
# SECOND EPIC POLICY + INNOVATION FORUM REPORT

## EPIC POLICY + INNOVATION COORDINATION GROUP

**OCTOBER 2021**

This report was completed by The Accelerate Group, a consultant to the California Public Utilities Commission and the Project Coordinator for the Electric Program Investment Charge (EPIC) Policy + Innovation Coordination Group. The information herein was collected and summarized by the Project Coordinator, with input from members of the EPIC Policy + Innovation Coordination Group, and does not reflect an official position of the California Public Utilities Commission.

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# FORUM SUMMARY

The California Public Utilities Commission (CPUC) held its second Electric Program Investment Charge (EPIC) Policy + Innovation Forum on October 28, 2021, to better connect ratepayer-funded research, development, and deployment (RD&D) projects with current and emerging California policy priorities.

The forum brought together RD&D project leaders, CPUC and California Energy Commission CEC Commissioners and staff, and other stakeholders to discuss near-, medium-, and long-term energy policy directions for the state of California, and the technology RD&D implications of those policy directions. The forum also offered a preview of the CPUC's new public database containing more than 60 searchable data fields for hundreds of EPIC RD&D projects.

EPIC is the largest state-level public interest electricity RD&D program in the nation, driving investments in emerging technologies to ensure the state's energy policy goals are achieved. The CPUC created the Policy + Innovation Coordination Group to support targeted feedback among policymakers and EPIC innovators.

In total, 332 stakeholders participated in the day-long event, including CPUC and CEC staff and Commissioners; RD&D project leaders; utilities; technology solution providers; researchers; and community representatives.

# BACKGROUND

## What is the Policy + Innovation Coordination Group?

The California Public Utilities Commission (CPUC) oversees and monitors the implementation of the ratepayer-funded Electric Program Investment Charge (EPIC) research, development, and deployment program. For EPIC funds from investment periods 1 (2012-2014), 2 (2015-2017), and 3 (2018-2020), there are four program administrators: the California Energy Commission (CEC), Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E).

In Decision 18-10-052, the CPUC established the Policy + Innovation Coordination Group (PICG) — comprised of a Project Coordinator, the four Administrators, and the CPUC — to increase the alignment of EPIC investments and program execution with CPUC and California energy policy needs.

## First EPIC Policy + Innovation Forum

The CPUC held its first EPIC Policy + Innovation Forum on February 18, 2021, to better connect energy research, development, and deployment (RD&D) projects with current and emerging policy issues. The Forum's goal was to highlight the results of the PICG's collaboration on equity, wildfire mitigation, transportation electrification, and utility Public Safety Power Shutoff RD&D projects.

Panelists and participants in the Forum shared direct experiences from RD&D projects regarding policy obstacles to new and emerging technology adoption, discussed ways to use these lessons to inform ongoing and upcoming CPUC proceedings, and identified new opportunities for coordination and collaboration to accelerate energy innovation.

More information on the EPIC PICG and the 2020 workstreams can be found at: www.epicpartnership.org.

## Presentations & Panelists

| Presenter / Panelist | Organization |
|---|---|
| Commissioner Martha Guzman Aceves | California Public Utilities Commission |
| Commissioner Clifford Rechtschaffen | California Public Utilities Commission |
| Chair David Hochschild | California Energy Commission |
| Commissioner Andrew McAllister | California Energy Commission |
| Jack Chang, Analyst | California Public Utilities Commission |
| Abhilasha Wadhwa, Analyst | California Public Utilities Commission |
| James McGarry, Analyst | California Public Utilities Commission |
| Ed Pike, Utilities Engineer | California Public Utilities Commission |
| Andrew Barbeau, The Accelerate Group | EPIC PICG Project Coordinator |

# WELCOME AND KICKOFF

10:00 AM – 10:15 AM

**Commissioner Martha Guzman Aceves**
California Public Utilities Commission

**Chair David Hochschild**
California Energy Commission

**Commissioner Clifford Rechtschaffen**
California Public Utilities Commission

## Summary

CPUC Commissioner Martha Guzman Aceves, CEC Chair David Hochschild, and CPUC Commissioner Clifford Rechtschaffen kicked off the event with an overview of the role of RD&D in accelerating innovation and enabling the achievement of the state's clean energy goals. The speakers highlighted the challenges in seeking to decarbonize the state's grid, buildings, and transportation.

Commissioner Guzman Aceves described the work of the PICG during 2020 and 2021 and highlighted the role of RD&D in finding clean energy solutions. Chair Hochschild emphasized the need to accelerate work on climate solutions. Commissioner Rechtschaffen described the urgent need to accelerate carbon emissions reductions in the forum's three focus areas: buildings, the grid, and transportation.

# EPIC BACKGROUND, PICG OVERVIEW

10:15 AM – 10:55 AM

**Jack Chang, Regulatory Analyst, Climate and Equity Initiatives**
California Public Utilities Commission

**Andrew Barbeau**
EPIC PICG Project Coordinator

## Summary

Jack Chang, an Analyst in the CPUC Energy Division focused on Climate and Equity Initiatives, provided an overview of the EPIC program and the efforts of the PICG to increase coordination, collaboration, and transparency in the state's electricity RD&D investments.

Andrew Barbeau, Project Coordinator for the EPIC PICG, provided a sneak peek at a new EPIC program-wide database that will be launched in the coming weeks, and will allow the public to gain more insights on projects funded through EPIC.

# BUILDING DECARBONIZATION SESSION

10:55 AM – 11:35 AM

**Abhilasha Wadhwa, Regulatory Analyst, Building Decarbonization**
California Public Utilities Commission

**Commissioner Andrew McAllister**
California Energy Commission

## Summary

Abhilasha Wadhwa, Senior Analyst in the CPUC's Energy Division, discussed the CPUC's recent decisions allocating $200 million in funding for the Building Initiative for Low Emissions Development (BUILD) and Technology and Equipment for Clean Heating (TECH) programs, funding for new and existing building electrification pilots. She also discussed recent changes to energy efficiency programs that support building decarbonization. Abhilasha led a discussion around nine key ideas for accelerating innovation in building decarbonization. CEC Commissioner Andrew McAllister joined the discussion to highlight the areas where the CEC EPIC program work aligns with the presented ideas.

Priority areas for future investment in RD&D that were outlined by Abhilasha and discussed with PICG Administrators and participants included:

- **Variable-speed heat pumps**: Abhilasha explained that this technology is available but has not become a market standard. She proposed RD&D to support testing to understand the efficiency of this technology and develop a proof-of-concept model for demand response aggregation of variable speed inverter units.

- **High-volume hot water & natural refrigerant heat pumps**: Abhilasha mentioned that there is only one established manufacturer in this space but the technology is not a market standard for heat pumps. She emphasized that work can be done on market awareness for

natural refrigerant water heaters, proof of concept for mass deployment, and further understanding of energy modeling in residential (multi-tenant) and commercial applications.

- **Residential all-in-one systems**: Abhilasha described the need to develop and test all-in-one decarbonized residential systems that could enhance resiliency. The described grid independent system included rooftop solar producing onsite hydrogen, which is fed into an energy storage system in the home, as well as electric heating, ventilation, and hot water. Such a system is currently being tested and is available in Europe. Abhilasha recommended that similar all-in-one systems could be piloted and tested in Public Safety Power Shutoff prone areas to understand the technology and the potential for scalability in California markets.

- **Appliance specifications for low-income housing and rehabs**: There is a disconnect between the functional needs of appliances in low-income homes and the current warranty and durability of these appliances. Abhilasha finds that further research can be done in the development of low-maintenance and space-efficient appliances with longer lifespans and in turn help to align tax-credit funded rehabilitation cycles and manufacturer practices.

- **Low GWP refrigerant in appliances**: Abhilasha finds replacing high global warming potential (GWP) refrigerant in appliances can have the largest impact on the building decarbonization sector, and if this is not scaled quickly refrigerants could undo other work being done in this sector. Abhilasha stressed that funding should go to projects that are working to achieve very low or zero potential for contributing to climate change. Virginia Lew from CEC agreed that this is highly important topic area and that the current technologies are not in the desired level of global warming potential and that further strides in RD&D need to be made.

- **Climate resilient buildings:** As wildfires become increasingly prevalent, Abhilasha asserted that the building community needs to change the way that they build and the types of materials they use. She emphasized that fire retardant is not fire resistant and highlighted that further RD&D could be done on fully fire-resistant building materials, with a focus on pilots in high wildfire threat areas.

- **Vehicle-to-Grid (V2G) and Vehicle-to-Building (V2B) retrofits**: A common theme across the day was the potential benefit of electric vehicles (EVs) connecting to the grid. Abhilasha highlighted that older EV and EV charging technology does not allow for bi-directional charging, which allows use of energy stored in an EV's battery to power a building or send it back to the grid. She stressed the importance of developing a simple retrofit solution to older EVs and chargers to easily allow for bi-directional charging. This would not only bring

benefits to the grid, but also benefit low-income and disadvantaged buyers who tend to buy older used vehicles. The CEC highlighted that in their recent solicitation they are looking for retrofit solutions and that there are still challenges with original equipment manufacturers (OEMs), software, hardware, and in charging technologies that need further research to achieve this retrofit solution. PG&E proposed an opportunity for coordination and collaboration between administrators by connecting CPUC and CEC staff with OEMs that support adopting retrofit technologies to help accelerate this technology development and deployment.

- **DC-DC ecosystems:** One of the challenges with full electrification of buildings and homes is that various technologies are either DC- or AC-based. With the pervasiveness of solar photovoltaic and batteries, electrical systems in homes and businesses tend to have some of both, but in conversion between the two there can be significant power losses. To minimize or eliminate these losses, Abhilasha proposes further RD&D into potential solutions for DC to DC only conversions within all technologies from the home. This research could include testing using power directly from solar (DC) to the vehicle (DC), and homes with certain DC-only appliances using backup power from EVs (DC).

- **Quantifying embodied energy in California buildings and products**: The building materials and construction sector equated to ~11% of the global CO2 emissions. Commissioner McAllister stated that as the grid becomes more electrified, that percent could increase to almost 50%. Abhilasha supports RD&D for a statewide calculator to quantify building material and construction CO2 emissions as well as the sector's exact carbon footprint. Both Abhilasha and Commissioner McAllister agreed that this calculator is highly important to accurately quantify the sector's emissions and ensure that all California agencies are using a consistent approach..

# INTEGRATED RESOURCE PLANNING SESSION

12:30 PM – 1:30 PM

**James McGarry,**
**Regulatory Analyst, Integrated Resource Planning**
California Public Utilities Commission

## Summary

James McGarry, an analyst with the CPUC Energy Division, discussed what the CPUC is doing to ensure the electric sector is on track to help California reduce economy-wide greenhouse gas emissions by 40% by 2030, and achieve 100% renewable and zero carbon electricity by 2045. James discussed how the CPUC models the state's resource needs and described how the CPUC is seeking to gain data from RD&D leaders to incorporate new technology types into their models such as clean firm generation, long-duration energy storage, and load flexibility.

James said the CPUC is looking for essential input from RD&D leaders, companies, and other stakeholders to build out its models for planning purposes and requested insights from RD&D and technology development efforts that the CPUC should be incorporating into its modeling (such as updated cost projections of such resources, or new operational characteristics of resources).

Specifically, James emphasized that the CPUC would benefit from high quality data for candidate resources that could optimize proposed renewable buildout, and that this data could flow into anticipated updates to Integrated Resource Planning (IRP) modeling inputs and assumptions in proceeding R.20-05-003. James requested that any data would be needed through around Q2 2022. After that, the next opportunity to submit candidate resource data would likely be in the next IRP proceeding cycle in early 2024.

James stated that further RD&D could help to produce resource potential, cost, and operating characteristic data for the following technology areas and emerging technologies. All of these technologies will not necessarily be added as candidate resources in subsequent IRP cycles. But they are examples of technologies that are not currently characterized in IRP modeling that could potentially be added in the future if sufficient data was made available.

- **Clean firm generation**, including but not limited to:
    - Enhanced geothermal

    - Small modular nuclear
    - Natural gas with carbon capture sequestration
    - Bioenergy with carbon capture sequestration
    - Zero carbon fuels
- **Long duration storage**, including but not limited to:
    - Adiabatic compressed air energy storage
    - Long duration iron air battery
    - Hydrogen as seasonal storage
    - Synthetic natural gas as seasonal storage

- **Load flexibility and shift demand response**, including but not limited to:
    - Managed V2G and EVs
    - Flexible heat pumps

During the discussion, long-duration energy storage was further explored by both CPUC staff and Mike Gravely from the CEC. Mike mentioned that not many companies have been identified that can provide 10-30 MW of storage at durations for what is considered long duration storage. More research is needed within this space and more manufacturers need to be identified who can test longer durations of storage, while keeping in mind supply chain constraints on lithium ion.

James mentioned that long duration storage modeling capabilities are limited. Currently, the only long duration storage type in the CPUC's IRP modeling is 12-hour pumped storage, demonstrating the value of gaining additional quality performance data and market potential data for this technology segment.

As a continual theme throughout the day, speakers stated that EVs could be a potential solution for loading shifting and flexible demand response. Knowing the EV adoption rate and potential role that these sources could provide to the grid, James indicated that he would also like to see good operational and cost data for using aggregated quantities of EVs for load shifting or flexible demand response.

# TRANSPORTATION ELECTRIFICATION SESSION

1:30 PM – 2:35 PM

**Ed Pike**, **Senior Utilities Engineer, Transportation Electrification**
California Public Utilities Commission

## Summary

Ed Pike, Senior Utilities Engineer with the CPUC Energy Division, led a discussion exploring what activities stakeholders think are the most important in the next three to five years to expand EV technologies and get them to market.

Ed emphasized a point that was made throughout the day and across the presentations, that Vehicle-to-building (V2B) and Vehicle-to-grid (V2G) technologies and services are critical areas for RD&D to contribute to grid support and reliability services. V2B and V2G services allow EVs to both charge from the grid and to supply electricity to buildings and/or the grid during times of high system-wide or local distribution-level energy demand, during power outages, and/or to provide grid services. Ed highlighted that most EVs on the market today do not support providing building backup power or grid services. More work needs to be done to encourage deployment of EVs and EV chargers with bi-direction charging capabilities.. Ben Wender with the CEC highlighted that the CEC is aligned with the CPUC on this issue and agreed that V2B is an area where more research needs to be done. He said the CEC has an open solicitation for V2B R&D and that retrofit solutions could be included in that solicitation.

Another critical area that Ed Pike mentioned is how automated load management of EV charging can be used to reduce electric system upgrades, due to concerns about how EVs may impact the distribution grid as all sectors become electrified. Ed described the need for additional data on the use of Advanced Load Management technology for medium- and heavy-duty EV fleets or high-capacity charging to manage load serving EV charging ports, and to record data on the potential grid impacts and benefits. Ed explained that, as of now, the CPUC finds automated load management is critical to reduce these system upgrades but less experience is available for medium and heavy-duty vehicles compared to light duty vehicles. .

Ed provided his assessment that some examples of areas with high needs for RD&D include electrification of, drayage trucks, off-road vehicles, and bi-directional charging using AC charging ports.

During the discussion period, EPIC Program Administrators mentioned several ways to prompt coordination and collaboration among stakeholders and administrators. These included:

- Partnering with OEMs and universities to evaluate the second life of EV batteries and potential use cases as storage.
- Evaluating and optimizing autonomous medium/heavy duty delivery vehicle routes to minimize load impacts and charging requirements.
- Researching ways to reduce losses with DC-AC-DC conversions.
- Collaborating with trucking industry to co-locate high-capacity charging with distribution substations and renewable generation.

# APPENDICES

## Video Recording:

## EPIC Background Presentation:

https://www.epicpartnership.org/resources/CPUC_Chang_PICG_Forum_Presentation.pdf

## Building Decarbonization Session Presentation:

https://www.epicpartnership.org/resources/CPUC_Wadhwa_PICG_Forum_Presentation.pdf

## Integrated Resource Planning Session Presentation:

https://www.epicpartnership.org/resources/CPUC_McGarry_PICG_Forum_Presentation.pdf

## Transportation Electrification Session Presentation:

https://www.epicpartnership.org/resources/CPUC_Pike_PICG_Forum_Presentation.pdf

## Integrated Recourse Planning Inputs and Assumptions:

ftp://ftp.cpuc.ca.gov/energy/modeling/Inputs%20%20Assumptions%202019-2020%20CPUC%20IRP%202020-02-27.pdf

More information on the EPIC Policy + Innovation Coordination Group and the Forum can be found online at www.epicpartnership.org.