

# California Hydrogen Business Council Comments on Webinar on Meeting California's Carbon Neutrality Goals: Approaches for the Industrial Sector

March 6, 2020

## I. INTRODUCTION

The California Hydrogen Business Council (CHBC)<sup>1</sup> appreciates this opportunity to share comments on the February 20, 2020 California Air Resources District (CARB) webinar on Meeting California's Carbon Neutrality Goals: Approaches for the Industrial Sector. CHBC strongly supports CARB's continued focus on industrial sector emissions in its efforts to pursue statewide carbon neutrality by 2045. We also thank the agency for acknowledging the need for renewable gas and fuel, as well as accompanying infrastructure, to effectively reduce industrial greenhouse gas<sup>2</sup> and for expanding its scope of inquiry to other regions to gather information on technology and policy innovation and best practices. Our comments, per the staff questions at the end of the presentation, are focused on:

- Highlighting that all the regions discussed in the webinar are pursuing zero carbon hydrogen as part of their decarbonization or carbon neutral efforts, and particularly that most are prioritizing zero carbon hydrogen as a key to reducing emissions in the industrial sector.
- Encouraging California to learn from these examples and leverage existing CARB programs, like Cap and Trade and SB 1383 and SB 100 implementation, to boost progress.
- Building on this effort by establishing a decarbonized hydrogen procurement and incentive program for non-core gas customers, supporting a cohesive policy framework on hydrogen backed by relevant regulatory mechanisms, research and development

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<sup>1</sup> The CHBC is comprised of over 100 companies and agencies involved in the business of hydrogen. Our mission is to advance the commercialization of hydrogen in the energy sector, including transportation, goods movement, and stationary power systems to reduce emissions and dependence on oil. The views expressed in these comments are those of the CHBC, and do not necessarily reflect the views of all of the individual CHBC member companies. Members of the CHBC can be found here: <https://www.californiahydrogen.org/aboutus/chbc-members/>

<sup>2</sup> Webinar presentation, Slides 9, 10, 11

funding, and public-private investment strategies, as well as continued international collaboration to identify and adopt best practices.

These measures can help overcome the hurdle of needing to decarbonize hydrogen quickly and economically scale, as well as ensure California builds on its longtime history as a clean energy and climate leader that remains on the forefront of innovation and sustainability.

## **II. COMMENTS**

The following are responses to the questions put forth by staff at the end of the webinar.

### **A. Question 1: What are your thoughts about the programs in other jurisdiction that were surveyed in this presentation? What elements of these programs might be worth considering for California?**

The CHBC supports CARB's focusing on the jurisdictions surveyed in the presentation. We especially encourage expanding this effort to include particular focus on decarbonized hydrogen development, which is a core element of addressing industrial greenhouse gas emissions in nearly all these regions, and how California can help lead this global development. Below are specific programs and projects region by region that we recommend CARB consider that may inform the state's approach industrial carbon neutrality.

#### **1. European Union**

- *Hydrogen Roadmap Europe*<sup>3</sup>- The European Commission's framework for hydrogen development includes the following key takeaways and recommendations for addressing industry sector emissions:
  - Hydrogen offers particularly promising benefits for high-grade heat industrial processes, which represents > 30% of industry's (e.g. cement and chemicals)

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<sup>3</sup> *Hydrogen Roadmap Europe*, European Commission's Fuel Cells and Hydrogen 2 Joint Undertaking; January 2019 (see section in Industrial applications starting on p. 37)  
[https://www.fch.europa.eu/sites/default/files/Hydrogen%20Roadmap%20Europe\\_Report.pdf](https://www.fch.europa.eu/sites/default/files/Hydrogen%20Roadmap%20Europe_Report.pdf)

- Cost competitiveness of hydrogen to decarbonize industrial process heat is highly dependent on electricity prices and carbon credit pricing, as well as availability of biomass and CCS, and may first achieve success in other sectors like transportation.
  - In the chemical industry, which emits ~ 20% of all CO<sub>2</sub> emissions, hydrogen can be adopted quickly because it allows companies to decarbonize production by replacing natural gas with hydrogen with significantly fewer retrofit investments and process changes than electrification.
  - Hydrogen is well-suited as a backup energy provider for all sectors because it guarantees uninterrupted, reliable, clean power and heat whenever needed, independent of weather conditions or imports.
- *Horizon Europe* - This project featured in the webinar presentation<sup>4</sup> supports renewable hydrogen as part of its program in an initiative that “aims to help create a clean hydrogen sector in Europe that is strong, innovative and competitive and fully capable of supporting and enabling the energy transition outlined in the Commission’s Communication ‘A Clean Planet for All’.”<sup>5</sup>
  - *Germany’s Hydrogen Strategy* – Recently the German government released a draft hydrogen strategy that aims to zero carbon hydrogen to decarbonize industry and transportation.<sup>6</sup> The strategy includes among other specifics:
    - 2030 target of at least 20% of hydrogen in Germany to be produced using renewables
    - Three to five gigawatts of electrolyzers
    - €3.4 billion in government support for fueling stations

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<sup>4</sup> Webinar presentation, Slide 15

<sup>5</sup> <https://www.euchems.eu/newsletters/european-partnership-for-clean-hydrogen-horizon-europe-programme/>

<sup>6</sup> <https://www.euractiv.com/section/energy-environment/news/germany-floats-draft-hydrogen-strategy-ahead-of-eu-presidency/>

- €650 million planned over four years, added to €400 million already issued, to fund testing facilities for industrial scale hydrogen production and applications.
- *Sample of individual projects*
  - Hanson UK's Ribblesdale cement plant – A project funded by £3.2 million government award with the purpose of researching the potential to cut carbon emissions in cement production by switching from fossil to decarbonized fuels, including decarbonized hydrogen, at an industrial scale.<sup>7</sup> The research project has been coordinated by UK industry body the Mineral
  - thyssenkrupp Steel, North Rhine-Westphalia, Germany – This state supported public-private partnership project aims reduce carbon emissions at the steel plant 30% by 2030 and to be greenhouse gas neutral by 2050 by replacing coal and coke with hydrogen. The first step at the plant, which emits 3% of the nation's carbon emissions, will be fuel switch energy for the plant's blast furnaces. By the mid-2020s, hydrogen will be used to reduce emissions directly at the followed by building large-scale direct reduction plants, which will be operating with hydrogen-containing gases starting in the mid-2020s.<sup>8</sup>
  - HySynergy - The Danish Energy Agency has awarded > 6 million euros to this project being developed by private industry to establish a large-scale, electrolysis-based hydrogen production facility at a Danish Shell refinery . The goal is to supply decarbonized fuel to the refinery and for transportation.<sup>9</sup>

## 2. Australia

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<sup>7</sup> <https://www.heidelbergcement.com/en/pr-26-02-2020>

<sup>8</sup> <https://www.thyssenkrupp-steel.com/en/newsroom/press-releases/world-first-in-duisburg.html>

<sup>9</sup> [https://www.businesswire.com/news/home/20191223005512/en/Everfuel-Awarded-Grant-Establishment-Large-Scale-Hydrogen-Production/?feedref=JjAwJuNHiystnCoBq\\_hl-YKT6SDyMw5Lye4ovXwHmkqD8R-QU5o2AvY8bhl9uvWSD8DYIYv4TIC1g1u0AKcacnnViVjtb72bOP4-4nHK5idAXrgr\\_e1ZUbxv](https://www.businesswire.com/news/home/20191223005512/en/Everfuel-Awarded-Grant-Establishment-Large-Scale-Hydrogen-Production/?feedref=JjAwJuNHiystnCoBq_hl-YKT6SDyMw5Lye4ovXwHmkqD8R-QU5o2AvY8bhl9uvWSD8DYIYv4TIC1g1u0AKcacnnViVjtb72bOP4-4nHK5idAXrgr_e1ZUbxv)

- ARENA<sup>10</sup> - Notably uptake of renewable hydrogen is the programs three investment priorities.<sup>11</sup>
  - \$44 million in research and development funding has already been granted to date<sup>12</sup>
  - Includes funding for trials of hydrogen blending into gas pipelines<sup>13</sup> and feasibility studies for two large scale renewable hydrogen projects.
    - Dyno Nobel facility, Moranbah, Queensland – Project to decarbonize the industrial facility, which currently runs on gas, to renewable hydrogen. The project consists of an approximately 210 megawatt solar farm coupled with a 160 megawatt electrolyzer to produce renewable hydrogen and “green ammonia.”<sup>14</sup>
    - Queensland Nitrates ammonia plant - Renewable hydrogen production and storage facilities to be built that use hydrogen produced with wind and solar power to supply a fifth of the ammonia needs from ammonia plant that currently relies only on gas.<sup>15</sup>
- *Australian National Hydrogen Strategy* – Lays out “a vision for a clean, innovative, safe and competitive hydrogen industry that benefits all Australians and is a major global player by 2030.” Regarding industrial applications:
  - Identifies refineries and ammonia facilities as “clear early opportunities” to scale hydrogen in Australia and globally.<sup>16</sup>

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<sup>10</sup> Webinar presentation, Slide 22

<sup>11</sup> <https://arena.gov.au/blog/renewable-hydrogen-projects-receive-new-funding/>

<sup>12</sup> <https://arena.gov.au/news/arena-gets-cracking-on-commercial-scale-hydrogen/>

<sup>13</sup> See: <https://arena.gov.au/news/power-gas-trial-to-inject-hydrogen-australias-gas-grid/> and <https://reneweconomy.com.au/hydrogen-potential-for-local-gas-networks-in-sa-and-victoria-47416/>

<sup>14</sup> <https://arena.gov.au/news/renewable-hydrogen-could-power-moranbah-ammonia-facility/>

<sup>15</sup> <https://arena.gov.au/news/queensland-green-ammonia-plant-could-use-renewable-hydrogen/>

<sup>16</sup> pp. 34, 39 *Australia's National Hydrogen Strategy*, Council of Australian Governments Energy Council; 2019 <https://www.industry.gov.au/sites/default/files/2019-11/australias-national-hydrogen-strategy.pdf>

- Identifies green ammonia as a new energy export priority for Northern Territory.<sup>17</sup>
- New opportunities for clean hydrogen such as clean ammonia exports, clean fertiliser exports, industrial heating, iron ore processing and steel making are priorities for support for research, pilots, trials and demonstrations along the supply chain.<sup>18</sup>
- *H2-Hub*<sup>19</sup>, Gladstone, Queensland - Multi-billion dollar project on a 171-hectare industrial site near existing energy export infrastructure being developed by The Hydrogen Utility.
  - Aims to include electrolyzer capacity of up to 3,000MW for production of renewable hydrogen and 5,000 tonnes of daily production of green ammonia.
  - Coupled with a AUD 4.2 million hydrogen injection facility that will blend hydrogen with natural gas in the pipeline and ultimately convert the pipeline to 100% hydrogen, with a vision of ultimately converting to all hydrogen.

### 3. New Zealand

- *New Zealand's Green Hydrogen Strategy Green Paper*, which “presents the New Zealand Government’s vision to harness the hydrogen opportunity for a sustainable and resilient energy future for New Zealand.”<sup>20</sup>
  - includes a framework for deploying hydrogen as a core pathway to reduce greenhouse gas emissions in New Zealand’s industrial sector.<sup>21</sup>

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<sup>17</sup> p. xxx, *ibid*

<sup>18</sup> p. 79, *ibid*

<sup>19</sup> <http://statements.qld.gov.au/Statement/2020/2/27/eye-on-gladstone-for-proposed-gigawattscale-green-hydrogen-and-ammonia-development>

<sup>20</sup> p. 11, *Green Hydrogen Strategy – A Vision for Hydrogen in New Zealand*, New Zealand Government; September 2019 <https://www.mbie.govt.nz/dmsdocument/6798-a-vision-for-hydrogen-in-new-zealand-green-paper>

<sup>21</sup> p. 59-65, *ibid*.

- Specifically identifies renewable hydrogen as a way to eliminate greenhouse gas emissions from process heat, as well as industrial applications that currently depend on hydrogen produced by fossil fuels.

#### 4. Tokyo

- *2020 Tokyo “Hydrogen” Olympics*<sup>22</sup> - Hydrogen is a central theme of the upcoming Olympic Games, which will highlight
  - cutting edge hydrogen fuel cell developments
  - thousands of new fuel cell passenger vehicles on the roads
  - 100 fuel cell buses new fueling stations
  - increased electrolytic hydrogen production.
- *Japan’s Basic Hydrogen Strategy*<sup>23</sup> – Aims to transition Japan to a hydrogen-based society that includes using hydrogen in the industrial sector to reduce carbon emissions.<sup>24</sup>

#### 5. United States

In addition to the loan programs mentioned in the presentation, we call your attention to the US Department of Energy’s H2@Scale initiative, which “explores the potential for wide-scale hydrogen production and utilization in the United States to enable resiliency of the power generation and transmission sectors, while also aligning diverse multibillion dollar domestic industries, domestic competitiveness, and job creation.”<sup>25</sup> Among the focus areas of a recent \$64 million funding solicitation is adding value with hydrogen to industrial applications, in particular steel manufacturing in this round.<sup>26</sup>

#### B. Question 2: What other programs administered by CARB could be leveraged or adjusted to support further reductions in the industrial sector?

<sup>22</sup> <https://fuelcellmaterials.com/tokyo-2020-the-first-hydrogen-olympic-games/>

<sup>23</sup> [https://www.meti.go.jp/english/press/2017/1226\\_003.html](https://www.meti.go.jp/english/press/2017/1226_003.html)

<sup>24</sup> p.3 , Basic Hydrogen Strategy, Japanese Ministry of Economy, Trade and Industry; 2017

[https://www.meti.go.jp/english/press/2017/pdf/1226\\_003a.pdf](https://www.meti.go.jp/english/press/2017/pdf/1226_003a.pdf)

<sup>25</sup> <https://www.energy.gov/eere/fuelcells/h2scale>

<sup>26</sup> <https://www.energy.gov/eere/articles/energy-department-announces-64m-advance-h2scale-new-markets>

**Cap and Trade** - CARB's Cap and Trade system could make green electrolytic hydrogen and hydrogen produced from renewable and zero carbon gas (e.g biogas) eligible for greenhouse gas reduction credits. Power plants and other large polluters currently have to pay when they emit greenhouse gas emissions, as part of the state's cap and trade program. These funds could go toward renewable hydrogen development and also act as an incentive to invest in hydrogen as a cleaner form of fuel for power plants and industrial applications. Funds could also be used toward public-private projects that demonstrate large scale deployment, such as decarbonizing port operations and associated goods movement with decarbonized hydrogen technologies that displaces fossil fuels.

**SB 1383 Implementation** - SB 1383 directs state agencies to *"consider and, as appropriate, adopt policies and incentives to significantly increase the sustainable production and use of renewable gas...."*<sup>27</sup> While the bill references biomethane and biogas, the author with whom we worked closely, explicitly and intentionally also broadened the language to "renewable gas" in order to include renewable hydrogen in implementation of the law. The Energy Commission's *2017 Integrated Energy Policy Report* reinforces this in its discussion on implementing SB 1383, specifically including renewable hydrogen in the suite of solutions California deploys to mitigate short lived climate pollutants.<sup>28</sup> Per SB 1383, CARB ought to consider policies and incentives, such as procurement programs, that encourage clean hydrogen adoption by industrial customers.

**SB100 Implementation** – CARB is one of the agencies jointly overseeing implementation of California's mandate to transition all retail electricity sales to 100% renewable and zero carbon electricity by 2045. Green electrolytic hydrogen for storage, as well as for thermal and fuel cell generation, ought to be included among the candidate resources. The next step would be to

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<sup>27</sup> The first paragraph of SB 1440 refers to the SB 1383 mandate: *"Existing law requires state agencies to consider and, as appropriate, adopt policies and incentives to significantly increase the sustainable production and use of renewable gas. Existing law requires the Public Utilities Commission (PUC), in consultation with the State Energy Resources Conservation and Development Commission and the State Air Resources Board, to consider additional policies to support the development and use in the state of renewable gas that reduce short-lived climate pollutants in the state."*

<sup>28</sup> See, e.g., 2017 IEPR pp. 260, 280, 285-286.



ensure that this inclusion on the Joint Agency Report on SB 100 Implementation currently in progress.

**C. What hurdles does California face for decarbonizing the industrial sector? How can CARB help overcome these hurdles?**

The biggest hurdle is that polluting fuels are currently cheaper than clean options like green hydrogen, which disincentivizes polluters from decarbonizing. The biggest key to solving this problem is to accelerate green hydrogen achieving scale by providing certainty to industry to encourage investment. In addition to the recommendations above, CARB can help overcome this hurdle by:

- **Create a hydrogen procurement standard for non-core customers** to set a requirement for purchase, with contracts that are adequately long to assure investors. Efforts to set a procurement standard pursuant to SB 1383 and SB 1440 at the CPUC may not include all renewable gas options and will not reach non-core customers who fall out of CPUC jurisdiction. CARB can help fill this gap for industrial customers, while providing market certainty to decarbonized hydrogen producers and developers that prevents them from taking their business to other countries and regions that are safer bets instead of California.
- **Support the establishment of an overarching hydrogen policy strategy for California** that brings the state's current piecemeal approach to hydrogen development, in which sectors and initiatives are siloed, under one cohesive policy framework. While the US Department of Energy has an H2@Scale program aimed at bringing down the cost of hydrogen by achieving economies at scale, California currently lacks an overall hydrogen policy. As the fifth largest economy in the world and one of the national state leaders in supporting hydrogen and carbon neutrality, we think that the state ought to develop a zero carbon hydrogen strategy of its own that builds on the national program. We believe creating industrial hydrogen hubs ought to be a pillar of such a strategy, and CARB ought to consider taking a lead in helping to launch such an initiative.

- **Support funding for research and development of decarbonized industrial hydrogen projects.** For example, we urge research and development projects similar to those discussed in these comments to be undertaken in California, which is home to nine cement plants that emit approximately 10 MMT of carbon annually.<sup>29</sup>
- **Collaborate internationally with the regions cited in the presentation on accelerating clean hydrogen development as an enabler of carbon neutrality in the industrial sector and beyond.** Technology and knowledge transfer with other frontrunners helps to accelerate learning and identification of best practices.

The CHBC once again thanks you for this opportunity to provide input on how to advance carbon neutrality in the industrial sector and looks forward to working further with you to understand and accelerate hydrogen's role in this critical endeavor.

Regards,

/s/ Emanuel Wagner

Emanuel Wagner

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<sup>29</sup> [https://www.cement.org/docs/default-source/market-economics-pdfs/cement-industry-by-state/calif-statefacsh-17-d2.pdf?sfvrsn=b77fe6bf\\_2](https://www.cement.org/docs/default-source/market-economics-pdfs/cement-industry-by-state/calif-statefacsh-17-d2.pdf?sfvrsn=b77fe6bf_2)