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Follow-up on Staff Workshop Regarding Research to Support a Climate-Resilient Transition to a Clean Electricity System

On March 5, 2021 California Energy Commission (CEC) Staff held a workshop to elicit feedback from energy utilities, the research community, and other stakeholders on a **forthcoming research opportunity** to support a **climate-resilient transition to a clean electricity system**.

This memo provides a [summary](#) of the workshop and an [overview](#) of the research efforts that CEC staff anticipate supporting through an EPIC-funded solicitation that is planned for release in October 2021.

Workshop Summary

Staff presented an overview of initial ideas on the scope and focus of two proposed research efforts of a forthcoming EPIC research solicitation. Attendees participated in discussion of five questions concerning key aspects of the solicitation, namely:

1. The scope and focus of the proposed research;
2. Priorities for extending the capability of energy models to incorporate climate change, variability, and extremes;
3. Applications of climate projections and analytics to foster electricity-sector resilience and address research gaps;
4. Allocation of funding for the proposed research efforts; and
5. Additional considerations related to implementation of the proposed research, including the extent to which downscaled global climate projections can inform climate-resilient operations of a grid in transition.

Feedback and technical input were received from investor-owned utilities (IOUs), the research community, state agency colleagues, industry experts, and private consultants.

Energy Commission staff have reviewed all oral and written comments, which have helped to inform the scope, content, and structure of the anticipated solicitation; and have helped delineate complementary research efforts that could be supported by future solicitations focused on topics such as community-level resilience or the dynamics of demand.

For workshop materials and written public comments, please see:

- The Staff Workshop notice and a recording of the workshop located here: <https://www.energy.ca.gov/event/workshop/2021-03/staff-workshop-research-support-climate-resilient-transition-clean>
- The docket containing written public comments is 19-ERDD-01 which can be found at: <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=19-ERDD-01>
Please note that the docket linked above includes public comments on a number of topics. A list of public comments responsive to the March 5, 2021, workshop can be found in the [Appendix](#) of this document.

Overview of Anticipated Efforts to Be Supported in Forthcoming Solicitation

Based on received feedback from this and other public workshops as well as internal discussions, we anticipate a solicitation that includes three funded groups. The first two groups were discussed at the March 5, 2021 workshop. The third group is anticipated to support enhancements to Cal-Adapt's interactive website to support energy sector stakeholders, and was not previewed in the March 5 workshop.

The three anticipated groups are described below, along with important context for each effort. For each of these groups, CEC anticipates a single award.

Group 1: Assessing and improving the climate resilience of an electricity system in transition
(\$1,700,000)

This effort focuses on energy system modeling to consider climate impacts on supply *and* demand in an integrated framework and to improve the climate resilience of a system that is rapidly evolving to meet California’s decarbonization goals. This work will leverage products from EPIC-funded research that are developing next-generation climate projections¹ and as well as a data platform and analytics engine to deliver those projections in a manner that fosters use in research and adaptation planning.² This work will illuminate emerging relationships between electricity supply, demand, and climate in California’s decarbonizing energy system and parameterize these relationships in a manner that supports evaluation of grid resilience and reliability in the context of SB 100 planning as well as CEC’s mid-term supply and demand forecasting.

Group 1 is expected to:

- Assess the climate resilience of the electricity system serving California and its ability to reliably meet anticipated hourly electricity demand in three time periods: (1) the system of today; (2) modeled system(s) of mid-century that achieve the goals of SB 100; and (3) the modeled system in transition from (1) to (2) (e.g., one or more intervening periods such as 2030).
- The above-mentioned assessment of climate resilience will use scenarios developed to support CEC’s demand forecasting and SB 100 efforts as a starting point in evaluating demand and demand-modifying scenarios representing an array of possibilities for climate conditions, energy efficiency, load flexibility, and load evolution.
- Consider climate change impacts on the regional distribution of zero-carbon generation, including insights from Group 2 of this solicitation.
- Evaluate technology strategies for improving climate resilience of SB 100-compliant long-term scenarios for the electricity sector, in the context of energy system transition pathways consistent with the State’s economy-wide carbon neutrality and sectoral decarbonization goals.
- Directly engage IOUs and other electricity-sector stakeholders from project inception to completion, leveraging and coordinating with stakeholder engagement efforts of related EPIC grants funded by Grant Funding Opportunity GFO-19-311 (referenced in footnotes 1 and 2) and Group 2 of this solicitation.

This effort is intended to help address the next steps on reliability and resiliency highlighted in the SB 100 Joint Agency report and will be on a timeline that is well-suited to inform the modeling efforts foundational to the 2025 SB 100 report. Accordingly, the Recipient will be required to dedicate resources to sustained interactions with the SB 100 modeling team, as well as CEC’s demand and supply forecasting teams, to ensure that results are directly useful to their efforts.

Group 2: Resiliency of solar, wind, and hydroelectric generation in a changing climate (\$700,000)

¹ EPC-20-006 with University of California, San Diego, *Development of Climate Projections for California and Identification of Priority Projections*.

² EPC-20-007 with Eagle Rock Analytics, *A Co-Produced Climate Data and Analytics Platform to Support California’s Electricity Resilience Investments*.

This effort will apply next-generation climate projections³ to improve understanding of how solar, land-based and offshore wind, and hydroelectric resources may change in the face of a changing climate.

Group 2 is expected to:

- Generate projected changes in solar, onshore and offshore wind, and hydroelectric resource availability and variability over the next decade and through mid-century.
- Evaluate changes in each resource individually, their spatial and temporal correlations, and the changing resource availability profiles during extreme events of relevance to electricity demand and supply and reliability planning.
- Expand consideration of climate-related phenomena that affect solar and wind resources in California and are now represented in next-generation climate projections (e.g., coastal low cloudiness, local-scale wind speed and direction).

This effort is intended to directly support supply forecasting and supply side analyses associated with SB 100 modeling by quantifying on an 8760-basis (i.e., hourly resolution 365 days per year) how supply of solar, wind, and hydroelectric generation are expected to be affected by climate change. The Recipient is also expected to share findings with the Group 1 research effort described above. Accordingly, the Recipient will be required to dedicate resources to sustained interactions with the SB 100 modeling team, CEC's supply forecasting team, and Group 1, to ensure that results are directly useful to their efforts.

Group 3: Cal-Adapt enhancements to support energy sector stakeholders (\$600,000)

This effort will align data and research results available to a broad range of non-technical stakeholders through Cal-Adapt's easy-to-use interface with the climate projections, data platform and analytics engine under development in support of California's anticipated Fifth Climate Change Assessment. This effort is important because it aligns the information available through Cal-Adapt's interactive web application with the sophisticated knowledge base—namely the aforementioned next-generation climate projections, data platform and analytics engine—that is intended to support energy sector adaptation planning.⁴

Group 3 is expected to:

- Enhance Cal-Adapt's interactive website to provide access to the climate projections that are used for California's Fifth Climate Change Assessment and that serve as a basis for IOUs vulnerability assessments and planning.⁵
- Provide data and visualizations portraying projected changes in the temporal and spatial distributions of zero-carbon electricity generation resources investigated by Group 2.

³ The next-generation projections are those developed by EPC-20-006 (footnote 1) and made available in forms that support research and planning by EPC-20-007 (footnote 2).

⁴ The projections and data platform efforts are supported by EPIC grants that launched in 2021 (EPC-20-006 and EPC-20-007; see footnotes 1 and 2).

⁵ CPUC's Decision on Phase 1, Topics 1 and 2 (D. 19-10-054 of the Adaptation Rulemaking, R. 19-10-054), issued November 1, 2019, anchors acceptable data to California's Climate Change Assessments process, and points to Cal-Adapt as a source of climate projection data developed for California's climate assessments.

<http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M319/K075/319075453.PDF>

Group 3 will require close coordination with the data platform and analytics effort recently launched under EPC-20-007. Led by Eagle Rock Analytics, this effort adds a new dimension—distinct from the interactive web application that is the focus of Group 3—to the Cal-Adapt enterprise by providing sophisticated, data-intense analyses to feed into energy sector modeling, detailed vulnerability analyses, and infrastructure and planning decisions. CEC’s vision for the expanded Cal-Adapt enterprise is to provide climate and data services for a wide array of uses and applications involving California’s energy sector, coordinating closely with other agencies, including the Governor’s Office of Planning and Research (OPR), that will provide support for additional stakeholders beyond the energy sector.

Additional Considerations Related to Cal-Adapt

To facilitate integration of the elements that will contribute to an expanded Cal-Adapt enterprise, the current Cal-Adapt development team funded by ongoing CEC grants is working with CEC staff and Eagle Rock Analytics to transfer the Cal-Adapt web application and hosting of Cal-Adapt.org to Eagle Rock Analytics by March 31, 2022. This transfer will facilitate integration of three key elements of CEC’s efforts to advance energy sector resilience:

- 1- Next-generation climate projection data, which will constitute a much larger (order of 1 PB) dataset than what the current Cal-Adapt web application hosts (order of 10 TB);
- 2- The forthcoming data platform and analytics engine, which will expand the Cal-Adapt enterprise to provide unprecedented computational and technical resources to help electricity sector stakeholders access and make use of next-generation projections;
- 3- The current Cal-Adapt web application, on which Group 3 builds, which provides interactive visualizations and easy access to data for a variety of users, including non-technical audiences.

Integration of these elements will result in an enhanced Cal-Adapt that includes features for a broad range of stakeholders who need easily accessible visualizations and data download tools while also providing a “pro” version for users with highly technical, data-intensive needs that can be addressed by the data platform and analytics engine. Specifically, Cal-Adapt visualizations will continue to provide powerful existing features that allow for local and state decision makers as well as community groups to easily visualize the effects that climate may have on their particular area of concern. The Cal-Adapt analytics engine and data platform, under development through EPC-20-007, will allow IOUs, research scientists, and others to access quality-controlled data using sophisticated models and analytics to dive deep into the potential impacts relevant to their interests in a much more granular and quantitative way than current visualizations provide.

Further, the data platform and analytics engine effort, launched under EPC-20-007, will be structured so that it can be easily transferred at the conclusion of the project in alignment with CEC’s aspirations to cost-effectively control and make use of data and tools produced through its funding programs. Similarly, the Group 3 awardee (and future awardees of CEC funds supporting Cal-Adapt enhancements) will be required to transfer relevant products to the entity specified by CEC for further expansion and development.

Finally, CEC is actively coordinating with the OPR to ensure that the interactive web-based features of Cal-Adapt are maintained for a broad base of users. OPR has articulated its high-priority goal of ensuring funding for maintenance and front-end enhancements to the web application, while leaving the applied research related to the web application, data platform, and underlying data with CEC.

Appendix

List of Public Comments Submitted to the Docket:

Comments can be accessed [here](#):

<https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=19-ERDD-01>

- Docket by Cody Goldthrie on behalf of Andrew Larkins (Sygensys Ltd), TN#236999, 03/05/2021.
- Docket by Alex Kovalick on behalf of Richard Jensen & C. Damon McLean (Supply Analysis Office), TN#237156, 03/14/2021.
- California Center for Sustainable Communities at UCLA, TN#237214, 03/18/2021.
- Rachel Clemesha, TN#237231, 03/19/2021.
- Rachel Clemesha, TN#237242, 03/19/2021.
- G Mathias (Matt) Kondolf (UC Berkeley), TN#237241, 03/19/2021.
- Licha Lopez (PG&E), TN#237244, 03/19/2021.
- Tim Carmichael (Southern California Gas Company), TN#237245, 03/19/2021.
- Loren Lutzenhiser, TN#237246, 03/19/2021.