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Energy Efficient, Grid-adapted, Alternative Water Supply

Additional submitted attachment is included below.

CALIFORNIA ENERGY COMMISSION

ELECTRIC PROGRAM INVESTMENT CHARGE 2021-2025 (EPIC 4)
RESEARCH CONCEPT PROPOSAL FORM

The CEC is currently soliciting research concept ideas and other stakeholder input for the EPIC 4 Investment Plan. For those who would like to submit an idea for consideration, we ask that you complete this form and submit it to the CEC by 5:00 p.m. on **July 2, 2021**.

To submit the form, please visit the e-commenting link, https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=20-EPIC-01, enter your contact information, and then use the "choose file" button at the bottom of the page to upload and submit the completed form. Thank you for your input.

1. Please provide the name, email, and phone number of the best person to contact should the CEC have additional questions regarding the research concept:

   Peter Stricker, pstricker@ecomerittech.com, 805-558-2993

2. Please provide the name of the contact person's organization or affiliation:

   Ecomerit Technologies

3. Please provide a brief description of the proposed concept you would like the CEC to consider as part of the EPIC 4 Investment Plan. What is the purpose of the concept, and what would it seek to do?

   In the context of increasing drought urgency in California, Ecomerit proposes a novel approach to desalination to provide an economic, rapidly deployable alternative source of water to coastal communities. Minimizing the carbon footprint of water produced with reverse osmosis (RO) is crucial to achieving a sustainable water solution, including optimizing the RO process to minimize energy demand, adapting the RO process to be more flexible and demand-response-compatible, and integrating RO facilities/devices directly with inside-the-fence renewable sources. Ecomerit's technology is focused on sustainable water production with additional design attributes allowing it to be efficiently deployed and minimally impactful on the ocean environment. The proposed project would 1) model the RO process with a variable energy supply to explore optimization of RO system design, advanced supervisory controls, energy storage and renewable energy generation profiles, 2) engineer an optimized pilot RO device connected to a grid emulator to observe RO process load response and 3) fabricate, deploy and test a pilot unit for small-scale municipal water use. As water stress

increases, water treatment technologies will become an increasingly significant element of state-wide electric load; thus, it is crucial to innovate energy efficiency approaches to water production.

4. In accordance with Senate Bill 96, please describe how the proposed concept will **"lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory energy goals."** For example, what technical and/or market barriers or customer pain points would the proposed concept address that would lead to increased adoption of clean energy technologies? Where possible, please provide specific cost and performance targets that need to be met for increased industry and consumer acceptance. For scientific analysis and tools, what data and information gaps would the proposed concept help fill, what specific stakeholders will use the results, and for what purpose(s)?

The primary goal of this technology is to reduce the carbon/energy intensity of RO supplied water below that associated with State Water Project (SWP) water as delivered to coastal communities. A recent study by the Bren School at UCSB in Santa Barbara estimates the energy intensity of water delivered to the City of Santa Barbara to be 3.56 MWh per acre-foot (AF) of water delivered. State-of the-art desalination plants in California (e.g. the Carlsbad Poseidon plant and Santa Barbara's plant both estimate their energy intensities to be 4.4 MWh/AF). Ecomerit's design presently estimates its energy intensity to be 3.5 MWh/AF with advances in controls and pump efficiency, but without yet optimizing for variable energy supply and demand response.

5. Please describe the anticipated outcomes if this research concept is successful, either fully or partially. For example, to what extent would the research reduce technology costs and/or increase performance to improve the overall value proposition of the technology? What is the potential of the technology at scale?

If successful, the pilot project would demonstrate the operational flexibility of the Ecomerit RO platform to adapt to variable load and demand response conditions, and validate the economics of water production. At scale (approximately 15% of coastal Southern California water demand), the proposed technology would increase water reliability compared with SWP water from 55% on average over the past 20 years, to 90%, while reducing desalinated water costs by 25% or more relative to existing state-of-the-art plants.

6. Describe what quantitative or qualitative metrics or indicators would be used to evaluate the impacts of the proposed research concept.

Energy costs account for approximately 33% of the operating costs of Ecomerit's technology. Reducing energy costs will allow its levelized cost of water (LCOW) to go below $2,000/AF. Presently, the City of Santa Barbara's desalination plant produces water for a cost of $2,600/AF, while the average cost of SWP water delivered to Santa Barbara over the past 20 years has been approximately $3,700/AF. In order for desalinated water to be economically viable for disadvantaged communities, water costs must be driven down below the cost of the next available source (avoided cost). SWP water costs become the avoided cost benchmark when local sources dry up during drought, ranging from $1,200 to over $3,500 depending on location.

7. Please provide references to any information provided in the form that support the research concept's merits. This can include references to cost targets, technical potential, market barriers, etc.

   https://www.santabarbaraca.gov/gov/depts/pw/resources/system/sources/desalination/default.asp

   https://bren.ucsb.edu/projects/not-drop-spare-sustainable-water-management-solutions-south-coast-santa-barbara-county.

   https://en.wikipedia.org/wiki/Claude_%22Bud%22_Lewis_Carlsbad_Desalination_Plant