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Filer:	Jeffrey
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UC Irvine Advanced Power and Energy Program Response to CEC RFI on Strategies to Attract Private Investment in Zero Emission Vehicle Charging Infrastructure and Other Clean Transportation

In order to qualify for commercial financing, infrastructure projects, including energy and transportation infrastructure projects, must satisfy a number of criteria. Two of the most important are a secure revenue stream and relative certainty that the systems will perform as designed. As part of its work on CEC agreement 600-17-008 "Roadmap for the Deployment and Buildout of Renewable Hydrogen Production Plants in California", UCI APEP developed recommendations related to financing of these facilities and infrastructure. The primary recommendations are provided below.

The timely build-out of facilities and infrastructure needed to enable wide-scale adoption of hydrogen as an energy and transportation solution will require a steady flow of private capital into the sector. Realizing the necessary capital flow will require that prospective investors foresee the opportunity to achieve an acceptable return on investment while accounting for risk and uncertainty. In addition, transparent and well-functioning markets are critical to the long-term success of the sector for investors and consumers. Factors that facilitate this include a broad and diverse array of market participants, low barriers to entry, ready access to market information such as pricing and effective mechanism for connecting buyers and sellers across the value chain (such as commodity exchanges and procurement platforms). Although the private sector must play a primary role in achieving these goals, the State can also play an important role.

State policies and programs should be designed to ensure that the renewable hydrogen sector can attract private capital sufficient to meet its capital needs in a well-functioning and established renewable hydrogen market structure by the mid to late 2020's. Financeability requires successful operating history for the relevant technologies, relative certainty of feedstock availability, and relative certainty of a secure stream of revenue from renewable hydrogen sales. The current status of the financeability of key renewable hydrogen production technologies is summarized in the table below.

The renewable hydrogen market is in its very early stage. Currently no fully dedicated renewable hydrogen production facilities are in operation in the State with reformed biomethane using existing SMR capacity as the dominant supply approach. The market has few participants and transparency on pricing or terms is lacking.

Several elements should be considered in developing programs to support renewable hydrogen supply expansion by addressing the financing gap and/or otherwise supporting market development.

- Transparent and widely communicated information on expected demand growth and planned production and supply capacity additions can help private investors in planning development to match market demand. The demand-forecasting element of the current AB 8 program should be continued and expanded to include other sources of demand, particularly for medium and heavy-duty applications.

Commercial Financeability of Key Renewable Hydrogen Technologies

	Commercially Financeable?	Comments
Hydrogen Refueling Station	Close	LCFS price risk is a remaining gap
SMR	Yes	100% financeable. Proven commercial technology with ability to secure revenue through conventional hydrogen production.
Liquefaction Facility	Yes	100% financeable. Proven commercial technology with ability to secure revenue through conventional hydrogen production.
Anaerobic Digester	Close	SB 1383 provides mandates that will make dairy projects suitable for commercial lending including subsidies and LCFS price support. AD projects using landfill diverted feedstock receive contracted tipping fees; LCFS price support mechanism may be needed for full financeability.
Electrolyzer	No	Capital costs declining but currently above levels required for cost competitiveness. Lack of long-term RH2 off-take agreements with firm pricing for LCFS value creates a financing barrier.
Gasifier	No	Technology is not fully commercial, requires high capital investment ($100M+). Lack of long-term RH2 off-take agreements with firm pricing for LCFS value creates a financing barrier.

Source: UCI APEP

- LCFS credits are an important source of value for the entire renewable hydrogen production and supply chain but uncertainty of future credit value introduces significant investment risk. An LCFS credit price support mechanism was proposed during the most recent legislative session in response to the requirements of SB 1383 (2018, De Leon)[1]. Should such a mechanism be put in place in the future, it is important that it apply to hydrogen and not only dairy biomethane as originally proposed.
- The state should also consider developing incentive programs such as grants, capacity credits, or loan guarantees allocated to renewable hydrogen production and related high-capital-cost facilities aggregate funding amounts be tied to optimal build-out strategies. Because loan guarantee programs typically require similar documentation and credit risk assessment to conventional project finance, such programs can provide a smooth evolution to pure commercial financing. In

1 *SB 1383* (Lara, Chapter 395, Statutes of 2016) C Link to bill text
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB1383

contrast to grant programs, such programs have the potential to return borrowed funds to the sponsor. Examples of such programs include the U.S. DOE loan guarantee program[2] and the green bond program proposed by former California state treasurer John Chiang.[3]

- For early-stage commercial technologies for which technical risk is a barrier to private financing, state support for commercial pilots via loan guarantees or other programs should require an independent engineering assessment of risk typical of independent engineering assessment required by investment banks. The commercial pilot project should then be required to focus effort on addressing the issues raised by the independent engineer and "retiring" the identified risks that would hinder private financing.
- Incentive eligibility should continue and extend the selection factors employed in the station program and the initial renewable hydrogen production solicitation (GFO-602) including:
    - Amount of match funding
    - Strength of the project commercial plan and track record of the applicant
    - Technology diversity and encouragement of new entrants
    - Disadvantaged community impacts
    - Carbon reduction
- Agencies providing grants or incentives can facilitate price transparency in the renewable hydrogen market by publishing anonymized pricing and related data on contracts for the purchase or sale of renewable hydrogen from projects receiving state support. The LCFS program and the CTP hydrogen station program already require reporting of key data on costs, quantities, and other operational elements. However, unbundled (separate) price or cost of renewable hydrogen and associated volumes is not among the publicly reported data.
- Operational reporting requirements for funded projects should be developed in consultation with project financing entities to ensure that reported metrics address the information needs of future prospective private lenders.
- State agencies, in collaboration with stakeholders, should systematically identify market barriers in assessing the development of the renewable hydrogen production and supply sector and target programs and incentives to address barriers and also include supplier diversity (number and demographics) in award criteria

2 DOE Loan Program Office page https://www.energy.gov/lpo/loan-programs-office; GAO DOE Loan Program Report https://www.gao.gov/assets/680/675595.pd

3 California Treasurer Green Bond Report https://www.treasurer.ca.gov/greenbonds/publications/reports/green_bond_market_01.pdf

- The market for biomass feedstock is not well formed and secure long-term feedstock agreements will be necessary for commercial viability of projects using biomass. State agencies should convene a stakeholder process to explore approaches to addressing this issue such as establishing an exchange or clearing house.