SENATE COMMITTEE ON ENVIRONMENTAL QUALITY
Senator Allen, Chair
2021 - 2022 Regular

Bill No:	SB 1347		
Author:	Hueso		
Version:	4/18/2022	**Hearing Date:**	4/27/2022
Urgency:	No	**Fiscal:**	Yes
Consultant:	Eric Walters		

SUBJECT: California Global Warming Solutions Act of 2006: scoping plan: renewable hydrogen production study

DIGEST: This bill requires the California Air Resources Board (ARB) to complete, as part of the Scoping Plan process, a comprehensive feasibility study regarding renewable hydrogen, as specified.

ANALYSIS:

Existing law:

1) Requires ARB to create a Climate Change Scoping Plan to achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas (GHG) emissions from sources or categories of sources of GHG by 2020. The plan must identify and recommend direct GHG emissions reduction measures, alternative compliance mechanisms, market-based compliance mechanisms, and potential monetary and non-monetary incentives that the state board finds are necessary or desirable to meet the 2020 emissions reduction goals. ARB must update this scoping plan at least once every five years through a public workshop process. (Health and Safety Code (HSC) §38561)

2) 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. (PUC §400.2)

3) Requires the California Public Utilities Commission (CPUC), California Energy Commission (CEC) and ARB to consider green electrolytic hydrogen an eligible form of energy storage and consider its potential uses. (PUC §400.3)

4) Establishes a Renewables Portfolio Standard (RPS) requiring certain percentages of electricity retail sales be served by renewable resources, most recently increased by SB 100 (De Leon, 2018) to 60% by 2030 and a state goal

of procuring 100 percent of electricity from eligible renewable energy resources and zero-carbon resources by December 31, 2045. Existing law requires state agencies, including the CPUC, CEC, and ARB, to take certain actions to support the state's clean energy goals. (PUC §454.53)

5) Requires, under SB 1505 (Lowenthal, Chapter 877, Statutes of 2005), on a statewide basis, no less than 33.3% of the hydrogen produced for, or dispensed by, fueling stations that receive state funds be made from eligible renewable energy resources as defined under the RPS.

This bill:

1) Requires ARB to, as part of the Scoping Plan process, complete a comprehensive feasibility study of renewable hydrogen production, distribution, transmission, and application, which is to include:
   a) The history of renewable hydrogen production, distribution, and utilization within the state;
   b) The potential job creation and work opportunities related to renewable hydrogen production, transmission, and distribution;
   c) The potential for opportunities to integrate renewable hydrogen production with drinking water supply treatment needs; and
   d) The potential for development and siting of renewable hydrogen production facilities collocated with hard-to-decarbonize industrial processes.

2) Requires ARB to deliver the study to the Legislature and post it on its website on or before December 31, 2023.

3) Permits ARB to contract with an educational institution or related organization to conduct the study.

4) Directs ARB to focus the analysis and recommendations of the study on hydrogen produced by splitting water into hydrogen and oxygen using eligible renewable energy resources through the process of electrolysis.

Background

1) *How to make hydrogen*. Hydrogen can be produced using a number of different processes. Thermochemical processes use heat and chemical reactions to release hydrogen from organic materials such as fossil fuels and biomass. Water (H2O) can be split into hydrogen (H2) and oxygen (O2) using electrolysis or solar energy. Microorganisms such as bacteria and algae can

produce hydrogen through biological processes.

Some notable methods to produce hydrogen include:

a) Natural Gas Reforming/Gasification: Synthesis gas, a mixture of hydrogen, carbon monoxide, and a small amount of carbon dioxide, is created by reacting natural gas with high-temperature steam. The carbon monoxide is reacted with water to produce additional hydrogen. This method is the cheapest, most efficient, and most common. Natural gas reforming using steam accounts for the majority of hydrogen produced in the United States annually.
   A synthesis gas can also be created by reacting coal or biomass with high-temperature steam and oxygen in a pressurized gasifier, which is converted into gaseous components—a process called gasification. The resulting synthesis gas contains hydrogen and carbon monoxide, which is reacted with steam to separate the hydrogen.
b) Electrolysis: An electric current splits water into hydrogen and oxygen. If the electricity is produced by renewable sources, such as solar or wind, the resulting hydrogen will be considered renewable as well, and has numerous emissions benefits. Power-to-hydrogen projects are taking off, where excess renewable electricity, when available, is used to make hydrogen through electrolysis.
c) Renewable Liquid Reforming: Liquids derived from biomass resources—including ethanol and bio-oils—can be reformed to produce hydrogen in a process similar to natural gas reforming. Biomass-derived liquids can be transported more easily than their biomass feedstocks.

2) *Hydrogen supply*. Today, the standard practice for producing hydrogen in California and across the United States is to split hydrogen atoms from fossil gas through a highly polluting technology called Steam Methane Reforming (SMR). Fossil fuel companies produce nearly all of the United States' annual supply of hydrogen—about 10 million metric tons—through SMR.

   Under SB 1505 (Lowenthal, Chapter 877, Statutes of 2005), California hydrogen fueling stations that receive state funds are required to supply at least 33.3% hydrogen made from eligible renewable energy resources under the California Renewables Portfolio Standard (RPS). While that is not a specific statutory definition of "renewable hydrogen," that particular phrase does not appear in statute.

   In ARB's regulations, however, renewable hydrogen is defined as, "hydrogen derived from (1) electrolysis of water or aqueous solutions using renewable

electricity (defined as RPS-eligible resources); (2) catalytic cracking or steam methane reforming of biomethane; or (3) thermochemical conversion of biomass, including the organic portion of municipal solid waste." Notably, this definition is broader than the stated focus of SB 1347, as well as potentially broader than the definition included in SB 1505.

Comments

1) *Purpose of Bill.* According to the author, "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. To meet California's ambitious goals for integrating renewable energy into California's electrical grid and to achieve zero-carbon emission objectives, the state must intentionally advance programs, incentives, and policies that ensure there are adequate resources to meet these goals and objectives. While California's solar and wind renewable energy programs have been shaped over decades, the state continues to make only incremental progress in the development and commercialization of other renewable energy resources and zero-carbon emission products, including renewable hydrogen. It is important that we have the informational resources to best understand the role that renewable hydrogen can have in the efforts to achieve the state's goal for carbon neutrality.

   "SB 1347 would develop an important informational foundation for understanding the broader context within which renewable hydrogen can be fully implemented and utilized in California, including potential job creation and work opportunities, the potential for application of renewable hydrogen to decarbonize advanced treatment water supply operations to also help our state advance its water resilience objectives, and opportunities for making progress on difficult-to-decarbonize industries."

2) *What is renewable hydrogen?* As described in the background, the definition of "renewable hydrogen" is not entirely clear, though the definition in ARB's regulations involving three categories of hydrogen (from electrolysis, SMR or cracking of biomethane, or thermochemical conversion of biomass) appears to be the most widely used. If signed into law, SB 1347 would represent the first appearance of the term "renewable hydrogen" in statute.

   Recent amendments made by the author direct ARB to "focus the study analysis and recommendations on hydrogen produced by splitting water into hydrogen and oxygen using eligible renewable energy resources through the process of electrolysis," which describes electrolytic hydrogen. However,

repeated use of the term "renewable hydrogen" persists throughout the bill.

Going forward, the author may wish to consider either expanding the type of hydrogen the bill requires ARB to focus on, or replace references to "renewable hydrogen" with "electrolytic hydrogen" to avoid confusion.

3) *Study scope*. As part of the feasibility study envisioned by SB 1347, there are four specific topics listed for inclusion: history, job impacts, water supply integration, and colocation.

   The history and job impact components will provide helpful context for policymakers as we plan and build the state's future green economy, but the other two specific details have not been part of previous discussions around hydrogen, and merit further discussion here.

   Drinking water supply treatment needs, including desalination, potable reuse, and salt and contaminant removal projects, are mainly linked to hydrogen because electrolysis entails the splitting of water. At sufficiently large scales, electrolysis could create a significant new demand for fresh water, and this should figure into the state's hydrogen plans. Desalination is one option for increasing the availability of water for electrolysis, but doing so would bring its own costs and considerations. According to a recent article published in American Chemical Society - Energy Letters, "if desalination by [reverse osmosis] is utilized, the additional energy requirement would be less than 0.2% of the minimum energy required to produce the hydrogen by electrolysis, and the energy cost would add approximately $0.01 to the price of hydrogen per kilogram." This suggests that further increasing the cost of hydrogen (by using desalinated water as a feedstock) does not necessarily preclude its use as an economical energy tool, but this certainly merits further study and consideration.

   As for colocation, the devil is in the details. Some commercial hydrogen fueling stations feature on-site generation. Much of this is from SMR, but it could be made through electrolysis as well. While drastically reducing transportation costs of hydrogen is appealing, it will have to be balanced with design, capacity, and capital expenditure considerations.

   All in all, these topics are pertinent and forward-looking inclusions in the broader conversation around hydrogen in California.

4) *Scoping plan is not the right home*. This bill requires ARB to include a feasibility study of renewable hydrogen production in the Scoping Plan.

Specifically, SB 1347 requires that study to be completed by December 31, 2023, and the code section itself is repealed January 1, 2025.

ARB is currently undergoing the process of updating the Scoping Plan update—which is expected to conclude this year—for the first time since 2017. This complies with the statutory direction to update the Scoping Plan every five years, and continuing on that trend, we can predict that the next Scoping Plan update would likely occur in 2027.

The timeline proposed in SB 1347 does not fit the Scoping Plan update process, but ARB can (and has) published reports on specific topics that are not part of the Scoping Plan as well.

5) *Committee amendments*. ***The committee may wish to consider amending SB 1347 to require ARB to complete the study not as a part of the Scoping Plan update process from comment 4 above.***

Related/Prior Legislation

SB 1075 (Skinner) advances hydrogen as a decarbonization solution by creating a Clean Hydrogen Hub Fund to support a state bid for a federal Hydrogen Hub grant. This bill requires ARB, CPUC, and CEC to consider green hydrogen in order to reduce greenhouse emissions and support the growth of California's hydrogen economy. SB 1075 is currently in the Senate Energy, Utilities, and Communications committee pending a 4/26/22 hearing.

SB 18 (Skinner, 2021) establishes a definition for green hydrogen, requires the ARB to include a strategic plan for green hydrogen in the next Scoping Plan update, requires CPUC to consider green hydrogen in resource adequacy requirements, and requires CEC to submit a report to the Legislature on the uses of green hydrogen for transportation and energy decarbonization. Directs ARB, CPUC, and CEC to consider green hydrogen as a zero-carbon resource for electric utility procurement plans if its production meets specified criteria. SB 18 died in the Assembly Appropriations committee.

SOURCE: Author

SUPPORT:

California State Association of Electrical Workers
Innergex Renewable Development, Usa, LLC

OPPOSITION:

None received

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