



CALIFORNIA ENERGY COMMISSION

Electric Program Investment Charge

Second Triennial Investment Plan Development

March 17, 2014

Energy Research and Development Division
California Energy Commission



Proposed Initiatives for Draft CEC 2015-17 EPIC Investment Plan

- The proposed funding initiatives are based on:
 - SB96 (2013 Statute) and other relevant energy statutes and policies.
 - Stakeholder comments received.
 - Current knowledge of state-of-the-art technologies.
 - Existing RD&D efforts, including 1st EPIC Investment Plan.
 - Known barriers and gaps.
 - Key factors driving clean energy development.
- Proposed funding initiatives incorporate:
 - CPUC EPIC defined program areas.
 - Guiding principles & electricity value chain.
 - Policy and other ratepayer benefits as described in CPUC EPIC decisions.
 - Greatest potential value proposition for ratepayers.



What's different from 1st investment plan?

- Applied Research Example: Energy Efficiency
 - Building Energy Efficiency
 - 1st plan: Established foundation for future large scale demonstration/deployments (see TD&D initiatives).
 - 2nd plan: Will continue focus on new technologies and strategies; address data gaps to accelerate future building and appliance energy efficiency code changes and identify breakthrough strategies for both ZNE buildings and significant energy efficiency gains in existing buildings.
 - 2nd plan: For new technologies, a “golden carrot” project to develop a super efficient consumer electronic device (set top box) is included.
 - IAW Efficiency
 - New Areas for 2nd plan:
 - Develop and test energy efficiency technologies in the IAW sectors (1st plan focused on demonstrations).
 - Strategies & technologies to increase end use water efficiency.



What's different from 1st investment plan?

- Technology Demonstration & Deployment Example: Energy Efficiency
 - Building & IAW Energy Efficiency
 - 1st plan: Focused primarily on large-scale deployment of IAW emerging technologies.
 - 1st plan: Building sector focus was on integrated facility-wide demonstrations with DSM, DR and other technologies; and small scale ZNE demonstrations in buildings/communities.
 - 2nd plan: Focus will be on building sector demos with emphasis on technologies investigated in the 1st plan and on large-scale deployment of the technologies both as individual measures and as an integrated package.
 - The latter can include large scale deployment of ZNE prescriptive packages in a subdivision or business park.



What's different from 1st investment plan?

- Market Facilitation
 - 1st Plan: Pilot programs initiated.
 - 2nd Plan: Market Facilitation is diversified beyond 1st Plan to accelerate clean energy technology market adoption in CA through targeted strategies.
 - February 7, 2014 workshop identified opportunities to increase adoption of emerging technologies through institutional procurement and product validation.
- New Solar Home Partnership
 - NSHP is added as an option to 2nd Plan: If EPIC funds are needed to fill a funding gap for NSHP, the Energy Commission would reduce the amount allocated to proposed initiatives in other EPIC program areas.



Applied Research and Development

- Energy Efficiency and Demand Response
 - *Strategic Objective 1.* Improve Energy Efficiency Technologies and Strategies in California's Buildings, Industries, Agriculture and Water Sectors.
 - *Strategic Objective 2.* Enable Cost-Effective Demand Response for California Electricity Customers.
- Clean Generation
 - *Strategic Objective 3.* Develop Innovative Solutions to Increase the Market Penetration of Distributed Renewable and Advanced Generation.
 - *Strategic Objective 4.* Improve Power Plant Performance, Reduce Cost, and Accelerate Market Acceptance of Existing and Emerging Utility-Scale Renewable Energy Generation Systems.
 - *Strategic Objective 5.* Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts.



Applied Research and Development

- Smart Grid Enabling Clean Energy
 - *Strategic Objective 6.* Advance the Use of Smart Inverters for Grid Support in California.
 - *Strategic Objective 7.* Develop Advanced Distribution Modeling Tools for the Future Smart Grid.
 - *Strategic Objective 8.* Advance Customer Systems to Coordinate with Utility Communications.
 - *Strategic Objective 9.* Efficient Integration of Plug-In Electric Vehicles to the Electricity System.
- Cross-Cutting
 - *Strategic Objective 10.* Advance the Early Development of Breakthrough Energy Concepts.
 - *Strategic Objective 11.* Provide Federal Cost Share for Applied Research Awards.



Strategic Objective 1. Improve Energy Efficiency Technologies and Strategies in California's Buildings, Industries, Agriculture and Water Sectors.

- S1.1 Advancing Efficient Solutions for Lower Energy Buildings.
- S1.2 Developing Model Designs and Strategies for Cost-Effective Zero Net Energy Homes and Buildings.
- S1.3 Apply Advanced Social Science Research Methods to Improve Adoption of Next Generation Energy Efficiency Solutions.
- S1.4 Develop and Evaluate Strategies to Improve Indoor Air Quality in Energy-Efficient Buildings.
- S1.5 Develop and Test Advanced Industrial, Agricultural, and Water Technologies and Strategies to Reduce Energy Use and Costs.
- S1.6 Advancing Strategies to Reduce California Buildings' Impact on the Water-Energy Nexus.



Strategic Objective 2. Enable Cost-Effective Demand Response for California Electricity Customers.

S2.1 Develop and Test Demand Response Technologies to Assess Performance, Increase Reliability and Improve Forecasting Techniques.



Strategic Objective 3. Develop Innovative Solutions to Increase the Market Penetration of Distributed Renewable and Advanced Generation.

- S3.1 Lower-Cost, Efficient, and Sustainable Bioenergy: Innovations to Improve Biomass-to-Energy Systems in California.
- S3.2 Develop Integrated and Hybrid Photovoltaic Technologies and Strategies to Reduce Costs and Advance Zero Net Energy Buildings.
- S3.3 Generating Electricity While Moving Water: Developing Solutions to Expand California's Use of In-Conduit Hydrokinetic Power.
- S3.4 Advance Breakthroughs in Renewable Energy Technologies to Dramatically Increase Efficiencies, Reduce Costs, and Enable Additional Renewable Resources.
- S3.5 Develop Piezoelectric-Based Systems for Harvesting Energy to Maximize Efficient Use of Emerging Energy Sources in California.



Strategic Objective 4. Improve Power Plant Performance, Reduce Cost, and Accelerate Market Acceptance of Existing and Emerging Utility-Scale Renewable Energy Generation Systems.

- S4.1 Boosting Concentrated Solar Power by Reducing System Costs and Increasing Performance.
- S4.2 Develop Innovative Tools and Strategies to Increase Predictability and Reliability of Wind and Solar Energy Generation.
- S4.3 Develop Advanced Technologies and Strategies to Improve the Cost-Effectiveness of Geothermal Energy Production.
- S4.4 Upgrading California's Aging Wind Turbines: Design, Cost, and Development Improvements That Meet Local Needs.



Strategic Objective 5. Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts.

- S5.1 Implementing Roadmap to Address Public Health Effects From Energy Technologies.
- S5.2 Developing Environmental Tools and Information for Future Renewable Energy Conservation Plans.
- S5.3 Improving Science for Water Management in Power Generation: Hydropower Forecasting and Hybrid Cooling Towers.
- S5.4 Providing Tools and Information for Regional Climate Change Adaptation Measures for the Electricity Sector.
- S5.5 Provide Small Grants to Solicit Innovative Energy-Related Environmental Research Concepts.



Strategic Objective 6. Advance the Use of Smart Inverters for Grid Support in California.

S6.1 Develop Smart Inverter Capabilities to Improve Grid Operations.



Strategic Objective 7. Develop Advanced Distribution Modeling Tools for the Future Smart Grid.

S7.1 Develop Open-Source Electricity System Modeling Tools to Visualize California's Modern Distribution Systems.



Strategic Objective 8. Advance Customer Systems to Coordinate with Utility Communications.

S8.1 Develop Customer Systems to Manage Demand Response, Renewables, and Electric Vehicles, and Integrate these Tools With the Grid.



Strategic Objective 9. Efficient Integration of Plug-In Electric Vehicles to the Electricity System.

- S9.1 Advancing Electric Vehicle Charging and Grid Services to Maximize Renewable Resources and Improve Grid Flexibility.
- S9.2 Advancing Vehicle-Grid Integration Technologies and Methods for Broader Use and Benefit for Residential, Private, and Public Users.
- S9.3 Advancing Technologies and Methods to Enable Safe, Efficient, Smart Recycling of Electric Vehicle Batteries.



Strategic Objective 10. Advance the Early Development of Breakthrough Energy Concepts.

S10.1 Provide Seed-Stage Funding for Disruptive Energy Technologies.

S10.2 Conduct Incentivized Prize Competitions to Foster Breakthrough Ideas for Clean Energy Solutions.



Strategic Objective 11. Provide Federal Cost Share for Applied Research Awards.

S11.1 Provide Federal Cost Share for Applied Research Awards.



Technology Demonstration and Deployment

- *Strategic Objective 12.* Overcoming Barriers to Emerging Energy Efficiency and Demand Side Management Solutions Through Demonstrations in New and Existing Buildings.
- *Strategic Objective 13.* Demonstrate and Evaluate Biomass-to-Energy Conversion Systems, Enabling Tools, and Deployment Strategies.
- *Strategic Objective 14.* Taking Microgrids to the Next Level: Maximizing the Value to Customers.
- *Strategic Objective 15.* Demonstrating Advanced Energy Storage Systems to Lower Costs and Improve Grid Reliability.
- *Strategic Objective 16.* Expand Smart Charging and Vehicle to Grid Power Transfer for Electric Vehicles.
- *Strategic Objective 17.* Provide Federal Cost Share for Technology Demonstration and Deployment Awards.



Strategic Objective 12. Overcoming Barriers to Emerging Energy Efficiency and Demand Side Management Solutions Through Demonstrations in New and Existing Buildings.

- S12.1 Identify and Demonstrate Promising Energy Efficiency and Demand Response Technologies Suitable for Commercialization and Utility Rebate Programs.
- S12.2 Demonstrate Large-Scale Deployment of Integrated Demand Side Management and Demand Response Programs in Buildings.



Strategic Objective 13. Demonstrate and Evaluate Biomass-to-Energy Conversion Systems, Enabling Tools, and Deployment Strategies.

- S13.1 Demonstrate and Evaluate Environmentally and Economically Sustainable Biomass-to-Energy Systems for Woody and Other Dry Biomass.
- S13.2 Accelerate the Demonstration and Early Deployment of Emerging Bio-Digester and Integrated Clean Generation to Efficiently Use Agricultural, Municipal, and Other Organic Waste.



***Strategic Objective 14. Taking Microgrids to the Next Level:
Maximizing the Value to Customers.***

S14.1 Using Microgrids to Evaluate a Combination of Emerging Technologies to Determine the Best Integrated Performance and Least Cost Configuration to Meet the Customers Energy Needs.



Strategic Objective 15. Demonstrating Advanced Energy Storage Systems to Lower Costs and Improve Grid Reliability.

S15.1 Demonstrations of Advanced Energy Storage Technologies in Transmission, Distribution, and Customer Side Applications to Transition to the Commercial Market.



Strategic Objective 16. Expand Smart Charging and Vehicle to Grid Power Transfer for Electric Vehicles.

S16.1 Demonstrate the Ability of Distributed Electric Vehicles to Provide Grid Services.



Strategic Objective 17. Provide Federal Cost Share for Technology Demonstration and Deployment Awards.

S17.1 Provide Federal Cost Share for Technology Demonstration and Deployment Awards.



Market Facilitation

- *Strategic Objective 18.* Foster the Development of the Most Promising Energy Technologies into Successful Businesses.
- *Strategic Objective 19.* Facilitate Emerging Energy Technologies into the Procurement Process of Large Purchasers.
- *Strategic Objective 20.* Accelerate and Optimize the Deployment of Energy Technologies Through Innovative Local Planning and Permitting Approaches.
- *Strategic Objective 21.* Inform Optimal Decision-Making Through Market and Technical Analysis.



Strategic Objective 18. Foster the Development of the Most Promising Energy Technologies into Successful Businesses.

- S18.1 Foster Successful Clean Energy Entrepreneurship Through Commercialization Assistance and Services.
- S18.2 Facilitate a Statewide Clean Energy Network to Provide Market Intelligence and Feedback to Entrepreneurs.
- S18.3 Provide Support for Entrepreneurs to Test, Verify, and Certify Their Innovations.



Strategic Objective 19. Facilitate Emerging Energy Technologies into the Procurement Process of Large Purchasers.

S19.1 Develop Tools and Strategies to Encourage Large-Scale Purchasers to Adopt Emerging Energy Technologies.

S19.2 Pilot Innovative Procurement Strategies to Reduce Costs for Clean Energy Technologies.

S19.3 Create a “Test Drive” Program to Help New Energy Technologies Qualify for Large-Scale Procurement.



Strategic Objective 20. Accelerate and Optimize the Deployment of Energy Technologies Through Innovative Local Planning and Permitting Approaches.

S20.1 Develop Innovative Approaches to Integrate Utility and Local Government Planning for Emerging Technology Deployment.

S20.2 Support Local Governments in Deploying Energy Assurance Strategies to Maximize the Safety and Reliability Benefits of Clean, Smart Energy Technologies.

S20.3 Reduce Bioenergy Costs and Delays by Developing a Programmatic Environmental Impact Report for Solid Fuel Biomass.

S20.4 Develop Innovative Strategies to Streamline the Permitting Process for Zero Net Energy Buildings.



Strategic Objective 21. Inform Optimal Decision-Making Through Market and Technical Analysis.

S21.1 Conduct Analyses on Different Technology Options and Strategies for the Electricity System.

S21.2 Develop a Clearinghouse for Advanced Energy Technologies, Strategies and Tools.

S21.3 Develop Roadmaps to Guide Future Investments.

S21.4 Measure and Verify the Ratepayer Benefits of EPIC-Funded Innovations.



New Solar Home Partnership

- The NSHP provides an upfront incentive to help transform the use of rooftop solar in the new housing market and make solar energy systems affordable for more IOU ratepayers.
- The Staff Draft EPIC investment plan proposes the option of using EPIC to help fund NSHP if other sources are not available.
- At this time, staff is interested in keeping all options for NSHP funding open, including combining different funding sources, provided that total funding does not exceed the \$400 million cap for NSHP under SB1 (2006).



Questions for Stakeholders

- Are critical research initiatives missing? If so, provide examples and why.
- Can some initiatives be dropped because of progress made to address this issue?
- What issues are deserving of significant funding due to their high potential for ratepayer returns?
- Are there initiatives that should be combined? Please explain why.



Next Steps

- Submit written comments by COB on March 28, 2014
- Email: Send comments to docket@energy.ca.gov
 - Please include the docket number **12-EPIC-01** in the subject line.
- Mail: Send a paper copy of comments to
California Energy Commission Dockets Office, MS-4
RE: Docket No. **12-EPIC-01**
1516 Ninth Street
Sacramento, CA 95814-5512