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**PG&E Comments on Proposed Natural Gas Research Initiatives for
Fiscal Year 2021-2022**

Additional submitted attachment is included below.



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California Energy Commission
Energy Research and Development Division, Natural Gas Program
Renewable Energy Division
Fuels and Transportation Division
Efficiency Division
(Docket No. 16-PIER-01)
1516 9th Street
Sacramento, CA 95814

Re: Pacific Gas and Electric Company Comments on Proposed Natural Gas Research Initiatives for Fiscal Year 2021-2022 (Docket No. 16-PIER-01)

Pacific Gas and Electric Company (PG&E) appreciates the opportunity to provide feedback on the natural gas (NG) Research and Development (R&D) Program's proposed energy-related natural gas research initiatives for the 2021-22 fiscal year (FY).

PG&E supports the California Energy Commission's (CEC) effort to strategize on future research and their budget requests for the FY 2021-2022 natural gas R&D Program. PG&E commends the CEC for hosting a workshop on January 29, 2021, to seek feedback on the proposed natural gas research initiatives from utility representatives, researchers, members of the public, and other interested stakeholders. PG&E offers the following comments in seven of the proposed research initiatives to assist the CEC staff in developing their proposed NG research plan for FY 2021-22.

1- Research initiative #1: Hydrogen and natural gas blending for industrial end-use applications - questions from the CEC:

- *Are there examples of industries that have successfully used hydrogen natural gas blends? Please provide links.*
PG&E and the other California gas utilities submitted application A.20-11-004 to the California Public Utilities Commission (CPUC) regarding a preliminary standard for hydrogen injection into the natural gas system. Chapter 3 of the testimony lists select global hydrogen blending projects where blends of hydrogen with natural gas were piloted in newly constructed gas pipeline systems¹. The end users were varied and included residential, commercial and industrial customers.

¹ Link to Ch. 3 testimony: <https://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A2011004/3358/361624771.pdf>

2- Research initiative #2: Industrial carbon capture and utilization – questions from the CEC:

- *What are CO2 utilization technologies with highest market potential?*
The CO2 technologies with the highest potential are those that can convert CO2 using renewable electricity into methane that is already interchangeable with the existing natural gas system. This would be by a methanation process, whereby CO2 + H2 + renewable electricity produces CH4 + H2O.
- *What technologies have highest potential for on-site conversion of CO2 at the industrial facilities?*
The technologies with the highest potential for on-site conversion of CO2 at the industrial facilities are those installed alongside a biomethane production plant to take excess CO2 and renewable electricity to create methane that is already interchangeable with gas delivered by the existing natural gas system. For example, chemical and biological electrolysis technologies exist in various stages of development that can achieve this.
- *What industries in California have most potential for carbon capture and utilization?*
In California, the natural-gas-system-related industries with most potential for carbon capture and utilization are the gas reforming processes that have a large CO2 biproduct that can be captured and repurposed into valuable products, such as an additive to cement, carbon nanotubes, etc.

3- Research Initiative #4: Technology development and demonstration for plastic pipeline repair and integrity improvement – questions from the CEC:

- *What are the most desirable improvements on current technologies or practices for plastic pipelines?*
The most desirable improvements are non-destructive evaluation (NDE) fusion testing tools. The most desirable improvements for operational needs are technologies such as inline camera inspection.
- *Which components of plastic pipeline systems are more vulnerable to aging, degradation or risks, so that the safety enhancements can focus more on these components?*
Aside from the known issues with vintage plastics, PG&E recommends that the rubber goods in stab fittings be evaluated for remaining life and impacts.
- *Are there any additional research areas of interest to improve the overall integrity of plastic pipeline systems?*
PG&E recommends that a research area that improves the way to mark materials should be found to improve the overall integrity of plastic pipeline systems. The quality of the inks that are currently used in the industry on polyethylene (PE) needs major improvement.

4- Research Initiative #5: Developing and demonstrating hydrogen-based power generation systems.

PGE offers the following general comments

There is increased focus on hydrogen research. While hydrogen is a promising long-term solution to decarbonizing the natural gas system, an immediate solution is renewable natural gas (RNG). Research is still needed to accelerate the efficient and cost-competitive production of RNG. For example, biomass is a good feedstock for creating RNG. There is also a large biomass resource potential in California, approximately 47 million bone dry tons. California doesn't yet have any plants that are converting wood-based biomass into RNG for injection into the natural gas grid. While advanced technology exists, there are financial barriers to getting such plants operational.

Questions from the CEC:

- *Are we effectively targeting research and technological development needs to support California's decarbonization goals and provide natural gas ratepayer benefits?*
PG&E agrees that power generation technologies that can effectively and efficiently use hydrogen as a fuel source are important. However, before that can happen, we need hydrogen generation technologies that are optimized for energy efficiency and are cost-effective at a large-scale. Earlier stage technologies need our support to advance and possibly become part of the state's portfolio of gas production technologies. When these technologies are more advanced and ready for a pilot demonstration, pairing with power generation downstream can occur. Consider emphasizing hydrogen production technology in addition to and separate from power generation in the cases of earlier stage development.
- *What are the technological and non-technological barriers to deploying hydrogen power generation that should be prioritized?*
One technological barrier is the compatibility of natural gas power generation with a blend of hydrogen and natural gas, with the possibility of converting to 100% hydrogen in the very long term. Hydrogen has different physical and chemical properties than natural gas.
- *What air quality considerations or benefits using blends should we be aware of?*
If using a blend of natural gas and hydrogen, combusted natural gas will still produce carbon dioxide and combusted hydrogen will simply produce water. Combusting a blend of natural gas and hydrogen for power generation purposes won't affect air quality from that perspective. More research is needed to understand the leakage rates of hydrogen in a natural gas-hydrogen blend. Hydrogen may have higher leak rates in comparison with pure natural gas.

5- Research Initiative #6: Quantify exposures to indoor pollutants in MF homes cook with NG or alternatives – questions from the CEC:

- *How should the study population be defined? (e.g., multi-family households that include residents vulnerable to air pollution exposures, low-income single-family homes, etc.)*
According to a study by the University of California, Los Angeles, "Environmental health burdens associated with gas appliance use can disproportionately affect low-income individuals, who are often renters with less control over appliance installation and maintenance, and typically living in smaller units, which can result in elevated pollutant concentrations." Based on this, PG&E

recommends that the CEC prioritizes low-income communities in any research initiative related to indoor air quality and cook stoves.²

PGE offers the following general comments

PG&E strongly supports investments in objective research that will contribute to understanding the indoor air quality (IAQ) impacts of cooking and to identify opportunities to mitigate cooking pollutants in new and existing buildings.

PG&E also supports investments into research that identifies strategies to ensure dwellings of all sizes have the proper kitchen ventilation (e.g., vented range hoods, vented downdraft exhaust, continuous kitchen exhaust, compartmentalization) needed to mitigate the negative impacts of cooking appliances on IAQ.

Decades of research has determined that the heating and cooking of food by any method releases ultrafine and fine particles such as particulate matter (PM) 2.5 micrometers or smaller as well as other irritants such as formaldehyde, acetaldehyde, acrolein and polycyclic aromatic hydrocarbons. When using natural gas, additional pollutants are released that negatively impact the IAQ, in particular nitrogen oxides (NOx) and carbon monoxide (CO).

PG&E is proud to support our customers' energy needs and provide electricity and natural gas for use in a variety of applications, including cooking.

6- Research Initiative #7: Location-specific analysis of decommissioning to support long-term gas planning.

PGE offers the following general comments

PG&E respectfully refers the CEC to its comments submitted on December 31, 2020, on the "Strategic Pathways and Analytics for Tactical Decommissioning of Portions of Natural Gas Infrastructure" (GFO-20-503) solicitation.³ Though submitted in response to one solicitation, the comments capture PG&E's perspective on how the CEC can achieve the greatest impact from research projects focused on "tactical decommissioning" and targeted building electrification.⁴

While more detail is provided in the prior comments, PG&E reiterates that its overarching recommendation is to build on existing expertise and experience, rather than duplicating efforts. Accomplishing this goal includes:

² "Effects of Residential Gas Appliances on Indoor and Outdoor Air Quality and Public Health in California." UCLA Fielding School of Public Health, Apr 2020: <https://coeh.ph.ucla.edu/effects-residential-gas-appliances-indoor-and-outdoor-air-quality-and-public-health-california>

³ Solicitation GFO-20-503, Strategic Pathways and Analytics for Tactical Decommissioning of Portions of Natural gas Infrastructure <https://www.energy.ca.gov/event/funding-workshop/2020-12/pre-application-workshop-gfo-20-503-strategic-pathways-and-analytics>

⁴ PG&E's comment letter addressed to Tonya Heron and Qing Tian on December 31, 2020, in response to the GFO-20-503 solicitation.

- Focusing resources on untested “use cases” and known gaps in order to achieve scale: on dozens of occasions, PG&E has pursued targeted electrification as an alternative to an upcoming gas system project—and PG&E will continue to do so. There are few opportunities that are cost-effective and feasible for PG&E to fund, however. Most of the work (and cost) of maintaining a safe gas system cannot be avoided with PG&E action and funding at this time. CEC research is needed to develop a pathway for this yet un-addressed majority of the system. The opportunities that PG&E can (and does) pursue are simply not enough to achieve California greenhouse gas (GHG) emissions reduction goals; a path to scale outside of these “unicorn” situations is crucial.
- Leveraging utility tools, analysis, and expertise: PG&E gas system engineers have deep knowledge of the operations of each gas system, and possess the training, tools, and access to confidential data to identify risks that require attention and scope the work needed to address those risks. PG&E experts can perform hydraulic modeling to understand impacts of changes on the system and conduct many other types of analysis that would be needed to inform “tactical decommissioning” plans and strategies. PG&E’s historical expertise in this area can provide critical input to complement the strengths of other entities.
- Driving problem-solving to the most critical challenges: from its successes (and failures) pursuing electrification alternatives to the gas system projects, PG&E has found that “tactical decommissioning” is most persistently and significantly limited by existing regulations, policy, and funding mechanisms. Lack of locations is not the obstacle to targeted electrification at scale; PG&E can identify many locations where a gas project is planned in the nearer-term, or even areas where “tactical decommissioning” might be feasible or beneficial in the longer-term. With no funding nor regulatory path to pursue targeted electrification in almost all cases, however, there is little value to identifying locations. Research and innovation are needed to address these most problematic hurdles—which exist in every location outside of those very limited circumstances that PG&E already pursues.

7- Research Initiative #8: Advanced hydrogen refueling infrastructure solutions for heavy transport.

PG&E offers the following general comments

PG&E supports promoting infrastructure compatibility and standardization across the various Fuel Cell Electric Vehicle (FCEV) types and opportunities to demonstrate innovative station designs that co-locate heavy-duty Compressed Natural Gas (CNG) fueling with FCEV fueling infrastructure to support California’s goals toward decarbonizing the transportation sector.

PG&E appreciates the time and effort that the CEC took to organize the workshop and prepare the Public Interest Natural Gas R&D Program’s proposed energy-related natural gas research initiatives for the 2021-22 fiscal year. PG&E also appreciates the opportunity to comment on the development of these important research initiatives. Please do not hesitate to contact me if you have any questions.

Sincerely,

Licha Lopez