STATE OF CALIFORNIA
EPIC TRIENNIAL INVESTMENT PLAN 2015-17
Proposed Energy Research Initiative
Questionnaire

CALIFORNIA ENERGY COMMISSION

(This is a Request for Information only - Complete Pages 1 and 2 for each initiative)

Title of Proposed Initiative: Waste-to-Energy Systems for Local Power and Energy with improved Air Quality

Investment Areas (Check one or more) – *For definitions, see First Triennial Investment Plan, page 12*:

☒ Applied Research and Development
☒ Technology Demonstration and Deployment
☐ Market Facilitation

Electricity System Value Chain (**Check only one**): *See CPUC Decision 12-05-037, Ordering Paragraph 12.a. http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF.*

☐ Grid operations/market design
☒ Generation
☐ Transmission
☐ Distribution
☐ Demand-side management

Issues and Barriers:

Waste-to-energy concepts can produce very significant greenhouse gas and criteria pollutant emissions reductions and significantly contribute to waste management while concurrently producing sustainable and local electric power and other energy streams (e.g., heat, fuel). However, many of these waste-to-energy concepts have not been able to demonstrate continuous low emissions operation, or have significant development issues to improve performance and reliability.

Initiative Description and Purpose:

The critical issues and barriers to be overcome include development of technologies for converting waste biomass and biogas streams into power, heat and fuels in ways that continuously and reliably accomplish this conversion with minimal criteria pollutant emissions. Post-combustion clean-up of emissions from waste biomass and biogas combustion systems, improved gasification technologies with low emissions, fuel gas clean-up for fuel cell use of waste gases, reduction of emissions from waste-water treatment plants and landfills, and other technologies for low criteria pollutant waste fuel energy conversion concepts will be advanced.
Recommended minimum funding level = $300,000/project; Recommended maximum funding level = $1,500,000/project.

Stakeholders:

Capstone Turbine; Solar Turbines; Caterpillar; Flex Energy; California Air Resources Board; University of California; Sacramento Municipal Utility District; Southern California Edison; Southern California Gas; U.S. Environmental Protection Agency; Air Pollution Control Districts and Air Quality Management Districts; FuelCell Energy; Bloom Energy; ClearEdge Power

Background and the State-of-the-Art:

- Many wastewater treatment plants are currently operating fuel cell systems on anaerobic digester gas (ADG), but, with mixed success with gas clean-up systems. Advancement of understanding and clean-up system capabilities to lower cost and improve performance is required.
- Nitrogen oxide emissions from waste water treatment plants have been observed from several sources, including flares and gas engines operating on ADG as expected, but also including nitrous oxide from some of the waste treatment processes themselves. Research and development efforts to reduce these emissions are required.
- Post-combustion clean-up of emissions from waste biomass and biogas combustion systems has been accomplished in demonstration projects but often requires additional waste fuel clean-up and often cannot achieve the same reduction in emissions as for combustion systems operating on natural gas. Improved criteria pollutant removal systems for waste biogas and biomass combustion systems are required.
- Improved gasification technologies with low emissions for the conversion of solid waste fuels are required.
- Waste fuel gas clean-up systems with improved performance characteristics are required for use of low emitting fuel cell technologies on landfill gas and solid waste gasification products.
- These technologies are also of interest by the U.S. Department of Energy, U.S. Environmental Protection Agency, California Air Resources Board, South Coast Air Quality Management District and other organizations.

Justification:

Describe how this technology or strategy will provide California IOU electric ratepayer benefits and provide any estimates of quantified annual savings/benefits in California, including:

- Wastewater treatment plants, Landfills, Dairies, Agricultural production sites and food processing sites that produce waste streams all have an interest in processing waste to produce useful products of electricity, heat, and/or fuels
- The IOU electric ratepayer will benefit by having additional sustainable sources of electricity that will offset their direct need to pay for more infrastructure (e.g., power plants, transmission and distribution lines)
- The IOU electric ratepayer will benefit by lower cost of electricity due to self-generation support of the utility grid network (appears as demand-side management)
- The IOU electric ratepayer will benefit by greater electric reliability caused by less stress on the network (especially during peak periods) due to self-generation
- Societal benefits include better management of waste streams with concurrent improvements in air quality and water quality
- This research is appropriate for public funding because it is not currently being accomplished by the private sector and because the market for such technologies is currently restricted due to performance and emissions concerns that do not allow these technologies to be implemented at this time – they must be advanced before they can be widely used.

Ratepayer Benefits (Check one or more)**:**

☒ Promote greater reliability

☒ Potential energy and cost savings

☐ Increased safety

☒ Societal benefits

☒ Environmental benefits – better air quality, less waste disposal

☒ GHG emissions mitigation/adaptation in the electricity sector at the lowest possible cost

☐ Low emission vehicles/transportation

☒ Waste reduction

☐ Economic development

Describe specific benefits (qualitative and quantitative) of the proposed initiative

Public Utilities Code Sections 740.1 and 8360:
The proposed research initiative is in alignment with section (e) (1) of CPUC Code Section 740.1 by supporting environmental improvement associated with the State's climate change and air quality goals. Additionally, the proposed research meets the criteria of these public utilities code sections by (a) providing benefits to ratepayers and (d) as no similar research is currently being undertaken.