

Date of Hearing: June 22, 2022

ASSEMBLY COMMITTEE ON UTILITIES AND ENERGY

Eduardo Garcia, Chair

SB 1075 (Skinner) – As Amended May 19, 2022

SENATE VOTE: 38-0

SUBJECT: Hydrogen: green hydrogen: emissions of greenhouse gases

SUMMARY: Advances hydrogen as a decarbonization solution by creating a Clean Hydrogen Hub Fund to support a state bid for a federal Hydrogen Hub grant. Additionally requires the California Air Resources Board (CARB), the California Public Utilities Commission (CPUC), and the California Energy Commission (CEC) to incorporate hydrogen in various decarbonization strategies, including requiring the CEC to develop a definition for “renewable hydrogen” that would enable a facility using the hydrogen to be an eligible Renewables Portfolio Standard (RPS) resource. Specifically, **this bill:**

- 1) Defines “clean hydrogen” as hydrogen produced from renewable energy resources consistent with federal definitions¹ that restrict clean hydrogen to hydrogen produced with a carbon intensity equal to or less than 2 kilograms of carbon dioxide-equivalent produced at the site of production per kilogram of hydrogen produced, or as that standard is revised by the I-Bank consistent with the Secretary of the United States Department of Energy (DOE).
- 2) Creates a Clean Hydrogen Hub Fund (referred to below as “the fund”) within the State Treasury and administered by the I-Bank to provide grants for clean hydrogen projects using funds appropriated by the Legislature to provide grants for clean hydrogen projects developed in California, to match federal funds granted to a regional clean hydrogen hub pursuant to Section 16161a of Title 42 of the United States Code, or to fund or match research grants that may be necessary to meet the goal of affordably producing hydrogen from renewable feedstock at scale.
 - a) Instructs I-Bank to prepare the criteria, priorities, and guidelines for awarding grants under the fund in line with the priorities and requirements of the federal Infrastructure Investment and Jobs Act relating to hydrogen and the state’s climate goals. These guidelines must be approved by a majority vote of I-Bank board.
 - b) Specifies that grant applications will be considered as they are received on an ongoing basis, so long as there remain moneys available within the fund to provide that grant.

¹ Section 16166(b)(1)(B) of Title 42 of the United States Code

- c) Specifies that I-Bank shall prepare and present an annual report to the legislature and on its website detailing information on individual funded projects, and describing how these projects contribute to the state's climate policy objectives and the fund's goals for hydrogen production and use.
- 3) Stipulates that grants shall only be provided to projects which (a) demonstrate and scale the production, processing, delivery, storage, and end use of clean hydrogen, and (b) advance progress to the goal to produce or use 15,000 tons per day of clean hydrogen in California by 2030.
 - a) Directs I-Bank to prioritize projects that (1) maximize the use of renewable energy resources, (2) help to achieve economies of scale and reduce the cost of clean hydrogen production from renewable and zero-carbon energy sources, (3) advance state greenhouse gas emission reduction goals, and (4) maximize socioeconomic, workforce, equity, and health benefits.
 - b) Specifies that I-Bank may provide grants from the fund to support a diverse range of projects across the state of California related to clean hydrogen in the public, private, and nonprofit sectors. In particular, the I-Bank should prioritize investment in clean hydrogen production from the private sector.
- 4) Requires the Governor to appoint a Clean Hydrogen Hub Director by April of 2023 to act as a state coordinator for efforts related to clean hydrogen production, processing, delivery, storage, and end use in California.
- 5) Requires the Director to consult with and coordinate clean hydrogen-related efforts with the federal government, the Independent System Operator, relevant state agencies, and local jurisdictions, as specified.
- 6) Defines "decarbonize," in this section, as meaning to reduce or eliminate associated emissions of greenhouse gases (GHG).
- 7) Directs CARB, in consultation with CEC and CPUC, to provide recommendations and definitions to the public and the legislature by June 1, 2024 on clean hydrogen production pathways, infrastructure, electrical usage, and cost benefit analysis. This report should include workforce development and the appropriate end uses for that hydrogen.
- 8) Directs the CEC to study and model potential growth for hydrogen in decarbonizing the electrical and transportation sectors of the economy in the 2023 and 2025 editions of the integrated energy policy report (IEPR).
- 9) Directs the CEC to consult with the CPUC and CARB to develop a definition of renewable hydrogen that, when used in an electrical generating facility, would enable the facility to meet the definition of a "renewable electrical generation facility" set forth in the RPS Program.

- 10) Clarifies that an “eligible renewable energy resource” may include an electrical generating facility using renewable hydrogen, as determined by the CEC in the RPS Program.
- 11) Directs CARB, CEC, and CPUC to consider green electrolytic hydrogen as an eligible form of energy storage, and to consider potential uses of green electrolytic hydrogen, in their respective decarbonization strategies.
- 12) Makes a number of findings and declarations related to the climate benefits of hydrogen and the need to develop a green hydrogen economy in the state.

EXISTING LAW:

- 1) Establishes the Bergeson-Peace Infrastructure and Economic Development Act, which creates the California Infrastructure and Economic Development Bank (I-Bank) in the Governor’s Office of Business and Economic Development (GO-Biz). Authorizes the I-Bank to make loans, issue bonds, and provide financial assistance for economic development projects, public infrastructure, and special fund programs. (Government Code § 63021)
- 2) Establishes the RPS Program requiring certain percentages of electricity retail sales be served by renewable resources, most recently increased by SB 100 (De Leon, Chapter 312, Statutes of 2018) to 60% by 2030. (Public Utilities Code § 399.11)
- 3) Includes, among the list of resource types eligible for the RPS Program, various types of bioenergy feedstock such as biomass, digester gas, municipal solid waste conversion landfill gas, and fuel cells using renewable fuels. (Public Resources Code § 25741)
- 4) Establishes a state goal of procuring 100 percent of electricity from eligible renewable energy resources and zero-carbon resources by December 31, 2045. (Public Utilities Code § 454.53)
- 5) Defines “green electrolytic hydrogen” as hydrogen gas produced through electrolysis and does not include hydrogen gas manufactured using steam reforming or any other conversion technology that produces hydrogen from a fossil fuel feedstock. The statutory definition does not specify the type of energy input needed to drive the electrolytic reaction; thus any energy input would qualify under this definition. (Public Utilities Code § 400.2)
- 6) Requires the CPUC, CEC, and CARB to consider green electrolytic hydrogen an eligible form of energy storage and consider its potential uses. (Public Utilities Code § 400.3)
- 7) Requires the CEC to adopt an integrated energy policy report every two years. This integrated report shall contain an overview of major energy trends and issues facing the state. (Public Resources Code § 25302 (a)).

FISCAL EFFECT: According to the Senate Committee on Appropriations, this bill would result in significant, ongoing costs in the millions of dollars. These costs would arise from GO-Biz implementing the I-Bank grant program, and CARB and the CEC conducting evaluations and assessments. Curiously, the CPUC does not anticipate a fiscal impact.

BACKGROUND:

The Hydrogen Color Wheel – Hydrogen has been considered the “swiss army knife” of decarbonization technologies; praised for its touted zero-GHG profile and potential to readily replace fossil fuels in most applications. However, there are many types of hydrogen with varying levels of climate benefits. In other words, not all hydrogen is created equal. The type of feedstock (what material is used to make the hydrogen) and the production method (what is done to break apart the feedstock into hydrogen) can greatly affect the environmental benefits of the resource.

Some notable feedstocks of hydrogen include biomass, biomass-derived liquids like ethanol and bio-oil, biogas, coal, natural gas, and water. These feedstocks are then broken down through thermochemical processes to generate hydrogen. The thermochemical processes vary and can generate different amounts and types of particulate pollution and GHGs. In every process, energy is needed in order to generate hydrogen. Some processes rely on clean resources exclusively for their power, while others are less discriminating. The combinations of feedstocks and processes result in a multitude of hydrogen products. A simplified color spectrum has been adopted to describe these hydrogen products; however, the definitions of these colors are neither universally agreed upon nor rigorous.

- “Gray (or brown) hydrogen” is produced from a natural gas feedstock and whatever energy is cheapest, via natural gas steam methane reforming. **The vast majority of hydrogen currently used in the United States comes from this process.** While cheap and efficient, it generates carbon dioxide and other pollutants, depending on the energy source used.
- “Blue hydrogen” employs the same process as gray hydrogen, but the carbon dioxide emitted from steam methane reforming is captured and stored, lessening the GHG impact of this process.
- “Turquoise hydrogen” uses a natural gas feedstock, which is passed through molten metal to split the natural gas into hydrogen and solid carbon.
- “Green hydrogen” is produced using only renewable feedstock – such as biomass, renewable natural gas, or water – and typically (but not always) relies on renewable electricity to generate the hydrogen.
- “Green electrolytic hydrogen” is a specific type of green hydrogen which uses water as the feedstock and renewable electricity to split the water in order to generate hydrogen. Green electrolytic hydrogen is currently the only type of hydrogen defined in the Public Utilities Code (Public Utilities Code § 400.2). However, its statutory definition does not

specify that renewable electricity must be used to split the water, making it only partially “green” in the traditional sense.

- “Pink hydrogen” refers to a specific type of green electrolytic hydrogen where only nuclear energy is used to split the water.
- “Yellow hydrogen” refers to a specific type of green electrolytic hydrogen where only solar energy is used to split the water.

As the Color Wheel indicates, any conversation about hydrogen is heavily dependent upon the color and precise definition of that color being discussed. With so many colors and so many loose definitions, it is easy to misunderstand or misascribe the climate benefits when discussing hydrogen.

What Do We Do With All the H₂? Hydrogen has the potential to be used in a multitude of applications – from fuel cells in cars; to replacing natural gas in homes; to fuel replacement in aviation, shipping, and trucking industries; and to generate electricity. One, much discussed, potential application of hydrogen is to firm our renewable energy grid. By using low-cost, abundant electricity from intermittent renewables during the day (i.e. solar and wind) to produce hydrogen, and then using that hydrogen in fuel cells or injecting into a pipeline to provide power at other times, hydrogen can act as a form of storage. However, in practice, many of the technologies used to produce hydrogen from renewables are still expensive and unable to economically cycle on and off in line with the availability of intermittent renewables. This example in the energy sector is characteristic of many other hydrogen applications – where the GHG footprint, cost, and availability of the hydrogen are uncertain or unclear – calling for a more thorough understanding of which hydrogen product is best suited to which application.

The Hydrogen Economy in California. Several initiatives and programs have been implemented in California to develop hydrogen use and production, largely in the transportation space. In 2004, then-Governor Schwarzenegger launched the Hydrogen Highway initiative, setting a goal of building 100 publicly funded hydrogen vehicle fueling stations. While California has yet to reach this goal (in 2020 there were approximately 50 publicly funded fueling stations in operation), the CEC announced an additional \$115 million for hydrogen fueling stations in 2020. Hydrogen vehicles also continue to be eligible for California ZEV subsidy programs.

California has spent more than \$300 million dollars in the past 10 years funding rebates for those who buy or lease hydrogen cars, construction of refueling stations and the purchase of transit buses, as well as subsidizing development of hydrogen-driven freight trucks. It is estimated that approximately 9,647 hydrogen fuel-cell electric vehicles were actively on-road in California in 2020-2021. Investment in hydrogen infrastructure is predicted to lead to job growth across a wide range of sectors. In addition to building refueling stations for hydrogen-powered vehicles, hydrogen can also be utilized to power industrial sectors which may otherwise be difficult to decarbonize such as transportation, long-haul trucking, electrical grid power, and renewable energy storage. The development of and conversion to hydrogen infrastructure in these industries and for consumer vehicles is predicted to lead to net job creation. Economic impact models

developed by Argonne National Laboratory predict that development of hydrogen fuel stations will lead to job growth across all stages of the hydrogen supply chain in California.

GO-Biz. In February 2010, the Little Hoover Commission undertook a review of the state's economic and workforce development programs. The report, *Making up for Lost Ground: Creating a Governor's Office of Economic Development*, analyzed the status and effectiveness of current programs since the 2003 demise of the Technology, Trade and Commerce Agency and recommended the creation of a new governmental entity to fill the void left by the dismantled agency. The report called for a single entity to promote greater economic development, foster job creation, serve as a policy advisor and deliver specific services (i.e., permitting, tax, regulatory, and other information) directly to the California business community. In April 2010, Governor Schwarzenegger issued Executive Order S-05-10 as a means to operationalize the report recommendations including the creation of the Governor's Office of Economic Development (GOED). In October 2011, the Governor signed AB 29 (John A. Pérez, Chapter 475, Statutes of 2011), which effectively codified GOED and changed its name to GO-Biz. Since its inception, the office has served thousands of businesses, 95% of which are small businesses. The most frequent types of assistance include help with permit streamlining, starting a business, relocation and expansion of businesses, and regulatory challenges.

Federal Hydrogen Hub Grants. Last year, the federal government included \$9.5 billion in federal grants for clean hydrogen development in the Federal Infrastructure Investment and Jobs Act (IIJA). This includes an \$8 billion Regional Clean Hydrogen Hubs grant program. The Regional Clean Hydrogen Hubs program includes diversity requirements for feedstock, end-use, and geography. Under the feedstock diversity requirement, there must be at least one hub that can produce hydrogen from fossil fuels, at least one hub for hydrogen produced from renewable energy, and at least one hub for hydrogen produced from nuclear energy.

COMMENTS:

- 1) *Author's Statement.* According to the author, "Green Hydrogen, made from renewable sources, is a multifaceted energy and fuel source that has the potential to help decarbonize otherwise difficult sectors such as long-haul trucking, our ports, and air travel. It can also be used to generate power or store renewable energy for later use. SB 1075 advances green hydrogen by creating a fund that will help California compete for a federal Hydrogen Hub grant, and requiring state agencies to include green hydrogen in all of California's plans for a climate safe future."
- 2) *Creating a Hydrogen Hub.* This bill aims to establish a statutory framework enabling California to compete for federal infrastructure funding. As stated earlier, the IIJA provided the DOE with approximately \$8 billion to establish hydrogen hub grants. According to the DOE, these hubs should be networks of clean hydrogen producers, potential consumers, and associated infrastructure in close geographic proximity. This bill establishes a California Clean Hydrogen Hub Fund and tasks the I-Bank with

administering the Fund to provide grants for hydrogen hub projects that meet requirements in the IIJA. This bill also contains various definitions and requirements intended to align the California Clean Hydrogen Hub Fund with IIJA goals for hydrogen production. To the extent that this bill makes California more competitive for these funds, this bill may enable California to obtain a substantial amount of non-state funds for hydrogen production.

- 3) *A matter of definitions.* As indicated earlier, hydrogen production methods vary and the resources used in those processes can be fossil fuels. The vast majority of hydrogen currently used is “gray hydrogen,” which is produced from methane. Other, cleaner forms of hydrogen exist, including green electrolytic hydrogen, the only type currently defined in statute, which includes hydrogen produced through the use of any type of electricity to split water into hydrogen and oxygen. This bill defines “clean hydrogen” as hydrogen produced from renewable energy resources consistent with requirements specified in the IIJA. The IIJA initially defines clean hydrogen as hydrogen produced with a carbon intensity equal to or less than 2 kilograms of carbon dioxide-equivalent produced at the site of production per kilogram of hydrogen produced. However, the IIJA requires DOE to work with the federal Environmental Protection Agency to establish a standard for the carbon intensity of clean hydrogen and enables DOE to revise the definition of clean hydrogen based on the standard developed with the EPA. This bill’s definition of clean hydrogen aligns with the initial definition established in the IIJA; however this bill does not specify the types of hydrogen production that would meet the definition. This bill also does not address how DOE revisions to the definition of clean hydrogen may affect grant eligibility at the state level.

Beyond “clean hydrogen,” this bill requires CARB, the CEC, and the CPUC with jointly develop recommendations on definitions for other categories of hydrogen, including green hydrogen, zero-carbon hydrogen, renewable hydrogen, and low-carbon hydrogen. The agencies must make recommendations and provide guidance to the Legislature on where the different categories of hydrogen may be used to meet eligibility requirements for existing programs. As part of the definition development, this bill requires the agencies to calculate life-cycle carbon dioxide intensity values for hydrogen pathways. Given the multitude of hydrogen types, it seems prudent to require a comprehensive review of the appropriate categories, emissions, and end-uses associated with each type of hydrogen and provide consistent definitions to reduce confusion and ensure hydrogen usage aligns with legislative goals.

- 4) *What is being added to the RPS?* As stated above, this bill requires CARB to work with the CEC and CPUC to develop legislative recommendations regarding the use of hydrogen in various decarbonization and energy procurement policies, including RPS procurement requirements. However the bill goes further to require “renewable hydrogen” to be defined such that a facility using it would automatically qualify under the RPS. While hydrogen can be made using feedstocks that are already eligible under

the RPS, it is not clear what types of hydrogen could be eligible for the RPS when used to repower electric power plants. As a result, this bill appropriately adds RPS eligibility as a list of considerations for the joint agencies to address when developing the various hydrogen definitions. However, a question arises as to whether this bill might be prejudging the outcome of the definition development by simultaneously including “renewable hydrogen” in the RPS undefined. *As a result, the author and committee may wish to clarify that the inclusion of “renewable hydrogen” in the RPS is subject to the completed definition development undertaken by the joint agencies in this bill.*

5) *Related Legislation.*

SB 733 (Hueso) establishes a definition of “renewable hydrogen,” and mandates the California Public Utilities Commission (CPUC) establish renewable hydrogen procurement goals for each gas corporation on a proportionate basis. Additionally requires the CPUC to approve a gas corporation’s expenses from infrastructure built to deliver biomethane, renewable hydrogen, or both from a producer to the pipeline as part of the corporation’s rate base paid for by their customers. Status: *pending hearing* in this committee on June 22nd, 2022.

6) *Prior Legislation.*

SB 18 (Skinner, 2021) would have required CARB, CPUC and the CEC to incorporate green electrolytic hydrogen into various decarbonization strategies, and would have required CARB to analyze and provide recommendations regarding potential uses of hydrogen to reduce economy-wide emissions. Status: Held in the Assembly Committee on Appropriations.

SB 697 (Hueso, 2021) would have required CARB to establish a Green Hydrogen Credit Program to provide industrial facilities that produce green hydrogen with an additional Cap-and-Trade GHG allowance of 10 tons for every metric ton of green hydrogen produced during a compliance period. Status: Held in the Senate Committee on Appropriations.

SB 1122 (Skinner, 2020) would have required CARB to incorporate planning and recommendations for green electrolytic hydrogen into the scoping plan. The bill contained provisions substantially similar to some of those contained in this bill. Status: Died in the Senate Committee on Energy, Utilities, and Communications.

SB 100 (De León) raised the RPS procurement requirement from 50 percent to 60 percent by 2030. The bill also 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 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 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. The bill died in the Assembly.

AB 2196 (Chesbro) ensured that biogas qualifies for RPS credit, provided its production, delivery and use meet certain conditions. Status: Chapter 605, Statutes of 2012.

- 7) *Double Referral*. This bill is double-referred; upon passage in this Committee, this bill will be referred to the Assembly Committee on Natural Resources.

REGISTERED SUPPORT / OPPOSITION:

Support

350 Silicon Valley
Air Products and Chemicals, INC.
Aquahydrex
Blockchain Advocacy Coalition
California State Pipe Trades Council
Calstart INC.
Fortescue Future Industries USA
Green Hydrogen Coalition
H2U Technologies
Mitsubishi Powers Americas
Novohydrogen, INC.
Planet Power Finance Ag
San Diego Gas & Electric
Silicon Valley Leadership Group
Southern California Gas Company
The Utility Reform Network (TURN)
University of California

Opposition:

None on file.

Oppose Unless Amended

Earthjustice

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