To help ensure that the 2025 plan is as impactful as possible.

Now for a safety moment, as you've had a moment to see this on your screen.

There are important reminders that we'd ask you to review and consider the measures that apply to your location.

I am currently in Sacramento, California, sitting in a home office And I'm happy to be reminded to move.

30 seconds every 30 minutes. I'd also call special attention to psychological safety As we want today's workshop to be a safe space for everyone to share new ideas.

Actively seek understanding and engage in respectful dialogue that are centered and solutions.

So in our three hours today, you can expect each topic area to include time for questions and comments.

We'll also leave time at the end of the workshop for any additional notes.

For questions, you will see the Q&A function at the bottom panel of your Zoom app or browser.

Please use that to participate in those sessions. And also feel free to submit questions at any time throughout the workshop.

This will help us maximize the time that we have to answer them.

You're also welcome Submit written comments after the workshop.

Just back at the previous slide, we have our email at innovationpg.com.

Where if you can submit those by Tuesday, April 29th, we'll do our best to respond.

And finally, we'll be providing a recording and other materials for download at PG&E.com slash innovation.

Super. So with that in mind. Our agenda today will feature voices from several members of the RD&D gas team.

After an introductory overview of RD&D's work. Will have a year in review and a look at its project selection process with the Q&A that I mentioned before taking a break. In the latter half, we'll dive into the 2025 proposed plan

And three major topic areas. Of gas system integrity, including integrity management and emissions.

And then finally, decarbonization. So this will bring us to the end of the day where we'll have a final chance to ask questions and share any final thoughts.

So now I'm delighted to introduce our featured presenters from PG&E's RD&D organization.

First, we'll hear from Senior Manager Jeanette Lindeman. Followed by gas engineers Aaron Resendez, David Zhu, Monique Montague.

And Stefan Ramos. With that. I'll hand it over to Jeanette for more on the gas RD&D organization.

Thank you, Kula. Good morning and thank you for joining us this morning. As Kula mentioned, my name is Jeanette Lindeman and I will be sharing some high-level information about the company and my team.

At PG&E, we recognize the tremendous opportunity innovation offers as we transform the energy system.

We have developed a tuner strategy or a 10-year plan to help us achieve a net zero energy system by 2040.

Which is five years ahead of California's goal, which will allow us to support our communities to achieve their net zero goals as well.

At PG&E, we have approximately 28,000 coworkers that live and work in the communities we serve, making a positive impact in our hometowns every day.

One impact we want to highlight is that in 2024, the procurement spend was approximately $4.1 billion in goods and services.

With diverse certified suppliers Creating prosperity across the service territory.

Looking at the gas organization. There are approximately 7,000 coworkers making an impact every day delivering on our goal of providing safe, reliable, clean, and affordable natural gas.

The gas system with nearly 50,000 miles of combined transmission and distribution pipelines serving nearly 4.6 million customers.

Will play a crucial role in the energy transition.

A consistent critical piece of the energy transition and our tuner strategy is greening the gas supply by moving away from fossil-based methane To cleaner fuels like renewable gas or RNG, clean renewable hydrogen.

And synthetic gas. We have made significant progress by achieving 38% emissions reductions And by the end of 2024, we had approximately 50 dairies supplying RNG across the service territory.

Placing us on track to have enough RNG to serve 15% of residential and commercial demand by 2030.

We recognize that although we've made progress. There's still much to achieve.

For those of you that joined us at last year's public workshop, we wanted to share how we've updated our program by closely collaborating with the CPUC and aligning with other California R&D programs.

We've changed our team's name from GAS Research and Development, or R&D, to guide research, development, and demonstration, or our D&D, to better reflect our activities.

And as Kula mentioned, I will provide an overview of the gas our D&D team, followed by specific initiative details provided by team members.

But wanted to highlight that our 2024 and 2025 plans are still under review by the CPUC And the information we will share with you today may change pending plan approval.

At the company, we realized that achieving a future state of animation neutral, more climate resilient energy system will require our D&D.

In 2013, the gas RD&D team was established to focus on breakthrough technologies and process improvement Increasing gas safety performance Customer satisfaction.

Cost effectiveness, reducing environmental impacts, and more efficiently attaining a regulatory compliance.

But we must note that enhancing safety is at the heart of everything we do.

With a core commitment that everyone and everything is always safe.

In 2023, the company established and communicated an R&D strategy report And in 2024, the strategy report was updated to begin exploring how artificial intelligence, or AI, can be incorporated to have a more efficient energy transition.

In 2023, aligning with the R&D strategy report. For those of you that attended last year's workshop may remember.

The team identified three categories of work, which were operations and maintenance aimed at maintaining and increasing safety and reliability of the system while reducing cost.

Reducing methane emissions focus on process and technologies that will reduce methane emissions if widely deployed.

And decarbonizing the gas system focus on developing and advancing technologies that if deployed widely would achieve system decarbonization.

In 2025, these categories of work have been incorporated into two research themes.

That aren't in alignment with other California R&D programs and are focused One on gas system integrity.

And two, decarbonization. As the team briefly shares their accomplishments and focus on future work, you will see these themes in more detail.

We invite you to provide feedback at innovation at pge.com. Please note that feedback must be received by April 29th to be considered as part of our 2025 plan that will be filed with the Commission by June 1st.

Again, thank you for joining us this morning. Back to you, Kula.

Thanks, Jeanette. Thank you for defining what True North means in action and how the team supports these efforts.

So we transitioned to our next section. We'd like to take a brief poll to understand who we have participating today. So the poll will appear on your screen.

Take a moment to select the profession that is most aligned with yours.

And we're looking forward to seeing the results.

All right, we'll give about 30 more seconds for those responses to roll in.

You've got about nine different options across academia. Cbos, community-based organizations.

Consulting general public government agencies, national labs.

Tribal nations, utilities

Let's see who's here.

All right. Thank you so much for voting. I'm seeing an excellent spread here.

Poll results are showing that we have about 43% representing a government agency We have 11% rather in second place, 25% represented by utilities.

11% representing consulting, and then we have a mix of national lab.

And academia and other. So thanks for your participation. We're really looking forward to hearing all of these perspectives in our discussions to come.

So next up

Is Aaron Resendez providing last year's 2024 in review, project selection process for the year to come.

Erin?

Thank you, Kula. And thank you, Jeanette, for getting us started this morning. And welcome, everyone. I really appreciate your participation today. So I'm Erin Resendez. I'm an engineer here in Gas RD&D.

And I'll briefly highlight some key areas of the 2024 program.

Now, you can find more information about what we're talking about today at www.pgne.com forward slash innovation. There you will find prior reports as well as the report that's being referenced today.

So during 2024, We had 100 next. We had 179 next Oh, one minute. Thank you. All right. So during 2024, we had 179 active projects across the two research themes that Jeanette highlighted a little bit earlier, of which 54 of those projects

Were completed. Taking a bit of a deeper dive, here's the breakdown by research theme and the amount invested during calendar year.

2024. And per guidance from the CPUC and to increase transparency, next.

Gas RD&D staff further tracked administrative costs among 12 spending categories. You can see the totals by category and you can see the total at the bottom.

So one of the primary drivers in our research portfolio is the ability to work with research community to support ours and the state's priorities by sharing the costs of the research.

The letters ratio is an indicator of this success. As you can see, for the research we supported during calendar year 2024, For every dollar that we spent.

We received approximately $22. In in-kind research funding.

By leveraging federal and state grants and working with research consortia such as GTI Energy, the Northeast Gas Association, the Pipeline Research Council International.

We ensure our customers are receiving the benefits of the research.

While prudently spending the funds provided to us by them.

And this chart gives you a breakdown of the leverage ratios for each of our research themes. You can see from the decarbonization leverage ratio There's a tremendous amount of interest and funding among utilities and correspondingly increased funding through state and federal grants. And we would expect this trend

To continue into the future.

In 2024, the projects supported by PG&E's Gas RD&D program have received commitments of over $70 million from state and federal public agencies. We thank those agencies for their continued research support.

Including the California Energy Commission. Pipeline hazardous Materials Safety Administration, the National Science Foundation.

And a number of organizations within the Department of Energy.

Another way we fund research is by participating in research consortiums. Consortiums are a major driver Again, for the leverage ratio.

Here you will see a snapshot of our annual consortia and membership dues.

As I mentioned earlier, our research consortia provide an equitable and affordable way for us to conduct our research By sharing the cost with other leading utilities.

But the research we conduct would not be possible without technology companies.

Academic institutions and national laboratories. This is just a small sampling of some of the organizations we have worked with during 2024. A more comprehensive list can be found in the annual report that's posted at PG&E.com forward slash innovation.

So I'm going to switch gears a bit. I'm going to talk about diversity, equity, inclusion.

And belonging, which is a key portion of PG&E's culture It drives how we engage our coworkers. It drives how we engage our community members. And equity is key to who we are and how we behave.

We evaluate every project. For its equity impacts. Our 2024 research portfolio included $275,000 in funded research located across 32 ESJ communities.

And here are just a few of the ways our research contributes to equity. My colleagues will get into more detail as they move through their respective portions of the portfolio.

Thanks, Erin. So Erin just highlighted the importance of environmental and social justice as it relates to research.

So we would like to hear your recommendations on how we can best support and engage with people and community-based organizations in these communities.

To facilitate that, we have another poll here on screen. And we'll give you about 90 seconds for your responses. This one is open-ended, so you'll have time to type in narrative sentences.

All right. Hopefully you've had a moment to enter some thoughts.

Around how the RD&D organization can best support and engage with people and community-based organizations.

Very eager to review each and every response to support the ongoing work And so I'll turn it back over to you, Erin.

Thank you so much, Paula. I appreciate it. And just so you know, in a moment, we're going to have a break. But first, I did want to share some information about our project selection process.

In 2024, PG&E released its second annual R&D strategy report.

It's 195 page document outlining our 67 highest priority challenges in building the next generation of California's energy infrastructure.

When first released in 2023, innovators from around the world heard our call.

And they joined us in tackling these challenges from over 600 proposals received by PG&E It was identified dozens of promising climate tech solutions to test.

Integrate and deploy at scale. Today's workshop is a continuation of that engagement, an opportunity for you to engage us in solving some of the most critical problems that we face moving forward.

Next. So of the 67 priorities.

Two themes were identified representing the 28 priorities within gas operations. My colleagues will share more about each of these research themes following our break.

And lastly, this represents the general flow of the project selection process. You will find a more detailed explanation within our 2024 annual report. And with that, I'm going to pass it back to Kula.

All right. Thank you, Erin, for the overview of the team's 2024 efforts and process.

We've come to our first Q&A section where if you haven't yet, please use the Q&A function again in your bottom panel.

And we'll make sure our teams can answer your questions accordingly.

So this would be related to

The overall gas RD&D organization how the priorities have evolved also As Erin mentioned, the ways that the dollars were leveraged from one to one. And then also the project selection process.

So looking for any questions or comments. On those three areas.

But we'll give it a bit more time.

Maybe I can start with you, Erin, just generally in referencing the project selection process in the report, what are the first steps that an interested organization should take.

In participating in the process.

Yeah, I think first and foremost, we've established, as Jeanette had talked about, a 10-year plan.

Our True North Strategy. And when you look through the R&D strategy report specifically, what you see is the problems aligned specifically to those particular TNS initiatives. So perhaps it's affordability.

And we're looking to reduce costs. One of the things that the R&D strategy discusses is the reality that we see less and less customers connected to the gas system as we move to decarbonize the state.

And make it more electrified, if you may. So how do we manage those costs in a very equitable way.

And there's other aspects to the R&D strategy. I just use that as one because I think most of us are familiar with affordability right now. Once we bring that idea in. They can submit that through the innovation inbox, innovation at pgne.com.

If they want to do it directly, we can work through a number of means and it depends on kind of the cost, the scale of the project, where it's at in its technology readiness level.

That we might work directly with them, meaning it might have a deployable technology. We need to demonstrate that technology, make sure that it meets our business needs. Perhaps it's a little earlier in its maturity. We may decide that it's best to work potentially with a

consortium of other utilities who might have kind of a similar need to find a solution, such as being presented. And we can work through that process.

And then lastly, sometimes it's around timing. When the urgency is high enough, we may look for means that perhaps are a little more nimble and quick. So working directly might be the fastest way to do that. But again, it's really going to depend on a number of factors.

That's great. Thanks, Erin. This one may be for Jeanette, since we do have some general members of the public attending.

Can you tell us what's in a name? What is the difference between R&D and RD&D? Why was it critical for the evolution of the naming of your organization

Sure. So I think I will say first and foremost, we're not your typical R&D organization where we're actually doing everything in-house. We're working with a lot of organizations, national labs, academia.

And one of the things that Erin just alluded to, right, is depending where in the technology readiness level.

Whatever we're looking at, whether it's a process or a You know, some sort of instrumentation sometimes we just, we're at a good place where we can just demonstrate it. We don't necessarily have to go in and do all the R&D that's ahead of it.

It really did reflect the fact that we do a lot of work just demonstrating to make sure that what we're hearing from either vendors or manufacturers that technology is going to work a certain way that it actually does and that it meets our goals oftentimes

California has very progressive or aggressive really safety rules that we have in the part of the United States. So there are certain things that may meet the requirements for other

utilities, but may not necessarily meet ours. And so we have to make sure that we're looking at all.

And sometimes we spend more time, I think, doing demonstration, making sure that not only Are we comfortable with the technology, but also the people that are going to be using it at the end of the day have an opportunity to try it out and make sure that it does

Allow them to, as we said before, right? Safety is at the heart of everything we do, that their safety is maintained and that we can do the work safely. And so that's part of the reason why we adjust it from just R&D to also including the demonstration piece.

Great. Thank you, Jeanette. We still have time for a couple of more questions if you'd like to add to those in.

The function at the bottom of your panel Zoom menu.

All right. I think we can.

Move along. Thank you, everyone, for your questions. And thank you, Erin and Jeanette for answering them.

So we do encourage your continued participation throughout the day. We'll take A five minute break. And when we come back, we'll be reviewing the RD&D plan for 2025, including presentations on those three major topical areas. It is now about 927. So we'll see you back at around 932.

Welcome back, everyone. We are now ready to proceed with the second half of our workshop where we'll start with the proposed plan for 2025 Before I turn it over to Erin, just a reminder.

That any questions that come to mind, feel free to drop them in the box.

We'll have time for Q&A. Throughout.

And before we break, our next break will be in about 30 minutes. We're really looking forward to hearing Any comments, any questions?

And with that, I'll turn it over to you, Aaron.

Thank you so much, Kabula. You can hear me? Good. Okay. Excellent.

All right. So we alluded to this a little bit earlier, and this was a collaborative effort with the Public Utilities Commission.

Where we transitioned from The themes that you see on the left, and Jeanette highlighted those a little bit earlier, O&M, reducing methane emissions, decarbonating the system. To the ones you see.

Over on the right-hand side. Where gas system integrity now encompasses both kind of the operations related work, the affordability work on our system, as well as the methane emissions. And then lastly, decarbonization, which Stefan will talk a little bit more about, which includes the impacts of hydrogen.

Integrating cleaner fuels, energy efficiency, and then lastly, networked geothermal.

So in 2025, we're planning our research based on approximately $8 million worth of spend. And the percentage breakdown is reflective of what our planned spend will be for each of these various categories. You'll notice that we have database added in there. We have a program evaluation that's going to be conducted by the Public Utilities Commission.

A little bit later this year. And then lastly, we break out in full transparency our administrative costs associated with overseeing and managing the portfolio research that we're talking about.

Today. And each of my colleagues will expand more on each one of their respective portfolio components.

But stakeholder engagement is critical to our success. It's one of the primary drivers for the workshop today is not only to share information about what we've done, but to seek input on various aspects of the research ecosystem that you feel

We should also be prioritizing going forward. But it ensures that our research aligns with California policy.

And we reached out to 10 organizations this year across the innovation ecosystem seeking input.

And here's a snapshot of some of that early feedback from these interactive interviews that we've had with them.

From the stakeholders that we reached out. Now, again, we're seeking input today and as you're opinion matters to us. We'd love to see any thoughts that you might have. I don't think that there is anything too wild that you could potentially propose that probably hasn't been thought of before

But you have the courage to actually speak it. So please share your input. You can put questions into the Q&A during my colleague sections in the website during the presentation, or you can submit them at innovation at PG&E.

Next. And so with that, I'm going to pass it back to cool it.

Thanks, Erin. Yeah, just a brief intro about our proposed plans across the first investment theme for gas systems integrity management.

The themes will be presented by gas engineers David Zhu. And Monique Montague.

Hey, David.

Hi, thanks Cola, for the introduction. I'm David. I'm one of the S&D engineer.

So I will focus on gas system integrity this is one of the two seams as you know So our care system is really an aging system. We face a lot of challenges from technical side Again, it's an aging system. There's a lot of environment change you can imagine

And also from business side during this energy transition period you know the gas market will expect to slightly going down.

So both sides will face a big challenge. Terms of a cost as well as safety and reliability.

Next slide, please. So in terms of uh so the solution to address this, I would say is innovation.

So to invest in innovation, our budget in this category is roughly about $5 million. It's about a little over 60%.

Of our total budget. So next slide, please.

So I will focus on three of the initiative while my other colleague will focus on the other three. So the first initiative I'm focus on is the geo hazardous risk management As you know, due to the climate and environment change, you will see more and more geohazard situation happen.

So which is not really addressed in the past. So that's particularly become a big journey to us.

So our solution to that is develop some innovative solutions to better handle this cost effectively.

The picture I'm showing here is Top one is really one of the projects I'm going to have more detailed explanation. It's regarding a pipeline subject to earthquake fall.

In Gale or California. The technology is involved in the five of sensor monitoring of the pipeline there.

Next slide, please. Okay.

Here, I would just want to emphasize what's the technical challenge at the industry.

For GeoHealth in the past, most effort is putting on monitoring GeoHealth itself, but the direct impact on the pipeline is lack of the good instrumentation to collect accurate test data in the field.

So what current practice really rely on the modeling, that's the geo hazardous impact on pipeline that's modeling has never been really fully calibrated with the field data.

So this is really the big challenge. Going forward, which ultimately, if you cannot get the really good calibrary modeling you can imagine it's normally involved in very unnecessary mitigation, which drive the cost could be very high.

So that's what we want to address this. Situation by develop more innovative cost effective in terms of non-intrusive or less intrusive technology to better address this geo hazards. Another thing I want to emphasize, geo hazard could happen anytime.

We want to have the technology that can quickly deploy to the field to get information or even install the instrumentation that can provide the on-site, on-demand or real-time monitoring.

Next slide, please. So when we decide the project, we consider several aspect following the CPUCI proceeding.

From its affordability and a rate payer's benefit and how we justify the fund.

So from this factor, we decided which project to. Next slide, please.

Yeah, also in terms of benefit, we want to make sure that the project generates enough benefit from a quantifiable way as well as non-quantifiable way.

For quantifiable benefit, basically cost saving how to estimate cost savings is what we need And of course, the project will lead to safety and reliability improvement.

From the non-quantifiable benefit, we will consider customer satisfaction and minimize any impact on the environment.

And also we have to engage a stakeholder. And to follow all the regulation.

Next slide, please. So the second initiative I want to emphasize is how we comply with the new regulation. As you know, because of the aging system, there are always more and more things going on and the regulation gets more and more stringent especially recent years the

Films at Megaloy require us to significantly expand our current inspection monitoring program.

Which definitely it will. Be a cost concern to us.

Next slide, please. So the challenge, as I mentioned to you to expand those kind of program with the existing plateis normally requires a lot of cost the issue so to address this issue concern the way is through innovation again. So how we can do that

Inspection monitoring cost effectively without sacrifice the Safe thing, reliability we should be able to reduce the cost to benefit our rate payer.

Especially in this energy transition. Period.

So when you... input to the new emerging field that will put another layer of the requirement.

So this is where we help not only the gas system integrity also will help the future energy transition to the imaging field.

Nest libraries. So again, we will consider several essays under the CPUC policy proceeding always address affordability, benefit.

And how to better justify the rate payer fund. Next slide, please.

So in terms of the benefit, we also followed several aspects from the saving, from the reliability safety As well as the environment impact.

Regulation justification to to justify to benefit analyze our a project to maximize our benefit.

Next slide, please. So the third initiative I want to focus on is the storage well. As many of you know, storageware plays a critical role in our gas system to handle the fraguated demand.

But the storage is very different from pipeline. Pipeline normally is pretty shallow.

Into the ground. But study you well cook You normally go down many, many feet to the ground.

To monitor the integrity, inspect the integrity of storage where it's very complicated and very costly.

So the current price is norm really involve shut off the put up where out of service and insert the inspection tool into the well.

That's ranked down to several thousand feet deep. So which has raised additional threat is the mechanical damage because of the intervention So this is actually a big challenge.

These days. Next slide, please. So as I mentioned, in recent years, there's more uh you already come out, especially after a big incident, as many of you guys know, at a big storage facility somewhere in California.

So this is more and more inspection and reward all these involved.

Which is a big cost burden to everybody. We try to address this by improvement some innovative monitoring solution to this.

Next slide, please. So again, we consider several aspects to determine the project in this space.

And I will want to say Fortunately, we will be able to partner with UC Berkeley and innovative company Southern California was be able to install some state-of-art fiber or sensor monitoring device in one of our storage facility.

With California Energy's sponsorship. Next slide, please. So in terms of benefits, I can say by implement those kind of real time or on-demand monitoring technology we don't have to do those intrusive inspection so frequently, at least. And because it has some

On demand or real-time capability we can we can get the pipeline condition anytime we want to monitor all the operation during operation What situation happened and even when there is a geohazard event happen, we have successfully demonstrated that sensitivity

To monitor the pipe condition on the seismic activity during several conference paper. So that has been very well uh approved and looking forward, we want to focus more towards next phase about how to implement the AI technology to further enhance the monitoring capability.

Next slide, please. So next, I will just show a case how we justifying establishment on the project and how we do the project and how the benefit expense will be.

So this is a situation we want to Field tests are non-intrusive inspection monitoring technology at a water crossing site.

I got a request from our line of business. We have a pipeline that has been exposed at the Sacramento river bottom in Northern California.

It is crossed, I would say you can say this is because of erosion so that's across the initiative on the geo headers, but also it's a compliance issue because California Land Commission asked the PGA to provide assessment Because when the pipe exports to rear bottom.

It doesn't raise a lot of safety concern. And it happened since it happened since eight to 10 years ago because the gradual erosion, the pipe get exposed. So the current plastic to do it is there's very difficult because this is considered into the category we call the difficulty inspect.

And also add to this river crossing. This is really a challenging one.

For inline inspection that's commonly used because this unpeakable pipeline which means normally when people do the pickable pipeline, which means pipeline is pretty straight, the geometry very simple, so you can pack a lot of sense into a module it can

Many, many miles under the gas forages. So that's the current practice with the pickle pattern.

When the pipe structure is very complicated, like many utility operator like us we are really have only close to 50% of pipeline applicable. So around 50% is non-peakable.

To handling those kind of things right now the best way to handle in live pipe is really using robotic technology.

So we do have a robotic technology to do But to incremental robotic technology, it will take time and the cost as well. And for geohazard situation, as I mentioned.

You want to monitor from time to time on demand whenever something happens, right?

So if you do those kind of inline inspection, it's not the way to monitoring.

It's the way to inspect once a while that's fine but Frequently monitoring is really changed.

So in this case, when I look at this problem. First of all, the step is how we care address affordability, right?

Into these change cases and how we do the project. We have different venues to do it, either do ourselves through industry consortium partner with other folks. For this particular case, because it's from our internal request and it's pretty urgent requirement.

And for this kind of field of work. The obvious straightforward approach is doing ourself.

Now, in terms of affordability, I have, as I mentioned, I have consulting through our network with other operators as well as many technology providers seem like there's not really any good solution.

So the only conclusion is you just try this innovative solution.

And fortunately, we have worked in this space because, as I mentioned, we have a high percentage of difficult inspect pipeline.

We have working on those kind of similar type of technology for a while.

That's our consider our long-term effort. So when I look into this problem based on our learning and of course we learned a lot of lessons in this field and we identified this seemed like a most promising approach.

To handle this particular case. So next slide. Yes. So this is not so last November, we start this first trial. So as you can see in the picture, that is a unit in the river. There's a little boat.

That's all the sensor was there. And the people in the boat, in the big boat is just to to put the the little boat in the river and program the starting ending point So there's a little bit both with all the sensor it will automatically running

Scanning the pipe following the signal. So this is the first, I always say this kind of technology is probably the first in North America to test this one.

So beyond this, really what we can do is only send some people diving there. But for this particular diver cannot staying there because of the very strong water stream.

And then just the best metric, we do provide best metric.

Service on this particular site a while every few years, but that's not sufficient.

So we're hopeful is through this technology we can get a more competing formation regarding to the erosion situation.

As well as the corrosion and the assessment. Plus the banding strand.

For this particular case. And beside this through the work, we also in parallel we will this year we're also planning to do another case study on this technology.

To do the corrosion inspection for pipeline that's subject to DC interference in Bay Area.

This is a pretty common situation. Many operator because dc interferes really make it a big change to the current external corrosion direct assessment.

Practice which normally the current way is not only not accurate but also lead to a lot of excavation, which is very costly.

I hope this by doing if this can really work very well, our estimate, again, the benefit is 10 times cost saving. So it's a huge benefit.

Because of this, we're also in partner with another certain operators through an industry consortium to do a test-based study so we can tested the different limitation for technology because a few tests they really only the a very limited dependent through the pipe condition. So doing test-based study, we can test the limitation by

You need different type of anomaly size to really test. So this is a good example. I explained here how we establish a project, how we do it in a different way.

And what's the benefit? Hopefully I can give you a clear picture of how we do the ID at the PGA.

So now I will turn back to Koda.

Thank you, David, for the details on The gas system integrity planning in progress. We've come to our next Q&A section. And as a reminder, we'll have a little bit under 10 minutes where this section, if you haven't had a chance, you can put your questions in the box.

And to get us started. This would be for... you david i'm curious, what are the biggest differences in how PG&E is looking at minimizing operations and maintenance costs?

In 2024 versus 2025. It seems like you'll always be top of mind. So just curious if any key lessons are being carried over.

So...

Yeah, the key lesson is that just, for example, the case study I mentioned here right so So the lesson, I would say is in term of planning, we should do better and for that particular case, when we're planning ultimately

It was pushed to the late of the year when the weather condition is not so good.

So we have to stop that And the other lesson we want to know, we want to uh communicate with the various stakeholders, even although it's our internal project, but we do have a lot of external connection with external connection with

The input there can help us better to execute the project more efficiently. That's what I'm saying.

But in terms of approach, again, we build our approach after many years of study not just the short term but long-term study to help us to quickly identify the new technology and try to pilot.

It's to realize our benefit as soon as possible.

Yeah.

Great, thank you. You mentioned stakeholder engagement And as a key part of aligning the benefits, what are you hearing from your current stakeholder communities on the non-quantifiable benefits. Are there any early standout recommendations?

So for the non-quantifiable, it's really for, let's say for the environmental impact, right? So I got a people's concern. Any technology you guys do have to minimize the excavation.

And have them minimize the damage to the pipe. Which can even during the, as I mentioned, the storage well right the current price that you need to put to the that we are out of service and have a lot of

Rig intervention that could cause a lot of damage. So that's how you can address this input AI. So people like to move towards if you guys, they said that you can provide something more non-intrusive way to do it without interfere with anything else, without any gas release. That's what people want to see.

Not just the cost saving, but how to address the safety and then reliability.

And also try to make the ID project more efficient, reduce the IND project risk.

Great. Thank you. Scanning for a few more questions.

All right. Well, this might go back to Erin or anyone on the team.

How can we say generally how can we generally In an overall sense, is PG&E measuring the real world impacts of its projects, not just in terms of technical success.

But trust. Rebuilding and community benefit.

Maybe I can answer this as well. So whenever I go to field, we always need to interact with the property owner, right?

So we really need to explain to them what's the benefit.

So they normally don't want to see a lot of things going on on their territory.

So once we be able to explain the way we are doing is less intrusive or even non-intrusive, they are always glad to cooperate with us.

Because this is obvious benefit. So we're not, we try to minimize any impact on their property.

By the non-intrusive way by minimizing any construction with the impact.

On their business. So that's what we tried to work who is the community.

Thank you, David. Absolutely.

Can I add to that, Gula? All right, so Several, I'm going to speak a bit later. But within PG&E, we do have our climate goals.

So we have our net zero goal. We have our emission reduction goal. And that's essentially our target. Something that we do within the company too is measure As Jeanette and Aaron mentioned earlier, how we're able to meet our 2025 goal, but we still have a long ways to go.

To go to reach net zero. Developing KPIs and developing metrics so we can track either monthly, quarterly, or annually.

How we're progressing towards those goals and those benefits associated with it. It gives us a way to To monitor and track.

Hey, are we close to the target? Can we do better? What areas do we need to do better in so That's just one way that we're measuring the benefits is comparing it against our goals.

You know, I'll add to that. This is Aaron Resendez again.

Thanks, Stefan.

So in our plan last year, PG&E, when it submitted it in in June of 2024.

One of the things that we actually included in there was a lot of details as well as KPIs.

For kind of a gas focused uniform framework for measuring success more broadly.

And this actually comes on the heels of SoCalGas doing similar, I want to say 2022 is when they submitted it. See, the electric side of the business, the Epic program that does electric R&D has a general framework for measuring success of its programs, right? It looks at everything from

Outages, duration of outages. It has calculators that it can refer to on a national level to calculate, you know, potential job opportunities, things like this. Right. And there's obviously the economics always.

We got to consider the economics. But in order to develop a framework that we can measure success, we got to have agreement.

From our industry partners. And so, you know, I would encourage industry partners to take a look at both SoCalGas as well as PG&E's suggested frameworks.

For measuring, I think that this has been over the longer arc of research and development within the utility space, an Achilles heel.

It's challenging to be able to calculate these. Oftentimes when you're at early stages.

It's hard to really quantify a lot of the benefits around a particular research project. So, you know, suffice it to say it it may have a certain thresholds on, say, the technology readiness level.

That you want to spend the effort and the time and the energy. Now that you've kind of determined that there's of feasibility to the future of this technology if you continue the R&D.

But those frameworks are articulated in our document last year, as well as, and I would reference SoCalGas. I want to say 2022.

It was the plan in your submission for that.

Thanks, Erin. And just as a quick follow up. Are the projects seeing an advancement in TRL, say from when they start to completion? David mentioned there might be some test beds.

As a part of the planned projects and in the case studies, are we seeing any advancement?

Given the participation with PG&E.

I would say yes. And the examples that you're going to hear and have already heard from David, right, the fiber optic being stalled on a pipeline started with fiber optic studies in the lab.

The fact that you're physically putting that now on an asset is in fact testimony to the technology readiness level going from its infancy, a one, a two, a three, up to something a little more mature, a seven and eight or a nine, where it's now out in the field.

In use. And you're going to hear more from Monique. You're going to hear more from Stefan around how technology readiness level is built into their portfolio and how they see that changing over time and pay particular attention to where you see

Actual activities in the field. These are the ones that usually started at an early level and are now at that demonstration.

We're now demonstrating it. Not just researching it.

Excellent. Thanks, Erin. Hence RD&D. Well.

I'm seeing no additional questions, so we can head into our next five minute break.

When we come back, we'll continue the review of the proposed 2025 plan for emissions and decarbonization, starting with gas engineer Monique Montague.

So let's take a five minute break and we'll see you back here at about 10.06. Thanks, everyone.

Hey, hopefully everyone has resettled themselves.

I'll hand it over to Monique Montague for continuing on about emissions. Monique.

Thanks, Paula. So good morning, everyone. As mentioned, my name is Monique. I'm one of the engineers on the gas R&D team here at PG&E.

And I am responsible for the methane emissions portfolio. And so today I'll be sharing with you a little bit about the later three system integrity initiatives. So first up, we have revised emissions calculations.

And so the projects in this initiative are really intended to collect necessary data to adjust the current emissions reporting framework And will also help to in turn drive down emissions.

Next slide, please. So although PG&E has made great progress in reducing emissions with respect to the natural gas leak abatement program.

There's still a lot of work left to be done. And as an example of some of the limitations that we're facing, figures for transmission metering and regulating station emissions are not based on actual recorded emissions, but instead on station level population based emission factors.

And while efficient, this approach doesn't always provide accurate emissions estimates and doesn't allow for operators to really demonstrate those emission reduction efforts that we have put in place.

So this initiative is really just working to address that by, again, collecting the necessary data to really try to adjust that current emissions reporting framework.

Next slide, please. So as David already mentioned, projects are decided based on affordability, ratepayer benefits, ratepayer fund justification, and CPUC.

Policies and proceedings such as Senate Bill 1371 the natural gas leak abatement program and the best practices that were established by the CPC.

To really reduce those emissions from natural gas facilities. And just to quickly highlight, I'd really like to call out a major accomplishment that was in part due to projects in the revised emissions calculation Initiative, and that is In 2023, we announced that PG&E actually surpassed our 2025 emissions reduction goal.

Two years ahead of schedule, which we are very, very proud of.

Next slide, please. So to quickly point out some of our rate payer benefits, we have affordability and equity, enhanced safety, improved reliability, better air quality, and of course, reduced GHG emissions.

And let's just hone on in reliability for a second. But if we take a closer look at a closer lens.

We can see that one of the benefits of collecting better emissions data is that we can promote reliability through optimized investment planning.

Next slide, please. Okay, so next up, we have efficient methane Sorry, efficient leak repair. And the purpose of this initiative is really to develop new and innovative technologies to reduce leak repair times while simultaneously enhancing coworker safety.

By preventing those repetitive motion injuries that often happen and also reducing methane emissions.

Next slide, please. So this has quickly become a really high priority for PG&E. And as the current meter set leak repair process is time consuming and it increases ergonomic exposure for our coworkers completing the repairs.

So if we can really work to develop those novel technologies that minimize repair times while ensuring a high quality still.

Without having to really break down the meter set, we can really reduce the emissions here and ensure coworker safety while completing repairs.

Next slide. So as mentioned before, projects are decided based on affordability, ratepayer benefits, ratepayer fund justification.

And CPUC policies and proceedings. And here, I just really like to emphasize that this initiative can promote affordability because By developing technologies that can repair meter set leaks without breaking down the meter set.

We can essentially streamline those repairs while simultaneously driving down those emissions.

Next slide. And this initiative can also really promote cost savings since the repair methods result in less lost gas, directly lowering costs.

It can also result in an extended infrastructure lifetime and a reduced frequency of expensive infrastructure overhauls.

Such as replacing meter sets in their entirety. And it improves reliability through timely leak repair and of course enhances safety as a likelihood of incidents that are related to methane leaks are drastically reduced.

Next slide. And so last up, we have advanced leak detection and the projects in this initiative aim to really investigate new and innovative leak detection technologies, such as advanced mobile leak detection and aerial leak detection platforms.

Including drones, helicopters. Fixed-wing aircrafts and even satellites.

Other technologies include continuous monitoring options for facilities such as underground storage and station assets.

Next slide. And so PG&E has always taken a very proactive approach to leak survey and the industry continues to evolve as new technologies to improve leak detection and quantification continue to really enter the market.

So advanced leak detection is one of the best ways to really enhance safety.

Reduce methane emissions and drive affordability for customers, which is why it's so important for operators to continue to invest in it.

And just a quick shout out to the nice search team for always driving the bus on a lot of these projects.

As well as the other California utilities, such as Southwest Gas and SoCalCas.

For continuous collaboration on this initiative always. Next slide, please.

And then similar to efficient leak repair, advanced leak detection can drive affordability by quickening the leak survey process. It also improves localization capabilities and it can reduce false positives.

Next slide, please. And advanced leak detection also has the ability to really enhance reliability through timely leak detection and repair. It can also enhance safety by providing those early indicators which can prevent incidents like loss of containment from occurring.

And it can reduce emissions by identifying larger emitters so they can be prioritized for repair.

Next slide, please. And so to wrap up my portion, I'll present a case study for our revised emissions calculations initiative.

That we did back in 2024. And the current emissions reporting framework for transmission metering and regulating stations uses a station level population-based emission factor, and this tends to really overestimate those emissions and not necessarily accurately represent them.

So in 2024, PG&E RD&D completed an internal pilot project in conjunction with QLM technology, where the QLM LiDAR-based camera was used to Continuously monitor emissions from 10 intermittent bleed stations for 24-hour periods of time. And the purpose of this was to really collect, again, the necessary data to support

The reporting framework adjustment from a station level population-based emission factor to a component level.

And a continuous monitoring technology was selected for this project. As continuous data is really necessary to accurately estimate emissions within station assets.

Since emissions here are often intermittent. And so if the reporting framework adjustment is accepted by the CPUC, it will really help California operators to demonstrate the abatement efforts that we've really been putting in place, all of these abatement efforts and strategies

To really mitigate emissions and With that, I'm going to go ahead and turn it back over to you, Kula.

Thanks, Monique. We have another poll.

As Monique shared about initiatives for revised calculations. Efficient leak repairs There we are. Efficient leak repairs, advanced leak detection With the following poll.

We'd like to know what types of benefits we should be seeking in the gas system integrity projects we support.

We'll give about 90 seconds for your responses. And please share as much.

I think there is a character limit, but we're looking forward to reading those responses.

In long form.

All right. Hopefully your responses are coming in.

I have about 10 more seconds for that. Full screen.

All right. Well, thanks again for your participation in that poll.

Hopefully this primed your consideration for additional questions or comments. In our next section with Q&A. If you haven't yet, please submit those in the box for our presenters review.

And I'll take a look to see what we have here.

All right. So our first question. For you, Monique, what cost-effective strategy would You like to see PG&E explore to repair methane leaks faster.

Hey, Kula. So I can talk about one that we've been working on a little bit.

But in one of the photos that you can see on the first slide for that section, we have a product called the Alpha tape.

And that's a silicone-based polymer that's actually used to repair meter set leaks up to 60 PSI.

Without breaking down the meter set. And so it is one of the pilot projects that we currently have going on right now in the R&D space.

Within our territory and it has been expanded from last year. We started a small mini pilot phase one and we've moved into a larger scale pilot of phase two. And so that is one of the technologies we are looking into. But again.

This is something that is a huge priority for us and we welcome Any suggestions that the general public has or even vendors that might be online We're constantly looking into this since it is a big issue for us.

Great. Thank you.

All right, let's take a look at You'd mentioned about how PG&E surpassed emission reduction goals ahead of schedule with the previous methodology in question.

Um as the goal is to transition to the new reporting framework What kinds of costs are you anticipating will be associated with the continuous monitoring at the component level?

Anything's stick out immediately for you that you could share?

Yeah, sure. So in terms of cost, we had our winter workshop for the SB 1371 group two months ago or so. And that's actually something that the CPUC along with the other utilities and ourselves have been discussing because When it comes to intermittent bleed station measurements, it becomes very expensive.

And we already have a lot of adequate data. So that's something that we're working on with the CPC to to determine whether or not we're going to be moving forward with excess measurements in that space or if we're going to continue to use the same approaches that we've used since they are somewhat cost effective, such as the QLM camera.

Thank you. All right, just checking our box here.

Any other questions from the audience?

About gas system integrity, whether that be emissions or on the management that David presented on.

We have a little bit more time to do and discuss that.

Well, Monique, how about commenting on a similar question as it relates to any early stakeholder engagement.

About the non-quantifiable benefits. Are there any standout recommendations? Coming your way.

Yeah, I think the team already touched on that pretty well in depth, but I do like what David said.

There are a lot of non-quantifiable benefits depending on the project. And I think the most important thing there is, like David said, we are often in the field Our team is very field heavy. So we're not only just desk engineers, but we're actually out there

With a lot of our customers. And like David said, oftentimes we do get a lot of questions from customers and I think One of our values is being trustworthy and as well as empathetic. And so at times.

When customers see you on their property you know Sometimes they might think you're there to shut off their gas. And so if you're just transparent with them and you can really share the reason why you're doing whatever it is that you're doing there, piloting the equipment, explain why you're doing it, explain those quantifiable and non-quantifiable benefits to them.

Then you actually wind up having a really good conversation that ends on a positive note. And a lot of times so I think that's the most important thing there.

Thanks for that. All right. Well, seeing no additional questions, let's continue learning about the proposed plans across investment Theme two, covering decarbonization.

This theme will be presented by gas engineer Stefan Ramos. Over to you, Stefan.

Awesome. Thank you, Gula. All right, so quick intro except for Ramos. I'm a gas engineer within the gas RD&D team, where my portfolio is focused on decarbonizing the gas system.

And so decarbonization is a broad topic from hydrogen to carbon capture to syngas.

To renewable natural gas. Geothermal energy efficiency, and even hybrid technologies.

And when it comes to decarb, a lot of my projects are external.

And with various research groups, so academia, national labs and research consortiums. We don't do the testing ourselves. We rely on others research to help us out.

And from Epic and the long-term gas proceedings, we understand that electrification is the near and long-term strategy For California. In regards to, I guess, our D&D, a majority of our decarb dollars are being targeted towards the hardtail electrify industrial sector.

And so carbs, GHD emission inventory has the industrial sector representing 23% of California's emissions.

And examples of this include petroleum refining, chemicals food and beverage manufacturing.

Wood, steel, and even asphalt production. And so some of the questions that we're trying to answer with our research is.

Can we integrate hydrogen? As part of our natural gas system.

Or at the end use to help decarbonize our industrial customers.

How does that affect our gas system if we do transport hydrogen? And can the customer's equipment even handle hydrogen?

Hydrogen is within our net zero plan for 2040. But we need to do research and development now.

To figure how it's all going to work out another renewable fuel, renewable natural gas. It's here. It's happening now.

And our business development and implementation team. Is actively interconnecting RNG sources onto our system.

The main projects we have in this space is mostly around gas quality testing to make sure we meet compliance requirements.

Just general high-level DCARB benefits, reduction in emissions, improvement in air quality.

Potential cost reduction if we can leverage our existing infrastructure to transport these cleaner fuels.

And transitioning our gas employees and even perhaps increasing the workforce as we introduce more clean alternatives onto the gas system.

Next slide, please. All right, shown on the slide is the proposed budget for 24 and 25.

For DCARB, we're proposing to spend around 2.2 to 2.3 million a year.

And the bulk of the funding is dedicated towards exploring the impact of hydrogen.

As we recognize its significant potential in reducing emissions. Particularly in the sectors that are challenging to electrify.

For this year's initiatives, we're also proposing to research within energy efficiency and network geothermal As this can help with affordability.

And we'll dive deeper into each of these during the next several slides.

In fact, of hydrogen So hydrogen is a clean alternative to fossil fuel natural gas.

Offering significant environmental benefits. Hydrogen can also be used to generate electricity.

Which can support our electrification efforts. Like I mentioned before, we're focused on the hard to electrify sector with hydrogen.

I've included several photos here. The top right is a visual of underground hydrogen storage where We have a CEC project. We're at Lawrence Berkeley National Lab is the lead.

And we have many partners within this space from Lawrence Livermore, Cindia, Shasta, UC Davis.

Arches and SoCal gas. We'll be evaluating our natural gas underground storage reservoirs for Feasibility of storing hydrogen. So for PG&E, we're looking at McDonald Island, one of our largest reservoirs within the Stockton region of our territory.

And the thought is to use excess electricity to generate hydrogen via electrolysis.

And to store that hydrogen, whether it's a blend or 100% within the underground natural gas reservoirs.

We can use it to help with peak shaving. Other projects we have in this space is with Missions Consortium's utilization technology development.

Or UTD focuses on the end use applications with hydrogen and shown in bottom middle photo is a boiler that is being evaluated for natural gas and hydrogen blending.

This one's actually a continuation of a CEC project. That evaluated an asphalt plant for hydrogen blends.

The bottom right photo is a project that we have with operations technology development or OTT.

To evaluate de-blending. And the reason for d blending is if the end use customer wants a higher percentage of hydrogen within their system.

Next slide, please. All right, so hydrogen's unique physical and chemical properties differ from natural gas.

Which may affect the integrity and safety of the existing infrastructure.

And so we need to study. Hydrogen utilization to understand its impact onto the gas system, the customer end use.

The equipment and appliances. And to adapt the existing infrastructure accordingly.

And as we start to integrate hydrogen, we're reducing emissions, we're benefiting communities.

Especially those within the disadvantaged communities with improved air quality. Next slide, please.

So earlier this morning, Aaron showed the leverage ratio for decarbonization. It was 38 compared to 9.

For the gas system integrity theme. And what a high leverage ratio means is that the projects are heavily funded by external sources compared to our contribution, which makes every dollar spent within the space much larger. And as it relates to the communities, we're looking to repurpose parts of our gas system

To transport these cleaner fuels to the customer. This will avoid costs to install electrical infrastructure.

Especially for the heart to electrify sector. And shown here are the rate payer benefits and CPC policies and proceedings.

Related to this initiative. Next slide, please.

Within this section, we're also thinking about how we can quantify the benefits.

Emission reduction, which is the volume of carbon emissions, the amount of energy storage and thinking about kind of the undergrad storage project that I mentioned a bit earlier on how much hydrogen or clean energy we can store within the reservoir.

And then you also have your non-quantifiable benefits and the promotion of hydrogen is more qualitative than it is quantitative.

Next slide, please. All right, jumping on to the next initiative. The main projects within integrating clean fuels is pretty much the gas quality testing, right? So the mercury action limits as well as the gas analyzer testing with mercury action limits, this is associated with a CPC directive.

And biomethane OIR. We also have There's an ongoing project that we have with GTI Energy and Southwest Research Institute.

Where they developed the lab scale system, inject mercury at different levels, and measure the mass loss of various components to see the effect that mercury would have on the system.

As we connect more RNG sources, we want to make sure we're within the gas quality limits to meet compliance. We also have a project with PRCI and OTD.

Where they're doing on-site siloxane measurement testing. I think that we have one installed over at SoCalGas right now that's actually capturing some measurements.

Some great progress there. Bottom right photo is a project that we have with C0.

Where they recently rebranded, actually changed their name to Graphic Energy.

And what their process is, is methane paralysis. Where you can convert renewable natural gas to hydrogen and to solid carbon in the form of graphite.

And we think this could be a great solution for hard to electrify industrial customers where we can leverage the same gas system to transport the renewable fuel.

Create on-site hydrogen that can be used in the industrial process.

And also get solid carbon that can be used for other products such as asphalt cement and chemicals as well.

Next slide, please. The challenge around integrating clean fuels is similar to the impact of hydrogen. We need to evaluate.

The impact of clean fuels to our existing system. In addition, one of the other things I didn't talk about earlier is We need to identify other opportunities for RNG sources to address Feedstock limitations. One of the pilot projects that we proposed

I recently got denied, which is around audio biomass. And with woody biomass, we're able to create renewable natural gas.

That can be served within the northern region where we do have a lot of vegetation waste. I believe our regulatory team is addressing some of those comments today.

But we welcome any feedback from the group here to see if we're If we should research this topic or we shouldn't. And I just want to get a feel for, okay, if If we wanted to support this, what information can we or data can we share so that we can push for our pilot to happen?

Next slide, please. All right, so from an affordability standpoint Descard, I mentioned earlier, has a high leverage ratio.

Similar to the impact of hydrogen, we're looking to repurpose parts of our gas system to transport cleaner fuels.

This will avoid costs with having to install additional electrical infrastructure.

Especially for the hard to electrify customers. And shown here are the rate payer benefits and the CPC policies and proceedings related to this initiative.

Next slide, please. Similar benefits to hydrogen, emission reduction and energy reliability.

The non-clientful benefits include operational efficiency and safety incidents as we don't have much data around this.

Next slide, please. So this is a new initiative for 2025.

Essentially all of my energy efficiency projects are within UTD, utilization technology development, and they have four main topics.

Residential and like commercial, industrial and large commercial transportation and food services.

We do recognize within a previous IOU decision that there are certain topics that we should have fun within the space. And so we did slow down funding within the residential commercial transportation and food services because We understand that electrification is California's primary solution to decarbonize these markets.

However, we're asking within this year if we should look to reengage in some of those projects.

And the reason for that is because We also recognize that affordability is an issue within California. One of the main takeaways I had when I attended a research conference Decarbonization doesn't mean full electrification. It could also mean reduction.

Of energy, right? So using more energy efficient burners or heat exchangers to reduce that amount of energy and the amount of emissions that impact air quality.

Next slide, please. So some of the challenges we face around energy efficiency is helping the customer implement these solutions.

We're also trying to figure out if we should include this in our plan or not. So welcome feedback on that. The benefits that we do see around energy efficiency is For example, using smart controls and on-site energy storage.

Without having to do extensive system upgrades as a potential. Cost or offer affordability opportunity. And as we transition to mostly electrification, we do need to address kind of the high energy usage.

With energy efficient equipment and processes. And hybrid solutions can be a great solution to that, where we can use electricity as the primary fuel.

But perhaps keep the gas side for reliability purposes. And just thinking about data centers, right? Because that's the new hot topic right now. They require a 99% reliable energy. So there could be a great mix of okay let's look to electrify most of it and perhaps use the reliable gas system to support that effort.

Next slide, please. And so affordability is top of mind for all of us.

Electrification is the near and long-term strategy for California. But we need to look at the transition.

And see how we can get there. Electrical upgrades are going to need some time.

But in the meantime, can we look at energy efficiency to help reduce those costs?

As we progress towards that target. Next slide, please.

Benefits we can highlight in this space. Energy savings, cost savings.

Operational savings and emission reductions The non-quantifiable benefits is the customer feedback and the stakeholder agreement, very similar to what we saw within the gas inter gas system integrity section.

Next slide, please. All right, my last initiative for 2025, network geothermal. And the reason why I have this on here is because of CEC's 25 to 26 plan focused on network geothermal.

Which is another method for us to help decarbonize the gas system.

I saw network geothermal for the first time at a conference last year.

Where an operator provided an update on their pilot project. And I recently learned that UC Berkeley is also looking to install geothermal on their campus.

And so we're not looking to be the primary applicant for the CEC RFP, a request for proposal.

But we are looking for partners where we can provide data such as load temperature data.

Or perhaps even identify sites where we can, instead of replacing the gas or installing a new gas main.

Can we turn this into a network geothermal project instead? And so we've already talked to a couple of groups, but would love to hear from the community here if On your thoughts on geothermal and if you're planning to apply for the RFP where we can perhaps

Have a partnership so that we can work together on bringing network geothermal into California.

Next slide, please. All right, so the overall challenge here is trying to meet our DCARB goals. Electrification is one path Can we supplement that with network geothermal?

As an additional option to to help decarbonize our customers.

Can we leverage our existing systems? That way it can make it more affordable so that we can distribute heat and cooling to our customers.

Next slide, please. From an affordability standpoint, I understand it's going to take a lot of capital investment to install a network geothermal system.

But once it is installed, the operational costs are going to be much less with increased efficiencies and having a network system where customers can share heating and cooling resources. Shown here, similar to the previous slide with the rate payer benefits as well as the associated policies and proceedings.

Next slide, please. Quantifiable benefits include cost savings, emission reductions, and system reliability.

The non-quantifiable benefits, very similar to the one I talked about with energy efficiency with customer satisfaction, stakeholder agreements, and regulatory justification.

Next slide, please. So highlighting one case study here from UTD focused on emerging distributed methane paralysis technologies.

I did mention methane paralysis before, which is breaking down methane into hydrogen and carbon at high temperatures.

The key advantages with methane paralysis is that it's a lower cost feedstock. So looking at methane instead of water and electricity.

In addition. Being able to handle the carbon capture a lot easier, right? So instead of having the emissions with methane paralysis, you're able to capture that carbon and use it for other processes. I think I mentioned asphalt cement and chemicals earlier.

With methane paralysis, we can also locate it at the customer NU side. So more focusing on kind of your hard to electrify customers.

With this project, we aim to classify emerging distributed methane paralysis solutions As good, better, or best fit for gas ratepayers and consumers to help decarbonize their operations.

And the research team within UTD has conducted primary research through direct outreach.

To leading technology developers. Creating a landscape survey of distributed methane paralysis technologies. And what this survey also included was a TEA, so a techno economic assessment.

Covering various applications from the conversion process the hydrogen end use and the carbon handling.

And the overall goal for this project is to help customers reduce their GH2 emissions.

And accelerate the transition to hydrogen as a low carbon fuel with the target being for hard to electrify customers.

With that, I will pass it back to Gula.

Thanks, Stefan. And here we are with another brief poll. Stefan talked about the challenges and solutions of initiatives like the impact of hydrogen, clean fuels integration.

Geothermal. So we're very interested in Capturing your input and driving decarbonization.

So in your work, what new trends or technologies in decarbonization are you aware of that you would recommend we explore further. So this again is an open-ended poll where you can type in your sentences Here on the screen we'll have

About 90 seconds for you to add your input. Thank you.

Also, as you're answering the poll, we do have Q&A coming up, so you can take some time to drop your questions in the box as well.

Great. So we'll get the poll closed and move on to questions.

And answers with Stefan with Stefan The decarbonization investment theme.

We've got about 10 minutes for this section. And let's get started. I see we do have one here.

For you, Stefan. How can we make methane paralysis more efficient and cost effective while keeping it safe and environmentally friendly?

Thank you for the question. So there are various ways to make methane paralysis more efficient and cost effective.

This could include optimizing energy use. Reducing the overall energy conception. We could also look at the improving the catalyst longevity, using more durable catalysts that resist deactivation over time.

There's also the process efficiency. Streamlining the process to maximize the conversion rate and minimize the amount of byproducts.

For safety measures when we do have this up and running, we want to make sure that we have safety protocols, including regular maintenance, monitoring for leaks.

And using advanced safety systems. Safety systems to detect and mitigate any potential hazards. So we're still within the early At stages of looking at methane paralysis, I know with other parts of the country, north of us in Canada, as well over in Finland, they're a lot more advanced. So benchmarking is also going to be key.

As they're introducing this. Process and equipment into the market. So we're monitoring that and we're hoping to bring it within states so we can help our customers decarbonize on the end.

Great. Thank you. We do have another question here.

From Jim saying that energy efficiency can lock in gas demand for the life of the equipment.

How do you decide when decarbonization should involve electrification versus efficient gas use?

That's a great question, Jim. And I think a lot of it is going to have to do with the customer and what they decide to go with.

I think cost as being one factor, environmental is another factor. So depending on what the customer's wants and needs are, then they can select between using a more efficient gas equipment or moving towards the electrification route.

One of the tools that we're looking at, and this is also a project with UTD is Okay, how do we get the right data points?

Where we can inform the customer on what it's going to cost from a lifecycle standpoint. If we're going to use a more energy efficient gas system Or if we go full electrification. I think with California, it's leaning towards the electrification route.

I think a lot of that is going to have to do with kind of the The infrastructure, if we need to install a higher load to feed that customer. Or if we can also use the existing gas system if there's one present.

And try to keep costs low. We want to be able to enable our customers to make an informed decision on their end on which path to choose.

For us, I think for us We want electrification, right? Because then there are no associated emissions with that. But from an affordability standpoint, if gas makes sense where we can leverage more efficient processes, then that's on the customer to select that.

Thanks, Stefan. So taking cues from the customer's comfortability is a large part of the decision-making process.

Great. We've got one other question here. This is related to something you mentioned earlier.

About the Woody Biomass Project. Why did that project get denied and can you share a general gist of what you received from the regulatory team?

Yes, and that is fairly recent news, but general feedback that I read through as I read through the proposed decision is We need to do a better job to show how we're reducing emissions with this pilot project and measuring the benefits to our customers.

I think there was also some concern about the generation of methane and if this would result in higher emissions.

With exhaust vents and an open stack flares. In my opinion, and so don't quote me on this.

But let's think about what happens if we don't do anything.

So we leave the vegetation waste to rot and create natural methane, which emits to the atmosphere over time. And kind of what I think of when I think of RNG is Like if you look at a lentil or a dairy, that organic matter is going to break down.

And there's going to be a methane emission. So it's going to get to atmosphere through that general or through that natural process.

The thought that I have is, can we be proactive? And to turn that rotting vegetation, which could also be used as a fuel to a fire, right? So wildfire also being a concern into renewable energies.

That our northern region can use where we do have a ton of vegetation waste.

So if you look at the Central Valley, we got the dairies barrier. We got some landfills, wastewater plants. We can capture that waste energy.

Over in the north side, we have a ton of vegetation waste where there's a huge potential where we can create renewable energy to support the communities there. I think what you'll see in the northern section is we have a lot of tribal communities. I think micro grids is one great solution.

Can we also supplement that with renewable natural gas created through the vegetation waste that's at a surplus in that area?

I do welcome feedback from the general community here. If this is something we should explore, how we can convince others and If not, what considerations do we make to not invest it as well?

I'll send us some feedback over there.

Thanks, Stefan. Proactive vegetation management, something to consider if anyone in the audience has opinions on that and the opportunity costs, please.

Let us know. We have one final question unless someone wants to take some time to type in the box right now.

For you, Stefan, what do you think is the biggest barrier in implementing decarbonization technologies?

Yes. Biggest barrier. A lot of the research is going to be your early tutorial.

Technical readiness level, right? So we got to do a lot of early stage research Where we actually see a lot of progress and you see this within the gas system integrity side.

Is being able to pilot and demonstrate if it'll work out or not.

The biggest barrier is us when they do pilots. I've been in this role now for a year and a half and I've been itching to do a lot more field demonstrations.

And so one of the things we'll need to push for and we hope to get some regulatory support is being able to do these pilots and just a shout out to our GSG emission strategies team And our regulatory filing around the hydrogen blending pilot. So we do a lot of lab scale.

Testing already through national research, the DOE high blend project, for example. But we want to be able to take those learnings nationally.

Put it within a demonstration that we can do within our territory. And so hydrogen to infinity is a great hydrogen blending project that we're trying to pursue.

And kind of the vision I see with this is, okay, we have hydrogen that can be generated through electrolysis or through methaprolysis as another alternative.

And having... like a cluster of industrial customers where we can feed that hydrogen to those industrial customers that are challenging to electrify. And so blending one source of hydrogen towards a community.

Of customers that need it, right? We're hoping that this pilot will demonstrate that we could do that.

We need approval first. And so that's kind of the biggest barrier right now is um getting approval to do these demonstrations.

Thanks. I recall at the beginning where we polled for professions that are in attendance. If anyone is interested in partnering and helping move forward demonstrations. You can email innovationatpg.com If your TRL is at the level We'll hopefully get these things

In the field. Stefan is looking out for you. I don't think we have any other questions for this section. So thank you, Stefan, for your presentation and your responses.

Moving on. We've actually made it to the end of our day. So we have a little bit more time for any additional questions about any topic we've covered or anything that we didn't that you might want to hear about.

But first, we have one final poll for your consideration.

Now that you know more about the types of projects we support.

How do you see these positively impacting ESJ communities? So our environmental and social justice communities.

Additionally, two-part question. How could we measure success in this area?

So that final poll will pop up on your screen and will give you about 90 seconds to respond.

Typing if... No thoughts come to mind about the first and second question if you're here representing an ESJ community or a community-based organization.

You can even drop your information in that question. If you think there's usefulness in a partnership or getting more input generally from your organization, please feel free to add that as well.

All right, our poll will be closing in about five seconds.

Really appreciate the participation. For our final... section looking to see if there are any last thoughts that you might want to to bring to the team.

And I think we do have one Given all of the content that we've covered today, Erin or Jeanette, anyone on the team.

In this second year, how would you summarize the PG&E RD&D program It's evolution. How would you summarize how it's evolving in this next year?

I guess I can start and maybe the team can piggyback on this.

I think for me, the biggest thing I've seen in this second year has been an increased collaboration with our peers for the program administrators.

With the California Energy Commission, with SoCal Gas, Southwest Gas. We just, I feel like we're talking more often. We're sharing lessons learned. We're trying to figure out how to How do we best collaborate? Which areas do we have that differentiate like for let's say for us.

We have a significant focus on what David had mentioned, right?

Pipelines that go underwater crossings. That seems to be a significant thing that we actually struggle with.

That SoCal gas we know doesn't necessarily have those. They may encounter those occasionally, but we do have a lot more of that being in the Bay Area and We found partners in some of the utilities out east that have similar

It's been... nice to see that I think through the public workshop and through having our annual report out there when things happen that people need help like if you remember last year there was that ship that hit the bridge out in the East Coast we actually

From previous connections, somebody reached out to us, said, hey, what have you used in some of your integrity management areas for underwater because they needed to do some inspections very, very quickly in those areas so having that support for us and being able to provide that to just maintain safety everywhere, right?

Has been, I think, a great point of maturity we're obviously... As we're starting our reports and our annual plans, we're still in the early stages but we're leveraging from even our Epic team internally that have a lot of lessons learned and they're willing to work with us and so

Whatever we learn from there, we're able to also share with our other peer administrators in the gas side.

A lot of collaboration and that means that the personal connection as well, right?

You can try to collaborate with people, but if you don't have that personal connection, so I feel the connection very much within my team and also with the other teams, which is great.

So I'll leave it at that. I don't know if anybody else in the team would like to chime in.

Aaron, I saw you pop on screen. I don't know if you wanted to add.

Oh, I just wanted to make myself available for the general Q&A. I think Jeanette said it well.

Excellent. Increased collaboration.

Certainly a theme throughout all of the topic areas. To make sure that all of the benefits are aligned with the communities that you're serving.

So I think that's certainly apt Any other questions, please feel free to share those in the box.

I think we're all set. With no other questions.

So thanks again for participating in the PG&E RD&D's annual workshop. These have been your presenters on screen. And I'll share personal thanks for their thoughtful discussions and answers today.

In closing. Remember that if you... Just couldn't come to think of anything in this time, in this moment, you can email additional questions or comments by Tuesday, April 29th of 2025.

Remember, there is a summer deadline for packaging everything. So please submit those questions by April 29th.

Two, innovation at PG&E.com. Of course, this workshop's recording and other materials can be accessed at our website at pgne.com.

Slash innovation. And we really appreciate you spending your Tuesday morning with us.

Have a great day, everyone.