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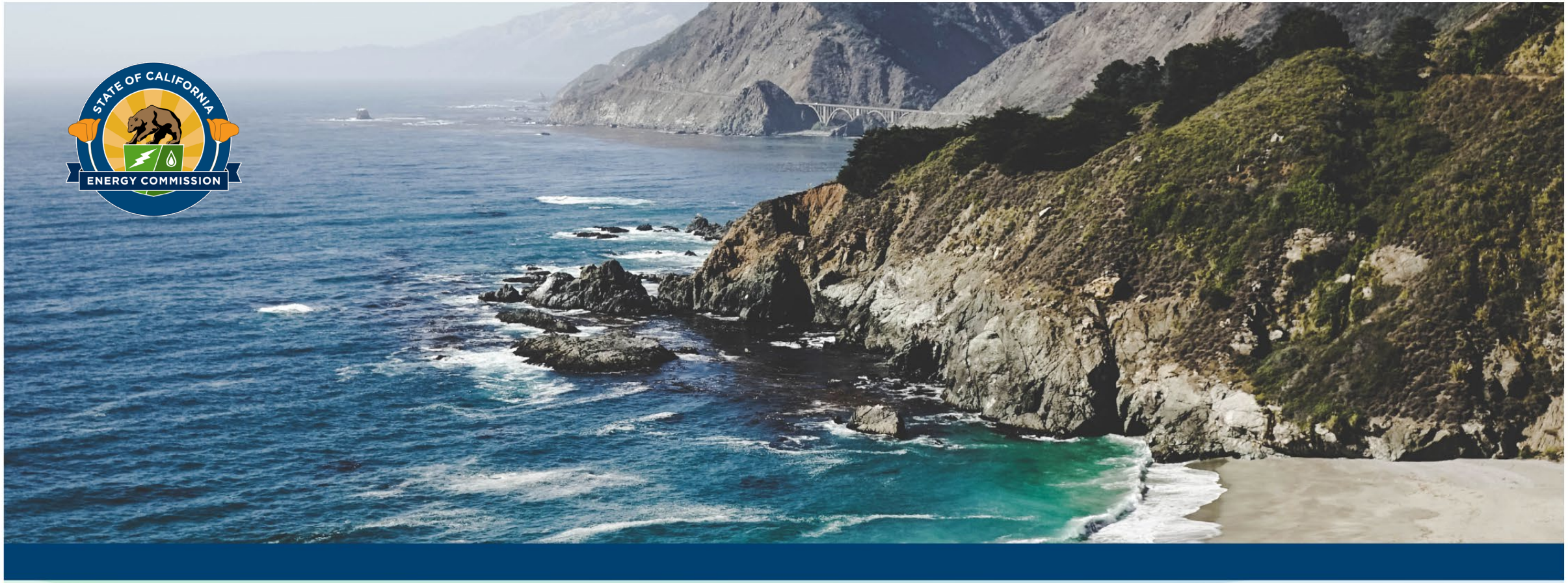


California Energy Commission

Title: Electric Program Investment Charge (EPIC) Interim Investment Plan, Staff Workshop

Presenters: Energy Research and Development Division Staff

Date: January 6, 2021

Agenda

Time	Item
1:30 pm	Welcome, Announcements, Meeting Overview, Interim Plan Background (Misa Werner)
1:35 pm	Opening Comments from Vice Chair Janea A. Scott
1:45 pm	Introduction: EPIC Background, Interim Plan Approach, Research Themes (Laurie ten Hope)
2:00 pm	Draft Research Initiatives (Virginia Lew, Mike Gravely, Jonah Steinbuck, Erik Stokes)
3:30 pm	Questions and Public Comment
4:30 pm	Adjourn

Announcements

- This workshop is being recorded and will be posted online.
- Participants will be muted during the presentation. Please type your questions in the Q&A window.
- Interim Plan documents and workshop materials, including this presentation, will be posted at: https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-EPIC-01
- Sign up for updates on the “EPIC” Listserve: https://ww2.energy.ca.gov/listservers/index_cms.html

We Want to Hear From You!

Please take the 1-Minute Survey to help us track demographic participation.

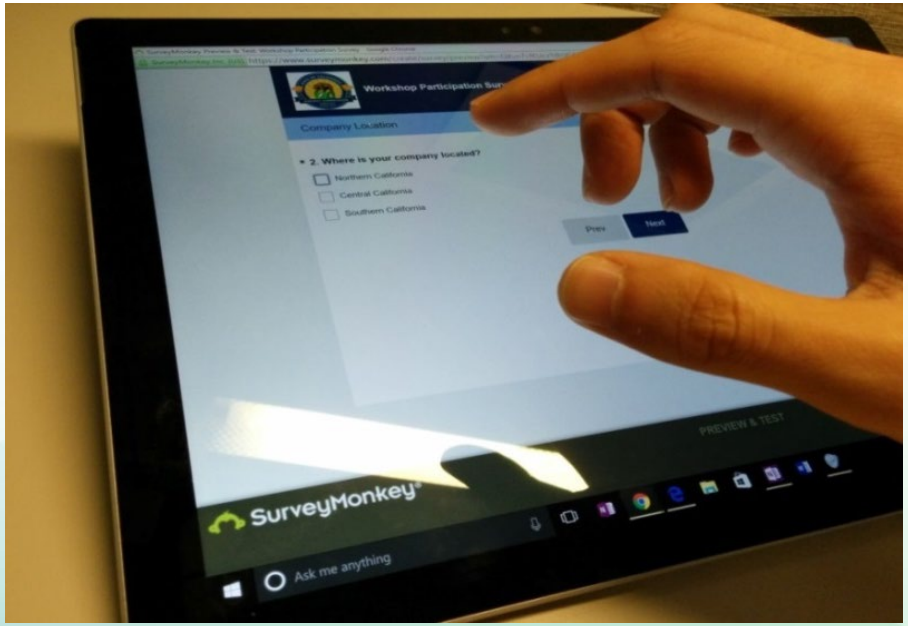
Responses are anonymous.

The information will help us enhance outreach.

Please use this link:
https://www.surveymonkey.com/r/01-06-2020

(See chat window during workshop.)

Thanks!



EPIC Interim Investment Plan Background

- The EPIC Program was initially authorized by the California Public Utilities Commission (CPUC) until December 31, 2020.
- In 2019, the CPUC initiated a 2-phased proceeding to renew EPIC Program funding.
- In **Phase 1**, completed September 2, 2020, the CPUC:
  - renewed the EPIC Program for 10 years, requiring two, 5-year investment cycles,
  - approved the CEC as a continued program administrator, and
  - authorized a budget of $147.26 million per year for the first investment cycle of January 1, 2021 through December 31, 2025 ("EPIC 4") to be implemented *after CPUC approval.*
- The EPIC 4 Investment Plan is due in October 2021, with approval expected early **2022**.
- Approval of a 1-year Interim Investment Plan ("Interim Plan") would provide bridge funding needed to maintain research momentum integral to reaching clean energy goals, benefiting ratepayers, and supporting economic recovery.

Interim Plan Schedule

- Disadvantaged Communities Advisory Group (DACAG) EPIC subcommittee meeting: 12/7/20
- Draft Interim Research Initiatives reviewed by CPUC staff: 12/14/20 - 12/21/20
- Public Release of Draft Interim Research Initiatives: 1/4/21
- Public workshop: 1/6/21
- **Written public comments due: 1/19/21**
- Review and edit draft plan based on public comments: 1/19/21 - 1/31/21
- Prepare final draft and submit to CPUC ~ early-February 2021
- Anticipated CPUC public comment period ~ 2 weeks
- Request CPUC Decision on EPIC Interim Investment Plan ~ Late-March 2021
- Anticipated EPIC 4 investment planning begins ~ April/May 2021

Opening Comments: Vice Chair Janea A. Scott

EPIC Background

The EPIC Program was established by the CPUC in 2011 to fund technology research to support California in meeting its clean energy goals, with a focus on providing ratepayer benefits, including reliability, lower costs, and safety. Research is driven by state energy and climate policies.

- Achieve a decarbonized electricity system and economy by 2045

- Lower energy burden and support vulnerable communities

- Increase responsiveness of customers and the grid in the face of risks

CALIFORNIA'S INVESTMENT IN CLEAN ENERGY INNOVATION

EPIC is California's premier public interest research program investing over $130 million annually to unleash innovation.

Entrepreneurial Ecosystem

$143 million invested

Through EPIC, the CEC is building a world-class ecosystem supporting clean energy entrepreneurship.

Resiliency & Safety

$106 million invested

Helping communities, businesses, and public agencies build a safer, more resilient energy system.

Building Decarbonization

$170 million invested

Improving the affordability, health, and comfort of buildings.

Grid Decarbonization & Decentralization

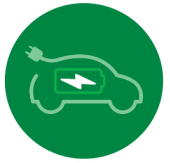
$154 million invested

Improving the cost competitiveness and performance of key technologies.

Industrial & Agricultural Innovation

$113 million invested

Scaling specialized technology solutions to drive energy efficiency without compromising production.



Transportation Electrification

$33 million invested

Supporting advances that reduce the cost of electric vehicle ownership and support the grid.

**Total investment, 2012-2019*

Benefiting All Californians

- A minimum of 25% of EPIC demonstration funding must be invested in disadvantaged communities and an additional 10% in low-income communities.
- To date, **65%** of EPIC demonstration funding occurred in disadvantaged or low-income communities.
    - Project selection criteria now consider localized health impacts & project benefits.
    - Solicitations require inclusion of community-based organizations (CBOs) as paid project partners who expand community engagement by deepening relationships through traditional and digital methods.
    - Empower Innovation Tool: Provides curated resources to connect under-resourced (e.g., disadvantaged, low-income & Native American tribes) communities with clean energy resources and accelerate the build out of our energy future. www.empowerinnovation.net

Interim Plan Approach and Guiding Principles

- EPIC Interim Plan covers year one (2021) of the full EPIC 4 Plan.

- Key criteria shaping Interim Plan research initiatives:
  - Addresses key state policy priorities
  - Near-term importance to the state
  - Builds on stakeholder-vetted EPIC 3 Investment Plan
  - Supports under-resourced communities

- Full EPIC 4 Plan: planning more diverse set of research initiatives informed by additional stakeholder outreach

Interim Plan Research Themes

- **Decarbonization**
  - Reduce GHG emissions and use of fossil fuels
- **Resilience and Reliability**
  - Manage through and recover from *large-area or long-duration outages.*
  - Reduce the frequency or impact of *small-scale or short-duration disruptions* in electric service.
- **Entrepreneurship**
  - Support clean energy entrepreneurs developing breakthrough technology solutions from idea to market

Approach to Equity

- Build on lessons learned from meetings, workshops, past research projects, project technical advisory committees, DACAG, and recent equity-related reports.
- Several proposed initiatives are outgrowths of projects that have been articulated as under-resourced community priorities and will include dedicated funding.
- Continue CEC's four-pronged Equity Strategy:
  - Increase awareness of EPIC and the opportunities it provides;
  - Encourage technology/project developers to seek out projects in under-resourced communities;
  - Scope many solicitations around specific issues facing under-resourced communities; and
  - Embed equity in clean energy entrepreneurship.
- Empower active community-based organization (CBO) engagement:
  - Applications must consider localized health impacts and project benefits.
  - Solicitations require inclusion of CBOs as paid project partners.
  - Empower Innovation Events planned for Spring 2021
- CEC plans to escalate equity engagement for the full EPIC 4 Investment Plan.

Draft Research Initiatives

Research Initiative	Decarbonization	Resilience & Reliability	Entrepreneur-ship
1. Advanced Prefabricated Zero-Carbon Homes	X	X	
2. Energy Efficiency and Demand Response in Industrial and Commercial Cold Storage	X	X	
3. Energy Efficiency and Load Shifting in Indoor Farms	X	X	
4. Optimizing Long-Duration Energy Storage to Improve Grid Resiliency and Reliability in Under-resourced Communities	X	X	
5. The Role of Green Hydrogen in a Decarbonized California—A Roadmap and Strategic Plan	X	X	
6. Valuation of Investments in Electricity Sector Resilience		X	
7. Vehicle-to-Building Technologies for Resilient Back-up Power	X	X	
8. Offshore Wind Energy Technologies	X	X	
9. Entrepreneurial Ecosystem	X	X	X

1. Advanced Prefabricated Zero-Carbon Homes

- **Description**:
  - Develop, design and build zero- or near zero-carbon, cost-effective, prefabricated homes that could include the following:
    - Meet or exceed the 2019 CA Building Energy Efficiency Standards
    - Be all electric
    - Be fire-resilient
    - On-site or near-site solar PV
    - On-site or near-site stationary storage
    - Price point below the median construction price per ft^2 for comparable buildings
- **Goal**: Increase efficiency, affordability, fire resiliency, and energy resiliency through energy-efficient design and technologies, solar PV, and storage.
- **Equity Considerations**: All homes would be built and deployed in under-resourced communities.

Technical Approach for Initiative 1

- **Approach**
  - Partner with prefab home builders to design and construct homes
  - Potential project team members: community-based organizations; state, local, and tribal governments; utilities; and financial stakeholders
- **Metrics and Performance Indicators**
  - # builders that adopt methods
  - # zero-carbon prefabricated home models with fire- and energy-resilient design features
  - # high-performance, affordable prefabricated homes placed in under-resourced communities
- **Anticipated Impact**
  - Potential to be a model for prefabricated home builders to construct zero-carbon homes at an affordable price for under-resourced community residents
  - Encourage diffusion into utility incentive programs, codes, and standards

2. Energy Efficiency and Demand Response in Industrial and Commercial Cold Storage

- **Description**: Develop and deploy advanced cold storage technologies to increase efficiency, cost-effectiveness, and demand response (DR) participation. Example technologies:
  - Artificial Intelligence-based software, controls, and energy management systems
  - Advanced coatings to reduce defrost cycle times
  - Innovative moisture control to reduce cooling load
  - Low global warming potential refrigerant
  - Thermal energy storage and controls to enable grid flexibility and participation in DR programs
- **Goal**: Demonstrate advanced innovative technologies for cross-cutting applications to improve energy efficiency, reduce greenhouse gas (GHG), and provide grid flexibility.
- **Equity Considerations**: Encourage demonstrations in under-resourced communities to reduce energy consumption, operation and maintenance costs, and improve job opportunities.

Technical Approach for Initiative 2

- **Approach**
  - Demonstrate and deploy innovative energy efficiency technologies at both industrial-scale cold-storage facilities and small businesses/grocers with cold storage.
  - Demonstrate approaches to enable and increase DR participation.
  - Perform tech transfer and disseminate knowledge on retrofits to increase adoption.
- **Metrics and Performance Indicators**
  - Electricity savings (>15%)
  - DR potential of >20% of the facility's electrical load
  - Reduce maintenance costs (>10%)
  - Simple payback periods of less than 5 years
- **Anticipated Impact**
  - Decreased energy costs for facilities
  - Provide grid flexibility across cold-storage facilities.

3. Energy Efficiency and Load Shifting in Indoor Farms

- **Description**: Demonstrate technological advancements for energy efficiency and load-shifting operations in indoor farms. This includes conversion of existing buildings to indoor farms and retrofits of existing greenhouses.
- **Goal**: Demonstrate potential for cost-effective growing of high-value crops (berries, fruits, herbs, etc.) in indoor farms to:
  - Reduce energy and water use
  - Promote food security
  - Revive vacated/abandoned buildings by converting into indoor farms
  - Reduce energy and costs associated with transport and distribution
- **Equity Considerations**:
  - All demonstrations will be in under-resourced communities.
  - Priority consideration given to projects that:
    - Improve economics of indoor farms in under-resourced communities
    - Retrofit empty warehouses or commercial buildings in under-resourced communities that could create local jobs and serve as a template for other development projects
    - Develop teaching and educational tools to disseminate knowledge to other indoor growers

Technical Approach for Initiative 3

- **Approach**
  - Demonstrate pre-commercial or underutilized technologies for the major energy-consuming systems, such as lighting, HVAC, and water reuse
  - Demonstrate energy savings and electric load shifting of individual and the suite of technologies
  - Develop an open-source technological platform (layout, equipment, operations, etc.) integrating best practices of energy and water conservation
- **Metrics and Performance Indicators**
  - Electricity savings (10%) and water savings (15%) versus baseline indoor farm
  - Load shifting of at least 20% of the facility's electrical load based on grid needs
  - Higher yields (10-15%) per unit of energy, area, and water
  - Simple payback for the package of demonstrated technologies under five years
- **Anticipated Impacts**
  - Reduction in energy use and increased potential for load reduction
  - Enabled conversion of abandoned buildings into indoor farms

4. Optimizing Long-Duration Energy Storage to Improve Grid Resiliency and Reliability in Under-resourced Communities

- **Description**: Demonstrate increased resiliency and reliability of clean long-duration energy-storage systems to critical facilities in under-resourced communities.
  - Demonstrate resiliency during grid outages and public safety power shutoff (PSPS) events.
  - Couple smart inverters, energy management systems, or a microgrid controller with storage, and document performance needs for critical loads while minimizing cost.
  - Clean alternative to back-up diesel generators and ability to “ride out” PSPS events and other grid power-loss events.
  - Operate during grid outages that last 24-36 hours.
- **Goal**: Increase customer resilience and reliability in under-resourced communities and demonstrate how these facilities can rely on clean renewables and energy storage to protect the community during unexpected grid outages.
- **Equity Considerations**: Projects will be sited in and targeted to the needs of under-resourced communities with high risk factors of power outages.

Technical Approach for Initiative 4

- **Approach:**
  - Build on seven energy-storage R&D projects that will demonstrate 10 hours or more of energy-storage duration.
  - Provide 14-16 hours of protection and as much as 24-36 hours with a renewable system like solar.
  - Demonstrate at least 24 hours of “ride-through” coverage for facilities and provide necessary services to residents.
- **Metrics and Performance Indicators:**
  - Survey community on performance in meeting critical loads for time required.
  - Measure the repeatable ability to provide 24 hours continuous and uninterrupted back-up protection to critical facilities during an actual or simulated power outage event.
  - Compute the polluting emissions eliminated compared to fossil-fuel alternatives.
- **Anticipated Impact:**
  - Demonstrate increased customer resilience and reliability in under-resourced communities with high risk factors of power outages and demonstrate how these facilities can rely on clean renewables and energy storage to protect the community during unexpected grid outages.

5. The Role of Green Hydrogen in a Decarbonized California—A Roadmap and Strategic Plan

- **Description**: Analyze green hydrogen and make recommendations on its role in meeting the zero-carbon goals of SB 100 by 2045.
  - Green hydrogen is a technology that can play a key role in the carbon-free energy sector.
  - Fundamental questions to be explored before committing significant research investments include:
    - How much of the energy-storage capability should green hydrogen meet?
    - What are the highest value uses of green hydrogen?
    - Does the success of green hydrogen in one sector influence potential success in another sector?
- **Goals:** Research the possible applications and uses of green hydrogen. Assess how green hydrogen can become a key technology to help California meet future planned decarbonization goals, especially in sectors with few other viable options.
- **Equity Considerations**: Hydrogen energy systems may both reduce the need for, and provide an alternative to, diesel-fueled generators, improving air quality and public health.

Technical Approach for Initiative 5

- **Approach**
  - Consolidate existing research plans and documents addressing uses and applications of green hydrogen.
  - Evaluate how much of the energy storage capability planned for the state, including seasonal storage can be met by green hydrogen.
  - Evaluate the synergistic impact of multiple sectors transitioning to green hydrogen.
- **Metrics and Performance Indicators**
  - Compare cost, life expectancy and performance of green hydrogen systems with alternative long-term and seasonal energy storage technologies.
  - Assess the synergistic impact on cost, infrastructure, and availability of green hydrogen technology if used in multiple market segments like clean generation, energy storage, transportation, industrial, and agricultural sectors.
- **Anticipated Impact**
  - Research and report on all the possible applications and uses of green hydrogen.
  - Provide an unbiased, fair analysis from a neutral point of view to ensure policy makers and future planners have the best information available to help them make future energy transition decisions.

6. Valuation of Investments in Electricity Sector Resilience

- **Description**:
  - Contribute to development of methods for valuation of public (societal) benefits of grid resilience investments. Clarifying the benefits of resilience investments is critical to properly incentivizing deployment of grid resilience measures.
- **Goals**:
  - Assist policymakers in addressing resilience needs.
  - Provide IOUs with a foundation for considering the benefits of resilience investments.
  - Assist CEC in targeting energy resilience research demonstrations to highest value applications.
- **Equity Considerations**:
  - This research will support investment in under-resourced communities by investigating the impacts of resilience investments in these communities.

Technical Approach for Initiative 6

- **Approach**
  - Include analyses of recent historical weather-related events and other situations (e.g., PSPS) that resulted in power outages.
  - Focus on equity concerns and impacts on Disadvantaged Vulnerable Communities (DVCs), as defined by CPUC.
- **Metrics and Performance Indicators**
  - Use of valuation frameworks by public agencies and IOUs to inform resilience investments.
  - Use of findings by IOUs to meet requirements to identify and prioritize actions that address climate change-related needs of DVCs.
  - Use of valuation frameworks by under-served communities in pursuit of funding to support customer and grid resilience.
- **Anticipated Impact**
  - Provide an empirically grounded basis for optimizing the benefits of resilience investments.
  - Contribute to prioritization of ratepayer-funded resilience investments in DVCs.

7. Vehicle-to-Building Technologies for Resilient Back-up Power

- **Description**:
  - Accelerate development and deployment of plug-in electric vehicles and charging equipment to power critical loads in buildings and homes.
  - Pursue cost reductions and demonstrate safety and performance requirements of vehicle-to-building (V2B) technologies.
- **Goals**:
  - Increase individual and community resilience with zero-emission technologies at lower cost.
  - Support the state's goals for rapid transportation electrification and inform future policies and programs that incentivize zero-emission vehicle deployment.
- **Equity Considerations**:
  - 25% of demonstration project funding in this initiative will be reserved for under-resourced communities.
  - Includes demonstrations with public vehicles (e.g., municipal transit buses) powering community buildings (e.g., emergency centers)

Technical Approach for Initiative 7

- **Approach**
  - Build R&D partnerships between automotive companies, charging equipment manufacturers, charging service providers, utilities, and others to advance V2B hardware and software technologies and strategies.
- **Metrics and Performance Indicators**
  - Number of homes, buildings, and individuals with access to zero-emission, vehicle-provided back-up power during grid outages
  - Power and energy provided to buildings and homes in real and simulated outages (kW/kWh)
  - Cost of zero-emission back-up power and energy ($/kW and $/kWh)
  - Number of new V2B commercial product offerings developed
- **Anticipated Impact**
  - Accelerate development and deployment of lower cost zero-emission back-up power solutions for increasing individual and community resilience.
  - Inform development of utility, CPUC, and other state incentive and procurement programs to encourage deployment.

8. Offshore Wind Technologies

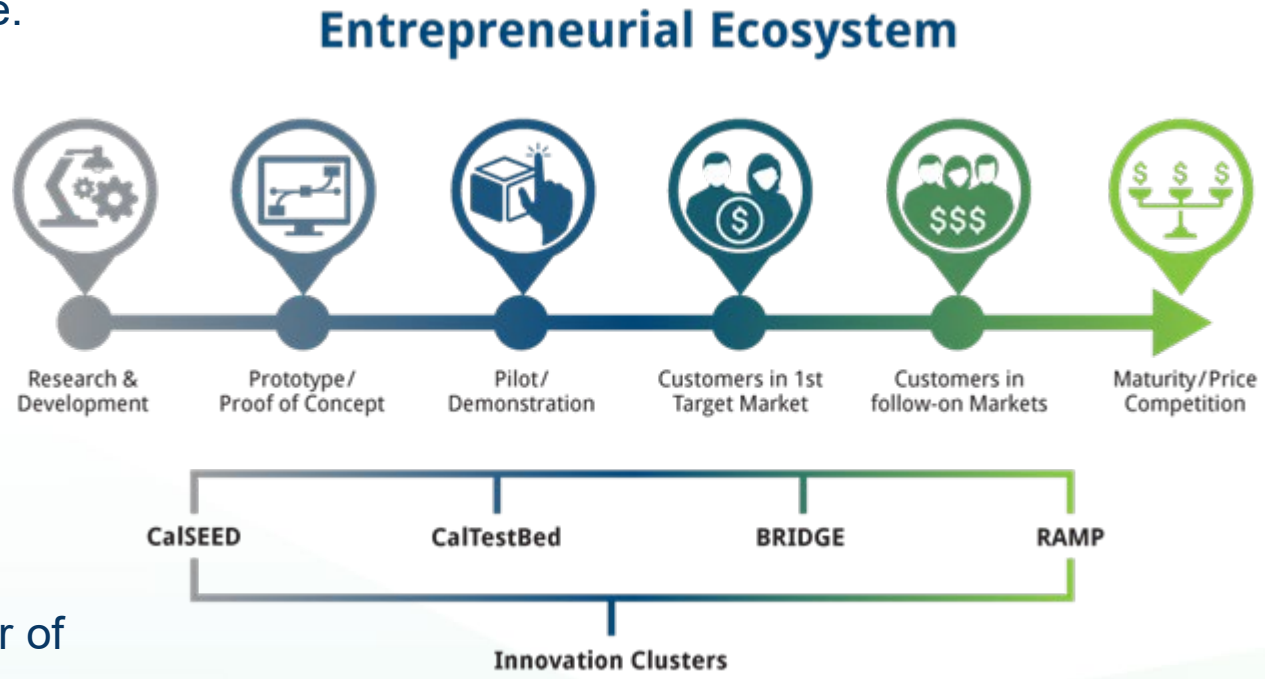
- **Description**:
  - Advance the development and demonstration of floating offshore wind energy (FOSW) technologies, specifically:
  - Spur innovation in manufacturing, assembly, and installation processes.
  - Test and validate monitoring systems for OSW components that reduce installation and operation and management (O&M) costs.
  - Develop tools and methods to assess environmental impacts from the assembly and operation of OSW components.
  - Pilot demonstrate FOSW systems and components.
- **Goals**:
  - Overcome barriers: manufacturing, O&M, environmental monitoring.
  - Increase cost competitiveness of OSW.
- **Equity Considerations**:
  - Potential benefits of OSW development for under-resourced communities include economic growth and job creation.
  - Enhance energy reliability and affordability for all Californians.

Technical Approach for Initiative 8

- **Approach**
  - Demonstrate innovative on-site manufacturing techniques or assembly of FOSW components, and test and validate FOSW inspection and monitoring systems.
  - Study potential impacts of FOSW on marine biodiversity, habitat, and coastal upwelling.
- **Metrics and Performance Indicators**
  - Improved cost-competitiveness by achieving levelized cost of energy (LCOE) of $75/MWh or lower.
  - Improved deployment readiness by achieving technology readiness level (TRL) of 7 - 8.
- **Anticipated Impact**
  - Make FOSW technology cost-competitive, delivering economic benefits and jobs.
  - Reduce monitoring and inspection trips, associated costs, and improve worker safety.
  - Identify potential impacts to wildlife and habitat and enable mitigation measures.
  - Provide a valuable resource for achieving SB 100 goals and supporting grid reliability.

9. Entrepreneurial Ecosystem

- **Description**: Continue funding for the CalSEED, BRIDGE and RAMP programs in the Entrepreneurial Ecosystem. In addition, provide funding for Market Research and Federal Cost Share.
- **Goal**: Accelerate the transition of intellectual property into successful entrepreneurial ventures that can help advance California's multiple clean energy goals.
- **Equity Considerations**:
  - CalSEED - set a minimum funding target that goes to entrepreneurs from underrepresented groups.
  - BRIDGE - higher funding amount for start-up companies working with DAC/LI communities to demonstrate their invention.
  - Applicants to RAMP will be evaluated in part on the number of skilled manufacturing jobs in California they are creating.
  - The Market Research - conduct customer discovery to identify features and functionality low-income customers want/needs in clean energy technology solutions.



Technical Approach for Initiative 9

- **Approach**
  - Provide direct funding initiatives to stage-gate new technologies through the innovation development pipeline.
  - Leverage the federal government's significant investment in basic and applied research.
- **Metrics and Performance Indicators**
  - Follow-on Private Investment and Leveraged Public Funding
  - Technology-, Commercial- and Manufacturing Readiness Levels (TRL, CRL, MRL)
  - Employment Growth
  - Production Capacity
- **Anticipated Impact**
  - Increased tech transfer of clean energy research from institutions into commercial ventures
  - Accelerated time-to-market and commercial success for new clean energy technology solutions

Submitting Written Comments

- Comments may be submitted using CEC's **e-commenting** system:
  https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=20-EPIC-01
- See revised **notice** for **e-mail and U.S. Mail** commenting instructions:
  https://efiling.energy.ca.gov/getdocument.aspx?tn=235954
- For all comments, please include docket number **20-EPIC-01** and **"EPIC Interim Investment Plan"** in the subject line and on the cover page.

Deadline:

Tuesday, January 19, 2021

Guiding Questions for Written Comments

1. Given the criteria for this one-year Interim Plan, do the initiatives capture the right emphasis for short-term “bridge” research until EPIC 4 Plan approval?
2. Considering climate, energy, and equity goals, are there any suggested refinements to the initiatives?
3. What additional strategies would stakeholders suggest for enhancing outreach and benefits to under-resourced communities?

Interim Plan Criteria

- EPIC Interim Plan: covers year 1 (2021) of the full EPIC 4 Plan (2021-2025).

- Key criteria shaping Interim Plan research initiatives:
  - Addresses key state policy priorities
  - Near-term importance to the state
  - Builds on stakeholder-vetted EPIC 3 Investment Plan
  - Supports under-resourced communities

- Full EPIC 4 Plan: longer planning process and plan duration allows for a more diverse set of research initiatives informed by additional stakeholder outreach.

Questions and Public Comments

- Please submit your question in the Question and Answers window or raise your hand, and you will be called on to unmute yourself. (Feature found under the Participants panel.)
  - First, we will call on participants with raised hands for verbal comments/questions.
  - Next, we will turn to the Q&A window for typed comments/questions.

- Please remember to introduce yourself by stating your name and affiliation.

- Please keep questions or comments under 3 minutes to allow time for others.

Thank You!

Docket for EPIC Investment Planning:
https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-EPIC-01

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