

Annual Report 2023–2024

Cal-Adapt: Analytics Engine

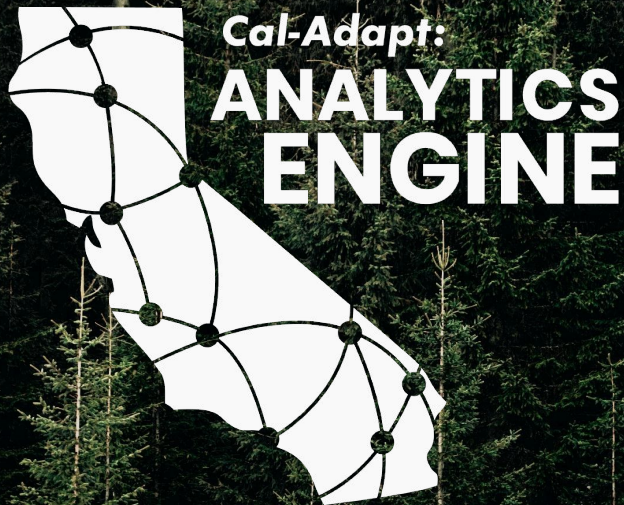
Progress update

Open Access to Data, Models, and Analytics Related to Energy Resilience Supporting California's Needs

Funding Provided by:

**California Energy Commission – EPIC Program
(EPC-20-007)**

The Cal-Adapt: Analytics Engine will guide users to customized and curated localized climate data to make informed decisions based on the best science to improve electricity sector resilience. This platform will provide users with customized data, advanced analytics, and powerful cloud computing resources, allowing users to perform high-level analysis without needing to download massive localized climate datasets.





Where We Started





5 Data Applications

- Prioritized from an original list of 15

3 Day Workshop

- Sept 2021
- Detailing the 5 priority data applications with stakeholders
- Stakeholder deep dive

6 Collaborating Institutions

- A team of academic, technical, and policy leaders are building the Cal-Adapt: Analytics Engine



Where We Are Now

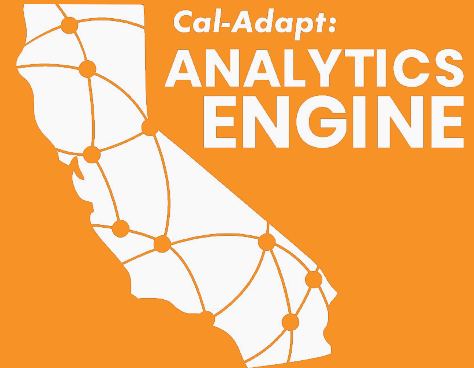




“With funding from the EPIC program, the Cal-Adapt: Analytics Engine continues to democratize climate data, provide scientific guidance, and develop analytical resources in collaboration with energy stakeholders to directly support California's climate resilience.”

– Susan Wilhelm, California Energy Commission

analytics.cal-adapt.org/





Enhancing Climate Data Analysis

The [Analytics Engine JupyterHub](#) is a crucial interactive cloud-based environment that provides access to localized California-specific climate data, advanced analytical toolkits, and robust cloud compute resources. In response to user feedback, the Analytics Engine team made significant improvements from 2023-24, enhancing JupyterHub's power and memory capacity for better data processing and analytics. Additionally, the team refactored all underlying code in [climakitae](#) to ensure more efficient performance and compatibility with updated dependencies. Users can now access Jupyter notebooks to find, process, and select data, perform comprehensive analysis and visualizations, and download smaller data subsets to their local machines using the open-source Python package [climakitae](#). These enhancements are vital for researchers and analysts, providing them with the tools and resources necessary to tackle complex climate data challenges effectively.



Regular Stakeholder Engagement

The Analytics Engine team conducts regular stakeholder engagement with Southern California Edison, Pacific Gas & Electric, and the California Energy Commission's Demand Forecast Unit to ensure that our tools and analytics are actionable and informed by deep stakeholder knowledge. This collaboration positions our project at the cutting edge of both science and practice, allowing us to address complex questions at the intersection of science, practice, and regulation. By bringing together users and data producers, we co-produce solutions for challenging issues, creating methodologies that guide users in tackling these questions effectively. This process is essential for bounding problem areas and developing innovative solutions tailored to the energy sector's needs.

analytics.cal-adapt.org/



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Data Applications

The Analytics Engine team is developing various notebooks to help users better understand climate data and make decisions using the most scientifically-forward projections data.



Developed Notebooks

- Determining an Average Meteorological Year
- Threshold Tools: Defining and analyzing custom extreme events
- Threshold Tools: Counting threshold exceedance events
- Time Series Transformations
- Exploring the regional response to a warmer world
- Exploring Uncertainty in Extreme Climate Events
- Exploring Uncertainty in Climate Data
- Using the the AE to reproduce annual consumption model
- Localized air temperature and dewpoint temperature
- Bias correct model output with respect to observations
- Using the Analytics Engine to access station data
- Hourly climate projections bias-corrected to the location of a weather station
- Exploring Uncertainty in Extreme Climate Events
- Exploring Uncertainty in Climate Data
- Heat Index Applications



Work in Progress

- Developing Model Agnostic Tools
- Climate Data Acquisition for Hydrological Renewables
- Calculating variance across models
- Threshold Tools Basics
- Calculating a Typical Meteorological Year
- Station Data Access
- Vulnerability Assessment



Analytics

[Applications](#)

[Example Applications](#)

[Training Resources](#)

Data

[About the Data](#)

[Accessing Data](#)

[Data Catalog](#)

[Metadata Standards](#)

[Data Updates](#)

Guidance

[About Climate Projections and Models](#)

[Using Climate Data in Decision Making](#)

[Glossary](#)

[References](#)

[Guidance Updates](#)

Developing Guidance Content

The development of guidance content for the Analytics Engine project has been a highly iterative process facilitated by the stakeholder engagement team. The initial set of guidance questions was identified through interviews with energy sector climate data users and focus group discussions with scientists, utility practitioners, and state agencies.

The guidance content hosted on the Analytics Engine website has been a co-produced effort and will regularly be updated to reflect advances in regulation, practitioner knowledge, and scientific understanding of climate change.



Data Updates



LOCA2-Hybrid

- Zarr-ified data
- ~100+ simulations
- Localized station Data

Additional WRF runs with solar and wind data

- Four new simulations
- A priori bias correction applied to the new simulations
- More variables that are tied to solar and wind data

Sea-Level Rise (SLR)

- Hourly sea-level rise projections for 13 locations, 3 sea-level rise scenarios, and 3 SSP scenarios, totaling into 117 different simulations

Hourly Station Data

- 33 stations with LOCA2-Hybrid data
- Each station has 129 simulations coming from 3 scenarios and multiple parent GCMs

Variable Infiltration Capacity (VIC) Hydrology Data

- Daily gridded Noah-MP streamflow and VIC hydrology data generated by UCLA
- Historical and future projections data for multiple basins across California

California Adaptation Forum 2023



[Workshop: Learn to use climate data & tools for decision-making in CA through Cal-Adapt](#)



Click the links to check out our presentations!

[Session: Actionable data & tools to enable climate-informed decision-making in California](#)

From left to right: Owen Doherty (Eagle Rock Analytics), Nancy Thomas (Geospatial Innovation Facility, UC Berkeley), Justine Bui (Spatial Informatics Group), Grace Di Cecco (Eagle Rock Analytics), and Nancy Freitas (Energy and Resources Group, UC Berkeley)

Climate Data and Analytics for CA's Ambitious Climate and Energy Goals

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Climate Data and Analytics for California's
Ambitious Climate and Energy Goals

Click on the
slide to check
out the whole
presentation!

Presented by Owen Doherty at ResiliEX Summit 2.0

IEPR Commissioner Workshop: Energy Demand Forecast Methodology Updates

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Click the slide to
check out the
presentations and
event recording!

Workshop Feedback Highlights:

- Analytics Engine tools: valuable for integrating into planning processes, particularly through incorporating uncertainty terms into aggregate infrastructure planning.
- Strong interest in Analytics Engine influence on applications related to building codes, appliance standards, and electrification efforts.
- Appreciation for Analytics Engine modernization, including the development of QA/QC protocols.
- Recognition of the Analytics Engine team's effective collaboration across the CEC and other agencies, promoting a unified framework and paradigm for addressing climate change.
- Localization notebooks identified as a critical for integration with demand forecasting.
- Analytics Engine's relevant and timely guidance on data selection recognized as beneficial.



IEPR Commissioner Workshop on Energy Demand Forecast Methodology Updates

2024 Integrated Energy Policy Report Update

July 30, 2024
California Energy Commission

The California Energy Commission (CEC) hosted a workshop to explore recent and proposed updates to its California Energy Demand (CED) forecast methodology with an emphasis on the use of climate scenario data.



AGU 2023

In addition to the California Adaptation Forum, ResiliEX, and IEPR Workshop, our team had three presentations at the American Geophysical Union (AGU) in San Francisco, CA, the premier climatological conference in the country, about Cal-Adapt: Analytics Engine, our data, methods, and co-production methods.



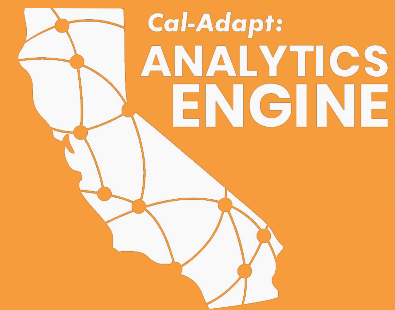
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Climate data and analytics for California's electricity sector

Nancy Freitas¹, Kripa Jagannathan¹, Andrew Jones², Owen Doherty³, Grace Di Cecco³, Victoria Ford³, Nancy Thomas⁴, Brian Galey⁴, Justine Bui⁵, Naomi Goldenson⁶, Nicole Keeny³, Ashley Conrad-Saydah⁷, Mark Koenig³, Smitha Buddhavarapu³

¹UC Berkeley, ²Lawrence Berkeley National Lab, ³Eagle Rock Analytics, ⁴Geospatial Innovation Facility, ⁵Spatial Informatics Group, ⁶Model World Consulting, ⁷Vibrant Planet

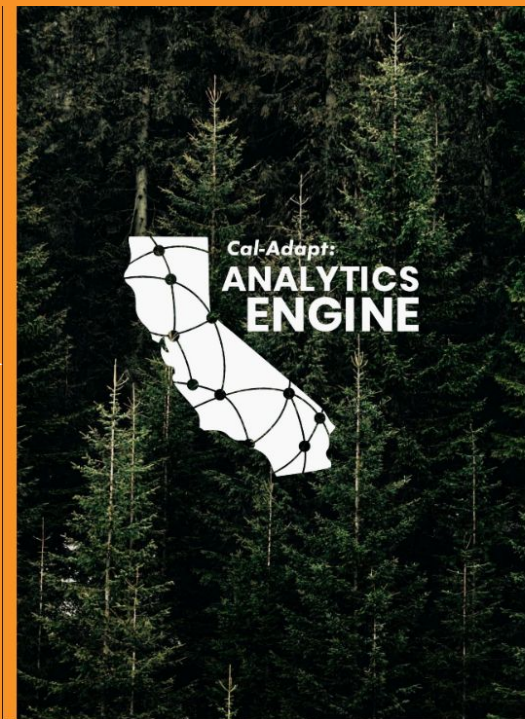


Click on the
slide to check
out the whole
presentation!



Presented by Nancy Freitas at AGU 2023

Click on the slide to check out the whole presentation!



Enabling Evidence-Based Decision-Making for a Resilient Energy Sector in California

AGU 2023 Fall Meeting SY24A-07

Primary funding provided by the California Energy Commission

Presented by Grace Di Cecco, PhD
Postdoctoral Researcher, Eagle Rock Analytics

analytics.cal-adapt.org/

Presented by [Grace Di Cecco](#) at AGU 2023



When knowledges and perspectives collide

Kripa Jagannathan

Nancy Freitas, Smitha Buddhavarapu,
Andrew Jones, HyperFACETS project team &
Cal-Adapt Analytics Engine Team

GC21C: Multisector Dynamics: Science and
Modeling for Societal Transformation I Oral
Dec 12, 2023



Presented by Kripa Jagannathan at AGU 2023

Click on the
slide to check
out the whole
presentation!

Project Priorities

Key focus areas for the Analytics Engine team.



Build SCE Pilot Notebook

Develop a notebook for Southern California Edison in which they can pull gridded data and begin supporting IOU CAVA proceedings.



ClimaKitAE Documentation

Develop findable, accurate, clear, and comprehensive ClimaKitAE information that users need and want, with channels for contributions.



Incorporate GWL

Incorporate global warming levels (GWL) into notebooks as an alternative method for grabbing time-based data and guidance on how to translate a user's time-based analysis to a warming level-based analysis.



Guidance to Notebook Materials Sync

Reiterate key messages from the guidance materials and principles into the notebooks by demonstrating realistic implementation, in addition to having the guidance materials reference specific notebooks as examples for users to work hands-on with concepts.



Where We Are Now



15 Jupyter Notebooks

- Step-by-step functionality to access, analyze, and plot climate data available on the Analytics Engine
- Additional notebooks in development



18 Project Team Priorities

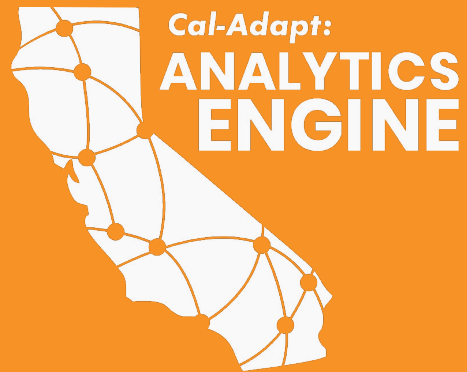
- Internal and external project priorities identified and established by the team for the next year of activities



3 Sections of Guidance

- [Analytics](#), [Data](#), and [Guidance](#)
- New sections of guidance developed by the Analytics Engine team on how to best utilize the climate data and analytics within the platform
- Additional guidance in development

Coming Soon



- This project has been extended under the California Energy Commission for another two years!
- Upcoming notebooks
 - Uncertainty Education
 - Multivariate Localization
 - Renewables
- You can contact us at: analytics@cal-adapt.org
- For more information, check out our website: <https://analytics.cal-adapt.org/>