DOCKETED	
Docket Number:	19-ERDD-01
Project Title:	Research Idea Exchange
TN #:	225136
Document Title:	Presentation - Next-Generation Wind Energy Technologies and their Environmental Implications
Description:	Staff Presentation by Rizaldo Aldas
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Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	10/29/2018 2:40:34 PM
Docketed Date:	10/29/2018

California
Energy Commission
Research & Development

Next-Generation Wind Energy Technologies and their Environmental Implications

Rizaldo Aldas
Energy Research and Development Division

October 25, 2018
Sacramento, CA



Agenda

- **Overview** of Research Initiative for Wind Energy R&D in the 2018-2020 EPIC Program
- **Presentation** DOE Wind Energy Technology Office's Research and Development efforts on Wind Energy Technologies
- **Panel Discussion** on Research Needs and Opportunities for Next-Generation Wind Energy Technologies
- **Panel Discussion** on the Risk to Sensitive Species and Habitats from Offshore Wind Energy Projects in California

California Energy Commission

Research Needs and Opportunities for Next-Generation Wind Energy Technologies

Silvia Palma-Rojas

RESEARCH AND DEVELOPMENT DIVISION

October 25, 2018

Sacramento, CA

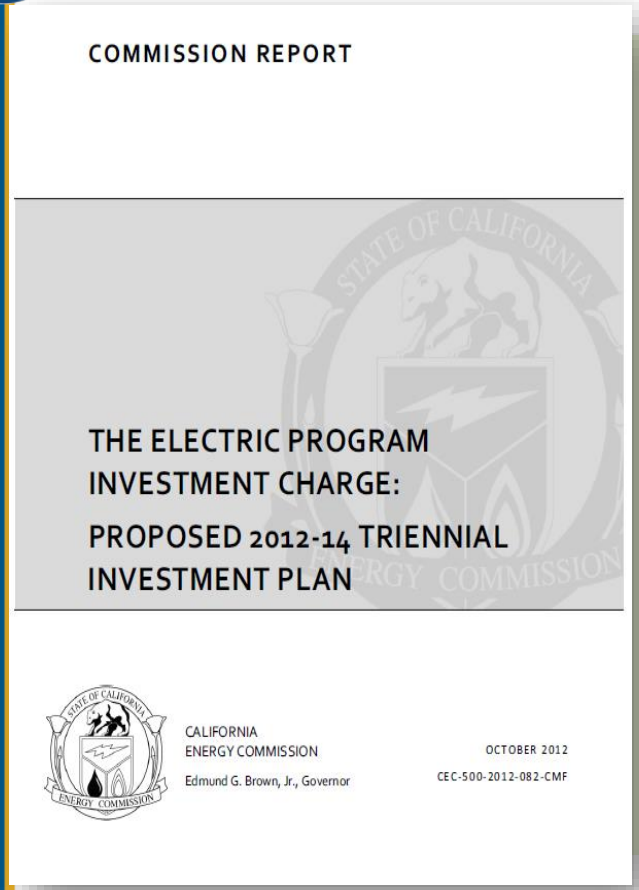
Electric Program Investment Charge (EPIC)
The Science of Innovation

Research

Demonstration

Deployment

EPIC Program: Triennial Investment Plans


COMMISSION REPORT

THE ELECTRIC PROGRAM INVESTMENT CHARGE:

PROPOSED 2012-14 TRIENNIAL INVESTMENT PLAN

CALIFORNIA ENERGY COMMISSION

Edmund G. Brown, Jr., Governor

OCTOBER 2012

CEC-500-2012-082-CMF

EPIC Program released:

- 2012-2014:Triennial Investment Plan
- 2015-2017:Triennial Investment Plan

- Funding initiatives on applied R&D for wind energy:
  - Develop Innovative Tools and Strategies to Increase Predictability and Reliability of Wind and Solar Energy Generation.
  - Upgrade California's Aging Wind Turbines: Design, Cost, and Development Improvements That Meet Local Needs.

www.energy.ca.gov/research/annual_reports.html

Current Wind Portfolio

Repowering Wind Energy

Wind Energy's Impact on Wildlife

Tall Wind Towers built on-site

Improving accuracy of prediction of short wind ramps

Wind Energy Forecasting

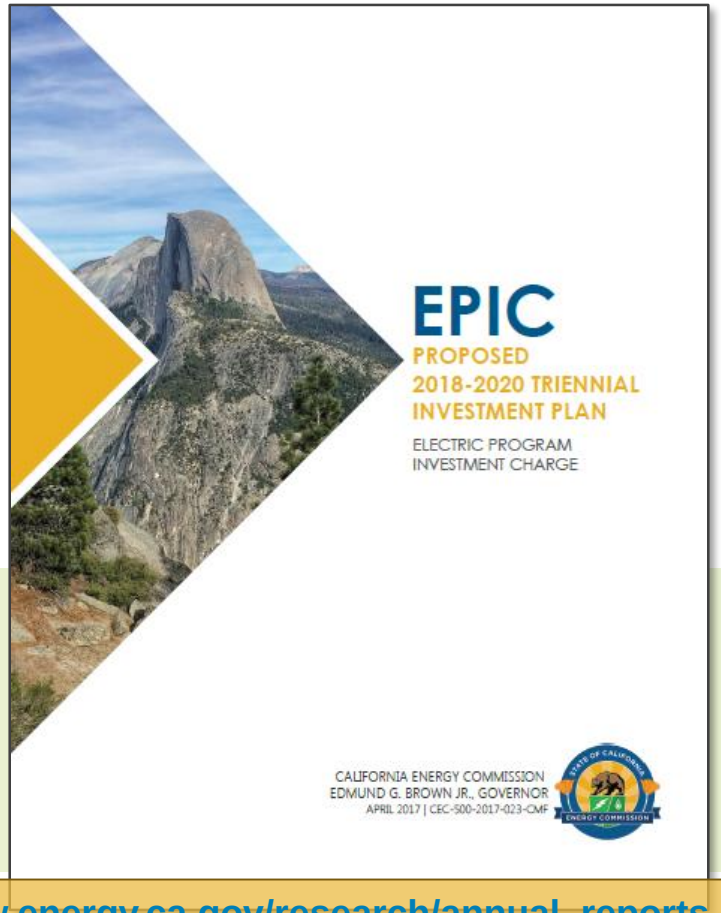
Going Forward

The Energy Commission submitted its EPIC 2018 – 2020 Proposed Investment Plan to the CPUC on May 1, 2017.

Strategic Initiative 4.2 "**Develop Technologies that Enable Increased Wind Capacity in California**" identified the need to:

- Advanced Manufacturing and Installation Approach for Utility-Scale Land-Based Wind Turbine Components
- Real-Time Remote Monitoring System for Offshore and Land-Based Wind Technologies

Strategic Initiative 7.3.1 "**Find environmental and Land Use Solutions to Facilitate the Transition to a Decarbonized Electricity System"**



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Discussion Questions – Panel I

- According to the Market Report 2017, there are neither new nor existing wind turbine manufacturing facilities located in California. How critical is it and are there opportunities for advanced manufacturing technology in California? How can the evolution in next generation wind energy technologies support the advancement of manufacturing in the state?
- What are the research needs to enable on-site manufacturing or hybrid solutions for wind energy technologies? What are the main on-site manufacturing challenges in California and what are needed to address those challenges?
- What are the research needs (e.g. in the area of materials science) to make the next-generation of wind energy technologies, such as super-sized blades and concrete or hybrid wind towers, feasible?
- Are the environmental life cycle aspects of the new composite materials and technology innovation being evaluated in the design and development of next-generation land-based and offshore wind technology?
- What is the current state-of-the art (e.g. use of drones and robots) for maintenance and monitoring of wind energy farms? Are there any further technological developments needed and are any of the currently available cutting-edge approaches applicable for use in any future offshore wind farms? What are the research needs to encourage proactive maintenance while reducing operational and maintenance costs and help future offshore wind projects have a competitive levelized cost of energy?
- What research are needed, e.g. environmental and technological, to set the stage for future development and implementation of offshore wind energy in California?

Key Questions

- What is the current state of next-generation wind energy technologies and real-time monitoring systems **in terms of benchmark performance, cost, and technical characteristics?**
- What are the cost and technical targets that need to be met to drive adoption of the targeted technologies?
- Aside from cost, what new features and capabilities are needed to improve the value proposition of the next-generation wind energy technologies and real-time monitoring systems?

Thank You!

Please submit your comments by November 1, 2018

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Presentation

DOE Wind Energy Technologies Office (WETO)'s Research and Development Efforts on Wind Energy Technologies

Michael Derby
Head of Research, Development, Demonstration and Testing

Panel Discussion

Research Needs and Opportunities for Next-Generation Wind Energy Technologies

Moderator: **Prof. C.P. van Dam**, UC Davis

Panelists:

Jason Cotrell, RCAM Technologies

Kevin Smith, DNV GL

Mo Li, University of California, Irvine

Walter Musial, National Renewable Energy Laboratory

Question #1

There are **neither new nor existing wind turbine manufacturing facilities located in California**. How critical is it and are there opportunities for advanced manufacturing technology in California? How can the evolution in next generation wind energy technologies support the advancement of manufacturing in the state?

Question #2

What are the research needs to enable **on-site manufacturing** or hybrid solutions for wind energy technologies? **What are the main on-site manufacturing challenges in California and what are needed to address those challenges?**

Question #3

What are the research needs (e.g. in the area of materials science) to make the next-generation of wind energy technologies, such as super-sized blades and concrete or hybrid wind towers, feasible?

Question #4

Are the environmental life cycle aspects of the new composite materials and technology innovation being evaluated in the design and development of next-generation land-based and offshore wind technology?

Question #5

What is the current state-of-the art (e.g. use of drones and robots) for maintenance and monitoring of wind energy farms? Are there any further technological developments needed and are any of the currently available cutting-edge approaches applicable for use in any future offshore wind farms? What are the research needs to encourage proactive maintenance while reducing operational and maintenance costs and help future offshore wind projects have a competitive levelized cost of energy?

Question #6

What research are needed, e.g. environmental and technological, to set the stage for future development and implementation of offshore wind energy in California?

Public Comments

Panel Discussion

Overview on the Risk to Sensitive Species and Habitats from Offshore Wind Energy Projects in California

Moderator: **David Stoms**, Energy Commission

Panelists:

Jeremy Potter, Bureau of Ocean Energy Management

Scott Terrill, H. T. Harvey & Associates

Chris Potter, Ocean Protection Council

California
Energy Commission
Research & Development

Overview of the Risk to Sensitive Species and Habitats from Offshore Wind Energy Projects in California

David Stoms, PhD
Energy Research and Development Division

October 25, 2018
Sacramento, CA



Recent Energy Commission Research

Cal Poly is developing machine learning tools to identify which species are present in underwater video. Courtesy of Cal Poly Corp.

Example studies

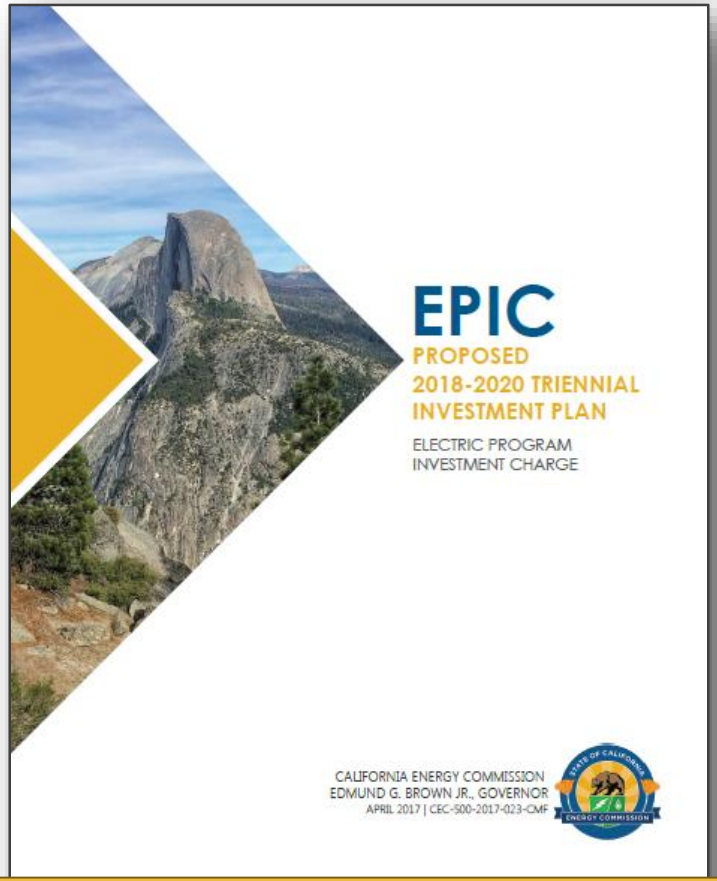
- *Preliminary Assessment of Offshore Wind Development Impacts on Marine Ecosystems*. CEC-500-2016-023. UCLA 2015
- *Evaluation of a Passive Acoustic Monitoring Network for Harbor Porpoise in California*. CEC-500-2016-008. Moss Landing Marine Laboratories 2015
- Lowering Costs of Underwater Biological Surveys to Inform Offshore Renewable Energy. Ongoing at Cal Poly Corp.

What Is In the Current Investment Plan?

Sub-Theme 7.3 Evaluate Strategies to Mitigate the Impacts of the Electricity System on the Environment and Public Health and Safety

Initiative 7.3.1 Find Environmental and Land Use Solutions to Facilitate the Transition to a Decarbonized Electricity System

- Investigate risks to sensitive species and habitats from their interactions with energy facilities and discover the mechanisms involved so that effective solutions can be developed
  - may conduct marine environmental research to assist the development, planning, and permitting of emerging wind and wave energy generation in response to the information needs of the California Intergovernmental Renewable Energy Task Force
  - topics of interest might include distribution and risk to marine mammals, birds and bats, and atmospheric and oceanic effects of large-scale offshore wind development



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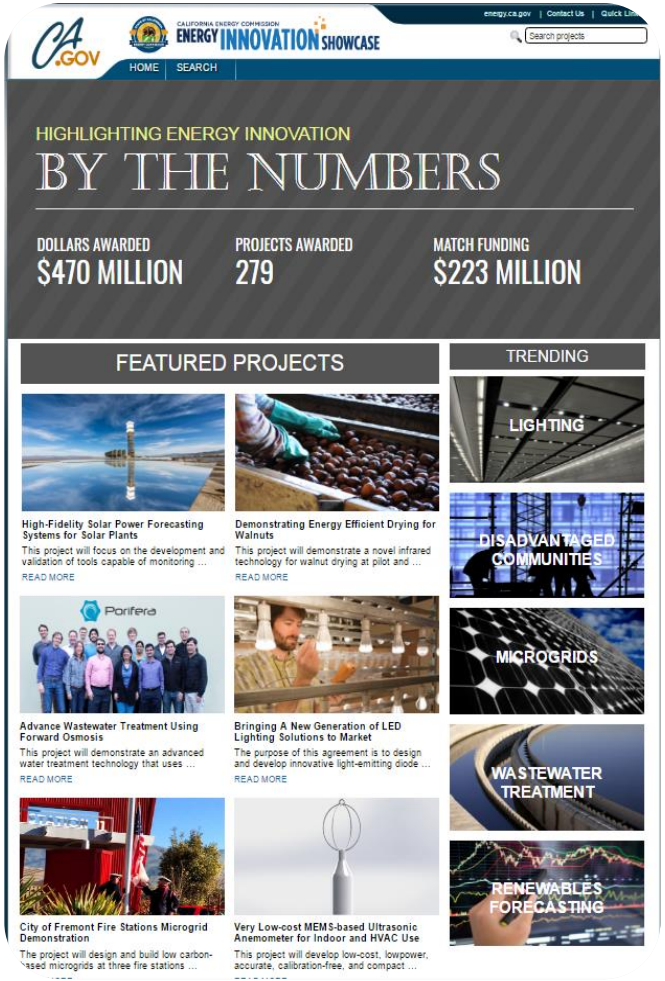
Discussion Questions

- Are there topics where EPIC could add significant value and not unnecessarily duplicate research being done by others? What are the topic(s) and what research would be needed to have a measurable impact?
- Are the barriers from knowledge gaps primarily due to:
  - Lack of environmental observation data?
  - Need for improved risk assessment methods?
  - Need for improved environmental monitoring and surveying technologies?
  - Other?

Public Comments



Enhanced Outreach & Engagement Opportunities

EPIC Innovation Showcase

- http://innovation.energy.ca.gov

Social Media

- Blogs, tweets and video features of research projects

http://calenergycommission.blogspot.com/

https://www.youtube.com/user/CalEnergyCommission

Opportunity email ListServ.

- http://www.energy.ca.gov/contracts/epic.html

Thank You!

Please submit your comments by November 1, 2018

- To website:
  https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=19-ERDD-01
- By email to the Docket Unit at:
  docket@energy.ca.gov
- By paper copy to the Docket Unit