PG&E Comments Climate Scenarios Workshop

Additional submitted attachment is included below.

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VIA ELECTRONIC FILING

California Energy Commission
Docket Unit, MS-4
Re: Docket No. 19-ERDD-01
1516 Ninth Street
Sacramento, California 95814-5512

RE: Pacific Gas and Electric Company Comments on Climate Scenarios and Analyses to
Support Electric Sector Vulnerability Assessment and Resilient Planning Workshop

I. Introduction

Pacific Gas and Electric Company (PG&E) appreciates the opportunity to submit
comments regarding the California Energy Commission (CEC) Workshop on Climate Scenarios
and Analyses to Support Electric Sector Vulnerability Assessment and Resilient Planning, held
Monday, December 16, 2019. PG&E enthusiastically supports the CEC-funded efforts to
advance climate research and develop high-quality climate projections. Spatially and temporally
granular projections of climate variables enables climate-informed utility planning and
empowers California investor-owned utilities (IOUs) to prepare to continue providing safe,
clean, affordable, and reliable energy even as the state faces more frequent and severe climate-
driven natural hazards. PG&E's responses to the specific questions posed during the Workshop
are provided below.

II. PG&E Responses to Workshop Questions

1. What factors should be considered in the decision of whether to fund one single effort or two smaller efforts? (see presentation slides 15-16)

Creating climate scenarios and analyses that are effectively tailored to support electric sector
infrastructure vulnerability analysis, and ultimately contribute to effective risk management, will
require concerted engagement of electric sector stakeholders. In PG&E's experience,
organizations with the technical expertise to deliver downscaled, forward-looking climate data
are necessarily specialized. For this reason, PG&E recommends that the Energy Commission
split the research into at least two distinct funded efforts, with one grant recipient primarily

tasked with overall research management and stakeholder engagement, overseeing the technical team(s) focused on delivering climate projections.

PG&E mentions "at least" two distinct funded efforts because we see the potential need for a third group of technical specialists to develop and coordinate the data platform through which updated climate scenarios and analytics will be presented. Indeed, the experts that contributed their work to the 4th Assessment were not also tasked with building Cal-Adapt.

2. **How can we explicitly incent the role of strong project management to ensure strong internal coordination (and coordination between grants, if two grants are funded) and successful design, application, and stakeholder adoption of data products?**

PG&E recommends including a requirement for demonstrated stakeholder engagement and project management capability as part of the grant criteria. Additionally, splitting the grant into at least two parts will likely incent organizations with applicable experience to apply based on their strengths; issuing a single grant may force the Commission to make difficult choices between organizations that are competitively qualified in one category or the other but not both.

EPIC has funded an ongoing project (EPC-16-063) to develop hybrid downscaling methodologies, but the current Grant Funding Opportunity (GFO) does not require that methodology to be used for the Fifth Assessment. What criteria or metrics should the GFO identify for evaluating applicants' proposed downscaling methods?

From a climatological perspective, such criteria and metrics could include 1) high spatial and temporal resolution and 2) the ability to accurately capture climate and weather extremes. Both of these cases could potentially benefit from a "hybrid" technique that combines physical processes constrained by dynamical downscaling with the computational expediency of statistical downscaling.

Also, PG&E suggests including language regarding which of the new "shared socioeconomic pathways (SSP)" underpinning Coupled Model Intercomparison Project Phase 6 (CMIP6) simulations will be considered and how these may differ from representative concentration pathways (RCPs), if applicable.

PG&E also recommends that the GFO language reflects that applicants demonstrate their ability and readiness to work with energy stakeholders to determine priority climate variables for study, and which climate variables merit a hybrid dynamical-statistical downscaling approach. PG&E views hybrid modeling as a likely necessary addition to statistical downscaling modeling, such as localized constructed analogs (LOCA), for certain variables.

3. **Ideally, the project(s) from this GFO will generate priority projections that represent a multiplicity of possible futures and constrain uncertainty by preferential model selection. How should the language of the GFO address this consideration?**

PG&E recommends that the GFO consider criteria that modelers not only base their methods on RCPs, but to also use SSPs, which allow researchers to consider additional pathways that global greenhouse emissions could take. SSPs are complementary to RCP scenarios in that they account for societal choices and political outcomes and may offer more information than the "business as usual" scenario currently provides. Such information could narrow the range of uncertainty we continue to face in climate modeling. Indeed, these SSPs are being used for the latest updates of global climate models and will serve as information used in the Intergovernmental Panel on Climate Change (IPCC) sixth assessment.

4. **What ongoing work to cull models contributing to CMIP6 for California should the proposed research be coordinating with? How should the proposed grant be scoped to leverage and coordinate existing or planned efforts?**

PG&E is not currently aware of any public discussions regarding efforts to select priority global climate models (GCMs) from CMIP6 for California. In terms of a framework for model selection, PG&E refers the Energy Commission to the Department of Water Resources Climate Change Technical Advisory Group "Perspectives and Guidance for Climate Change Analysis" (August 2015). This paper provides a high-quality framework that could be used to decide which of the numerous GCMs that contribute to CMIP6 can be reduced to a manageable number while maintaining the validity of climate projections.

PG&E notes that the priority GCMs identified via the Department of Water Resources (DWR) analysis[1], which are the GCMs currently included in Cal-Adapt, were evaluated against climate variables that are specifically important to water resources planning (p 29). The DWR approach could be updated to include a larger cross section of evaluated climate variables, including those pertinent to utility climate risks (e.g., winds), and also climate extremes (e.g., heat waves and heavy precipitation).

Grant applicants should demonstrate that they are aware of the variables most relevant for utilities; are up to date on current efforts to select priority GCMs for California from CMIP6; and should explain why they do or do not see a need to reevaluate priority GCMs for use by the energy sector as a precursor to providing climate projections.

PG&E also sees value in a bias toward maintaining a constant set of priority climate models to encourage a coordinated approach to climate adaptation in the state, up to the point that certain models obviously underperform on climate variables critical to certain types of planning.

5. **As California increasingly strives to integrate projected climate change into infrastructure design and planning, understanding the likelihood of possible outcomes and uncertainty of projections is increasingly important. We would like to open the floor for discussion of considerations that the GFO language should reflect**

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[1] Department of Water Resources Climate Change Technical Advisory Group "Perspectives and Guidance for Climate Change Analysis" available here:
https://water.ca.gov/LegacyFiles/climatechange/docs/2015/Perspectives_Guidance_Climate_Change_Analysis.pdf

regarding quasi-probabilistic interpretation of projections and indicators of uncertainty.

PG&E appreciates that the Energy Commission is thinking about how to facilitate decision-making under uncertainty, especially considering that adapting to climate-driven natural hazards will require action from a broad range of stakeholders with widely varying levels of climate-related knowledge.

Quasi-probabilistic projections account for uncertainty by evaluating projection percentiles and identifying projection ranges as likely vs. very likely, and so forth. In practice, larger model ensembles (e.g., larger than 10 models) provide more robust quasi-probabilistic projections. The number of models utilized should be carefully considered so that California utilities have the necessary information to make informed decisions. Ultimately, quasi-probabilistic projections are paramount to providing a range of projections that can be matched to specific industry or company risk-tolerance thresholds. A larger model ensemble (to the degree practical) is useful for understanding the potential range of scenarios and uncertainties, and informs planning under a scenario-driven framework as well as through a bottom-up, robust decision-making framework.

Reference to "quasi-probabilistic projects and indicators of uncertainty" evokes the State of California Sea-Level Rise Guidance Document[2], which provides a framework for decision-making under a set of easily understandable sea-level rise scenarios. Charts indicate the 1-in-X probability of sea level rise meeting or exceeding certain thresholds, and even indicates which set of measurements to consider given low, medium, high, or extreme risk aversion.

PG&E views this type of product as the top of multiple layers of climate information. The Ocean Protection Council (OPC) report represents a significant synthesis of complex climate projections for use by decision-makers and non-climate experts. Underpinning this document are layers of data and analysis that have different audiences and use-cases.

PG&E's priority is access to high-quality, temporally and geographically granular projections of climate variables that are material for planning and operation of electric and natural gas systems. As long as this data is made available for use, electric sector stakeholders will be able to perform the many secondary analyses that are required to understand asset exposure and sensitivity. Additional layers of analysis also can be helpful, but, as mentioned by Dr. Westerling during the December 16 workshop, purpose-built tools cannot be both specific enough for practical application and also useful to everyone. PG&E very much supports the creation of purpose-built tools and hopes to work with the grant awardees to design tools that will enable climate-informed utility planning. Additionally, access to the underlying data is critical, as it enables energy stakeholders to ask new questions as they arise.

6. **Practitioners of climate change risk management may preferentially use projections that perform well in the historical period for their area of interest, based on available observations.**

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[2] Ocean Protection Council "2018 Updated State Of California Sea-Level Ride Guidance Document" available here: http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A_OPC_SLR_Guidance-rd3.pdf

A. Should the fifth assessment require bias correction to help meet this desire?

PG&E understands that bias correction of the raw outputs of global climate models is a fundamental step in developing climate projections. Additionally, issues of bias are in part addressed by CMIP's criteria for endorsement of modeling participants. Model bias should also be addressed by the selection of a set of priority climate models, which provide a range of outputs at a given level of certainty.

B. How should the desire for historically validated projections play into the development of priority projections and/or guidance for usage of projections?

Historical validation of climate projections is a baseline expectation. Per the DWR Technical Advisory Committee (TAC) Report, "…there is little to gauge the suitably of a climate model other than its performance in simulating observed climate." (p 24.) The metrics used for an evaluation of historical-performance could also consider metrics pertinent to utility risks and a greater cross section of extremes (e.g., not just hydrologic-based extremes explored as part of the DWR study).

PG&E also notes that hybrid downscaling methodologies may allow for more precise historical validation, which could be used in examining climate variables for which very high geographic and temporal resolution is required, or for which there is relatively high uncertainty based on statistical downscaling alone.

7. **Climate change vulnerability assessment and risk management can be approached through a top-down, scenario-driven framework as well as through a bottom-up, robust decision-making framework. Ideally, the Fifth Assessment will include both top-down and bottom-up approaches that are harmonized so that different studies' results can be integrated and used to deepen our understanding of risks and resilience options.**

A. Are there different considerations regarding a desire to harmonize and integrate these approaches that should be articulated in the GFO language?

At a high level, it seems likely the climate projections developed for the 5th Climate Change Assessment will be useful to either type of planning, especially if the climate projections are generated for utility-relevant variables and at geographic and temporal granularity that is meaningful to the consideration of electric and natural gas assets. Ultimately, top-down and bottom-up approaches are complimentary and can be informed and constrained through new downscaled projections.

Of particular interest are scenario-driven extreme events. Top-down stress-test scenarios (akin to the current long-term drought scenarios developed for California's 4th Climate Change Assessment) could be developed as additional analyses after consultation with utilities so that they consider scenarios of consequence viewed through an impact-specific lens.

III.   Conclusion

PG&E reiterates the Company's strong support of CEC-funded research into high-quality, highly granular climate and weather data. PG&E looks forward to gaining access to the data and hopes that further analysis will drive insights that help maintain a safe, clean, affordable, and reliable energy system.

Sincerely,

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