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*Comment Received From: Product Slingshot, Inc d/b/a FORECAST3D*
*Submitted On: 7/8/2021*
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## Investment Plan Idea

*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:

   Alan Lang / alan.lang@gknpm.com / (248)705-1319

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

   GKN Sinter Metals, llc / Forecast3D

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?

   We would like to see the CEC focus some of their investment plan on newer hydrogen technologies, such as Metal Hydrides Storage to help bring these technologies to market and establish use case track records. Metal hydrides provide a safer and cost effective capital investment verse compressed hydrogen storage, given the proper use case, but are still relatively unknown in the market place. We suggest funded projects in the following area's;
   - Data center projects to replace diesel engines with MH storage and fuel cells at 0.5-3 MW.
   - Power demonstration projects for power grid backup at substations with metal hydride storage and fuel cells or turbines turbines
   - Solar power project with seasonal hydrogen storage with up to 250 kg hydrogen storage in metal hydrides.
   - Cell and telecom tower renewable back up power replacing loud, polluting and spewing carbon emissions diesel generators.

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)?

   Compression of hydrogen for storage poses a substantial risk to the roll out of hydrogen technologies. It is a known, developed technology, but the capital and ongoing maintenance costs have limited opportunity for a substantial improvements, which can hinder hydrogen adoption. Metals hydrides provide a paradigm shift to this challenge, by eliminating the need for compression is use cases where an electrolysers and fuel cells are needed, because they can be taylored to operate at the working pressures of these systems.

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?

   Research in the areas described in section 3 will provide validation of Metal Hydrides in practical use-case and allow for the configuration of these systems to be optimized from a cost and performance perspective. We currently see the economics of metal hydride hydrogen storage systems vs compressed hydrogen storage systems as better or at a minimum of on par today, with substainal opportunity for improvement. It is not unreasonable to project a 40-60% cost improvement and and 15 - 25% performance improvement in the next 2-3 years

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

   Technoeconomic analysis vs compressed hydrogen storage solutions and/or other hydrogen storage technologies
   Performance metric dependant on use case

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.

References

Benefit Analysis of Long-Duration Energy Storage in Power Systems with High Renewable Energy Sharea, et a Guerra. Link:
https://doi.org/10.3389/fenrg.2020.527910

- Highlights the needed for season storage, where metal hydrides fit in

Department of Energy Hydrogen Program Plan, 2020
https://www.hydrogen.energy.gov/pdfs/hydrogen-program-plan-2020.pdf

- Call for material and system level RD&D of material based storage