Date of Hearing: March 30, 2022

ASSEMBLY COMMITTEE ON UTILITIES AND ENERGY
Eduardo Garcia, Chair
AB 2302 (Quirk) – As Introduced February 16, 2022

**SUBJECT**: Hydrogen underground storage: study

**SUMMARY**: This bill requests the California Council on Science and Technology (CCST) to analyze opportunities for hydrogen underground storage. Specifically, **this bill** requests:

1) An assessment of existing infrastructure as well as geologic opportunities for hydrogen underground storage.

2) Guidance on regulations for hydrogen storage codes and standards.

3) An assessment of regional future need for hydrogen storage.

**EXISTING LAW**:

1) Requires specified actions of state agencies to develop the use of green electrolytic hydrogen and requires the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC), to, where feasible, authorize procurement to increase the use of energy storage using green electrolytic hydrogen. (Public Utilities Code § 400)

2) Defines green electrolytic hydrogen as hydrogen gas produced through electrolysis and not as hydrogen gas manufactured using steam reforming or any other conversion technology that produces hydrogen from a fossil fuel feedstock. (Public Utilities Code § 400.2)

3) Requires the CPUC, State Air Resources Board (CARB), and CEC to consider green electrolytic hydrogen an eligible form of energy storage, and the potential uses for the technology. (Public Utilities Code § 400.3)

**FISCAL EFFECT**: This bill is keyed fiscal and will be referred to the Committee on Appropriations for its review.

**BACKGROUND**:

*California Council on Science and Technology.* CCST was established in 1988 pursuant to Assembly Concurrent Resolution 162 (Farr and Garamendi) and modeled after the U.S. National Academies. CCST convenes experts from California's academic and research institutions to provide objective advice and analysis in response to requests from the governor, Legislature and other state entities on policy issues relating to science and technology. CCST is operated as a 501(c)(3) nonprofit governed by a Board of Directors, and its core funding is provided by the following institutions: University of California; California State University; California Community Colleges; California Institute of Technology; Stanford University; NASA Ames Research Center; NASA Jet Propulsion Laboratory; Lawrence Berkeley National Laboratory;

Lawrence Livermore National Laboratory; Sandia National Laboratories and SLAC National Accelerator Laboratory.

CCST's mission is carried out via two primary programs: Science Advice and the Science Policy Fellows. CCST delivers policy-relevant science information via briefings, workshops, and peer-reviewed reports and CCST recruits, trains, and places PhD scientists and engineers in a year-long fellowship, working as staff in the California state government. The CCST Science Policy Fellows Program is funded by a statewide network of philanthropists and foundations as well as support from the state budget.

*CCST Peer-Reviewed Reports.* CCST serves state offices on their science advice needs. For example CCST completed a report on underground natural gas storage in 2018 titled, "*Long-Term Viability of Underground Natural Gas Storage in California: An Independent Review of Scientific and Technical Information."* In this capacity, CCST works with their academic and research institution partners and other experts to develop assessments of the available information around a specified topic. CCST gathers information through meetings with experts, reviews of the scientific literature, submission of information by outside parties, and investigations by the author team and/or CCST staff. These commissioned reports then undergo independent external peer review.

*Potential Role of Hydrogen in Our Clean Energy Future*. Hydrogen is the lightest element and can be combusted with pure oxygen to produce only energy and water. It typically exists in a gaseous state though it can be cooled and compressed into a liquid. Hydrogen can serve as a carrier of energy and be used in power generation, transportation, and industrial applications, either through electricity generation as in fuel cells or through use as a combustion fuel in place of fossil gas. It can also be stored for long periods. Displacing fossil fuels with hydrogen may cut greenhouse gas emissions and because it can be stored, hydrogen offers advantages to support electric grid reliability.[2] However, there are many unknowns that impair broad adoption of hydrogen including future storage sites, the potential to leverage existing infrastructure, and safety and environmental risks of its storage, transport, and usage.

**COMMENTS**:

1) *Author's Statement*. "In 2018, California enacted Senate Bill 100, which set a policy requiring that renewable and zero-carbon energy resources supply 100 percent of electric retail sales to customers by 2045. The ubiquitous nature of hydrogen as a decarbonization tool, while presenting numerous benefits, also presents certain challenges in terms of optimization and efficiency. This bill will address critical operational and technological hurdles needed to accelerate and expand the use of hydrogen by: conducting research to demonstrate the feasibility of this emergent technology; supporting the development of tools and technologies for the hydrogen industry; and accelerating and expanding the use of hydrogen by leveraging existing facilities (e.g., existing natural gas storage reservoirs)."

2) *Lingering Questions*. This bill seeks to address the operational and technological hurdles that could impair the acceleration and expansion of the use of hydrogen, with a special focus in the context of storage. Given the potential economy-wide applications of hydrogen, it seems reasonable that detailed analysis of its storage and transport, as well as related policy recommendations, be sought. However, there remain unanswered

questions surrounding hydrogen usage that inform the potential costs and benefits of hydrogen underground storage. An analysis evaluating hydrogen storage constraints may benefit from a broader scope in order to better understand all aspects of a potential future hydrogen economy. *Therefore, the committee may wish to refine the scope of the requested report to comprehensively reflect the current status of knowledge related to hydrogen storage.* Doing so would also more appropriately align with CCST's skillset.

3) *Related Legislation.*

SB 1075 (Skinner, 2022) would require CARB, in consultation with CEC and CPUC, to prepare an evaluation of the deployment, development, and use of hydrogen, and would require CARB, CEC, and CPUC to consider potential uses for green electrolytic hydrogen in their respective decarbonization strategies. Status: In Committee – Senate Energy, Utilities, and Communications Committee.

4) *Prior Legislation*.

SB 18 (Skinner, 2021) would require CARB to identify the role of hydrogen, and particularly green hydrogen, in helping California achieve the state's climate goals and, in consultation with the CEC and CPUC, to prepare an evaluation of the deployment, development, and use of hydrogen. The bill would further require CEC to study the potential growth for hydrogen and its role in the electrical and transportation sectors as part of the 2023 and 2025 IEPR. Status: Died – Assembly Committee on Appropriations.

AB 491 (Blanca Rubio, 2019) would have requested a study from CCST in consultation with CPUC, CARB, and CEC analyzing the potential impact of increased hydrogen concentration in California's natural gas system. Status: Died – Assembly Committee on Appropriations.

SB 1369 (Skinner) established a definition of green electrolytic hydrogen, required the CEC and CPUC to incorporate green electrolytic hydrogen as a resource that may be considered for procurement to reach state clean energy goals, and required the CPUC, CEC, and CARB to consider green electrolytic hydrogen an eligible form of energy storage. Status: Chapter 567, Statutes of 2018.

SB 100 (De León) established a goal of procuring 100 percent of the state's electricity from zero-carbon resources by December 31, 2045. Status: Chapter 312, Statutes of 2018.

SB 433 (Mendoza, 2017) would have authorized the CPUC to allow a gas corporation to procure zero-carbon hydrogen and recover through rates the reasonable cost of pipeline infrastructure developed to transport the hydrogen to end users. Status: Died – Assembly Utilities and Energy Committee.

SB 826 (Leno, 2016) requested CCST to undertake a study to address operational safety and potential health risks, methane emissions, supply reliability for gas and electricity demand, and the role of storage facilities and natural gas infrastructure in California's long-term greenhouse gas reduction strategies. Status: Chapter 23, Statutes of 2016.

SB 840 (Committee on Budget and Fiscal Review, 2016) requested a study from CCST on technical aspects of biomethane related to its delivery in common carrier pipelines and impacts on end uses of biomethane. Status: Chapter 341, Statutes of 2016.

Assembly Concurrent Resolution 162, (Farr, 1988), urged the President of the University of California in collaboration with the Presidents of the University of Southern California, the California Institute of Technology, Stanford University, and the Chancellor of the California State University to establish the California Council on Science and Technology. CCST reports to the presidents and chancellor and responds appropriately to the Governor and Legislature on public policy issues significantly related to science and technology.

**REGISTERED SUPPORT / OPPOSITION**:

**Support**

California State Pipe Trades Council

Sempra Energy Utilities

California State Council of Laborers

Utility Workers Union of America, AFL-CIO

**Opposition**

None on file.

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