Public Workshop to discuss Achieving Carbon Neutrality in California: A Report by E3
Comments by True North Renewable Energy, Mitsubishi Power and Ørsted

September 9, 2020

True North Renewable Energy, Mitsubishi Power and Ørsted are pleased to provide these comments in response to the Public Workshop, "Achieving Carbon Neutrality in California: A Report by E3." It is becoming increasingly clear that zero-carbon gases, including biogas and green electrolytic hydrogen, will be a necessary component in California's drive to successfully achieve carbon neutrality. It is time for the state to implement key policies, like those outlined in this letter, that will catalyze growth in this sector and unlock its full potential. Doing so will not only offer a major step toward achieving the state's climate objectives, but will also propel an infrastructure construction boom, akin to that seen as a result of the Renewable Portfolio Standard, which will aid in the state's recovery from the COVID-induced recession.

For decades, True North Renewable Energy, LLC and True North Venture Partners (True North) have invested in disruptive technologies that can reduce climate change and improve fundamental societal practices to be more sustainable – including renewable electricity production, water treatment, organic waste recycling, and renewable and electrolytic gas and fuel production. We also contribute research and analysis in major international markets to help shape policies that enable green economic expansion and advance climate change policies. The companies' individual and collective work ranges from thin film solar technology development and deployment (First Solar), to organics recycling-to-biogas (True North Renewable Energy, LLC), to electrolysis for hydrogen production (Aquahydrex).

Mitsubishi Power leads the industry in power generation and energy storage solutions and is at the forefront of deploying green hydrogen and battery energy storage systems. Mitsubishi Power's mission is to provide power generation and storage solutions that enable our customers to combat climate change and advance human prosperity. Mitsubishi Power was recently awarded a contract by the Intermountain Power Agency for turbines to support transitioning the Intermountain Power Plant from coal today to a blend of 70 percent natural gas and 30 percent green hydrogen by 2025, and then 100 percent green hydrogen by no later than 2045. The project, which is operated by the Los Angeles Department of Water and Power, will immediately reduce emissions from the plant by 75 percent in 2025, and is a critical element to the utility's climate goals and SB 100 compliance plans.

Ørsted is a leading global renewable energy developer with over 10 GW of generation worldwide consisting of offshore wind, onshore wind, solar and bioenergy facilities. In 2020, Ørsted was recognized as the world's most sustainable company by Global 100 Index. The company is looking to continue its renewable investments in the U.S. market and sees California as an exciting potential market for green electrolytic hydrogen.

Our companies are global leaders facilitating change in the energy sector, developing and commercializing technologies that produce and utilize non-fossil, zero-carbon energy resources – including renewable power, green electrolytic hydrogen and biogas. We look forward to helping the state meet its short-lived climate pollutant reduction goals and supporting and accelerating its transition to 100 percent clean energy – not just in the power sector, per SB 100, but across all sectors. With that in mind, we respectfully submit the following comments for consideration.

Climate and Economic Crises, as well as the Climate Neutrality Executive Order, Require Greater Urgency

We encourage CARB to explore a wider array of scenarios than presented in the E3 report as it moves forward with its Scoping Plan development, including considering more aggressive goals than achieving net-zero emissions by 2045. Understanding that fossil natural gas currently plays a critical role in providing grid reliability, we also encourage CARB to accelerate new strategies that will support more rapid replacement of fossil natural gas with zero-carbon gases, while quickly growing the green economy in the state and creating jobs.

The Executive Order guiding the development of the Scoping Plan specifically establishes a new statewide goal, additional to existing greenhouse gas targets, to "achieve carbon neutrality as soon as possible" and to "achieve and maintain net negative emissions thereafter."[1] The date of 2045 was provided as a backstop, but is not necessarily the goal itself. CARB's scenarios and policymaking should fully explore how the state can meet the stated goal of achieving carbon neutrality as soon as possible and should place an emphasis on early actions to promote zero-carbon gases replacing natural gas.

Reject False Tradeoffs, Including Electrification versus Zero-Carbon Gas

CARB should not artificially impose conflicts between viable strategies to address climate change, which create a perception of arbitrary "tradeoffs," as was teed up in the framing questions. It will be more effective to view all practical and ready strategies to address climate change as additive and immediately needed. Undoubtedly, as another framing question asked, the least regrets strategies the state can pursue are those that create jobs and emissions benefits today – whatever they may be.

Similarly, we urge CARB to resist "either-or" solutions or speculating that certain clean energy investments today will become stranded assets decades into the future – after which they would likely have been fully capitalized, anyways. No scenario developed by the state has suggested a decreasing demand for clean energy into the future. To the extent that evolving demand patterns in one sector or another might shift markets or need for existing clean energy

[1] Executive Order B-55-18. https://www.ca.gov/archive/gov39/wp-content/uploads/2018/09/9.10.18-Executive-Order.pdf

solutions, they too can adjust accordingly. In fact, we are seeing this today, as refineries in the state retool to process renewable fuels, or as shuttered biomass power plants are reimagined as carbon removal facilities.

These concerns often come up in discussions around building electrification, and are used to dissuade investment in zero-carbon gases, including biomethane and green electrolytic hydrogen. The argument is if buildings are going to increasingly electrify, demand for natural gas will fall and zero-carbon gas projects could become stranded assets. This argument misses the fact that zero-carbon gas can uniquely decarbonize virtually any sector of the economy, particularly those which rely in gaseous fuels, and will play an important role in achieving deep decarbonization and carbon neutrality in California, one way or another.

There are near-term opportunities to reduce the use of fossil gas as green hydrogen production costs are rapidly declining and more diverted organic waste is recycled to biogas. Long-term plans to retire portions of the state's fossil gas infrastructure should not interfere with these immediate and promising opportunities. The growing success for clean renewable electricity can continue while the state also expands the integration of zero-carbon gases in a complimentary manner. Zero-carbon gases will expand options for energy diversity, improve energy reliability and assist with resiliency efforts. Overreliance on a limited menu of energy technologies or resources undercuts future optionality, and therefore, innovation, market competition, and energy reliability.

Zero-Carbon Gas is a Ready and Necessary Waste and Carbon Neutrality Solution

Indeed, zero-carbon gas will be needed and useful, in virtually any sector and wherever gas is used. Biomethane, for example, is a solution to pressing biomass waste and short-lived climate pollutant problems, as well as an important source of jobs in rural and often disadvantaged communities.[2] While it also offers an attractive energy carrier to decarbonize hard-to-abate sectors, as highlighted in the E3 report, CARB and other state agencies need to approach it increasingly as an immediate and important organic waste recycling option.

The recent Lawrence Livermore National Laboratory report, "Getting to Neutral," highlighted the opportunity associated with converting waste biomass to zero-carbon gases, including biomethane and hydrogen. According to the report, it is, in fact, one of the most significant climate opportunities in the state, and one whose potential and costs are the same in the near-term (2025) as they are over the longer term (2045).

[2] For example, in its Standard Regulatory Impact Assessment (SRIA), CalRecycle estimates that developing infrastructure to meet the state's organic waste diversion requirements will quickly create 8,000 jobs, growing to 17,000 by 2024, then settling at a permanent increase of 11,000 new jobs. http://www.dof.ca.gov/Forecasting/Economics/Major_Regulations/Major_regulations_Table/documents/Final_Sria_11-16%20.pdf

Recognizing biomethane as a waste recycling and short-lived climate pollutant solution, with significant economic benefits, argues for it to be deployed its maximum extent as quickly as possible – by 2030. Anything less would seem to an inadequate response to climate change and the economic challenges we face. Its end use is almost a secondary concern, and as described above, can evolve over time as markets do.

Zero-carbon gas has the unique ability to decarbonize hard-to-abate sectors including the last parts of the power and transportation sectors – which wind, solar and batteries can't practically do on their own – as well as the industrial sector, buildings, fertilizer and agriculture, and waste. Getting to the scale required to do so, beyond what biomethane from waste resources can provide, requires developing sources of green hydrogen, which will become cost-effective with large- scale adoption.

Several studies expect green electrolytic hydrogen to rapidly scale, fall in price, and become a widely available, cost-effective energy and climate solution over the next decade – just as solar and batteries have become over the past decade. For example, Bloomberg New Energy Finance suggests costs for green electrolytic hydrogen could plunge by 80 percent by 2030,[3] while an analysis by McKinsey for the Hydrogen Council finds that green electrolytic hydrogen could become an increasingly cost-effective solution for decarbonizing many sectors of the economy, beginning as soon as the 2025-2030 timeframe.[4] This is validated in a recent study by E3, which shows that power plants using green electrolytic hydrogen could be profitable in Southern California by 2025-2030.[5]

With the widescale availability of low-cost, renewable power available – including in California – those reports and others point to scaling electrolyzer production as the key barrier to enabling renewable hydrogen as a cost effective energy and climate solutions.[6,7] Accordingly, if we adopt policies that facilitate scaling electrolyzer production capacity, we can quickly unleash cost-effective, zero-carbon energy solutions. Now is the time to begin doing so.

If the state sets a target, it will create a market. We've seen this with solar, batteries and other forms of green energy. The Scoping Plan and other programs at ARB can set targets which will result in positive market disruption and new diverse green energy resources that grow the green economy.

---

[3] https://www.bloomberg.com/news/articles/2019-08-21/cost-of-hydrogen-from-renewables-to-plummet-next-decade-bnef

[4] https://hydrogencouncil.com/wp-content/uploads/2020/01/Path-to-Hydrogen-Competitiveness_Full-Study-1.pdf

[5] https://www.ethree.com/e3-evaluates-hydrogen-opportunities-in-a-low-carbon-future/

[6] For example, an analysis by HSBC bank notes "A glut of wind and solar power can make our lightest element economic." https://www.gbm.hsbc.com/insights/global-research/renewables-can-make-hydrogen-green

[7] As another example, former Energy Secretary and Nobel Prize winner Steven Chu has noted renewable power prices at some sites are already below levels needed to make green electrolytic hydrogen cost-effective. https://www.forbes.com/sites/jeffmcmahon/2019/04/02/get-ready-for-1-5%C2%A2-renewable-electricity-steven-chu-says-which-could-unleash-hydrogen-economy/#14fa86b41c01

Green Stimulus through Zero-Carbon Gas Buildout

California has always been, and continues to be, an international leader in creating long-term sustainable new market frameworks that result in expanding the green economy, drastically increasing clean technology jobs and accelerating greenhouse gas emission reductions. Under California's policy leadership, we have benefitted from a robust clean energy sector boom for nearly two decades, with policies ranging from the Renewable Portfolio Standard, to Million Solar Rooftops, to energy storage targets, to zero-emission vehicle initiatives. The green economy exploded with these policies, creating more than half-a-million clean energy jobs in the state, constant technology innovations, and new market opportunities and private investments in infrastructure in California.

A similar policy effort around zero-carbon gases will yield similar economic results. Green electrolytic hydrogen, in particular, offers double job benefits across the renewable power and zero-carbon gas sectors. Policies supporting green electrolytic hydrogen will turbocharge job creation in the renewable power sector, while also supporting existing and new jobs in the gas and other sectors. For perspective, Bloomberg New Energy Finance projects that to meet a 1.5°C climate target, about a quarter of global energy demand would be supplied by renewable hydrogen, which would double demand for renewable power in the future.[8]

Carbon Neutrality Scenarios Should Highlight a Greater and Near-Term Role for Zero-Carbon Gases

As CARB explores pathways to achieve carbon neutrality in its Scoping Plan, and policies to do so separately, it should support a more significant and near-term role for hydrogen and biomethane than highlighted in the E3 report. Specifically, we urge CARB to look at the near-term potential and opportunity for zero-carbon gas and develop policies to capture the opportunity.

Zero-Carbon Gas Can Help Decarbonize the Power Sector Faster and More Efficiently

The power sector is one example. The recent draft SB 100 scenarios released by the joint agencies, which unfortunately do not explicitly include zero-carbon gas, show that including zero-carbon firm and dispatchable resources (such as power plants using zero-carbon gas) can reduce new power plant requirements by about 70 GW, or nearly 40 percent.[9] At costs specified in the analysis, it would reduce costs of complying with SB 100 by nearly $5 billion annually, and reduce emissions associated with doing so. Furthermore, the scenarios showed that the SB 100 goals could be achieved as soon as 2030, with zero added costs through at least

[8] BNEF (2020) *Hydrogen Economy Outlook, Key Findings,* Bloomberg New Energy Finance, March 30. https://data.bloomberglp.com/professional/sites/24/BNEF-Hydrogen-Economy-Outlook-Key-Messages-30-Mar-2020.pdf

[9] https://efiling.energy.ca.gov/getdocument.aspx?tn=234549

2027 and with incremental costs afterwards that appear to be less than the savings identified by including zero carbon firm and dispatchable resources in the modeling.

The take-away from those draft scenarios seems to be that the state can achieve better emissions outcomes and the goals of SB 100 more quickly than originally envisioned and cost-effectively, especially if it includes zero carbon resources like hydrogen and biomethane. This is further validated in a recent study by Energy Innovation, which finds that zero-carbon gas can lead to a zero-carbon grid across the U.S. by 2035, without increasing customer costs.[10]

We appreciate that the E3 carbon neutrality scenarios achieve zero carbon emissions in the power sector in its entirety, and not covering retail sales as required by SB 100, and highlights a role, albeit a small one, for zero-carbon fuels like zero-carbon gas. This is something we have specifically asked for in the context of SB 100.[11] We urge CARB and the joint agencies to take a deeper look at the role that green electrolytic hydrogen and other zero-carbon gases can play in more rapidly, completely, and cost-effectively decarbonizing the power sector – both in the SB 100 joint report and in the Scoping Plan development process. Note that in its own SB 100 planning, the Los Angeles Department of Water and Power includes green electrolytic hydrogen in every scenario, including one that would achieve zero emissions and displace all fossil gas generation by 2035.[12]

Zero-Carbon Gas Can Anchor Rapid Industrial Sector Decarbonization

We believe the timing and strategies to decarbonize the industrial and agricultural sectors deserve more scrutiny than offered in the E3 report. The scenarios appear to arbitrarily pick 2045 as a date for decarbonization, based on the backstop in the carbon neutrality Executive Order. The fact is, these sectors could be primed for rapid decarbonization on a faster timeline if a detailed and coordinated plan is developed to decarbonize the dozens of large, industrial facilities in the state. The solutions are known and ready, including zero-carbon gas, and we encourage CARB to explore strategies to decarbonize the industrial sector proactively – and much more quickly – than envisioned in the E3 report.

Zero-Carbon Gas Supplies Can Come Online Much More Quickly than Identified in E3 Report

We are disappointed to see the scenarios showing a potentially smaller or delayed role for zero-carbon gases than in previous E3 studies. For example, E3's previous high building electrification scenario, which was its most conservative in terms of the role of zero-carbon gas, included 7 percent zero-carbon gas in the pipeline by 2025 and 14 percent by 2030. Some of its

[10] https://energyinnovation.org/wp-content/uploads/2020/09/Pathways-to-100-Zero-Carbon-Power-by-2035-Without-Increasing-Customer-Costs.pdf
[11] https://efiling.energy.ca.gov/GetDocument.aspx?tn=234324&DocumentContentId=67172
[12] https://www.ladwp.com/cs/idcplg?IdcService=GET_FILE&dDocName=OPLADWPCCB726105&RevisionSelectionMethod=LatestReleased

other previous scenarios include more than 10 percent zero-carbon gas by 2025 and more than 20 percent by 2030 – including 7 percent hydrogen by energy (20 percent by volume) in 2030.[13] Now, in its carbon neutrality scenarios, E3 assumes only 5 percent hydrogen by 2045, and 12 percent biomethane by 2045 in one scenario. This change is confusing, especially as the urgency to address climate change and investment in green electrolytic hydrogen only accelerates.

This underscores our position that policies, rather than assumption-based models, should drive future energy and greenhouse gas emission reduction programs. Already, important policies from the Legislature and agencies exist that support development of zero-carbon gas and should serve as guideposts as the state moves forward toward carbon neutrality. CARB should not limit its approach based on modeling with a strong bias toward a few technologies and scenarios that favor those technologies. To do so would dismiss the potential for necessary innovation, resulting in a potentially catastrophic gap for future energy planning and statewide needs.

Recommendations for Achieving Carbon Neutrality As Soon As Possible

Achieving carbon neutrality as soon as possible, as required in the Executive Order, requires supporting zero-carbon gas development as soon as possible. Among other strategies, we think the state can achieve carbon neutrality well before 2045 if it takes the steps below to most quickly put waste to beneficial use as biomethane and other useful products and develops green electrolytic hydrogen at cost effective scale.

By leveraging California's existing climate and environmental policy framework – including CARB's existing climate policies, SB 1383, SB 1369, SB 100, SB 1440 and the Executive Order on Carbon Neutrality – CARB can help optimize current programs and develop new ones to rapidly expand markets, spur investment, and support job growth, while deploying the organics recycling and zero-carbon gas infrastructure we will need to meet our climate goals. In particular, CARB and the state should:

- Move forward with and support CalRecycle's existing SB 1383 ***organic waste diversion and recycling mandates***.
- Implement SB 1369 to ***deploy green electrolytic hydrogen as long duration energy storage*** and in other applications.
- Clearly ***define green electrolytic hydrogen and other zero-carbon gases as a renewable and zero carbon resource*** for the purposes of implementing SB 100.
- ***Incorporate green electrolytic hydrogen into SB 100 planning*** to achieve zero emissions in the power sector and clearly identify the associated operational, cost, and emissions benefits.

[13] https://www.ethree.com/wp-content/uploads/2018/05/Comparison_Graphs_CEC-EPIC-GHG-Scenarios-clean-26Jan2018.xlsm

- Adjust rate structures and market rules to ***put curtailed and surplus renewable power to use***, generating renewable hydrogen for use as long duration energy storage or to decarbonize the gas system and other sectors.
- Through the SB 1440 implementation proceeding, ***develop biomethane procurement standards that support CalRecycle's organics diversion regulations and develop hydrogen injection standards*** allowing green electrolytic hydrogen to be safely injected into the natural gas pipeline.
- Through the Scoping Plan or other process, ***develop a strategic plan*** for making green electrolytic hydrogen a cost-effective, widely available climate solution within the next decade and a driver of economic growth in California.

Additional policies targeted at managing organic waste and developing zero-carbon gas as a solution to decarbonize hard-to-abate sectors will serve to accelerate progress towards achieving climate neutrality and net-negative emissions in California and bring down costs for these important technologies. In addition to leveraging existing programs, CARB and the state should develop new zero-carbon gas policies to create jobs and cost-effective climate solutions, including:

- Create a ***zero-carbon gas procurement program*** that is broadly inclusive of all zero-carbon gas, such as biomethane and green electrolytic hydrogen, with ambitious energy and infrastructure targets and price controls to minimize cost.
- Establish an ***electrolyzer deployment target*** in-line with the policy need and market scale required to achieve cost-parity with fossil-based gases.
- Provide ***monetary incentives to support first-mover projects for organics recycling and green electrolytic hydrogen***, accelerate project development, and maximize benefits.
- ***Adopt financial mechanisms*** that can support new zero-carbon gas policies and infrastructure by re-imagining existing programs to attract private investment and reduce consumer costs.
- ***Support a series of pilot projects*** as launching pads for the green hydrogen and electrolysis market.
- Provide ***non-monetary support for shovel-ready projects, incentives to attract private capital and cost-effective project financing to enable new infrastructure***.

Moving Forward Together

As California is realizing a successful transformation of its electricity system to 100 percent zero-carbon and renewable electricity, one of the next big tasks is to create a similarly meaningful, holistic, and long-term policy in the industrial and gaseous fuels sectors. Leveraging the electricity systems to produce zero-carbon gas and reduce fossil gas use in the state is the next obvious steps for an economy-wide decarbonization effort. This is the exact approach being embraced internationally by other climate-conscious governments. The sooner

California moves to reduce fossil gas usage and replace it with zero-carbon gases, the sooner we can safely and reliably achieve carbon neutrality and preserve energy diversity.

While this new decade ushered in an overwhelming pandemic that has disrupted our lives and devastated our short-term economic outlook, California's collective environmental state policies also present opportunities to immediately expand the green workforce and put us on a long-term trajectory of continued sustainable revitalization. Upgrading and repurposing fossil gas systems, power plants, and delivery infrastructure to serve green hydrogen and zero-carbon gas production and delivery, and leveraging the vast and expanding renewable electric resources, is our next big opportunity in energy diversity and for the state's green economy. As international investors, developers, and technology and solution providers, who are also committed to a zero-carbon future in California, we look forward to tackling this challenge with you.