DOCKETED

Docket Number:	17-EPIC-01
Project Title:	Development of the California Energy Commission Electric Program Investment Charge 2018 â€“ 2020 Triennial Investment Plan
TN #:	215839
Document Title:	Steve Jones Comments: Large scale renewable hydrogen generation via electrolysis linked to grid stabilization and zero carbon fuel.
Description:	N/A
Filer:	System
Organization:	Steve Jones
Submitter Role:	Applicant Representative
Submission Date:	2/10/2017 10:14:38 AM
Docketed Date:	2/10/2017

Comment Received From: Steve Jones
Submitted On: 2/10/2017
Docket Number: 17-EPIC-01

Large scale renewable hydrogen generation via electrolysis linked to grid stabilization and zero carbon fuel.

See attached document for comments

Additional submitted attachment is included below.

CALIFORNIA ENERGY COMMISSION
1516 NINTH STREET
SACRAMENTO, CA 95814-5512
www.energy.ca.gov

The Energy Commission is currently soliciting ideas and stakeholder input for the 2018 – 2020 EPIC Triennial Investment Plan. For those that would like to submit an idea for consideration in the 2018-2020 EPIC Triennial Plan, we ask that you complete the form below. Submittals are due by **5:00 p.m. on February 10, 2017.**

Part 1. Initiative Description and Purpose:

1. Please provide a brief description of the proposed initiative:

Large scale renewable hydrogen generation via electrolysis linked to grid stabilization and zero carbon fuel.
This initiative would see large MW scale electrolysers depolyed at strategic CAISO locations in CA to provide multiple benefits including:
1) grid stabilization
2) renewable energy storage and curtailment avoidance
3) zero carbon vehicle fuel
4) grid ancillary services such as demand response
5) zero carbon fuel to help decarbonise the natural gas sector in CA

2. What technical and/or market barriers would the proposed initiative help overcome? For scientific analysis and tools, what knowledge gaps would the proposed initiative help fill?

The proposed initiative would help to overcome numerous barriers including:
1) providing large scale energy storage that provides benefits above and beyond simple electrical storage as currently mandated by the CPUC.
2) providing zero carbon fuel to the growing number of fuel cell electric vehciles in CA. The market is predicting a shortage of hydrogen in the 2020-2022 timeframe and this initiative woud help to provide low cost zero carbon fuel.
3) allowing electrolysis to have access to CAISO market and provide simultaneous benefits to both the electrical and gas sectors.
4) providing a 'first of kind' project to demonstrate the benefits of large scale electrolysis on the electrical grid and the natural gas sector.

Part 2. Benefits and Impacts

3. If this initiative is successful, either fully or partially, what would be the expected impact? Who are the primary users and/or beneficiaries?

The impact of this initiative would be a dramatic increase in the volume of zero carbon hydrogen produced in CA. 99+% of hydrogen generated in the state comes from reformation of natural gas and thus has a carbon and local air quality footprint.
The primary users and beneficiaries would be: 1) fuel cell vehicle drivers (public and private) 2) electric utilities
3) gas utilities

4. Describe what quantitative or qualitative metrics or indicators would be used to evaluate the impacts of the proposed initiative:

Metrics that would be used include:
1) CO2 saved vs gasoline/diesel equivalent vehicles
2) MWhrs of renewable electricity curtailment avoided
3) MWhrs of energy stored
4) MBTUs of natural gas replaced
5) additional jobs created for construction, operation and maintenance

5. Please provide a list of peer-reviewed references that support the responses for questions 3 and 4. Proposed initiatives that include peer-reviewed references will be given stronger consideration.

1. CHBC whitepaper: https://californiahydrogen.org/sites/default/files/CHBC%20Hydrogen%20Energy%20Storage%20White%20Paper%20FINAL.pdf
2. HES workshop: http://www.nrel.gov/docs/fy15osti/62518.pdf (2016)
3. H2@Scale workshop: https://energy.gov/eere/fuelcells/downloads/h2-scale-workshop (2016)
4. CA near-term business cases: http://www.nrel.gov/docs/fy17osti/67384.pdf (2016)
5. Lifecycle cost of HES: http://www.nrel.gov/docs/fy10osti/46719.pdf (2009)
6. Power-to-gas DNV-GL: http://www.europeanpowertogas.com/fm/download/28
7. Commercialisation of energys torage in europe: http://www.fch.europa.eu/sites/default/files/CommercializationofEnergyStorageFinal_3.pdf

6. (For technologies only) What competitive advantages does the proposed technology solution have over current benchmark technologies? If the technology is beyond the prototype stage, what strategies do you suggest to bring to scale?

The competitive advantages include:
1) ability to store large ratings (MWs) and amounts (MWhrs) of power for very long periods of time (weeks/months). This would not be possible with traditional technologies such as batteries, pumped hydro and flywheels.
2) the ability to export energy from the electricity to the gas sector. Hydrogen energy storage is unique in its ability to efficiently transfer energy between these sectors.
3) the ability to produce truly zero carbon hydrogen at a significant scale for many thousands of fuel cell vehicles.
The technology of electrolysis is mature however the market currently results in small (sub MW) sized units which fail to capitalize on the cost benefits of scale. Multi MW module depolyment allows the benefits of scale to be realised by using common components and grid scale technologies; these components are not usually avaiable to smaller module sizes.

Part 3. Connection to Energy Commission's EPIC Framework

Energy Commission staff have developed a draft strategic framework to guide the CEC's planning and implementation of EPIC across triennial investment cycles. One of the objectives of the draft strategic framework is to communicate a consistent set of priorities for organizing current and future EPIC investments.

7. Please indicate which of the following strategic framework themes you feel the proposed initiative best fits within:
    - Advance Technology Solutions for Deep Energy Savings in Building and Facilities
    - Accelerate Widespread Customer Adoption of Distributed Energy Resources
    - Increase System Flexibility from Low-Carbon Resources
    - Increase the Cost-Competiveness of Renewable Generation
    - Create a Statewide Ecosystem for Incubating New Energy Innovations
    - Maximize Synergies in the Water-Energy-Food Nexus
    - Develop Tools and Analysis to Inform Energy Policy and Planning Decisions
    - Catalyze Clean Energy Investments in California's Underrepresented and Disadvantaged Communities

(Select One)

If Other, Please Specify