

## DOCKETED

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<b>Filer:</b>	Timothy Smith
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# Current EPIC Research Portfolio on Climate Change Science and Proposed Strategy for the 2018-2020 EPIC Triennial Investment Plan

Susan Wilhelm, Energy Generation Research Office,  
Energy Research and Development Division

Staff Workshop on Actionable Climate Science for the  
Electricity and Natural Gas Sectors

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## Outline

- **Scope** of EPIC-funded climate science research
- **Current portfolio** (climate science)
- **Proposed draft research initiatives**, 2018-2020 plan

*We encourage & need your feedback on our research initiatives.*



## Scope of EPIC-funded climate science research

- Contribute to **deep reductions of GHG emissions** from the electricity system while informing the deployment of an energy system that is **less vulnerable to climate impacts**
- Illuminate **interconnectedness** between electricity sector and other systems (e.g., water, emergency response) and ensure a coherent approach across sectors
- Produce **actionable results** and undertake, where needed, additional research to tailor results (e.g., tools) to inform operations and planning



## Past & Ongoing EPIC Projects (climate change)

**CLIMATE PROJECTIONS & PROBABILISTIC FORECASTING:** Development of regional climate models and empirical data and to enhance energy sector management.

**VULNERABILITY AND RESILIENCE TO CLIMATE CHANGE AND WEATHER-RELATED EXTREMES:** Explore electricity sector vulnerability to phenomena that may be exacerbated by climate change, e.g., extreme heat, drought, floods, wildfire, and urban heat islands.

**LONG-TERM SCENARIOS FOR THE ENERGY SECTOR:** Study of resilient energy scenarios compatible with 2030, 2050 climate goals.

**INTEGRATING CLIMATE READINESS INTO THE ELECTRICITY SYSTEM:** Characterizing barriers to adaptation, investigating system interconnectedness in relation to resilience, visualizing and delivering results via Cal-Adapt (<http://cal-adapt.org/>) to support energy sector decision-making.



## EPIC Third Investment Plan: General Outline (DRAFT)

1. Advance Technology Solutions for Deep Energy Savings in Building and Facilities
2. Accelerate Widespread Customer Adoption of Distributed Energy Resources
3. Increase System Flexibility from Low-Carbon Resources
4. Increase the Cost-Competitiveness of Renewable Generation
5. Create a Statewide Ecosystem for Incubating New Energy Innovations
6. Maximize Synergies in the Water-Energy-Food Nexus
7. **Develop Tools and Analysis to Inform Energy Policy and Planning Decisions**
  - 7.1 *Identify Pathways for Achieving California's Energy and Climate Goals*
  - 7.2 *Increase the Resiliency of the Electricity System to Climate Change and Extreme Weather Events*
8. Catalyze Clean Energy Investments in California's Disadvantaged Communities



## Subtheme 7.2

### *Increase the Resiliency of the Electricity System to Climate Change and Extreme Weather Events*

**Improved Understanding of Climate- and Weather-Related Risks and Resilience Options** (*initiative 7.2.1*)

**Clarify Interactions Between Renewable Electricity Systems and Climate Change to Ensure an Effective, Resilient Transition to Low-Carbon Energy in California** (*initiative 7.2.2*)

**Integrate Climate Readiness into Electricity System Operations** (*initiative 7.2.3*)



## 7.2.1. Improved Understanding of Climate- and Weather-Related Risks and Resilience Options

Develop next generation of projections, including additional parameters essential to electricity sector operations and planning, and investigate climate-related risks to infrastructure and operations with sufficient detail to inform action.

### *Examples of potential research under this initiative:*

- As requested by IOUs, develop **projections of hydrological and meteorological parameters** required for adaptation of operations and planning, leveraging evolving Global Climate Models as well as an innovative downscaling method (*under development*\*) that combines best features of statistical and dynamical models.
- Develop **probabilistic forecasts to inform operations and infrastructure-related decisions** in a manner resilient to changes in atmospheric rivers, regional heat waves, coastal fog, and other phenomena.

\* Ongoing EPIC-funded research grant: *Advanced Statistical-Dynamical Downscaling Methods and Products for California Electricity System Climate Planning*, University of California, San Diego, Scripps Institution of Oceanography.



## 7.2.2. Clarify Interactions Between Renewable Electricity Systems and Climate Change to Ensure an Effective, Resilient Transition to Low-Carbon Energy in California

Investigate how regional climate change may change the availability and distribution of wind, solar resources, and biomass in California.

*Examples of potential research under this initiative:*

- Use climate scenarios developed by prior initiative to analyze how renewable sources of electricity could be affected through impacts on parameters such as peak wind speeds, solar irradiation, and cloud cover.
- **Provide essential input into long-term energy scenarios (7.1)** that portray cost-effective paths to meeting 2030 and 2050 goals as well as resilience imperatives



### 7.2.3. Integrate Climate Readiness into Electricity System Operations

*Address further gaps between development of “actionable” science and actual use of improved technical knowledge, including development of tools and consideration of interconnections between electricity and other systems.*

*Examples of potential research under this initiative:*

- **Develop tools to enable direct use of research results** (via Cal-Adapt\*) for seasonal management (e.g., outlook for atmospheric rivers, probabilistic seasonal forecasts) and long-term electricity sector planning.
- Clarify electricity sector **vulnerabilities associated with interconnections** to other systems and suppliers (*responding to 2016 Integrated Energy Policy Report*).

\* Cal-Adapt is California’s interactive website for visualizing climate-related risks. Please see our publicly available beta-site for the latest data: [beta.cal-adapt.org](https://beta.cal-adapt.org)



Subtheme 7.1

*Identify Optimal Pathways for Achieving  
California's Energy and Climate Goals*

**Integrated Pathways for Energy Futures: Tools and Science-Based  
Research for Holistic Energy Decision Making (*initiative 7.1.1*)**

**Applied Social Science Research to Inform Technology Development  
and Adoption for Deep Decarbonization of the Energy System (*initiative  
7.1.2*)**



## 7.1.1. Integrated Pathways for Energy Futures: Tools and Science-Based Research for Holistic Energy Decision Making

Integrate knowledge regarding promising energy technologies, policy imperatives, and climate resilience to prioritize contributions to deep GHG emissions reductions.

### *Examples of potential research under this initiative:*

- Coordinate other initiatives to **rigorously consider effects of climate change** and interactions between the water and energy sectors.
- Provide additional site-specific analyses of **how electrification could affect local demand and resources as well as equity issues** (*a study funded by a forthcoming RFP will be described later this session, but additional studies are needed*)
  - potential costs and benefits of electrification for disadvantaged and low income communities
  - electrification of energy services (e.g., transportation) can substantially reduce exposures to air pollutants such as particulate matter and ozone



## 7.1.2. Applied Social Science Research to Inform Technology Development and Adoption for Deep Decarbonization of the Energy System

**Viability of technology solutions depends on user adoption and effective use.**

*Examples of potential research under this initiative:*

- Behavioral research to facilitate penetration of technically, environmentally, and economically sound energy efficiency programs and adoption of other energy technologies.

*Research in this area could require:*

- Implementation via interdisciplinary teams to minimize the problem of not considering the new advances in economics and social sciences in technology development and deployment.



## Seeking Feedback from You:

1. Are these the right research initiatives?
  2. How can we make our research actionable?
- Discussants will respond following presentations
  - Public comments today at 4.30
  - Accepting written comments\*\* to the 17-EPIC-01 docket:  
<https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=17-EPIC-01>

\*\* deadline for written comments: 5 PM, Thursday March 23



# Thank you

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