solar
22 infrared does have its challenges.

1 First of all, you need the sun to be
2 at certain altitudes in the sky. You can't
3 handle shadows, you can't measure in shadows.
4 When there's clouds, it challenges reliability of
5 your measurements, and ultimately, the
6 sensitivity is challenged also.

7 On aircraft, using third-party data,
8 the sensitivity would have gotten the aircraft
9 solar IR. It would have caught between 30 and 40
10 percent of the emissions that we measured.

11 So, we ended up developing a LiDAR
12 solution. So, LiDAR, meaning instead of using
13 sunlight to measure the existence of methane, we
14 bring our own light source. We bring a laser.

15 And so, we shine a laser down and see
16 how much the light gets absorbed, and we can
17 determine how much methane is there.

18 We choose to use a sensitivity for the
19 production sector, that catches greater than 90
20 percent of the total emissions in the production
21 sector.

22 Now, we could go further. And we do.

1 For distribution sector, for instance, we're all
2 the way down. We're typically 95 percent.
3 Probability detection is around 25 SCF, or 50 kg
4 per hour, right now, and our next-generation
5 sensor should get us down to ten SCF.

6 But if we did that for the production
7 sector, we would absolutely bury our clients.
8 And so, this is the key, is a thoughtful plan.
9 And you really need those emissions distribution
10 to be able to thoughtfully plan out how we're
11 going to both policy and argue moving forward.

12 Okay, those were some production
13 slides. Here's a few slides, we're very active
14 also in the transmission and distribution
15 sectors. Here's an example of data for the
16 transmission sector.

17 Obviously, our spatial resolution is
18 sufficient to oftentimes distinguish and resolve
19 between multiple pipelines on our right-of-way.

20 And then, we provide this auditable
21 swath, which is really valuable for us, because
22 we can audit what our light providers cover, and

1 it's valuable to our clients because they can
2 audit us on what we cover.

3 And it's going to be valuable for the
4 regulatory bodies, because they can regulate and
5 audit the operators to make sure that their sites
6 were covered.

7 And I'll point out that while we flew
8 this section, this was a pond. And our laser
9 light just bounced right off the pond, and we
10 don't get signal from standing water.

11 And so, you see the out in the swath
12 coverage. Well, we want our clients to know
13 that. So, we want you to know what we got and
14 what we didn't get. And that's important for all
15 sectors, actually.

16 And I'll point out for the
17 transmission sector, yes, we cover subsurface
18 assets like pipeline right-of-ways. But also, we
19 found a lot of emissions in the transmission
20 sector are coming from the compressor stations.

21 And so, we, of course, also scan the
22 surface assets as well, right in line with our

1 pipeline scans.

2 The distribution sector, similar. As
3 I said, there's going to be a public release,
4 hopefully today, on very large effort with a
5 major gas utility that we're working on.

6 And similarly, we increased the safety
7 of the distribution sector. I won't comment
8 today on how many leaks per square mile we're
9 finding, but it's significant, and both from a
10 safety standpoint and for reducing emissions.

11 And, of course, we provide actionable
12 data so our clients can direct the crews straight
13 to the source. And this is important across all
14 sectors.

15 And finally, my last slide, in the
16 end, we've been hearing this and getting a lot of
17 pull from the industry to certify the emissions
18 of operators. And so, to do that, we really need
19 to nail quantification.

20 And so, this shows our measured
21 emissions rate versus what was measured on the
22 ground for controlled emission rate for our blind

1 study.

2 And so, you want everything to fall on
3 this one-to-one line. And as you can see, the
4 correlation of our data is extremely good.

5 And over here shows a similar, it's
6 just percent error now, as a function of the
7 emission rate. And you can see there's a spread
8 for each measurement. And for a single
9 measurement, that spread is about plus or minus
10 15 percent.

11 But all we have to do to beat that
12 single measurement uncertainty down is to make
13 multiple measurements, measurements of many
14 different leaks along a pipeline, for instance,
15 or upstream.

16 Once you start making many, many
17 measurements of multiple leaks, then we're able
18 to average that down and you can approach our
19 bias, which in this study was just plus-three
20 percent.

21 So, in terms of certification and to
22 check inventory throughout the value chain, the

1 aerial LiDAR technique can be very valuable and
2 accurate for certifying.

3 Okay, that's it. And thank you for
4 your time. I really appreciate it.

5 MS. BARAKAT: Thank you very much, Dr.
6 Roos. Now, I would like to introduce our second
7 panelist from Satelytics, Sean Donegan, who will
8 be presenting on Satelytics' methane detection
9 capabilities.

10 MR. DONEGAN: Thank you, Kandi.
11 Welcome, everybody. And thanks for the
12 opportunity to present. I do need to be able to
13 be made the presenter. I was going to show
14 software live. Nathan?

15 MR. HALL: Oh, I'm sorry. Let me stop
16 what I'm sharing. And you should now be able to
17 share your screen.

18 MR. DONEGAN: Super. Thank you.
19 Okay. Are you now seeing my screen, Nathan? Can
20 I just get a check?

21 MR. HALL: Yes, we are.

22 MR. DONEGAN: Okay. So my name is Sean

1 Donegan. I'm from a company called Satelytics.
2 We're based in Perrysburg, Ohio. We're a
3 software company. We're based in the 751st most
4 visited city in the nation, hoping for people to
5 visit to raise that number, come visit us.

6 We're a software company with a very
7 unique set of data. We have over 36 algorithms.
8 They're based on a convolution on Euro network,
9 so artificial intelligence, which in layman's
10 terms means the more data is held, the smarter
11 and more accurate it becomes.

12 And we have three real goals in life,
13 and that is to minimize consequences, detect
14 events early, so that you can deal with them, and
15 in the case of methane leak you're not losing
16 revenue for those oil and gas companies.

17 Number two, minimize cleanup costs,
18 because they escalate quickly. And number three,
19 very simply, to minimize the court of public
20 opinion. Because, of course, when there are
21 events, they tend to have a very negative event
22 in the press on the oil and gas and the pipeline

1 community.

2 So, our goal is to get out ahead of
3 that and minimize any of those consequences, or
4 all of them.

5 Software. All of those algorithms can
6 run independently. We are agnostic to the data
7 source and we use a series of data. Practically
8 speaking, most of it comes from satellite.

9 And there's a real practical reason,
10 back to the minimizing of consequences. Pretty
11 straightforward.

12 If we gather the data today from a
13 satellite and we're pointing it over a specific
14 area, that's referred to as tasking. Today, you
15 can revisit anywhere in the world, in some cases
16 multiple times a day. But let's say, to be
17 conservative, four to five times a week.

18 And literally within a couple of
19 hours, using the Satelytics data and analytics,
20 you have the answers in your hand. So, there's
21 no weeks or months or days. You'll literally
22 have it within a couple of hours.

1 And that's true whether we're looking
2 for methane, liquid leaks, arsenic and heavy
3 metal concentrations in water, geohazards like
4 landslips and landslides.

5 But of course we are agnostic from the
6 data source. So, it could come from a satellite,
7 a drone, a plane, a stratospheric balloon, or all
8 of the above.

9 Today, you can revisit, as I said,
10 four to five times a week anywhere in the world
11 with a satellite conservatively, but the billions
12 of dollars that's being spent above the Earth's
13 surface will mean that in years to come, the next
14 five years, you will be revisiting anywhere in
15 the world with a satellite within minutes.

16 So, we're using the power of the sun,
17 which shines on the Earth's surface or a body of
18 water, and to see below the surface we're using
19 corroborating factors, or surrogates.

20 So, the old tradition of a canary down
21 the mine. There's no better an example of, if
22 you have a methane leak or you have a liquid

1 hydrocarbon leak below ground, vegetation's
2 incredibly sensitive. And it is one of many ways
3 that we can detect what's going on below grade.

4 But our main goal is to look at the
5 spectral signature. The DNA, if you will, of the
6 target. So, methane has a unique spectral
7 signature and absorption feature.

8 And unlike any other software company
9 that you're going to hear, we want to get very
10 specific. So, not only do we locate and identify
11 the constituent, but we quantify it.

12 We feed to a flow of nine kilograms an
13 hour on flow rate, and we feed to a flow of ten
14 parts per million in the plume. And it's being
15 applied in industries, whether that's your local
16 distribution gas company, or whether it's the
17 traditional oil and gas footprint.

18 And literally within a couple of
19 hours, we can see buildings, structures,
20 salinity, liquid hydrocarbon, methane, all from
21 the same set of data.

22 And we're using very high resolution

1 data so that we can get to the granularity. Not
2 the big emitters, or, let's look using 20 meter
3 by 20 meters on the ground and guess, or 400
4 meters by 100 meters and sort of pinpoint, here's
5 the state of Florida, and try and guess where the
6 emissions are. We want to base it on true, tried
7 and tested facts.

8 The software itself, every algorithm
9 is groundproofed before it's put into commercial
10 operation. We started life on Lake Erie, looking
11 at toxic algae blooms. That in the other 35
12 algorithms take about three to four months to
13 develop, including the groundproofing.

14 But with methane, it's complex. It
15 took us 18 months to develop, because the three
16 factors that you have to account for is close to
17 the location, as you're seeing those methane
18 escapes in the plumes, is wind velocity, wind
19 direction, and relative humidity, all factors
20 that need to be screened in at the current time.

21 But literally, once you've set up the
22 capture mechanism using a satellite, the data is

1 then caught on a frequency that you determine.
2 So, you're pointing it over an area on a
3 frequency.

4 As that data is gathered, in our
5 particular case we make use of the amazon cloud
6 extensively, because clearly we don't ever delete
7 any data, because we want to keep on learning
8 from that data.

9 And then, within a couple of hours,
10 whether you're using a tablet, a browser, or a
11 smartphone, that data is available. Nothing to
12 install, no user licenses -- because we want to
13 make it very easy -- nothing to install because
14 we don't want any threat to any corporate
15 network, in the day of ransomware and malware,
16 etc.

17 And then, literally you're looking at
18 those results. And of course, we don't work in
19 isolation. People use Ezri, GIS systems,
20 reporting systems, audits.

21 All of that data, any of the imagery,
22 any of the analytics, any of the results that we

1 produced, can be output in a number of different
2 ways.

3 Simply, you can select a group of
4 records and download them, if that's your
5 preferred method.

6 Or, for the propeller heads in the
7 room, we could be using anything from the APIs or
8 the web services, to take a look at that data.

9 So, let's take a look at some of those
10 live. Nathan, could you help me out? You're now
11 looking at my software screen, sir.

12 MR. HALL: Yes.

13 MR. DONEGAN: Okay, thank you. So,
14 what you're now looking at is the data's been
15 collected by Satelytics' process through the
16 engine, and you're now logged on to Satelytics'
17 two-factor authentication. And you can see on
18 the left-hand side of the screen we've got a
19 little menu that we can hide and pull right.

20 And then, I thought I'd show you the
21 full cycle. So, one of our largest customers in
22 the world, they have put Satelytics through many

1 blind studies and many tests in many different
2 locations around the world.

3 And I'm literally going to show you a
4 forward operating area. They always say never
5 work with animals, CEOs, or software live, and
6 here we go. Here's two of them.

7 And literally, we can look at the
8 plume and pick out any of the pixel values where
9 we're measuring that methane in
10 parts-per-million, or indeed what sets us aside
11 is we can also look at the accurate flow rate
12 that may be coming from that particular area.

13 We make it very simple to use. So,
14 we've got a little feature called jewel maps. It
15 defaults to being synchronized. Literally, you
16 can turn off the synchronization and say, show me
17 a different location on a different date, zoom
18 into the area, pick out any of those particular
19 pixels, and of course look at the flow rate if
20 you so wish.

21 Well, that's one aspect. But in your
22 local neighborhood, you could also be looking at

1 methane that's closer to home, that's literally
2 on a distribution network. And in this
3 particular case, again, same sort of granularity
4 where we want to get to.

5 You can see this is a very suburban
6 setting. We can pick out any of the point values
7 on the methane itself, or indeed, if you wish,
8 you could look at those flow rates by simply
9 clicking on where we see the source.

10 Same feature, jewel maps. Look at the
11 other side of the coin. You can unsynchronize
12 this. And all of this is real customer data that
13 I've been permitted to show you. So, it's real
14 live, it's in operation, and it's data that's
15 relatively recent, so you can see. And there, of
16 course, you can see the flow rates on both sides
17 of the equation.

18 Any of the data you've selected could
19 be literally downloaded by hitting the little
20 button.

21 Now, let's take it full circle. And
22 then, I'll stop if there are any questions and

1 answers.

2 But the full circle, as one of our
3 largest customers, has got Satelytics in its
4 drive to net zero, but also it's looking at the
5 other side of the coin, and in this case is
6 looking at the carbon offset.

7 So, that all becomes part of that
8 methane equation. And in years to come, maybe
9 we'll be looking at forestry as part of oil and
10 gas as any other.

11 And here, what you're looking at is
12 from the same set of data. Satelytics is telling
13 this particular customer all the tree speciations
14 from above the Earth's surface, literally from
15 the same set of data.

16 And then, this particular customer
17 overlays it with a grid. And I'm not sure the
18 relevance of the size, but each one of these
19 grids are 16 meters by 16 meters on the ground.

20 And if you click on any one of them,
21 it will give you not only the exact or the
22 average -- excuse me. It will give you the

1 average tree cover, or give you every tree that's
2 in that particular area, and the tree height.

3 We measure tree heights within six to
4 eight percent of the accuracy. That's what the
5 groundproofing has shown. And with methane, just
6 to finalize that, while we measure nine kilograms
7 as the flow rate and ten parts-per-million as a
8 low from a plume capture, in the blind studies
9 that have been conducted, and some of the sites
10 like METEC and VIVER in Spain, we have been
11 within six to eight percent on the flow rates.

12 But conservatively, if you put it at
13 ten percent to either side of the number, that's
14 where we are.

15 So, everything you see here is real.
16 That's a little snapshot on Satelytics. And I'll
17 stop there and hand it back to the moderator.

18 MS. BARAKAT: Thank you, Sean. Very
19 interesting presentation. Now, I would like to
20 introduce our third panelist from ProFlex
21 Technologies, Stuart Mitchell, who will be
22 presenting on ProFlex continuous leak detection

1 technology. Stuart, I'm handing it over to you.

2 MR. MITCHELL: Hi. How are you doing?

3 Thank you so much. Just to introduce myself, my
4 name is Stuart Mitchell. I'm one of the managing
5 partners over at ProFlex and I'm going to be
6 talking through our partnership with Siemens
7 Energy for spontaneous leak detection.

8 So, today we're going to be talking
9 about spontaneous leak detection. What this
10 really means is that any breach within a pipeline
11 that produces a liquid or gas creates a extra
12 pressure wave in the pipeline.

13 This is basically and simply a wave
14 that travels up and downstream in the fluid in
15 the pipeline, and can be detected by a system.

16 This is not to detect creasing leaks,
17 such as weeping seals, or a leak in a valve or
18 anything.

19 So, why have we done this? A lot of
20 people talked about either detection and how fast
21 the systems can go pick up new leaks in
22 pipelines.

1 So, for us, anything that's longer
2 than five minutes in being able to detect and
3 notify a leak, is more around leak confirmation
4 than leak detection. It's like shutting the
5 stable door after the horse is already gone.

6 Our system has also been designed to
7 pinpoint leaks in that time frame locally. The
8 round about plus or minus 20 to 50 feet. What
9 this does for an operator, it enables those to go
10 and be able to confirm the leak, but also
11 significantly reduces their explanation time in
12 going to repair that leak.

13 So, the other thing, people talk about
14 product loss. Obviously, you reduce loss
15 identifying a leak very quickly. And small leaks
16 may be half-inch to two inches in diameter.

17 Helps you reduce the amount of product
18 that you lose, but also allows you to take action
19 on the pipeline before you cause a massive
20 release.

21 We'd like to think of our system as
22 being really beneficial in terms of lead

1 security. So, what this means is that you might
2 have other systems already in your pipeline.

3 We can use our system, the ProFlex
4 sealing system, to supplement your existing leak
5 detection system, for critical pipeline segments,
6 or even the whole pipeline system.

7 And we specifically designed the
8 system to be able to respond to new and pending
9 regulations. So, where you have to have
10 particular reaction times to a leak and be able
11 to shut valves, etc., we're not relying on
12 outside sources, photographs, satellites, people
13 on the ground, or particularly the amount of the
14 product that's released.

15 We can react, as I say, in probably
16 less than five minutes, to get a notification to
17 the operator that a leak has occurred. So, this
18 system represents proved 24/7 monitoring and fast
19 response for small leak sizes.

20 So, how does it work? We're working
21 up a variation of negative pressure waves. So,
22 what this actually means is when you get a small

1 hole or rupture in a pipeline, you get a local
2 pressure change.

3 That local pressure change permeates
4 through the gas or liquid, up and downstream to
5 the pipeline, and what you can see here is, with
6 the pointer, a couple of sensor sets
7 representing.

8 So, the wave is propagating up and
9 downstream along the pipeline, hits the sensors.
10 From there, what we're doing is we've got
11 hardware locally along the pipeline that can
12 process that data in real time.

13 And what we're trying to achieve here
14 is we're trying to remove background noise and
15 highlight the leak event. So, by employing
16 engineers, algorithms that are able to filter the
17 signal along the pipeline, we're able to take out
18 what is normal, in terms of pipeline pressure
19 response, and highlight exactly what you need to
20 see. A leak has occurred.

21 What then happens is, the local buses
22 that you see here under the pointer, they're able

1 to transmit a small section of data. So, each of
2 these boxes or nodes, through pressure and
3 temperature sensors, detects a leak has occurred.
4 We transmit a small packet of data to a cloud
5 location. In this case, the Siemens Energy
6 Cloud.

7 And that each time a sensor picks it
8 up, it has a different timestamp that that has
9 occurred.

10 So, what then happens is, when we've
11 transmitted that data, we're able to use location
12 algorithms to accurately locate where the leak
13 has occurred. And we can do that within maybe 20
14 to 50 feet of accuracy.

15 The interesting thing about the system
16 that we've worked, probably over the last nine
17 months in partnership with Siemens on, but
18 probably the last three years now in developing,
19 is the range of applications.

20 So, people have mentioned sometimes
21 about needing to go play over cities, towns, and
22 different areas, to give you coverage.

1 Whatever system that we're on, we can
2 detect leaks on. So, whether it's long
3 transmission lines on pipelines, whether it's
4 down to gathering systems, we've got a system
5 working upshore already, process plants,
6 anything. The system is able to be designed and
7 specifically engineered to suit those systems.

8 And as I say, that allows you to pick
9 up a leak within five minutes of it occurring,
10 and notifying the operator where it is accurate
11 to plus or minus 20 to 50 feet.

12 Technology is applicable to a range --
13 I mean, we've mainly talked about gas today, but
14 whether it's water, gas, oil, or mixtures, and
15 things like NGLs as well, we're able to detect
16 leaks within all types of media and all types of
17 pipeline consideration.

18 So, little case studies, kind of
19 getting into the meat of how we do this. We've
20 got pressure sensors on the pipeline that are
21 sampling roundabout a thousand samples a second.
22 And what you see here is the blue trace, is raw

1 pressure data.

2 So, this was from an actual pipeline
3 that we are monitoring. And what we're actually
4 doing here is we're gathering live data, maybe
5 for up to one to two weeks.

6 And why we do that is, we're trying to
7 establish what is normal operation for that
8 pipeline. And by normal operation, for an
9 operator, that could mean opening and closing
10 valves, shut-ins, shutdowns, heating pumps up,
11 shutting them off, turning them back on. We
12 count that as normal. We gather all that data.

13 What we also do is we introduce leak
14 events after the same time, through simulating
15 them through a small bore opening in the
16 pipeline, open a small valve, release a tiny
17 amount of fluid -- maybe -- or gas, five to ten
18 seconds, and that's enough data for us to be able
19 to process that.

20 What we then do is design filters to
21 turn this blue line here into this yellow line,
22 which is our filtered signal.

1 What we're trying to do is when we
2 release the leak events, which is shown by the
3 small green dotted lines, this was the timing
4 when we released the leak on this line.

5 It's a very small leak, maybe a
6 quarter-inch in diameter, and for only five to
7 ten seconds.

8 What you then see is a filter here, as
9 we move along, is removing all of this normal
10 operation.

11 This is quite dynamic. The line that
12 you see there in blue is changing maybe from 145
13 to 185 PSI, and is varying quite significantly.

14 We'll turn that into a flat line, and
15 then what you see just after the green dotted
16 line, which is the pining of when a leak was
17 released, the simulated leak, you see this yellow
18 line here spiking.

19 And in each case, we're able to filter
20 out what is normal operation to a flat line, and
21 the very, very obvious spike, which was the leak
22 event.

1 We then set thresholds -- a leak
2 section threshold. We have this red line
3 compared to the yellow line. Not the blue, the
4 yellow.

5 And what we're doing here is giving
6 you a great deal of margin against normal
7 operation. So, effectively, we're taking maybe
8 two weeks a month of normal operating data,
9 designing filters, simulating leaks to your leak
10 threshold side as an operator, and then we're
11 putting a threshold to make sure that you
12 minimize or remove entirely false positives from
13 the system, but get notified, as I said, in well
14 under five minutes -- typically, a minute or when
15 the leak event has occurred.

16 So, the system. A leak detection
17 system with Siemens is an engineered solution.
18 So, it's tailored specific to your pipeline. And
19 that's where we differ from, I guess, a lot of
20 providers that we are specifically looking at --
21 what is happening in your pipeline system -- and
22 then tuning the hardware you see over here, which

1 is common hardware, we're using the software to
2 tune that system specific to your pipeline.

3 So, how we do that is pretty
4 straightforward. So, we take a couple of field
5 test units to field, and we determine
6 feasibility.

7 And what we're doing here is we're
8 connecting pressure and temperature sensors onto
9 the pipeline, any small bore branch from a
10 quarter-of-an-inch upward, we can connect our
11 sensors to it.

12 And then, what we're doing is we're
13 sampling normal operations in the pipeline, and
14 we're introducing small bore, maybe a
15 quarter-inch, half-inch, eighth-inch even for
16 some clients, size of leak, and we're catching
17 those on our boxes that are separate. Typically,
18 anything up to 20 to 30 miles apart on the
19 pipeline.

20 So, we use that data to determine the
21 number of nodes on the pipeline. And then, we
22 tune our algorithms based on that data. We're

1 writing specific algorithms for your operations
2 in your pipeline.

3 What we're also able to do is adjust
4 those algorithms, or response to them, in real
5 time, depending on change in pressure,
6 temperature, or the fluids that you're pumping,
7 or gases through that pipeline.

8 A great example of this when we're
9 going NGLs, for example, they can bear intensity
10 massively, and therefore the propagation rate
11 changes.

12 Our system is able to update in real
13 time, in the event of a leak, to accurately adapt
14 to those changes and find out where the leak has
15 occurred.

16 Once we tune the system, we drive on
17 it for you, and then give you an operational
18 handover once everybody's happy, and then provide
19 ongoing maintenance and support as a complete
20 package.

21 What I'm going to do here is hand over
22 to my colleague Matthew Grimes over at Siemens,

1 and he's going to talk you through the more
2 interesting part, which is a video capture of a
3 site demonstration of our system.

4 MR. HALL: And this is Sam Hall.
5 Please stand by while we load the video.

6 MR. GRIMES: Sure. And thank you,
7 Stuart. Like Stuart said, my name is Matthew
8 Grimes. I'm with Siemens Energy.

9 What we're seeing here is two of the
10 edge nodes that Stuart was showing you on the
11 pipeline. They are collecting this data at the
12 edge. We simulate a leak up here, and you can
13 see that data on the edge node, that this is the
14 filtered data that Stuart was talking about in
15 the slide a couple of slides back.

16 That data is captured. Down here, you
17 can see that each edge node is registering that
18 as an incident, so there's a timestamp and an
19 incident that's associated with those two
20 different nodes.

21 That data is collected -- it collects
22 about a minute before and a minute after the

1 event is detected. It sends that data up to the
2 cloud, and then the cloud uses that data to
3 compare with one another and decide, is this an
4 incident? Is this a leak?

5 The spike you're seeing here at the
6 end, that is actually closing the valve. You
7 wouldn't normally see that on a leak but we do on
8 our loop.

9 This is our test loop cloud software.
10 So, these are two different sensor nodes that
11 show up there. And they're the ones that's
12 collecting the data and sending it up to the
13 system.

14 After the cloud has had a chance to
15 review the information, this will be the software
16 that the operators will use. And they will get
17 either a text message, an email, however they
18 want to be alerted that there was an incident.
19 That will give them a link that will bring them
20 into this software.

21 Once the cloud is done reviewing all
22 the information, it will send them an alert and

1 -- there we go. So then, you'll get an alert
2 saying you have a leak on your line.

3 That will give you the exact GPS
4 within 20 to 50 feet of where the location is,
5 and you can send that out to your boots on the
6 ground that can go out and start working on it.

7 Like I said, they will also be
8 forwarded an email with the information about the
9 leak, links to where it is in the map, and here
10 again we just have an additional one, just in
11 case you missed the first one, water coming out
12 of the pipe.

13 And this whole system's set up here in
14 Houston, and we have different variations of
15 demos and options that we can do.

16 And that's the demonstration on this
17 end. Can we go back to the slides? I believe
18 there might be one or two more.

19 MR. HALL: Please stand by.

20 MR. GRIMES: Thank you. Oh, I guess
21 that was it. Thank you guys for your time, for
22 listening.

1 MS. BARAKAT: Thank you, Stuart. And
2 thank you, Matthew, for that presentation.

3 (Simultaneous speaking.)

4 MR. MITCHELL: Yeah, thank you so much
5 for your time.

6 MS. BARAKAT: And now, I would like to
7 introduce our fourth panelist from ABB, Inc., Dr.
8 Doug Baer, who will be presenting on ABB's leak
9 detection technologies. Dr. Baer, handing it
10 over to you.

11 DR. BAER: Great. Super. Thank you
12 very much. So, I greatly appreciate the
13 opportunity to present an overview today of ABB's
14 comprehensive line of advanced leak detection
15 solutions.

16 My name is Doug Baer. I'm the Global
17 Product Line Manager for Laser Analyzers, within
18 the Measurement and Analytics Division at ABB, a
19 leading provider of natural gas and methane
20 advanced leak detection technology. The same
21 technology is used in our industrial and
22 scientific analyzers used by companies and

1 leading scientists worldwide.

2 Since Congress last reauthorized
3 PHMSA, gas leak detection technology has advanced
4 dramatically. Today, commercially available
5 technology can find, map, locate and quantify
6 natural gas leaks and emissions with higher
7 reliability, faster speed, and lower costs, than
8 ever before.

9 Advanced leak detection technology
10 provides decision-makers with the best, most
11 accurate, reliable, cost-effective, and timely
12 information, so that they can make the most
13 informed decisions possible.

14 In the next 14 minutes, we will
15 present a brief overview of ABB's innovative and
16 advanced gas leak detection solution. These
17 solutions combine leading-edge technology, based
18 on cavity-enhanced laser absorption spectroscopy
19 techniques, with recent advances in software,
20 that describes gas plume dispersion, and with
21 cloud-based data analytics cannot only detect,
22 but define, locate, attribute, and quantify,

1 leaks as well, to reduce risk, increase safety,
2 and decrease weight, throughout the natural gas
3 infrastructure.

4 So, there's been many excellent talks
5 given to motivate the development of advanced
6 leak detection technology, so I'll simply throw
7 up this slide and say essentially, we're talking
8 about the ability to improve health, improve
9 safety, and save money, and while decreasing
10 waste.

11 ABB features one gas measurement
12 technology, which is patented, that we use in all
13 of our analyzers, for detecting, finding,
14 mapping, and quantifying, natural gas leaks,
15 while driving, using MobileGuard; walking, using
16 MicroGuard; flying, using HoverGuard; or
17 stationary, using EverGuard.

18 These are commercially available
19 solutions that were designed to operate
20 independently as standalone products. But
21 together, they can even provide better data.

22 All of these individual advanced leak

1 detection solutions, one, respond accurately to
2 local changes in background methane and ethane
3 concentration in ambient air, as small as a few
4 parts per billion.

5 High sensitivity methane and ethane
6 measurements allow faster, more reliable
7 detection of large, small, and even hidden, leaks
8 far from their sources.

9 They respond quickly to dynamic
10 changes in gas concentration, and report data
11 rapidly, to enable operators to find more leaks
12 in far less time than conventional methods.

13 They require virtually no warmup time,
14 so users can start collecting data essentially
15 anytime, and within one or two minutes after
16 power-on.

17 They generate quantitative digital
18 reports automatically that summarize results,
19 that include leak location, size, and attribute,
20 obtained over a particular time interval, or
21 during a survey.

22 These reports can be available,

1 essentially immediately, to a cloud-based server,
2 always controlled by the customers, and thus to
3 anybody anywhere with granted access.

4 Importantly, all solutions have passed
5 rigorous cybersecurity testing and reviews, to
6 assure data, security and full system integrity.

7 The schematic diagram in the left
8 illustrates the principles of conventional diode
9 laser absorptions technology. This technology
10 has been around for many years, but lacked the
11 speed and sensitivity to detect leaks fast.

12 ABB's patented LGR ICOS technology
13 provides that extremely long -- on the order of
14 several kilometers -- closed obstacle path within
15 a compact package.

16 As a result, these analyzers, based on
17 extracted sampling of local air, report local
18 point-wise measurements of methane and ethane
19 concentration, at rates up to ten times per
20 second, with high sensitivity, on the order of
21 PPB; high precision, on the order of 0.05 percent
22 of reading and accuracy; and a wide dynamic range

1 from PPM level all the way up to percent level;
2 yet are also rugged, safe, and simple to service,
3 essentially anywhere.

4 The operational lifetime of these
5 analyzers exceeds 15 years, as all of our
6 original batch of scientific analyzers produced
7 in 2005 are still in operation.

8 These solutions that I present are
9 commercially available -- not R&D. But we still
10 have a vibrant team of scientists and engineers
11 who continuously improve our hardware/software
12 and analytical capabilities, and we are hiring.

13 So, let's first review MobileGuard,
14 ABB's driving-based ALD solution, which is used
15 by many utilities, LDCs, and oil and gas
16 operators throughout the US, Canada, China,
17 Europe, Australia, and South America.

18 The MobileGuard driving-based solution
19 consists of four physical subsystems, and can
20 operate in almost any vehicle, and include an
21 analyzer capable of methane and ethane
22 measurement, which is generally placed in the

1 cargo area; a GPS or GNSS antenna and receiver,
2 to geolocate the car and measurement location; a
3 sonic anemometer, to measure local wind velocity,
4 required for indicating leak origin and emissions
5 rate; and a proprietary air inlet, mounted on the
6 front bumper, designed to allow operation, even
7 during rain and snow.

8 The fifth subsystem involves
9 innovative software and communications, to
10 analyze data quickly, to detect leaks in real
11 time, predict their origin to within a narrow
12 search area, and quantify their size in units of
13 volume metric emissions rate, typically standard
14 cubic feet per hour, meters per minute, or
15 kilograms per hour, and present the detailed
16 result immediately to the user, in a rich,
17 quantitative graphical interface, and securely
18 share the results to the cloud, if desired.

19 By measuring both methane and ethane
20 specifically, we can attribute the emissions
21 source properly, to either natural gas or biogas
22 from a landfill, animal, or another source.

1 MobileGuard can record data while
2 driving at highway speed, although 20 to 25 miles
3 per hour is typical.

4 Unlike less effective, older mobile
5 methods, which requires a vehicle to operate very
6 near the source or drive slowly, MobileGuard
7 requires no warmup time or compressed gas
8 cylinders to operate, and can detect leaks
9 hundreds of feet away from the source.

10 The software incorporates the measured
11 data recorded continuously while driving, and
12 utilizes advanced analytics based on complex
13 fluid dynamic model of plume dispersion, and
14 sophisticated analytical techniques, to quickly
15 ascertain the likely locations of the leaks, the
16 leak attributes -- like I said, natural gas or
17 biogenic source -- the effective area surveyed
18 upwind, and a quantitative estimate of the
19 emissions rate, or leak size for each indication,
20 and displays this information clearly, in real
21 time, in a visual, detailed, easy-to-read yet
22 graphically rich, user interface to the operator

1 that include geospatial maps, whether on Google,
2 OpenStreetMap, ASSURE, or whatever; and
3 continuous data time chart and detailed system
4 health metric.

5 This is just a brief slide to remind
6 me to say that the data is recorded continuously,
7 at a rate of typically between 1 Hz and 10 Hz,
8 depending on the application.

9 In order to make the data maximally
10 actionable, the data and detailed reports can, at
11 user discretion, be securely uploaded to, and
12 downloaded from, the cloud for sharing with
13 stakeholders.

14 The cloud has user-access settings to
15 allow re-drive by the user. It is also regularly
16 audited to ensure it is secure, and
17 27001-certified.

18 Moreover, ABB Software offers a set of
19 comprehensive capabilities dedicated to big data
20 analytics, such as filtering, trending analysis
21 over time and space, as well as asset class and
22 pipe material, etc.

1 File system semantics, file-level
2 security and scale, essential user management,
3 and cohesion across all our leak detection
4 solutions. All ABB solutions have been
5 thoroughly and extensively tested for
6 cybersecurity.

7 Conventional technology, based on
8 infrared sensing or imaging, cannot deliver the
9 results necessary to quickly and reliably
10 pinpoint leaks, as we've heard already in earlier
11 talks.

12 So, we invented MicroGuard, our
13 handheld ALD solution, to complement MobileGuard,
14 or as a standalone solution.

15 The MicroGuard solution incorporates
16 the same technology as MobileGuard, to precisely
17 pinpoint leaks quickly while walking. This novel
18 solution incorporates a lighter, battery-powered
19 analyzer, proprietary air sampling wand, along
20 with sophisticated software that operates on a
21 smartphone.

22 The MicroGuard software serves as a

1 wireless -- via a Bluetooth connection -- user
2 interface that is simple and easy to use,
3 downloads, reads, and views, geospatial maps
4 generated and shared to the cloud by MobileGuard,
5 allows users to incorporate notes -- whether they
6 be written, audio, photos, and video -- into a
7 live report during and after each walking survey.

8 It generates comprehensive, detailed,
9 and digital reports summarizing the results
10 automatically after each survey, and shares those
11 digital reports to a cloud-based server after
12 each survey.

13 MicroGuard's precision, better than 1
14 PPB, or 0.05 percent of leaving; fast response,
15 around 3 Hz; and data rate, around 10 Hz; enable
16 surveyors to quickly, reliably, and precisely,
17 pinpoint leaks from a distance that may be missed
18 by older, slower methods (audio interference).

19 Moreover, MicroGuard provides a
20 digital workflow and enables users to monitor
21 their overall performance and efficiency in
22 finding leaks.

1 MicroGuard is an extension of ABB's
2 renowned Micro-portable Series of Greenhouse Gas
3 Analyzers, used by leading scientists on all
4 seven continents.

5 ABB developed a handheld
6 methane/ethane analyzer in response to industry
7 demand, because walking surveyors, using
8 technologies, typically require 45 minutes or
9 longer to pinpoint leaks, if, in fact, they are
10 successful at all.

11 Due to the high precision and time
12 response of MicroGuard, the same as that in
13 MobileGuard, walking surveyors can now find leaks
14 within less than five minutes.

15 Since MicroGuard provides the same
16 measurement sensitivity as MobileGuard, when
17 walking surveyors and investigators arrive
18 onsite, they can immediately start honing in on
19 the source, rather than wandering around hoping
20 to find it with far less sensitive conventional
21 sensors, whether they be electrochemical,
22 traditional, tunable diode laser, infrared

1 camera, etc.

2 This diagram summarizes the result
3 described in a walk package report generated
4 after a walking investigation with MicroGuard.

5 In this investigation, a walking
6 surveyor first downloaded from the cloud a map
7 and data from a recent MobileGuard investigation,
8 which indicated a gas leak emission source within
9 the yellow shaded area.

10 The MobileGuard drive package was
11 shared with and downloaded to the MicroGuard
12 android app prior to the start of the walking
13 investigation.

14 The path driven by the car is drawn in
15 a color that corresponds to the methane level
16 shown in the color scale on the bottom-left, that
17 was recorded while driving MobileGuard, from
18 right to left on the map shown. The investigator
19 started the route near the bottom-center of the
20 map shown.

21 Using our novel search strategy, the
22 investigator was able to pinpoint the precise

1 location of the leak in less than five minutes,
2 despite the presence of several obstacles; namely
3 fences and barriers.

4 Many other investigations have yielded
5 similar results, but time does not permit me to
6 describe that today.

7 Not all measurements can be performed
8 while driving or on foot. To address
9 applications requiring measurements in locations
10 inaccessible by road or walking, we've reduced
11 the weight of MicroGuard analyzer, in order to
12 operate on commercial, unmanned aerial vehicles,
13 or drones, to create HoverGuard.

14 This allows surveyors to investigate,
15 find, map, and quantify, a leak while flying,
16 near bridges, storage tanks, and locations with
17 right-of-way restrictions, or otherwise difficult
18 to access.

19 HoverGuard subsystems are like those
20 in MobileGuard. They offer the same performance
21 advantages, as well as mapping and reporting
22 capabilities of MobileGuard and the entire

1 platform; namely, speed, sensitivity,
2 selectivity, time response, and environmental
3 ruggedness.

4 HoverGuard has been validated in
5 independent tests and field evaluations, in the
6 US, Canada, UK, France, China, the UAE, and
7 Singapore.

8 The bullets lists are essentially the
9 same performance attributes for MicroGuard, which
10 is not surprising since the obstacle
11 configurations of HoverGuard and MicroGuard are
12 similar.

13 Unlike other UAV-based systems based
14 on open pathways absorption or infrared imaging,
15 or LiDAR, that essentially recorded path average
16 column density, HoverGuard measures gas
17 concentrations and wind velocity at its location,
18 and thus allows it to record three-dimensional,
19 geospatial concentration and wind velocity
20 distribution continuously, in real time during
21 flight.

22 This allows it to effectively map the

1 evolution of the gas plume over time and our
2 innovative plume dispersion model, to re-create
3 the gas trajectory from which the origin and the
4 magnitude of the leak source can be determined.

5 Early versions of HoverGuard
6 participated in blind evaluations at the Methane
7 Emissions Test and Evaluation Center that Stuart
8 Riddick described -- or METEC -- in Fort Collins,
9 Colorado.

10 As Stuart mentioned earlier, METEC is
11 a controlled-release facility designed to
12 simulate real world natural gas infrastructure,
13 and was used in this case to evaluate the
14 effectiveness of various leak detection
15 technology.

16 During these tests, HoverGuard always
17 operated at a safe altitude, five to ten meters
18 above the top of all assets. The HoverGuard
19 result, when properly analyzed, demonstrated a
20 100 percent detection efficiency for leaks larger
21 than three standard cubic feet per hour, and over
22 90 percent detection efficiencies for smaller

1 leaks, down to one SCF, or standard cubic feet
2 per hour.

3 I have time for two applications to
4 highlight. HoverGuard has been deployed over a
5 river in New York State, to detect potential
6 leaks in an underwater pipeline unintentionally
7 subjected to overpressurization.

8 Conventional methods for leak
9 detection in those situations involve looking for
10 bubble.

11 Using a methodical and rapid rasser
12 (phonetic) flight trajectory, HoverGuard rapidly
13 confirmed the underwater leak, in agreement with
14 the bubble method, and identified another node
15 leak nearby.

16 In collaboration with researchers at
17 Lawrence Berkeley Lab -- part of UC Berkeley --
18 and funding from the California Energy
19 Commission, HoverGuard was deployed recently
20 above an abandoned, uncapped, undocumented, and
21 uncharacterized, gas well in the Sacramento River
22 Delta region in California.

1 During this investigation, HoverGuard
2 was able to find the location of the known
3 Artesian well, and characterized the side, and
4 showed that the well is still substantially
5 active, spewing methane into the atmosphere.

6 What's even more interesting, is that
7 HoverGuard was able to detect and estimate the
8 location of a larger, previously unknown,
9 emissions source located deeper into the marsh,
10 in addition to several other peripheral,
11 previously unknown, sources.

12 The three-dimensional plume data shown
13 in the Google Earth figure on the left, were
14 obtained from the MobileGuard fence-line flight
15 pattern, flying at altitudes up to 33 meters
16 high, as well as large, predicted emissions
17 source location regions, in yellow.

18 This site was between several old oil
19 exploration fields, and maybe an abandoned,
20 undocumented well.

21 The diffuse nature of this source has
22 made it difficult for other technologies to

1 locate the finding, until now.

2 The figure on the right is a plot of
3 the detection density conducted in March of 2021
4 for all flight.

5 And various sources pinpointed with
6 the MicroGuard handheld sensor are clearly
7 highlighted by the data collected by HoverGuard.

8 And if I have time, I'd like to play
9 a video of the pool that is shown here.

10 MR. HALL: Please stand by while we
11 load that video.

12 DR. BAER: So after traipsing through
13 the marsh and the wetlands, we eventually found
14 the large leak source indicated by HoverGuard
15 within a bubbling pool. The video shows a large
16 leak source found at this pool by HoverGuard.
17 Look closely at the bubbles in the water. Note
18 the size of the numerous methane bubbles
19 emanating from this previously unknown large
20 distributed source, which may be due to many
21 underwater feet or broken wells that can be heard
22 from many locations within the reed.

1 It is suspected that there are tens of
2 thousands of undocumented leaks and feet
3 throughout the United States.

4 That's enough of the video.

5 So to briefly summarize, ABB offers a
6 wide portfolio commercially available, high
7 performance advanced leak detection solutions
8 that address the PIPES Act of 2020 by detecting,
9 mapping, quantifying, and finding natural gas
10 leaks wherever they may be for practically any
11 application. Utilities and pipeline operators no
12 longer have to use outdated equipment to ensure
13 the safety of their assets and their customers.

14 At a high level, we believe minimum
15 performance standards and a definition of
16 advanced leak detection should be based on four
17 key elements. One, detect leak emissions with
18 high precision and thus at very low
19 concentrations which, on the face of it, may
20 appear to be small leaks but in fact may be large
21 leaks that are hidden and/or distant. Two,
22 estimate their locations. Three, estimate their

1 size for volumetric emissions rates; and then
2 four, complete these tasks and securely share the
3 results in minutes, not days.

4 At ABB, we seek to provide our
5 customers with the best product available. The
6 customers using our technology tell us that they
7 love it because it offers the most accurate,
8 up-to-date, and cost-effective information on the
9 size and location of leaks. This allows
10 important decisions to be guided by local and
11 up-to-date facts rather than broad or general
12 assumptions.

13 With the widespread adoption, these
14 commercially available, market proven, advanced
15 detection tools will enable the oil and gas
16 industry to discover and fix natural gas leaks
17 quickly, maximizing safety and minimizing
18 greenhouse gas emissions quickly, reliably, and
19 cost effectively.

20 We look forward to working with PHMSA
21 and the oil and gas industry, utilities, and the
22 public to craft smart, sensible, and safe rules

1 to ensure the safe and best commercially
2 available technology in the marketplace.

3 My contact information may be found by
4 searching online for my name, Doug Baer, B-A-E-R,
5 and affiliation, ABB, and I would be happy to
6 answer any questions. Thank you so much.

7 MS. BARAKAT: Thank you, Dr. Baer for
8 the presentation. This concludes the four
9 panelists' presentations. I want to thank you
10 all. I will turn it to Sam Hall for questions
11 and answers.

12 MR. HALL: Thank you, Kandi. We have
13 just a few minutes for questions and answers for
14 this panel, and we do have several queued up in
15 the Q and A box. If you're on the telephone line
16 and you wish to make a comment with your voice,
17 dial 10 and you will be placed in the queue.

18 The first question comes from Paul
19 Espenan from Bridger Photonics. What work are
20 you doing to increase the size of the swath?

21 DR. ROOS: Yeah, that's a great
22 question. We already have a proprietary scanner

1 that gives us 40 degrees field of view if we want
2 it. And so that, our swath is designed to
3 capture the vast majority of typical well sites
4 and right-of-ways. So if -- for us to increase
5 the swath size right now buys us very little,
6 because we don't catch any -- once we're covering
7 your typical well pad and right of way, it really
8 doesn't do us much good to increase our swath
9 further. So we can but we don't have much
10 incentive. We kind of hit that sweet spot for
11 our swath size.

12 MR. HALL: Thank you. Pam Lacey,
13 L-A-C-E-Y, from the AGA says, question for Dr.
14 Roos. You said you can calculate flow rate.
15 Have you tested this plane-based laser technology
16 on known emissions from a flow rate at METEC?

17 DR. ROOS: Yeah, we have tested it at
18 METEC, and we've tested it many times with
19 industry as well. So I'm happy to share those
20 results with you. Just come find us, but kind of
21 typically, on a single measurement basis, under
22 favorable conditions, a single measurement is

1 plus or minus 15 percent.

2 There was a third-party, completely
3 blind study recently that was performed by Matt
4 Johnson's group up in Canada. We didn't even
5 know we were being tested. And that was the
6 other end of the spectrum, challenging
7 conditions, and it was plus or minus 30 -- about
8 30 -- plus or minus 30 percent uncertainty. But
9 again, I'll emphasize that when we scanned for an
10 operator, their inventory includes many, many
11 emissions. And so that single measurement gets
12 beaten down so we end up approaching our bias,
13 which is very small single digits. So that's --
14 as long as you have many leaks that we're
15 scanning, or if you don't, if you only have a few
16 leaks, we can scan them multiple times, but we
17 end up approaching our bias, which is very small
18 single digits.

19 MR. HALL: Thank you for that. We
20 have a question from Nikos Salmatanis. This is a
21 question for ProFlex. Has your technology been
22 tested for multiple -- excuse me -- for

1 multi-phase pipeline operations?

2 MR. MITCHELL: Hi, Nikos. This is
3 Stuart from ProFlex. Yes, it has. And usually,
4 that's quite a complex thing for making pressure
5 wave based systems to do. With our system, we're
6 able to cope with that through continuously
7 measuring density, pressure, and temperature and
8 varying propagation rate based on that. One
9 great example of working with multi-phase was for
10 a client with quite a complex salt water disposal
11 system where we had events such as column
12 separation and static lines, and by working out
13 accurately where you need to place the sensors to
14 ensure that you not isolate for any part of the
15 system, our system can still work with
16 multi-phase lines even in events where we get
17 column separation, etcetera.

18 MR. HALL: Thank you for that answer.
19 We have just about three minutes left in the
20 session. Operator, do we have anyone in queue?

21 OPERATOR: No questions in queue at
22 this time.

1 MR. HALL: Thank you. A follow-up
2 question for ProFlex Technologies. What pressure
3 was the case study operating at, and what size
4 pipeline; what pressures does the technology work
5 on, and what is the distance monitoring station
6 can cover -- what is the --

7 MR. MITCHELL: So --

8 MR. HALL: -- distance that the
9 monitoring station can cover? Excuse me, sir.
10 Go ahead.

11 MR. MITCHELL: Sure. Knowing that we
12 are probably a little bit short on time, the
13 demonstration was a functional demonstration we
14 did for clients. That was only a 4-inch line
15 with pressures around about 20 to 30 PSI. The
16 technology works on a range of pressures,
17 anything probably as low as 10 to 15 PSI up to
18 high as you want really. In fact, the higher the
19 pressure, the better the system will function in
20 terms of detecting leaks.

21 Distance between monitoring stations,
22 that's just a function of, as an operator, what

1 size of leak you want to detect and also, what's
2 the pressure within the pipeline. So the smaller
3 the leak size that you want to detect, the lower
4 the pressure, closer together the monitoring
5 stations have to be, and the reverse is true:
6 higher pressure, pick a leak size, more
7 separation. We like to define it typically
8 between sort of 15 to 30 miles between stations,
9 but you can go, maybe if you're looking for a
10 very, very small leak at low pressure, down to
11 five miles and anything up to even 100 miles in
12 between them.

13 MR. HALL: Thank you for that answer.

14 One moment while I modify my screen. George
15 Ragula makes a comment. We've heard from a
16 number of technology providers of significance as
17 how their results have been validated by an
18 independent source. From direct experience with
19 the evaluation/validation of evolving ALD systems
20 several times validated by independent sources,
21 the actual results in practical field
22 applications have always yielded different

1 results. Unsure if terminology is part of this
2 issue. A leak indication is not a leak until it
3 is confirmed by boots on the ground that have
4 barholed it out as part of the pinpointing
5 process using a combustible gas indicator in
6 order to properly classify the leak and hazard
7 level. When collecting vast amounts of data
8 under dynamic conditions such as varying wind
9 conditions, directions, and speed, the likelihood
10 that multiple leak indications are coming from
11 the same leak source is a real concern.

12 That is a comment. Would anyone like
13 to address that in our final minute?

14 MR. MITCHELL: Yeah. Stuart here from
15 ProFlex Technologies. Just from the point of
16 validation, actually, our technology is currently
17 undergoing a program with DNB to have our results
18 validated, the use of the software, use of the
19 hardware on pipelines with real applications
20 validated by DNB. So for us, that's a yes.

21 MR. HALL: Anyone else wish to
22 comment?

1 DR. ROOS: I'll add that, you know,
2 comparing to ground crews, it's challenging for a
3 lot of our technologies, because we move so much
4 faster than the ground crews. So for instance,
5 we can scan up to hundreds of sites per day, and
6 ground crews typically can cover three. So it's
7 really hard to get apples to apples comparison
8 for those. My -- I always advocate for
9 completely blind testing where we're doing jobs
10 and someone unbeknownst to us goes out on the
11 sites and performs controlled releases. Then you
12 get someone in their actual operations, and they
13 don't know they're getting tested. I think
14 that's the best way to go.

15 MR. HALL: Thank you --

16 MR. DONEGAN: This is Sean Donegan
17 with Satelytics. We, for the last four years,
18 every week have been part of a group consortium
19 called iPipe in North Dakota. And that was part
20 of putting real technology through its -- through
21 field operations, and it was quite a process to
22 get selected. And we've been collecting data

1 every week, and we collected 3000 square
2 kilometers up there and within a few hours, these
3 folks were out groundproofing to validate what we
4 were finding as well as blind studies at METEC,
5 VIVER, and other places in the world, because
6 it's not just about the volume of leaks, it's
7 also about the environment in which you're trying
8 to detect them. So they're very much a part of,
9 I think, probably all the folks here who've
10 presented concerns, what we develop in the petri
11 dish matches in the real world and works.

12 MR. HALL: Thank you, Mr. Donegan.

13 Quickly, to the gentleman who spoke just before
14 Mr. Donegan, could you please identify yourself
15 for the record?

16 DR. ROOS: Yeah, that was Pete Roos
17 with Bridger Photonics.

18 MR. HALL: Thanks, Dr. Roos.

19 DR. ROOS: Happy to provide some of
20 those blind third-party studies if you're
21 interested.

22 MR. HALL: Very good.

1 DR. BAER: And I'd like to add
2 something. Doug Baer from ABB. So George is
3 totally right. A lot of these emission
4 indication search areas need to be validated by
5 boots on the ground. And in fact, every one of
6 our many customers throughout the world now has
7 tested the ABB's and vast leak detection
8 solution, namely MobileGuard, for several months
9 before finally purchasing it. And they looked at
10 these things, and they assessed the ability for
11 the technology to identify the estimated location
12 and then turn those into actual leaks and then
13 ultimately save time in finding the leaks. And
14 of course, they always do. Otherwise, they
15 wouldn't be our customers.

16 So the point is that the advanced
17 sensitivity and precision that we're talking
18 about -- and I want to take this opportunity to
19 address some of the comments regarding the need
20 for ppb or ppm or things like that -- what we're
21 really talking about is not just the ppb
22 sensitivity part, but because there's a

1 background level of methane in the air that's
2 typically about 2 ppm -- and I say about 2 ppm
3 because it moves around a little bit -- what the
4 instruments allow us to do is make very precise
5 measurements on the order of better than .1
6 percent of reading because of the background
7 level.

8 So because of this high sensitivity,
9 the ppb sensitivity, we also can constantly get a
10 high precision measurement. And that high
11 precision measurement allows us to identify the
12 presence of these little tiny blips in the
13 background levels that allow us to accurately
14 project the emissions location from great
15 distances.

16 So it's not just about sensitivity,
17 but it's about high precision. And moreover,
18 it's about time response. And of course, we
19 can't locate the actual leak location in terms of
20 what fitting, but we can minimize the search area
21 dramatically and allow, you know, on foot, you
22 know, on the boot -- on the ground with boots to

1 enable them to find these leaks in just under a
2 few minutes. So that's the value of this
3 advanced leak detection. It saves enormous
4 amounts of time. It identifies leaks which
5 previously, because of their hidden nature, go
6 undetected until we get real problems.

7 In fact, if I can take the
8 opportunity, there's one of these situations
9 where we were actually testing the system. We
10 did -- we -- an indication of a leak came up. We
11 were a block-and-a-half away. We drove to the
12 present -- to the location where we thought the
13 leak was. We got out of the car and we're
14 looking around with our MicroGuard, and we
15 identified a crack in the road. And the crack
16 was emanating on the order of 5 to 10 ppm. Now
17 unless you've got a very sensitive and very fast
18 responding instruments, 5 ppm signals can't be
19 readily detected by a so-called ppm-level sensor.

20 So the people that we were with, our
21 customers, were able to dig a hole, because they
22 were qualified to do that, they dug a hole in the

1 street and sure enough, under the street, there
2 were combustible levels of methane generated from
3 a large pipeline that was broken.

4 And so because of the nature of the
5 way the methane was seeping out, it seemed like a
6 quote, unquote, small source or small leak. But
7 in fact, it was actually a very large hazardous
8 leak that was, in fact, hidden. And of course,
9 they fixed the leak and it was a big success.

10 But I hope that illustrates the value
11 of these so-called high-sensitivity,
12 fast-responding instruments to identify the
13 presence of the leak and to find them fast, even
14 though they might appear to be small leaks.

15 MR. HALL: Thank you all for your
16 comments. We certainly appreciate your answering
17 those questions. For those of you who are not
18 able -- were not able to get your comments read
19 or your questions read, we do apologize. Due to
20 time limitations, we do need to move on to our
21 next panel, but we do record your comments and
22 questions on the Q and A board, and they will be

1 entered into the record.

2 And I'd like to take this opportunity to
3 remind everyone that you can submit public
4 comments -- or excuse me -- submit comments to
5 the public docket by May 24th on this meeting.

6 Kandi, do you have any closing
7 comments?

8 MS. BARAKAT: I just want to say thank
9 you very much to all the presenters. You
10 provided very informative presentations and
11 valuable knowledge with respect to leak detection
12 technologies. Thank you very much.

13 MR. HALL: Thank you, Kandi. And I'll
14 echo Kandi and thank our panelists and those of
15 you who have provided comments and questions.

16 We'll now move on to our next panel.
17 It is my pleasure to introduce Massoud Tahamtani,
18 Deputy Associate Administrator for Policy and
19 Programs in the Office of Pipeline Safety. He'll
20 be moderating our next session, and the panel is
21 focused on creating incentives to minimize
22 methane emissions. Massoud, the floor is yours.

1 MR. TAHAMTANI: Thank you, Sam, and
2 good afternoon, everybody. Exciting discussions
3 and presentations on a number of promising
4 technologies. Clearly, proven technologies will
5 play a critical role in continuously advancing
6 pipeline safety and reducing emissions from our
7 pipeline system.

8 As Sam indicated, our last panel for
9 today is a discussion involving possible
10 incentives to help minimize emissions. And we
11 have three very qualified individuals to help us
12 with that discussion. First, I'm pleased to
13 introduce Commissioner Diane Burman, who serves
14 with the New York State Public Service
15 Commission. She is a member of the National
16 Association of Regulatory Utility Commissioners
17 serving on a number of committees. She is the
18 Chair of the NARUC and Department of Energy
19 Natural Gas Partnership Initiative. Commissioner
20 Burman was recently appointed by the NARUC
21 President as Co-Vice Chair of the Select
22 Committee on Regulatory and Industry Diversity,

1 and to the task force on emergency preparedness,
2 recovery, and resiliency as well as a task forces
3 special subcommittee on lessons learned from
4 COVID-19. Commissioner Burman also serves on
5 PHMSA's Gas Pipeline Advisory Committee and we
6 thank her for her service there. Commissioner
7 Burman, the floor is yours.

8 MS. BURMAN: Great. Can you hear me?

9 MR. TAHAMTANI: Yes.

10 MS. BURMAN: Great. Thank you. I'm
11 really happy to be here today. I'm going to talk
12 a little bit on these issues. I know we're also
13 going to have, hopefully, time for Q and A, and
14 we do have other panelists. I'm going to give a
15 short overview of current status of things. I'm
16 going to talk a little bit about what NARUC is
17 doing and has done, and I'm going to get under
18 the hood a little bit very specifically to New
19 York State. And then I'm going to look at other
20 things to think about and some concerns and
21 priorities.

22 For me, it really is important that we

1 underscore that the challenge and the goal of
2 state energy policy, at least as I see it, is to
3 balance reliability, environmental
4 sustainability, and the cost of energy supply to
5 meet the needs and demands of consumers and to
6 support the growth of our state's economy.

7 That's why when, through listening
8 yesterday and today, I really felt that that's
9 sort of my understanding of what state energy
10 policy is really resonated with what we heard,
11 especially when there -- we talked about earlier
12 today the mission of PHMSA pipeline safety
13 research program, R&D program. And talking about
14 that and focused on sponsoring R&D projects that
15 were focused on near term success to improve
16 safety, reduce environmental impacts, and enhance
17 reliability. And it really does complement sort
18 of my thought process.

19 The current administration is
20 targeting carbon emissions from electro-power
21 sector by 2035 and a carbon neutral economy by
22 2050. Many states, my state included, are

1 looking at the role of gas in going more towards
2 a decarbonized future. And analyses show that
3 natural gas in particular is likely to continue
4 to play a central role in global energy
5 production even if human-induced global warming
6 is held to the under 2 degree Celsius and that
7 expanding and upgrading natural gas
8 infrastructure may indeed be necessary to meet
9 the big task of decarbonization. So it's really
10 important for us that we do look at -- and this
11 is a very important topic on creating incentives
12 to minimize emissions -- it's timely and
13 important that we make sure that we're fortifying
14 and upgrading the system, because it could
15 actually help prepare the existing infrastructure
16 to transport zero carbon fuels as they become
17 available, and in the meantime, focus on reducing
18 harmful methane leaks from natural gas.

19 As I look at it since over the course
20 of being involved in NARUC, we've done a number
21 of things very complementary to this and
22 actually, on our website at NARUC, there's a

1 section for the Center for Partnerships and
2 Innovation, which lays out under there a
3 subheading on natural gas. And this does go into
4 what the Natural Gas Infrastructure Modernization
5 Partnership, which I'm chairing through NARUC and
6 DOE, is doing, which is really also focused on
7 learning about emergent technologies pertaining
8 to critically important issues around enhancing
9 infrastructure and pipeline safety.

10 But it has a bunch of links there that
11 I think are really relevant for folks including
12 past videos and presentations and reports on
13 artificial intelligence for natural gas
14 utilities, natural gas distribution
15 infrastructure replacement and modernization,
16 which has a reviewed state program, a whole host
17 of information on the renewable gas workshop
18 summary that goes into some safety issues,
19 sampling of methane emissions, detection
20 technologies and practices for natural gas
21 distribution infrastructure handbook for state
22 energy regulators, and it also goes into some of

1 the activities we did with the U.S.-Europe
2 Methane Strategy in January of this year and
3 looking at Con Edison's AMI-enabled natural gas
4 protector program briefing. It has a reporting
5 and presentation on that as well as ARPA-E
6 REPAIR.

7 So for -- in terms of going back,
8 looking at some of that information, if you are
9 interested in getting under the hood, I think
10 that's a really good resource and can give you a
11 lot of detailed information on what NARUC is
12 currently doing and would be helpful.

13 For me, in New York, I've always been
14 focused on the importance of the integrity of the
15 natural gas system and safety is paramount to
16 that. We in New York do have a gas safety
17 performance measure report that we look at. It
18 actually comes out every June. In that report,
19 it focuses on three things; damage prevention,
20 emergency response, and leak management. Under
21 the leak management, we look at the LDC's
22 performance to effectively maintain leak

1 inventories and keep potential hazardous leaks to
2 a minimum. We look at year-end backlog of leaks
3 requiring repairs, and we look at incentive
4 programs to reduce safety risks and to help in
5 that.

6 I really feel very comfortable in
7 saying that New York continues to do really well.
8 We have a success story. And I'm going to list
9 out a number of -- eight things that I think that
10 we have done well. Some focus on where we can
11 continuously improve on substantial reductions in
12 leak backlog and what we're doing.

13 So one, initially, with repairable
14 leak backlogs, we started highlighting repairable
15 leak backlogs, particularly those associated with
16 leaks that our regulations require to be
17 repaired. So these are Type 1, 2a, and 2; in
18 other words, all but the Type 3. And we did this
19 in our annual gas safety performance measure
20 report which, again, gets presented every June to
21 the Commission. And that's significant because
22 it makes sure that every commissioner needs to

1 focus on this. We get a lot of information that
2 comes to us. Having something annually reported
3 to us really makes sure that we are taking a
4 critical look at that -- that each commissioner
5 is, and not just someone who might be focused on
6 it as a specialty.

7 And this essentially highlights the
8 number of repairable leaks each utility had at
9 the end of the year. Now this report has morphed
10 over the years, and it's morphed into also
11 reporting total leak backlog. So this includes
12 all leaks including Type 3.

13 And at the same time, we also
14 instituted performance metrics for each company
15 that instituted a regulatory liability in NRA for
16 each LDC if they do not meet thresholds for total
17 leak and repairable leak backlogs. What's
18 important to us is that the thresholds are
19 focused on continuous improvement, and that's a
20 constant theme that I think is really important
21 in regulation, but especially in safety. I've
22 learned a lot over the years in terms of the need

1 for us to be focused on continuous improvement.
2 I do point out that I really do believe that API
3 1173 and pipeline safety management systems can
4 be a really helpful tool for us and something
5 that we should really take a look at how we can
6 do it even better.

7 And so then the second thing is we
8 instituted -- so we instituted a performance
9 metric also that included positive rate
10 adjustments in addition to the NRAs. This allows
11 the companies to earn a positive rate adjustment
12 for superior performance.

13 The third thing is we instituted a
14 performance metric through incentives to address
15 and eliminate the highest volume emitters from
16 the leak inventory. Typically, LDCs are able ---
17 were able to earn an incentive for fixing the
18 highest 25 to 50 emitting leaks per year even if
19 they were only a Type 3 leak.

20 The fourth is our leak survey and
21 investigation regulations in New York require
22 each survey to be conducted with an approved

1 device. That's something I just want to point
2 out is that this is different as opposed to the
3 192 requirement of a leak detection device. We
4 looked at this as an improved device. It ensures
5 the technology used for leak surveys and
6 investigation meets expectations and increasing
7 the likelihood that existing leak will be
8 discovered. I point out this because I see this
9 also as something that we can do working with
10 more R&D and other collaborators and stakeholders
11 on what we can do in terms of having more
12 approved devices and getting technology engaged
13 more in these issues.

14 The fifth is we had an aggressive
15 leak-prone pipe replacement program where we
16 expected companies to replace all leak-prone pipe
17 within 20 years. We started this in 2014, the
18 end of 2014, the beginning of 2015 and under
19 this, we went from a 50-year replacement strategy
20 to a under 20 years replacement strategy. I will
21 point out that this is something that I'm really
22 concerned about. It really is important that we

1 have a lot of support for our leak prone pipe
2 replacement program. It has been difficult in
3 the current environment, and it's really, really
4 important to safety, reliability, and resiliency,
5 and I really get back to the importance of
6 fortifying and upgrading that system to help us
7 prepare for the existing infrastructure for the
8 new future as well. And so it really is very
9 important.

10 The sixth is new technologies. We are
11 really receptive to new technologies. I believe
12 that our approval process tries to be as
13 straightforward as possible. And our
14 expectation, really, is that new technology must
15 perform at least as well as the plain ionization
16 devices. And if it does, if we find the same
17 leak in a double blind study, it's likely to
18 receive approval. Again, we can always do better
19 on what we're doing with technologies and how
20 we're helping to streamline that process.

21 The seventh is -- and this is one that
22 I think is the signature thing for us. I do

1 point out NARUC does have it on their website,
2 the video and the presentation on this program.
3 We have supported wide-scale rollout of
4 residential methane detectors to the point that I
5 strongly believe that New York is a leader with
6 this deployment. We have worked with Con Edison
7 in particular to support their development in
8 deployment. At first, we did this through a
9 pilot program and then system wide of AMI-enabled
10 residential methane detectors that
11 instantaneously alert gas control of the presence
12 of methane so that service personnel and 911 can
13 be deployed. Con Edison is on schedule to have
14 an AMI-enabled detector in every building in
15 their gas service territory within the next three
16 to five years.

17 And I point this out because the
18 importance of this is this came after a horrible
19 event that helped us all to refocus and learn,
20 and it helped us to, with the support of
21 important R&D as well as collaborating with many
22 different sectors, it helped us actually achieve

1 something that I think is really important to
2 future safety and really is a great model.

3 The eighth thing is we supported
4 increased leakage services surveys throughout New
5 York. In New York City, Con Edison conducts --
6 for example, Con Edison conducts a monthly
7 driving leakage survey in addition to the
8 mandated annual survey. These driving surveys
9 are intended to monitor the cast iron network for
10 cracks and leaks. In Upstate, we have had
11 companies transition to the annual leak survey as
12 opposed to 3-year and 5-year surveys. Now
13 initially, there was a spike in leaks found from
14 doing these surveys annually, but over time, the
15 leaks found have fallen dramatically. So bottom
16 line, in New York, I think our progress has been
17 made by shedding light on the leak issue through
18 these performance measure reports; two,
19 instituting metrics geared at continuous
20 improvement; three, rewarding superior
21 performance; four, being open to new technologies
22 like AMI R&D; and five, targeting enforcement

1 dollars towards programs that benefit rates
2 payers and safety initiatives.

3 I will say I recently voted no on some
4 enforcement dollars, and part of the rationale
5 for me was that the dollars were not going back
6 to the gas safety issues that we were trying to
7 target. And for me, it's really important that
8 our enforcement dollars need to go to benefit the
9 rate payers in the safety initiative and working
10 with the companies and other stakeholders to do
11 that.

12 The other thing for our progress has
13 been made by supporting leak-prone pipe program
14 replacement. It's really important for us to
15 have support with that, especially because there
16 is a lot of opposition to doing that.

17 We are also supporting increased
18 frequencies of leakage surveys. And then I think
19 our progress has been made because there's a lot
20 of leadership support. We get a lot of ability
21 to also lean into the support we've had from our
22 federal regulators and others to say that we're

1 doing things that are helpful.

2 So that's New York specific. It talks
3 a little bit about NARUC. I gave you an overview
4 of different things. I do want to just mention
5 some things that I see, a couple of observations.
6 Some of these observations are just kind of
7 looking at it in general. But also, some of
8 these come directly from what I heard yesterday
9 and earlier today.

10 So one thing, yesterday a lot of the
11 presentations were focused on that methane
12 emissions have increased steadily and noticeably
13 since the 1990's. I just want to push back on
14 that a little bit, just because I think it's
15 important for us to really understand exactly
16 what we are saying, because as I see it, I think
17 that it can be said that it is true that CO2
18 levels have dropped substantially during that
19 same time period. And so I think that for me,
20 it's important for us to fully understand, have
21 the CO2 levels fallen more than the natural gas
22 levels have risen, and really look at that.

1 We also have to understand and
2 recognize the role that the increased use of
3 natural gas in the energy sector has played,
4 especially in the conversion from coal to gas, so
5 the coal to the methane may skew some of those
6 numbers. And I really would be concerned if the
7 focus were then not on focusing on the importance
8 of going from coal to gas or from fuel oil to gas
9 and actually discontinuing important conversions
10 during this time period.

11 The other is I think we need to look,
12 at when we talk about methane emissions, how the
13 U.S. emissions of CO2 and methane compare to
14 other industrialized countries such as China and
15 India.

16 Another important aspect is we have to
17 keep in mind that we do need to talk about the
18 elephants in the room, or I should say the dogs
19 in the room, because some of you may be hearing
20 my dog barking as my son gets ready to leave for
21 soccer. There has been talk about the fact that
22 infrastructure needs to -- there's going to be a

1 lot of infrastructure that's needed to electrify
2 heating loads, especially in cold weather
3 climates. And there's going to be a massive need
4 for increases in upgrades in the electric
5 transmission and distribution systems to carry
6 this load even with energy efficiency measures.
7 And again, as analysts are showing, natural gas
8 is going to play a large part -- a large role,
9 and we really should be cognizant of what we need
10 to do to support the safety and reliability and
11 resiliency continuing in that.

12 The other is we should be really
13 careful we do not inappropriately prioritize
14 emission concerns over safety concerns when it
15 comes to leaks. And then I think it's important
16 when we look at incentives and emission rates
17 that -- and this is something -- you know,
18 default emission rates are generally used to
19 estimate the emissions from the natural gas
20 industry. Operators are required to submit their
21 estimates, I think, to the EPA. And I've heard
22 several times that emissions are higher than

1 previously thought, and this is based on, in
2 part, allegedly by data that's submitted by
3 operators.

4 So I kind of would push back and say
5 maybe we should really examine this and test its
6 accuracy, because is it possible that what the
7 actual data is showing is that the operator's
8 estimates are because it's based on the use of
9 the default value. Perhaps the actual rates may
10 actually be lower than the default value
11 estimates. So I say this because technology used
12 to measure actual emissions are sometimes cost
13 prohibitive, and those expenses are not always
14 recoverable. So I think a policy focus should be
15 based on actual emission rates rather than
16 theoretical emission rates. And also, what are
17 we doing to help promote the technologies that
18 can give us the tools to more accurately account
19 for things?

20 Next, we need to be sure that emission
21 models accurately account for cast iron that has
22 been rehabilitated either through aligning or

1 having joint fields with technologies such as
2 this spot. I'm not sure that currently they
3 accurately account for advances that states and
4 operators have made in overall leak reduction.
5 for example, states like New York that have
6 odorization requirements that exceed federal
7 requirements, therefore, leaks from the states
8 that are doing things for leak -- overall leak
9 production advances, their leaks may actually get
10 reported more quickly, and we want to encourage
11 that rather than discourage that.

12 The other thing is we need to think of
13 ways to make advanced leak protection methods
14 more affordable, especially for smaller gas
15 operators with fewer customers to spread costs
16 out among such as municipalities.

17 Then I have two more things. One, I
18 think it's really important that the pipeline
19 safety staff are directly involved in state rate
20 cases and even the rate cases that go on at FERC.
21 I think that for me, I've seen firsthand the
22 important role that safety staff take in these --

1 in having an active role in rate cases. And
2 sometimes I think, especially as we look at new
3 technologies and associated expenses with that,
4 if you don't have the safety staff there looking
5 at these issues and it's left strictly to an
6 accounting staff, they may not be approved.

7 Safety staff being involved in many of
8 our rate cases have shown that for the case, that
9 the expenses for the technologies and associated
10 expenses are more than offset by leak and risk
11 reduction. If someone was to ask me what are the
12 top pipeline safety issues that we should be
13 looking at in creating incentives, I would say,
14 again, number one is pipeline safety management
15 systems and helping in this area can be huge.
16 The other is operator qualifications and
17 residential methane detectors really need to be
18 at the top of the list. And, you know, I really
19 think that we can all go a long way working
20 together in helping in this area.

21 With that, I'm going to wrap up. I
22 know we're going to have some questions, and I

1 look forward to engaging with the other panelists
2 as well as those virtually in the audience.

3 Thank you.

4 MR. TAHAMTANI: Thank you,
5 Commissioner Burman. Appreciate your remarks and
6 your observations.

7 Our next speaker, who will not have a
8 PowerPoint presentation either, like Commissioner
9 Burman, is Brian White. Brian is the Deputy
10 Director of the Division of Pipeline Regulation
11 at the Federal Energy Regulatory Commission. He
12 joined the Commission in 2006 after working for
13 eight years in the Regulatory Policy Group for
14 the Columbia Gas System. Previous to that he
15 worked for eight years in the Policy Analysis
16 Group for AGA. Brian, the floor is yours.

17 MR. WHITE: Thanks. Can you hear me?

18 MR. TAHAMTANI: Yes.

19 MR. WHITE: Okay. Let me turn my
20 speakers off. Thank you. So yes, I apologize I
21 don't have a set presentation, but I thought I'd
22 talk a little bit about first, how pipeline rates

1 are established; second, our modernization policy
2 statement which is the regulatory vehicle the
3 Commission created a few years ago to try to help
4 pipelines upgrade their systems, and then a
5 little bit about how pipelines recover fuel
6 today. And I apologize, too. I'm upstairs
7 hiding from our animals, too, so I apologize for
8 any background noise.

9 So in terms of how pipeline rates are
10 established, pipelines currently recover their
11 cost through two basic charges. All fixed or
12 most fixed costs are recovered through a
13 reservation charge, so shippers, customers that
14 use the pipeline systems pay a reservation fee
15 for the right to use that capacity on a firm
16 basis. And then the variable costs the pipelines
17 incur are recovered through what's called a usage
18 charge. When you actually move gas through the
19 systems, you pay a predicative rate, and these
20 rates or charges are set in what's called a
21 general section flow rate case. The pipeline
22 comes in and all of its costs are examined across

1 the board over a set time period. These tend to
2 be kind of complex cases. They're assigned to an
3 administrative law judge. They go on for a
4 while. Parties file testimony and eventually,
5 the rate cases usually, not always, but usually,
6 result in a settlement where the parties agree
7 basically to compromise and agree to rates that
8 everybody can live with going forward.

9 These settlements usually have a
10 couple different components to them. One is a
11 rate moratorium. So the pipeline will agree when
12 it enters into the settlement with its customers
13 not to file another rate case for a time period
14 going forward, say three or four years. At the
15 same time, the customers also will agree not to
16 challenge the pipeline's rates for a set time
17 period, three or four years. Customers are
18 allowed to petition for -- the Commission on its
19 own, can open up an investigation on pipeline
20 rates, but often the settlements will have this
21 type of rate moratorium where the rates are set
22 and then they stay fixed for a certain time

1 period.

2 The settlements also usually, not
3 always but usually, have some type of comeback
4 requirement where the pipeline will agree to come
5 back and file another rate case at a future time
6 period, say three or four years down the road,
7 they come back in with another rate case.

8 So the rates that are established in
9 the settlements are fixed. They're set, they're
10 there for a time period. They're not chewed up.
11 They don't change each year, that kind of thing.
12 They are set in time and they stay that way until
13 either the pipeline or the Commission does
14 something further down the road.

15 There are other cost recovery
16 mechanisms that some pipelines have for certain
17 costs, and these are what we call trackers. And
18 for example, the Columbia Gas System has certain
19 contracts on other pipelines that it recovers
20 through these trackers. They're not part of the
21 base rate. They're just passed through to its
22 customers, it's contracts that the pipeline needs

1 to maintain service. So it's not part of a rate
2 base. They don't return, but it's a different
3 mechanism that can be used by pipelines to
4 recover certain costs.

5 The Commission does not like trackers.
6 They like to examine all costs at one time, but a
7 lot of these come out of settlements where the
8 pipeline -- the customers agree to a mechanism to
9 address certain things. The Tennessee system had
10 a settlement where they agreed to a pipeline
11 safety greenhouse gas tracker for a certain
12 amount of cost there, and the Commission approved
13 it because it reduced the port's settlement and
14 things that come out of settlements are a net
15 deposit to the system. So these are separate
16 costs that are incurred, recovered apart from the
17 base rates.

18 Next, a little bit about how the
19 pipeline establishes its rates. In terms of the
20 modernization policy statement, in 2015, the
21 Commission issued a policy statement which was --
22 and it's -- I guess I should point out first it

1 was a policy statement, not an order, and there's
2 a distinction there. When the Commission issues
3 an order out of a rulemaking proceeding, the
4 pipelines are required to do something. An
5 example would be when the Congress passed the
6 corporate tax reduction in 2017, Commission
7 issued Order 849 which required the pipelines to
8 file a form, to reduce their rates, or provide a
9 different option, and the pipelines had to do
10 that.

11 The policy statement is a regulatory
12 vehicle that basically says if you're going to do
13 something, here's how we'd like you to do it. It
14 doesn't require you to do it. It's kind of a
15 roadmap for how you need to do it.

16 So in 2015, the Commission issued a
17 policy statement on cost recovery mechanisms for
18 the modernization of natural gas facilities. And
19 this was basically issued in response to a couple
20 different things that were going on. Congress
21 passed the Pipeline Safety Act in 2011. That was
22 one of the things. And then the PHMSA had

1 started up their pipeline safety reform
2 initiative to address pipeline infrastructure,
3 safety, reliability.

4 So the Commission kind of saw what was
5 happening. We knew that as a result of these
6 initiatives, pipelines would probably face new
7 safety standards that would require significant
8 capital costs to enhance the safety and
9 reliability of their systems. We also -- the
10 Commission also inserted the pipelines may, in
11 the future, face some increased environmental
12 monitoring cost and environmental compliance cost
13 as well as potentially having to replace or
14 repair existing compressors or other facilities.
15 So the modernization was -- the modernization
16 policy statement was put in place to -- and I'm
17 going to read the quote here -- to address these
18 potential costs and to ensure that existing
19 Commission rate-making policies do not
20 unnecessarily inhibit interstate natural gas
21 pipelines' abilities to expedite needed or
22 required upgrades and improvements.

1 So the modernization policy statement
2 does allow for trackers to be established to
3 recover certain costs associated with replacing
4 old and inefficient compressors, replacing
5 leak-prone pipes, things like that, and
6 performing other infrastructure improvements and
7 upgrades to enhance the efficient and safe
8 operation of the pipeline systems. And it also
9 sets in place the standards that are required for
10 the pipelines to do this.

11 You had five basic principles that are
12 in the modernization policy statement that the
13 pipelines would have to comply with. Number one
14 would be a review, that it would have to be done
15 in accordance with the review of existing base
16 rates. So you couldn't just file for a
17 modernization tracker. You have to file to also
18 at the same time change your base rates.

19 Number two, you had to define your
20 eligible costs. So it has to be -- it can't just
21 be a vague kind of, you know, we're going to do
22 this, we're going to do that. If you look at the

1 Columbia settlement, which was the first one
2 through, it clearly listed all of the different
3 facilities that they were going to do under the
4 modernization settlement. So it's, you know,
5 this pipe, this pipe, this storage facility. It
6 has to be defined.

7 Number three was an avoidance of cost
8 shifting. So existing customers in the system
9 would be protected in case the pipeline loses
10 load, discounts, things like that.

11 Number four was a periodic review, so
12 it had to be a defined time period, couldn't go
13 on ad infinitum.

14 And number five, it had to have
15 shipper support, which is a big criteria. The
16 pipeline needs to work with its shippers to come
17 in and agree, they have them agree with what
18 facilities are going to be replaced and how that
19 process will occur. So that was the fifth
20 criteria.

21 To date we've had two pipelines, that
22 at least I'm aware of, that have settlements that

1 came out of this, the Columbia, the second
2 Columbia modernization settlement was here, and
3 National Fuel, I believe, is the other one that's
4 put in place a settlement under the policy
5 statement.

6 Several pipelines have proposed cost
7 recovery mechanisms under this vehicle. However,
8 as a result of the settlement negotiations with
9 their customers, they elected not to move
10 forward. So it doesn't always -- it does not
11 always come to fruition.

12 I think the Commission is hopeful that
13 this mechanism will contribute in the future,
14 going forward, but we do recognize that there --
15 that in these rate cases, there are a lot of
16 issues at play and customers don't always support
17 them. So it is a variable that is out there.

18 And the third thing I wanted to talk
19 about was kind of how pipelines recover fuel.
20 Most of the pipelines recover fuel through a
21 tracker mechanism. And by fuel, I mean a couple
22 things. It's obviously a fuel that's required to

1 run the compressors. And there's also a lost and
2 unaccounted for component usually in that fuel,
3 and that can kind of be a wide variety of things.
4 It can be leaks. It can be blowdowns. It can be
5 meter error, accounting error. It's kind of a
6 mishmash of categories, but that's also part of
7 the general fuel percentage.

8 So the pipelines go through a -- they
9 have a fuel cycle. They make an estimate of what
10 their future throughput is and how much they
11 think they'll need to run the compressors, that
12 type of thing. And they will actually create a
13 fuel rate for the system. So say it's 1 percent
14 is what we think we need to operate our system.
15 And then the shippers, the customers that use the
16 pipeline, will give them that fuel when they
17 transport their gas. So if you're trying to move
18 100 dekatherms and the fuel rate is 1 percent,
19 you will actually give the pipeline 101
20 dekatherms. You give it the fuel that's required
21 to operate the systems.

22 I guess this -- now this is kind of

1 Brian White talking, maybe not the Commission
2 talking. The fuel trackers, they have positives,
3 and they have negatives. They tend to be fairly
4 non-controversial. The pipelines' tariffs lay
5 out the tracker mechanisms. There's a true up
6 mechanism. Obviously, nobody's estimates are
7 going to be correct, so if one year the pipeline
8 recovers more fuel than needed, you know, it
9 rolls over the balance, and the rate's reduced
10 next year. Vice versa, if it doesn't collect
11 enough, the rates go up next year. So it tends
12 to be -- they tend to be non-controversial, and
13 that's at least a positive, I guess, from moving
14 forward.

15 On the negative, you know, one could
16 say maybe they're not the best vehicle for
17 encouraging, you know, full efficiency, since
18 it's just a passthrough. There are some
19 pipelines, not that many left, that have a fixed
20 fuel rate. So in a rate case, you may agree that
21 the rate is 1 percent and then, you know, if the
22 pipeline can operate its system at .8 percent

1 fuel, then they get to keep the differential.
2 Similarly, if they can't, if they operate the
3 system at 1.3 percent, that comes out of their
4 own pocket. So one could, not necessarily me,
5 but one could make the case that that would be a
6 better incentive for encouraging efficient
7 operations.

8 The Commission's regulations give the
9 pipelines the options. You can have a fixed fuel
10 rate. You can have a tracker. Either one. We
11 don't mandate one or the other. So that's
12 basically it for me. Thank you.

13 MR. TAHAMTANI: Thank you, Bran.
14 Thank you very much. Our last speaker is Erin
15 Murphy. Erin spoke to us yesterday on another
16 panel, and thank you, Erin, for agreeing to serve
17 on this panel. I'll take about 30 seconds and
18 introduce Erin again. She is a senior attorney
19 with the Environmental Defense Fund Energy
20 Markets and Utility Regulation Team. She
21 presents EDF before federal and state agencies
22 advocating to reduce methane emissions from gas

1 distribution transmission networks, maintain pro
2 gas utility planning frameworks make sure
3 alignment with policy -- climate policy.

4 Previously, Erin worked on Clean Air Act
5 litigation, clerked with the Maine Supreme Court,
6 and graduated from Georgetown Law and the
7 University of Florida. And the floor is yours,
8 Erin. Thank you.

9 MS. MURPHY: Thanks, Massoud. Can you
10 hear me?

11 MR. TAHAMTANI: Yes.

12 MS. MURPHY: Great. Hi, everybody.
13 Good afternoon, again. I am thankful to PHMSA
14 for the opportunity to participate in this panel
15 and conversation today. I am going to just share
16 a couple of examples of positive and negative
17 incentives that EDF has observed in different
18 state commissions and agencies. And these
19 incentives are specific to distribution
20 companies. And so let me get started.

21 So taking a look at some helpful leak
22 incentives that we've seen -- and the quoted

1 example in this slide is from New York -- so
2 there are some incentives in place for gas
3 utilities to receive a positive revenue
4 adjustment for repairing additional Type 3 or
5 Grade 3 high emitting leaks beyond their annual
6 reduction target. And the example I'm pulling
7 here is from National Grid's last rate case
8 settlement, which allows the company to earn a
9 positive revenue adjustment of one basis point
10 for the repair of every 50 additional high
11 emitting Type 3 leaks beyond their annual backlog
12 target with a maximum of five basis points
13 available.

14 And obviously, the objective of this
15 incentive is to provide the utility with a reason
16 and sort of a financial reason to specifically
17 pursue these Type 3 leaks that are known to be
18 higher emitters. And for additional context --
19 and I think I mentioned this in my presentation
20 yesterday -- National Grid recently proposed the
21 next rate cases and enhanced high emitter methane
22 detection programs, which would deploy advanced

1 leak detection with the objective of identifying
2 and remediating these super emitting leaks.

3 So this positive revenue adjustment
4 kind of connects to that high emitter program and
5 the deployment of ALD by the utility. And EDF
6 would recognize an additional element of these
7 types of incentives, which would be to require
8 reporting to quantify the abated methane
9 emissions that resulted from the Type 3 leak
10 repairs and just because that additional
11 reporting element would, of course, provide
12 transparency for the regulator and the public to
13 understand the progress that's being made as a
14 result of the program.

15 I also wanted to note it's not
16 included on the slide, but another helpful
17 example of this type of incentive is a regulatory
18 program in Massachusetts that requires gas
19 utilities to identify and repair grade 3 non-
20 hazardous leaks that are determined to have a
21 significant environmental impact. And there is a
22 more detailed explanation in the Massachusetts

1 regulation of how that program is implemented.
2 But it similarly requires gas utilities to make
3 sure that they're identifying and working to
4 remediate those high emitting Type 3 leaks.

5 So if we take a look at some unhelpful
6 incentives that we've seen in place -- and I want
7 to note that the -- these specific utilities that
8 I'm pointing out here as examples are partially a
9 product of where my own work focuses and looks.
10 They're certainly not looking to identify these
11 as bad actors or anything like that. Rather just
12 looking at some of the incentives that we've seen
13 in place in different jurisdictions around the
14 country.

15 So this -- and I think this certainly
16 happens in other jurisdictions as well, but we've
17 observed it in New York and D.C. where the gas
18 utility has leak backlog performance metrics that
19 carries a financial penalty if the utility's leak
20 backlog increases year over year. And obviously,
21 that's an incentive that's put in place with the
22 admirable objective of decreasing the number of

1 leaks on the system, which is absolutely
2 something we want to see.

3 But there's a problem that results
4 from the way these incentives are structured,
5 which is that it incents utilities not to use
6 advanced leak detection or any other innovation
7 that they might identify that could significantly
8 increase the size of their backlog, because if
9 there's a big jump in the utility's backlog
10 because of a new leak detection program, then in
11 turn, if the utility doesn't have the staff or
12 the resources rapidly on hand to repair all of
13 those newly found leaks quickly, then they're
14 going to be reporting or they could be facing
15 reporting a big increase in their backlog at the
16 end of the year, and thus experiencing this
17 negative revenue adjustment or penalty, however
18 it may be structured.

19 And so a solution that EDF has
20 recommended is that regulators should instead
21 incentivize reductions in the volume of leaked
22 methane on the system rather than focusing on a

1 reduction and the number of leaks in the backlog.
2 And so on the one hand, this is with the
3 objective of incentivizing and encouraging
4 utilities to find all of the leaks that are on
5 their system and report on those leaks and then
6 furthermore, to focus the remediation effort in
7 addition, of course, to all safety-focused
8 programs, but from an environmental perspective,
9 to focus remediation efforts on those high volume
10 leaks.

11 And obviously, an incentive like that
12 would pair very well with implementation of
13 advanced leak detection by a gas utility, because
14 ALD surveys would provide those leak volume flow
15 rates for individual leaks that would allow the
16 utility to engage in this prioritization to
17 address higher emitting leaks first.

18 I'm going to talk briefly about lost
19 and unaccounted-for gas. EDF, these are a couple
20 of recommendations that are pulled from a white
21 paper that EDF released earlier this year that
22 provides a number of recommendations for state

1 regulators to improve oversight of gas utilities
2 to ensure that oversight is being aligned with
3 climate change goals.

4 So one of our recommendations is the
5 Commission should review standards for lost and
6 unaccounted-for gas that are attributable to
7 leaked gas and consider whether they are
8 consistent with climate commitment.

9 And another element of that would be
10 requiring gas utilities to incorporate the
11 societal cost of methane into their long-term
12 planning. And I want to point to a specific
13 example here. So a recent order from the
14 California Public Utilities Commission did
15 require that utilities include in the cost
16 benefit analysis for their leak abatement
17 compliance plans a quantification of the avoided
18 social cost of methane.

19 And so by really putting pen to paper
20 in terms of -- in trying to put a dollar amount
21 on the value to society of reducing these methane
22 emissions, we think it's helpful in creating that

1 incentive and also that transparency to see, you
2 know, why this is important and worth pursuing.
3 And I'll note that that requirement from the
4 California Commission for Utility Leak Abatement
5 Compliance Plan is, you know, a result of the
6 larger program that's come out of FD 1371 in
7 California.

8 And I also just wanted to make the
9 point because I know this is often a topic of
10 discussion, just the level of challenge in
11 identifying what portion of loss is attributable
12 to actual leakage and, therefore, to methane
13 emission on the system. In its recent order, the
14 California Commission found that it was able to
15 quantify that portion of loss, and that's in part
16 because of the more detailed reporting
17 requirements that the Commission has to break
18 down leakage on the system. And in that
19 instance, the California Commission estimated
20 that methane emissions represented about 30
21 percent of total loss for the four large gas
22 utilities in the state. And there's a more

1 detailed explanation in that Commission order of
2 how they did that math, essentially.

3 And finally, just to talk a little bit
4 about reporting, I wanted to share a specific
5 example from Washington State, which passed
6 legislation, I think it was in 2019 -- it might
7 have been last year in 2020 actually -- that
8 requires all gas utilities in the state to file
9 annual leak reports. And so each gas utility is
10 required to file an annual leak report and then
11 in turn, the utilities commission is then
12 required to take that information and sort of
13 sort through it and produce its own reports to
14 summarize some of that information.

15 So the commission is permitted to
16 require the gas utilities to report the volume of
17 each leak measured in carbon dioxide equivalent
18 as well as in thousands of cubic feet. And then
19 the commission has to estimate the volume of
20 leaked gas and the associated greenhouse gas
21 emissions from operational practices in the state
22 using that data that was reported. And starting

1 in 2021, the commission is required to publish
2 annual aggregate data regarding those greenhouse
3 emission volumes and the causes of the leaks.

4 So I think this is just a helpful
5 example to show, and I think this, you know,
6 carries forward some of the controls I was
7 talking about yesterday in terms of the value of
8 reporting both so that utilities can demonstrate
9 improvements over time in reducing emissions on
10 their system which, you know, can provide a lot
11 of value, including value to stakeholders and
12 investors, but then also, of course, there's an
13 oversight value here as well and transparency to
14 the public.

15 So there's, you know, a lot of sort of
16 push and pull mechanisms that are available, and
17 there's, of course, huge variety across the
18 country, but those are at least some high level
19 observations about incentives that can either
20 push for or detract from utility efforts to
21 identify and manage the leaks on their systems
22 with an eye toward reducing methane emissions.

1 Thank you.

2 MR. TAHAMTANI: Thank you, Erin. Now
3 we have plenty of time for questions and answers.
4 Sam, do we have any questions?

5 MS. BURMAN: This is Diane Burman.
6 Before we get to the questions I just wanted to
7 know if I could kind of respond to a couple of
8 things.

9 MR. TAHAMTANI: I'm going to ask you,
10 Diane, perfect opportunity to go ahead and
11 respond to, I'm assuming some of the points that
12 Erin shared.

13 MS. BURMAN: Yes. Well, first of all,
14 I think it was great. And I appreciated some of
15 the analysis in looking at that.

16 I think the bottom line, first in
17 terms of, and Brian talked a little bit when he
18 was talking about FERC, about the rate
19 proceedings and how they typically result in the
20 fuel tracker with the true-up mechanism. And I
21 do think that Brian raised a good point about
22 what's positive and negative of that.

1 And while trackers do provide
2 incentives to improve fuel efficiency and reduce
3 loss not accounted for gas and modernized
4 compressors, pipelines, understandably, have
5 concerns due to the risk of unrecoverable costs.
6 So that's something that kind of gets looked at
7 with settlement negotiations and trying to figure
8 out how to do that.

9 So, it may be something, from my
10 perspective, when we look to FERC, that FERC can
11 be helpful in methane, in advancing methane
12 reduction from jurisdictional pipelines in
13 approving and incentivizing replacement of
14 facilities that are known methane emitters. And
15 also helping to streamline the approval process.

16 But also, across the board, I think
17 the federal regulators and the state regulators
18 can really be helpful in looking at ways that our
19 policies may actually be not incentivizing enough
20 to make it workable and figure out some solutions
21 that will help with that.

22 And, Erin, I think you raised some

1 good points. Obviously it was a lot that it is
2 in potential filings or current filings at the
3 commission, that I can't speak directly to.

4 I do want to point out that however I
5 may decide on a matter that comes before the
6 commission it's based on what's in the record
7 itself and not from discussions that might happen
8 in this setting.

9 But I did think that what was
10 important is to kind of look at a little bit,
11 especially as the loss and unaccounted for gas
12 issue, is something that really needs to be
13 thoughtfully looked at. And again, a reminder
14 about not inappropriately prioritizing emission
15 concerns over safety concerns when it comes to
16 leaks.

17 But just in terms of the loss and
18 unaccounted for gas, I think it can be difficult
19 to compare one state and how they categorize it
20 in another state. So the reference to California
21 is helpful, but loss unaccounted for gas is
22 primarily an accounting concept for gas

1 distribution. And state and federal agencies
2 have varying definitions for it.

3 And in general, as kind of how I see
4 it, is that it may not always be something that
5 is the best way for us to rely on to accurately
6 measures reductions in methane emitted into the
7 atmosphere. So at times it can be an imperfect
8 metric for the effectiveness of infrastructure
9 replacement programs.

10 And so, I do think it does, it is, it
11 does require us spending a little time on what's
12 appropriate and what is the best incentives to
13 help fix all leaks, but also whether you're
14 fixing a leak because it's from the safety
15 perspective, you're fixing the leak to address
16 the methane, emission perspective is really
17 important for us to look at.

18 But I really, really appreciate that
19 Erin laid out the different issues. And also
20 possible solutions. So I wanted to give her
21 credit for that. So thank you very much.

22 MR. TAHAMTANI: Thank you,

1 Commissioner Burman. Sam, I understand we have
2 questions. Please go ahead.

3 MR. HALL: We do have some questions
4 in the Q&A chat box. Before I get to those, I
5 just want to remind anyone who's on the telephone
6 called dialed into the toll free telephone line,
7 if you wish to make a comment, Dial 1 and then 0
8 on your phone, then you'll be entered in the
9 queue.

10 While you do that, we have a question
11 from Aalap Shah, A-A-L-A-P, S-H-A-H. And I
12 believe this is directed to Erin.

13 Does this incentive apply to temporary
14 leak repairs?

15 And I don't have any more specificity
16 so perhaps you can understand what is meant
17 there. If not we can move on.

18 MS. MURPHY: Sure, I can take a stab
19 at that. I imagine that's a reference to some of
20 the leak incentives that I was talking about in
21 the first couple of slides.

22 And I want to start by sort of

1 characterizing this as something that I came to
2 while working on a case and really trying to
3 think through what is the best way to structure
4 some of these incentives.

5 And I ended up envisioning sometimes
6 utility leak backlogs as a jar of marbles, right?
7 And the jar of marbles are constantly marbles
8 being put into the jar and constantly marbles
9 being taken out of the jar because any utility is
10 constantly identifying new leaks on the system
11 and then always in the process of going out and
12 repairing those leaks. So there's kind of this
13 balance in place, right?

14 And I imagine the question might be
15 referring to a way that leaks that are
16 categorized by a utility if some of them as
17 categorized as temporary. And I can't speak to
18 the specifics of how that categorization might
19 work or might come into play, but I think the
20 principle that we're trying to recommend is that
21 because we want utilities to be incentivized to
22 put, adopt into their operation technologies that

1 find as many of the leaks on their system as
2 possible, including leaks that might not have
3 been identified previously using traditional
4 survey methods, we don't want to see utilities be
5 penalized for going out and finding those leaks,
6 right.

7 And in turn, we want to make sure that
8 utilities are able to have the resources they
9 need on hand to remediate leaks in a timely
10 fashion. So I think there is a balancing there
11 and different ways of thinking about how we can
12 really maximize utilities attention to this
13 issue.

14 MS. BURMAN: And just, this is Diane
15 Burman, just to clarify also. For in New York
16 it's only for permanent repairs, and repairs must
17 be verified after, I think, 14 to 30 days to
18 qualify.

19 MS. MURPHY: Thanks, Diane. Probably
20 a more succinct response than what I provided.

21 MS. BURMAN: And the other thing I
22 just, I think is important also, for us, I do

1 believe we're all on the same page, that we need
2 to figure out ways to incentivize the elimination
3 of leaks, especially if there is not necessarily
4 a regulatory requirement to repair them so how do
5 we do that.

6 And I do point out though, I don't
7 necessarily know that I have a cause and effect
8 data to prove it, but all of our LDCs with the
9 lowest leak backlogs also have very low loss and
10 unaccounted for gas. So, for me, that's
11 important information.

12 MR. HALL: Very good. We have a
13 question directed to Commissioner Burman from
14 Rebecca Craven.

15 Rebecca says, I thought I heard you
16 refer a couple of times to declining levels of
17 Co2. I'm not sure of the context for that but
18 I'd appreciate it if you could clarify that
19 portion of your remarks.

20 MS. BURMAN: So I guess for me it was
21 making an observation that yesterday I heard a
22 number of times that methane emissions had

1 increased suddenly and notably, noticeably since
2 the 1990s. And I do believe that it's important
3 for us to look because I do believe that it's
4 true that the Co2 levels have dropped
5 substantially during that same time period.

6 And so, we should be looking at that
7 and making sure that we're carefully evaluating
8 what we're doing, but also in the context of not
9 just state-by-state and U.S. emissions of Co2 and
10 methane, but we should be comparing it to other
11 industrial countries. Such as China and India.

12 And I do think that for me, even
13 looking at what we've done going from coal to gas
14 conversions, as well as fuel oil to gas and how
15 that has been helpful, I think is really
16 important. Understanding also that looking at
17 the whole energy production has to include also
18 the focus on the role that gas has played
19 increasingly in the energy sector.

20 MR. HALL: Very good, thank you. Rick
21 Weber asks a question directed to Erin.

22 Which examples from states

1 incentivizing leak detection should be included
2 in the PHMSA rule?

3 MS. MURPHY: So, I'm not sure if have
4 a direct answer to that at this time. I think my
5 presentation is teaching to catalogue some of the
6 positive and negative incentives that we have
7 seen with the hopes that that can help inform the
8 way the PHMSA rule is structured.

9 MR. HALL: Thank you. Ryan Miller
10 says, where we can find more information on the
11 methodology for the leak gas calculation in the
12 Washington State law?

13 MS. MURPHY: Sure. So, I imagine that
14 there is going to be methodology developed by the
15 Commission, by the utilities commission, as it
16 implements that state law. And I am not aware if
17 that has been published yet, but I'm certainly
18 happy to try to track that down.

19 So, I'm sorry, I don't know who you
20 are, but if you saw my email in the presentation,
21 or when that presentation is posted, please feel
22 free to reach out.

1 MR. HALL: And then due to the way this
2 question and answer system is working, we have a
3 follow up question for Commissioner Burman from
4 Rebecca Craven regarding her initial question.

5 Rebecca says, so you mean Co2
6 emissions, not levels? Commissioner Burman, you
7 might be muted.

8 MS. BURMAN: Yes. No, okay, I think
9 Co2 emission levels have dropped substantially so
10 for me, I think I answered the question.

11 MR. HALL: Okay, thank you. Operator,
12 do we have anyone in queue?

13 THE OPERATOR: We have no questions on
14 the phone at this time.

15 MR. HALL: And, Massoud, there are no
16 additional questions in the Q&A box.

17 MR. TAHAMTANI: I have a couple of
18 questions. We talked about loss and unaccounted
19 for gas. And this goes to Commissioner Burman and
20 Brian.

21 Are caps on loss and unaccounted gas
22 appropriate means to incentivized methane

1 emission control?

2 MR. WHITE: This is Brian. From a
3 FERC perspective, I mean, we don't have any type
4 of cap. And it's in our regs that we issue it.

5 I think what we do is, really we look
6 at things on a case-by-case basis. The
7 commission, loss and unaccounted for does tend to
8 be a fairly small piece of the fuel pie, but we
9 do look at it in each fuel cycle.

10 And there have been times with, I know
11 the Columbia system, a couple of the midcontinent
12 systems, that we've seen the numbers go way up
13 and we have instituted proceedings to address
14 those. But there is not like a standard we have
15 that we look each time, we kind of just look at
16 what goes on, how things have changed
17 year-to-year and kind of react that way.

18 MS. BURMAN: So, thank you. So this
19 is Diane Burman. So for me, loss and unaccounted
20 for gas, it's really an method of screening which
21 takes the highest priority for replacement.

22 As I understand it nationally, this

1 data is reported to both PHMSA and Energy
2 Information Administration. And that is used to,
3 overall, evaluate the overall efficiency and
4 infrastructure investment needs of the gas
5 distribution system.

6 And obviously there is several
7 components that comprise the loss and unaccounted
8 for gas metrics, including, but not limited to,
9 things like the billing cycle adjustment, meter
10 error, meter tampering, theft. And then to a
11 lesser extent, the methane releases associated
12 with construction and pipe replacement, venting
13 and purging.

14 That's way for me it's a useful
15 metric, but at the same time we also need to
16 recognize that it's not necessarily can be always
17 relied upon to accurately measure the reduction
18 in methane admitted into the atmosphere. And so
19 it can be an imperfect metric when we get to the
20 effectiveness and infrastructure replacement
21 program.

22 In New York, LDCs do report loss and

1 unaccounted for gas to us on an annual basis.
2 They each have a default amount based upon
3 historical information.

4 And the fault amount allows them to,
5 in which they're able to collect for repairs. If
6 they go over that amount, they cannot collect the
7 amount for repairs.

8 To the extent that that cap is a
9 challenge and is problematic from incentivizing
10 the overall goal that we want, it's something
11 that I think folks have weighed in on.
12 Obviously we heard from Erin, some of her
13 thoughts on what we can do in this area. So I
14 hope that's helpful.

15 MR. TAHAMTANI: Thank you very much.
16 Sam, I'm checking back again to see if there are
17 any questions from the public.

18 MS. MURPHY: Massoud?

19 MR. HALL: We do have any additional
20 question. Go ahead.

21 MS. MURPHY: This is Erin. I just
22 wanted to add on very briefly to that discussion

1 of loss. To make one clarifying point.

2 Which is that, we're not suggesting
3 that loss should be a metric that's used to try
4 to estimate methane emissions on the gas system,
5 in fact, that's part of why EDF advocates for the
6 use of advance leak detection as a better way to
7 really track and understand leakage from the
8 system. So I almost view it the opposite.

9 It's not that we view loss as a tool
10 to really drive or change the way utilities are
11 handling leaks in this state, but almost the
12 opposite. Like, let's just make sure that the
13 way loss is considered and recovered, and cost
14 right now isn't a barrier or a disincentive to
15 taking the actions that's needed to reduce
16 methane emissions on the system. Thanks.

17 MR. TAHAMTANI: Thank you.

18 MS. BURMAN: That is a good point. I
19 think what's important is also looking at, is
20 what we're doing from a policy perspective
21 actually helping to properly incentivize and are
22 we having an effect that we can, from an

1 accountability perspective, really look at and
2 quantify.

3 MR. TAHAMTANI: Thank you. Back to
4 you, Sam.

5 MR. HALL: Dustin Trent asks, Erin,
6 you mentioned the incentives are generally for
7 distribution systems, will there be a separate
8 incentive rollout for transmission systems or
9 will the same incentives apply?

10 MS. MURPHY: Yes, so, I guess I'll
11 just say briefly, the incentive I was describing
12 are programs that exist in various states across
13 the country. And I think there is going to need
14 to be more careful thinking and consideration
15 about whether any of these types of incentives
16 could translate to something that would be
17 helpful on the federal level from PHMSA, and if
18 so, what would they look like, right?

19 So that's not a question I have an
20 answer to right now. And I think you have raised
21 another important question which is, how should
22 incentives differ and what's sort of the best

1 structure for the different elements of the
2 system here, including transmission and
3 gathering.

4 And I don't think I have an answer for
5 that at this time, but agree that it's something
6 that's going to be really important to consider
7 moving forward.

8 MR. HALL: Very good. We have an
9 additional question from Kindal Keen.

10 Have there been any studies that have
11 looked at loss compared to the number of leaks
12 found from one year to the next?

13 MS. MURPHY: This is Erin. I am not
14 sure actually if that has been done or not. We
15 can look into it.

16 MR. HALL: Okay.

17 MS. BURMAN: And can they repeat the
18 question?

19 MR. HALL: Yes, certainly. Have there
20 been any studies that have looked at loss
21 compared to the number of leaks found from one
22 year to the next?

1 MR. TAHAMTANI: Any other questions?

2 MR. HALL: There are no additional
3 questions in the Q&A box. Operator, are there
4 any commenters in the queue?

5 THE OPERATOR: No questions from the
6 phone.

7 MR. TAHAMTANI: I'll go ahead and ask
8 another question. Thank you, Sam.

9 For the Panel, how can PHMSA take
10 commissions, or FERC, encourage operators to
11 adopt advance leak protection technologies?

12 MS. BURMAN: So, this is Diane Burman.
13 So I would just say it's really important that
14 you be supportive and have an open mind, that we
15 all kind of work together to evaluate and help to
16 adopt newer technologies in a prudent way.

17 Again, I did say that I think it's
18 imperative for our safety staff to be involved,
19 but I think it's still comparative for us to
20 really be focused on moving the value in this
21 space because if we do, we are actually helping
22 reduce greenhouse gas emissions, we're helping to

1 make things safer. And I think it's important
2 for us to make sure that our policies are aligned
3 in the way that it's helpful to do that.

4 I have the question repeated before on
5 the study. I'm not aware of any studies
6 specifically, but I am aware that our companies
7 at least, with low leaks, have low loss and
8 unaccounted for gas.

9 And so for me, it's something that I
10 think how we are looking at all these things is
11 very helpful and important.

12 As to PHMSA directly on loss and
13 unaccounted for gas, I think one thing would be
14 defining exactly what it is. As I look at the
15 definition in the annual report, it's not
16 necessarily so clear. And as I said, each
17 different state and federal folks look at it
18 differently.

19 MR. TAHAMTANI: Any comments from
20 Brian or Erin?

21 MR. WHITE: Yes. That's, see, that's
22 a tough one. I mean, we tend, from a FERC

1 perspective, we tend to be more of an economic
2 regulatory agency.

3 I am struggling with, like what the
4 regulatory vehicle we would have to do that. I
5 guess I, certainly that's something that the
6 pipeline customers could agree to in their
7 discussions if they were going down the
8 modernization topic statement route.

9 Other than that I'm not, I'm just not
10 sure how it would come up in a FERC proceeding to
11 be perfectly honest with you.

12 MR. TAHAMTANI: Thank you, Brian.
13 Erin, anything?

14 MS. MURPHY: Sure. So, I think so
15 maybe just a highest level observation I would
16 have that almost goes without saying, in terms of
17 how PHMSA, as an agency, can encourage an option
18 of these technologies is that, of course, we're
19 so excited by the great mandate out of the PIPES
20 Act of 2020 and pleased that PHMSA is moving
21 forward with a rulemaking accordingly to set
22 these advance leak detection standards.

1 And so, we're happy to be part of this
2 conversation and make sure that the agency has
3 all the information it needs to set those
4 standards appropriately.

5 I think I probably shared our best
6 examples of positive incentives that we've seen
7 out of state commissions. I wanted to mention
8 one other thing because I imagine anyone
9 listening to this meeting from a utility is
10 thinking about the fact that all of this costs
11 money, and we recognize that as well.

12 And when EDF is engaged in utility
13 proceedings on the state level and is recommended
14 an option of these technologies and
15 implementation of new programs, we recognize that
16 that is something that the utility needs dollars
17 in order to undertake. And so we always try to
18 ensure that there are resources accompanying any
19 mandate to pursue a program. And so, we'll
20 continue to recognize that.

21 MS. BURMAN: This is Diane Burman. I
22 also think it's really important that PHMSA,

1 state commissions and FERC also support the need
2 for resources as well. Especially in the area
3 when we're talking about the impact on the
4 opportunities for jobs in the clean energy space.

5 This area is one that really needs a
6 lot of qualified technical staff, not just at the
7 commission and the agencies, but also an ability
8 for in industry as well. And so, being
9 supportive of that is really important.

10 MR. TAHAMTANI: Thank you. Sam, any
11 questions from our public audience?

12 MR. HALL: Operator, are there any
13 questions in queue?

14 THE OPERATOR: No questions in queue
15 at this time.

16 MR. HALL: No further questions,
17 Massoud.

18 MR. TAHAMTANI: Thank you. I got a
19 couple more questions.

20 Obviously a lot has been done to
21 reduce legacy pipelines, like cast iron, bare
22 steel and legacy plastics. But we still have

1 about, I think, 20,000 miles of cast iron in the
2 country. I'm not sure how many miles of steel we
3 have. And then don't have the number for the
4 legacy plastics.

5 What else can we do, the commission,
6 PHMSA, others, do to continue to reduce the
7 legacy pipelines that often are responsible for
8 most of these leaks, I think? Commissioner
9 Burman.

10 MS. BURMAN: I think we need to
11 continue to encourage what we are doing in New
12 York. Again, like I said, in 2014, 2015, the
13 commission did open up and focus on aggressive
14 leak prone pipe replacement program. And we
15 expected companies to replace all the prone pipe
16 within 20 years.

17 The issue really is, is that there is
18 a lot of pressure not to continue that
19 aggressiveness. And it's something that we really
20 need to be focused on.

21 And for me, we have performance
22 metrics for the leak prone pipe replacement, we

1 have emergency response time, damage prevention.
2 We go through all these different things. And
3 we're trying to create incentives for other gas
4 pipeline safety measures, such as improvements to
5 damage prevention or installation of residential
6 gas detectors.

7 I'm really hopeful that we can all
8 focus on the need to continue in a reasonable
9 way, pushing important safety mechanisms in this
10 area.

11 MR. TAHAMTANI: Thank you so much.
12 You touched on my second question, on damage
13 prevention and residential gas protection. Erin,
14 any comments on any of that?

15 MS. MURPHY: Yes. I'll just build on
16 what Commissioner Burman was describing and say
17 that we certainly agree that leak prone pipe
18 replacement is a big part of this conversation
19 and an important tool in the tool box to continue
20 to address these really elderly, leaky segments
21 of pipe.

22 I think our approach in terms of

1 thinking about what is the best fit for any given
2 pipe segment is to think about the options on the
3 table, which are leak repair, leak prone pipe
4 replacement, as well as retirement.

5 And I want to just briefly touch on
6 that retirement option because it's something
7 we're seeing, particularly in states that have
8 more ambitious climate goals and climate
9 legislation that's starting to be implemented.

10 And I'll give an example from New York
11 because I've been doing a lot of work there
12 recently and watching things unfold. So there
13 are two gas utilities in New York that recently
14 issued, not issued, but recently made small pilot
15 type proposals to try to identify leak prone type
16 segments that are nonessential sections of the
17 distribution system that could be primed for
18 retirement. And so, that's another sort of
19 element to be considered here.

20 Obviously that's something that needs
21 to be approached really carefully and
22 strategically to ensure that there is another

1 energy solution online for those customers.

2 MR. TAHAMTANI: Thank you, Erin. And,
3 Brian, you're welcome to comment.

4 MR. WHITE: Yes. I guess that's
5 really what our modernization policy statement
6 was designed to do, to let the pipelines come in,
7 work with their customers and come up with a plan
8 to replace their systems.

9 I think the two that are, that have
10 been in place, Columbia National Fuel, our old
11 systems. So that it seemed to have worked well
12 there.

13 But I think we realized that at the
14 same time we have seen other proposals fail just
15 because in a rate case there is a lot of
16 competing, competing issues. So, we continue to
17 hope that that vehicle is available and that the
18 pipelines and their customers will take advantage
19 of it.

20 MR. TAHAMTANI: Thank you, Brian.
21 Sam, one last chance for any questions?

22 MR. HALL: Yeah. We do in fact have

1 three additional questions. From Corinne Byrnes,
2 this may be more of a comment.

3 Can you look again at approving cast
4 iron lining as a reconstruction process that
5 would be capitalized?

6 This would greatly help operators with
7 power cast iron that is in good shape but needs
8 sealing.

9 From Wallace B. McGaughey. I
10 apologize sir, if I'm mispronouncing your name.
11 Are residential methane detectors being
12 considered as a requirement and regulation?

13 MR. WHITE: I'll look into that. I
14 guess, I'll come to that saying, we're looking at
15 everything.

16 MR. HALL: Yeah. Good.

17 MS. BURMAN: And I just want to flag
18 --I just want to flag again, on the residential
19 methane detectors, especially AMI enabled ones,
20 the safety gained by installing a very affordable
21 device is immense.

22 I get that states have a long way to

1 go with this. But, in New York we are seeing
2 quantifiable successes where the company was
3 notified of gas leaks prior to the customer
4 detecting any gas odor.

5 This is for also inside and outside
6 leaks, you know, that were determined to be the
7 source. It was not just inside leaks that this
8 applied to.

9 But also, this really came about from
10 engagement in these issues. And after an event
11 in New York, and actually NTSB made some more
12 recommendations about the importance of
13 residential methane detectors.

14 Just as a point of reference, we have
15 instituted programs in both rates and enforcement
16 settlements that require residential methane
17 detectors to be provided in most of our largest
18 LDCs.

19 And for Con Ed, we have improved
20 installation of AMI enabled detectors on 100
21 percent of their services. And they're to be
22 completed in the next three years.

1 At least seven of our other largest
2 LDCs have residential methane detector programs
3 that require RMDs to be distributed to customers.
4 Most of those customers, we're focusing on low
5 income customers and heat customers.

6 For what it's worth, that's the
7 information that we have.

8 MR. HALL: Very good. We have a
9 follow up question from the same commenter. What
10 data is there to indicate the amount of methane
11 emission that can be attributed to residential
12 leaks?

13 MS. BURMAN: Can you repeat the
14 question?

15 MR. HALL: Sure. The question is,
16 what data is there available to indicate the
17 amount of methane emission that can be attributed
18 to residential leaks?

19 MS. MURPHY: So --

20 MS. BURMAN: So, I'm not sure I know
21 -- I'm sorry, Erin.

22 MS. MURPHY: Yeah. I'm not sure either.

1 And it sounds like the question's referring not
2 to the distribution system, but to the sort of
3 end use residential site and leaks from there.

4 And I don't have an answer to that.
5 I think a lot of the research that I shared in
6 the presentation yesterday does attribute and try
7 to, you know, quantify the methane emissions from
8 the distribution system, but not the residential
9 end site.

10 MR. HALL: Very good. Lindsey
11 Fitzgerald asks, are residential methane
12 detectors considered advanced leak detection
13 under the PHMSA PIPES rule?

14 I assume that might mean Act.
15 Massoud?

16 MR. TAHAMTANI: Can you repeat the
17 question, please?

18 MR. HALL: Sure. Are residential
19 methane detectors considered advanced leak
20 detection under the PHMSA PIPES rule?

21 MR. TAHAMTANI: I think we need to
22 look at that. I'm not sure.

1 MR. HALL: Okay. Very good. Operator,
2 are there any additional questions in queue?

3 OPERATOR: Yes, we do. Go to the line
4 of Randy Knepper. For the record, sir, please
5 spell your first and last name.

6 Your line is open now.

7 MR. KNEPPER: Yeah. My name is Randy
8 Knepper. It's R-A-N-D-Y K-N-E-P-P-E-R. And I'm
9 a State Regulator from New Hampshire. So,
10 interesting discussion and I appreciate the
11 panelists.

12 A couple of comments I want to make.
13 When we talk about type three or class three
14 leaks, the GPTC guidance talks about monitoring.

15 And so, I want to approach my feed to
16 at least found successful in New Hampshire has
17 been to define what monitoring is. And how often
18 you have to go back and look at a leak.

19 Because if you have a leak, it's only
20 going to do two things. It's only going to get
21 worse, or it's going to stay the same, but it's
22 not going to heal itself.

1 So, one way to incentivize or maybe
2 it's deincentivize, whatever you want to call it,
3 is to help the utilities or LDCs make that
4 economic decision a little bit.

5 And so, one of the things we've done,
6 is we've said you know, how many days you got to
7 go back to monitor that leak. And it's not just
8 the next inspection period.

9 So, we came up with different things
10 to do that. And it's been very successful in
11 reducing backlogs.

12 Second comment is, when you talk about
13 backlogs, be careful with your starting point.
14 Because I find that the data that the LDCs
15 sometimes have on their leaks, isn't -- they've
16 double counting, they -- they're not sure.

17 This one's three, this one's two.
18 I've been there a couple of times. This one
19 doesn't exist.

20 So, you have to kind of establish, you
21 know, what is a true count on number of leaks.
22 So, don't even just assume that the leak list is

1 correct to start with.

2 I'm a big believer in find it and fix
3 it. And I'm a big believer in what Commissioner
4 Burman said, is that pipeline safety specialists
5 have to be in front of their commissioners.

6 Especially in terms of rate cases. To
7 comment on things like this and the new
8 technologies and the approaches that the
9 utilities are taking.

10 That's it.

11 MS. BURMAN: This is Commissioner
12 Burman. I just want to thank Randy for speaking
13 openly.

14 Finding as many active methane leaks
15 as possible and repairing them in a timely
16 manner, not only improves safety, but it reduces
17 methane leaking into the atmosphere.

18 I really think for me, it's also about
19 a collaborative approach in a way that's working
20 with the federal regulators, the state
21 regulators, interested stakeholders, and
22 industry.

1 I really like the leaning into how we
2 can improve our policies on new technologies that
3 are appropriate and will work. So, I'm really
4 looking forward to engaging on those issues.

5 MR. TAHAMTANI: Thank you all. And
6 thank you --

7 (Simultaneous speaking.)

8 MR. HALL: Operator --

9 MR. TAHAMTANI: Sorry, go ahead, Sam.

10 MR. HALL: Well, I was going to ask
11 for an additional question from the Operator if
12 there's anyone else in queue.

13 OPERATOR: No additional questions in
14 queue.

15 MR. HALL: Thank you. And no
16 additional questions on the Q&A box. Go ahead
17 Massoud, excuse me.

18 MR. TAHAMTANI: Well, thank you very
19 much to our panelists here. Again, a great
20 discussion to all those in our two-day public
21 meeting.

22 With that Sam, if there are no

1 questions, and we've had our public comments. Or
2 would you like to see if there are public
3 commenters?

4 MR. HALL: We do have a public comment
5 portion of the agenda here. And we can
6 transition to that now.

7 MR. TAHAMTANI: Please, go ahead.

8 MR. HALL: Our public comment period
9 begins now. I want to thank our previous
10 panelists and those of you who provided comments
11 and questions.

12 This is -- this public comment period
13 will be moderated by me. I am Sam Hall. I am a
14 Program Manager in the Office of Pipeline Safety.

15 This is a bit different from a Q&A
16 session. We don't have the ability to answer
17 questions due to limitations on technology.

18 We can't have all of our speakers up
19 and available at the same time. So, this is your
20 opportunity to simply provide comment that you
21 wish to be considered as part of the record.

22 If you want to make a comment with

1 your voice, you must be dialed into the
2 conference line, which you can see in the top
3 left of your screen, and also on the slide.

4 If you're not dialed into the
5 conference phone number, you can type your
6 comment in the Q&A box on your screen. And we'll
7 attempt to read those comments.

8 Please keep your comments on the
9 telephone to two minutes or less. We want to
10 provide opportunity for all to comment within the
11 time allotted in the agenda.

12 And I'll be encouraging commenters to
13 wrap up their comments within two minutes.

14 Please keep your comments professional and within
15 the scope of this public meeting.

16 We do reserve the right to cut off and
17 mute commenters who refuse to yield the floor or
18 who cause a deliberate disruption to the
19 proceedings. Although we do not anticipate
20 having to do that.

21 If you do have a comment and you are
22 dialed into the telephone number, please dial one

1 and then zero to be entered into the queue.

2 The comment period is now open.

3 Operator, please go ahead if you have any
4 comments in queue.

5 OPERATOR: Yes. We go to the line of
6 Dirk Smith. Your line is open now.

7 MR. HALL: And Mr. Smith, if you would
8 please spell your name for the record?

9 MR. SMITH: Spelled D-I-R-K. The last
10 name is Smith.

11 MR. HALL: Thank you, sir.

12 MR. SMITH: Thank you for the
13 opportunity to comment. First, I would suggest
14 that PHMSA might review the current grade
15 classification system to account for the amount
16 of methane emitted over the life of the
17 classified leak.

18 Brooke Sinclair told of KUB's policy
19 to repair class one leaks within two hours. Such
20 a leak does emit a great deal of methane, but
21 only for a very short period of time.

22 We have experience with operators who

1 have pinhole leaks in plastic service lines. And
2 while GPTC recommends class three leak repair
3 within 15 months, I have read of some operators
4 who have a two-year repair window.

5 The class three leak unrepaired for 15
6 to 24 months over the life of the leak, might
7 leak as much as the two-hour class one leak.

8 So, with one and a half million miles
9 of PE fuel gas pipe and distribution service,
10 this could be a considerable source of emissions,
11 if the current repair time frames remain in
12 place.

13 Second, I'd like to note that while
14 much intention in this hearing has been given to
15 leak detection and repair, apart from damage
16 prevention, I hope PHMSA will dedicate an equal
17 amount of effort to leak prevention in its
18 rulemaking. Which it has done in the past.

19 In 2015, in order to reduce future
20 pinhole leaks in PE fuel gas pipe, PHMSA ruled
21 that no regrind resin be used in manufacturing PE
22 fuel gas pipe.

1 And it cited research reports of
2 static breakdowns of pipe. And believed that
3 improving resin quality would prevent pinhole
4 leaks.

5 Indeed, Gas Research Institute as well
6 as four forensic lab studies, have shown interior
7 pipe static as the cause of pinhole leaks in PE
8 fuel gas pipe.

9 Knowing that, operators which were
10 experiencing such pinhole leaks, installed
11 interior static suppression in their system. And
12 achieved a 90 percent reduction in pinhole leaks
13 in subsequent leak surveys.

14 Brooke Sinclair noted that KUB found
15 couplings were a common source of leaks in their
16 steel system.

17 I think by working to identify such
18 potential leaks prior to installation, leaks are
19 prevented. You're going to have repair costs
20 saved, and methane emissions reduced.

21 And this could be accomplished by
22 establishment of leak safety reporting system

1 modeled after NASA's Aviation Safety Reporting
2 System.

3 The ASRS system allows those involved
4 in the aviation system to anonymously report
5 safety incidents with immunity from prosecution
6 in those incidents.

7 The information received through this
8 program has widely been credited for improvements
9 that resulted in the fact that there have been no
10 fatal crashes in the United States of U.S.
11 flagged air transport carriers in the last ten
12 years.

13 So, I hope PHMSA will take those two
14 suggestions in account. Thank you.

15 MR. HALL: Thank you for your
16 comments, Mr. Smith. Any additional callers on
17 the line, Operator?

18 OPERATOR: Yes. One moment, please.
19 We'll go to the next line, is Mark Uncapher.
20 Your line is open now.

21 MR. UNCAPHER: U-N-C-A-P-H-E-R. And
22 I'm the Executive Director of the Fiber Optics

1 Sensing Association.

2 And I wanted to make the observation
3 that much of the discussion in the last two days
4 demonstrates how new and emerging technologies
5 can enhance pipeline safety, and also meet
6 environmental expectations.

7 I wanted to note that the Pipe Fact,
8 Section 105, directs PHMSA to conduct a study and
9 report back to Congress on the potential for
10 having its own pipeline research and test
11 facility.

12 Pipelines are, of course, the only
13 transportation mode without their own facility.
14 So, having a recognized federal pipeline research
15 safety and test facility, will help speed the
16 validation of promising technologies, and lead
17 too much more rapid adoption.

18 MR. HALL: Thank you for your comment,
19 sir. Any additional callers in queue?

20 OPERATOR: Yes. We'll go to the next
21 line. One moment, please.

22 And that next line is Damon Evans.

1 Your line is open now. Please go ahead.

2 MR. EVANS: Thank you. Good
3 afternoon. Thank you again, for the opportunity
4 to speak and provide some additional perspectives
5 on leak detection, and particularly leak
6 detection technology.

7 My name is Damon Evans with the
8 American Petroleum Institute. And I work with
9 our member companies on safety and cybernetics,
10 including leak detection.

11 After a day of robust discussion
12 around the use of this technology, there are a
13 couple of things that I wanted to highlight that
14 are critically important to pipeline operators in
15 managing leak detection.

16 The first is the importance of
17 continuing to allow operators the flexibility to
18 select and implement specific commercially
19 available leak detection and repair technology
20 and best practices -- and best practices that are
21 appropriate to the assets involved.

22 Pipeline operators take a programmatic

1 approach to leak detection, which at times can
2 include various types of tools to address leak
3 detection concerns.

4 And often, operators have found that
5 there is not one specific technology or approach
6 that is right for every pipeline system.

7 Specifically, many operators employ
8 computational pipeline monitoring system, CPM and
9 other similar technologies. But, that is only
10 one aspect in considering a layered programmatic
11 approach to leak detection management.

12 Other tools operators are utilizing in
13 concert, are such things as drones, satellite
14 imagery and visual inspection surveys.

15 For liquid pipelines, American
16 Petroleum Institute recommends recommended
17 practice 1175. It proves operators a framework
18 to develop and implement a comprehensive leak
19 detection management program that is similar to
20 the techniques used in gas pipeline leak
21 detection protocols.

22 Also, American Petroleum Institute

1 recommended practice 1130, on the computational
2 pipeline monitoring supports, are the current
3 regulatory requirements through incorporation by
4 reference, providing operators the latest in TPM
5 as they continue to look for ways to enhance
6 their current programs.

7 Additionally, it cannot be overstated
8 that the importance of research and the
9 development and testing of leak detection,
10 technology must continue in order to properly
11 address current and future concerns of methane
12 emission from pipeline systems.

13 And you have heard earlier today, leak
14 protection continues to be a strategic research
15 priority within the industry.

16 And a great deal of research is
17 ongoing to improve performance in the detection
18 of small leaks, highlighting the importance to
19 align research priorities between the industry
20 and the government.

21 Lastly, during the most recent
22 pipeline safety reauthorization, Congress

1 included a mandate authorization for PHMSA to
2 establish a technology pilot program to include
3 testing and evaluation of technologies, including
4 leak detection for gas and liquid pipeline.

5 Prior to inventory updates, PHMSA
6 requires data to demonstrate technology
7 capabilities or the technical validity of newly
8 developed risk models and safety management
9 practices.

10 The pilot program identified in the
11 2020 PIPES Act, can help in building that data
12 needed to modernize and seal gas in its
13 regulations.

14 As such, we would encourage PHMSA to
15 move quickly in establishing the technology pilot
16 program, to ensure operators have ample time to
17 participate and test new technologies.

18 Thank you for your time.

19 MR. HALL: Thank you for your comment.

20 OPERATOR: And Mr. Evans, if we can
21 get you to spell your first and last name for the
22 record?

1 MR. EVANS: Yes, sir. Damon Evans,
2 D-A-M-O-N, Evans, E-V-A-N-S.

3 OPERATOR: Thank you.

4 MR. HALL: Thank you. We have no
5 comments in the Q&A box. Go ahead Operator.

6 OPERATOR: Well go to the next line.
7 One moment, please. And please spell your first
8 and last name for the record.

9 And Erik Rodriguez, please go ahead.

10 MR. RODRIGUEZ: E-R-I-K
11 R-O-D-R-I-G-U-E-Z. Hello everyone. I'm with the
12 Gas Emissions R&D Group at SoCalGas.

13 I just wanted to mention a few key
14 points from our research lessons learned that I
15 think would be valuable for this audience.

16 For emission factor studies, we've
17 seen that national studies only provide a
18 national average. These are therefore, not
19 useful in emission reduction strategy.

20 Company specific emission factors have
21 the advantage of being able to track reduction
22 efforts.

1 Leak measurement is not easy. And it
2 requires standardized procedures and equipment.
3 Which are actively being developed, as we covered
4 during this meeting.

5 Sample size and sampling technique are
6 critical to obtain necessary procession and
7 confidence in leak rates.

8 Because leak measurement is so costly
9 and difficult at the moment, being able to
10 perform sample measurements and use statistics to
11 determine company leak rates and develop company
12 emission factors, is advantageous.

13 Second, emissions can be reduced
14 without knowing the true volume of the emissions
15 through largely prioritization strategies, leak
16 inventory reductions, and risk-based leak survey
17 strategies.

18 And lastly, cost effectiveness is key
19 to evaluating new technologies. We must always
20 keep in mind the incremental costs of adding
21 screening technologies, compared with just doing
22 additional leak survey, or the incremental cost

1 of installing and maintaining additional sensors
2 compared to inspecting facilities more
3 frequently.

4 That is all. Thank you.

5 MR. HALL: Thank you for your
6 comments. Go ahead Operator.

7 OPERATOR: And we have no further
8 comments in queue at this time.

9 MR. HALL: We also have no comments in
10 the Q&A box. I'll give folks a minute to make
11 their comments if you wish.

12 And again, we're standing by for any
13 additional comments from the public. If you have
14 a comment on the telephone line, you can dial one
15 and then zero to get into queue.

16 Or you can enter your comment in the
17 Q&A box. We'll give you 30 seconds to
18 participate if you wish.

19 Okay. One last check. Operator, no
20 additional comments?

21 OPERATOR: No additional comments at
22 this time.

1 MR. HALL: Thank you. Thank you all.
2 This concludes the public comment period. Thank
3 you very much for your comments.

4 We'll now transition to the close out
5 and wrap up for the day. Again, please welcome
6 Massoud Tahamtani, Deputy Associate Administrator
7 for Policy and Programs.

8 The floor is yours, Massoud.

9 Massoud, you may be muted.

10 MR. TAHAMTANI: Thank you, Sam. On
11 behalf of our Acting Administrator, and Associate
12 Administrator, and our entire staff involved with
13 organizing this public meeting, thank you all for
14 your attendance and participation in this public
15 meeting.

16 And a special thanks to all of the
17 panelists. And the last time I checked, we had
18 over 270 individuals still on the line. That's a
19 great indication of the interest in this matter.

20 As had been mentioned a couple of
21 times, public meetings like this are very
22 important to PHMSA, in order to have an open

1 exchange of ideas with all of our stakeholders,
2 and to establish a public record to assist us in
3 carrying out rulemaking and other mandates.

4 Over the last two days, we've covered
5 a lot of areas relative to leak detection, leak
6 repair, and methane emission reduction.

7 It was a lot of productive dialog in
8 each of the panel discussions. We had a lot of
9 great questions and great responses.

10 We heard a variety of perspectives
11 from public, federal and state government,
12 pipeline operators, and the technology sectors.
13 We truly appreciate all your comments and
14 feedback.

15 I do wish to reiterate our overall
16 goal of reducing methane emissions and improving
17 pipeline safety using a variety of approaches.

18 Our staff under John Gale's
19 leadership, who has done a lot of work already to
20 help PHMSA meet this mandate, will begin drafting
21 this proposed rule considering the comments and
22 feedback we have received during this public

1 meeting, and I'm sure will receive in this
2 docket.

3 So, with that, I will now turn the
4 meeting over to Sam to conclude what I believe a
5 very productive two-day public meeting.

6 Thank you, Sam. Back to you.

7 MR. HALL: Thank you, Massoud. This
8 does conclude our meeting for today. Thank you
9 again to all who participated, especially our
10 panelists and our commenters.

11 As a reminder, a recording and a
12 transcript of the meeting will be available on
13 the meeting website where you registered in
14 approximately ten business days.

15 This concludes the meeting. Thank you
16 again. Have a good and safe evening.

17 OPERATOR: Thank you. Ladies and
18 gentlemen, that does conclude your conference.
19 We do thank you for joining. You may now
20 disconnect. Have a good day.

21 (Whereupon, the above-entitled matter
22 went off the record at 3:51 p.m.)

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C E R T I F I C A T E

This is to certify that the foregoing transcript

In the matter of: Pipeline Leak Detection, Leak Repair
and Methane Emission Reduction

Before: USDOT/PHMSA

Date: 05-06-21

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