



**Tim Carmichael**  
Agency Relations Manager  
State Government Affairs

925 L Street, Suite 650  
Sacramento, CA 95814

tel: (916) 492-4248  
Email:  
TCarmichael@semprautilities.com

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Ms. Rajinder Sahota  
Division Chief, Industrial Strategies Division  
California Air Resources Board  
Sacramento, California

Submitted electronically to: [rajinder.sahota@arb.ca.gov](mailto:rajinder.sahota@arb.ca.gov)

Re: Comments in response to July 8, 2019 Public Meeting: The Role of the Industrial Sector  
in Meeting California's Carbon Neutrality Goals

Dear Ms. Sahota:

Southern California Gas Company (SoCalGas) appreciates the opportunity to comment on the California Air Resources Board's (CARB) July 8, 2019 public meeting titled, The Role of the Industrial Sector in Meeting California's Carbon Neutrality Goals (workshop). Having worked with industrial customers for many decades, SoCalGas is well positioned to assist in achieving deep decarbonization of California's industrial sector. We have extensive knowledge and long-standing relationships with our industrial customers, many years of experience in developing and implementing successful customer energy-efficiency programs; and we manage a strong research, development, and demonstration (RD&D) program with a long history of delivering new technologies that directly benefit our customers.

It was evident from the panel speakers and discussion at the workshop that there is no clear or agreed upon path to reach California's carbon neutral vision. However, there was consensus that protecting competitiveness of California's industrial sector and reducing the potential for economic leakage are paramount. Further, global economics and climate change policies will be major drivers in determining the balance between greenhouse gas (GHG) emissions sources and sinks. Given the challenge of projecting the pace and scale of innovation and industry trends, California must allow an "all of the above" approach with maximum flexibility and technology neutral policies for California's diverse industrial sector.

SoCalGas offers the following observations on areas CARB should further examine as it develops a pathway to carbon neutrality for the industrial sector:

### **Low carbon fuel solutions**

- Prioritize the use and further development of renewable gas (RG), such as biomethane and renewable hydrogen to provide immediate reductions in GHG emissions.
- Utilize existing energy infrastructure to accelerate the adoption of low carbon fuels.
- Adapt the examples in Europe where several industry working-groups are examining standards for hydrogen blending into the natural gas grid as a way reduce GHG emissions.
- Embrace the finding in the recent study by Energy Futures Initiative that noted, “[f]uels that are durable, storable, and easily transportable play a fundamental role in ensuring that all sectors can operate at the scale, timing, frequency, and levels of reliability that are required to meet social, economic, and stakeholder needs.”<sup>1</sup>

### **Technology solutions**

- Expand energy efficiency programs for the industrial sector as they remain one of the most cost-effective, near-term approaches to reducing GHG emissions.
- Continue to invest in and prioritize near-commercial demonstration and research focused on the needs of the industrial sector.
- Consider new electric-power generation, combined-heat and power, and tri-generation technologies. Certain technologies, such as fuel cells, can produce electric power, heat, and hydrogen that can be used for fuel.
- Expand funding opportunities for pre-commercial carbon-capture and use demonstrations.

### **Market solutions**

- Create market approaches and accelerate the commercialization of new, cost-effective renewable thermal technologies.
- Mitigate economic leakage to help maintain California’s robust economy and ensure GHG emissions reductions are realized.

SoCalGas further expands upon these points in the following sections and these related appendices:

Appendix A – Hydrogen Opportunities

Appendix B – Existing Energy Efficiency and Emerging Technologies

Appendix C – SoCalGas’ RD&D Programs

Appendix D – Renewable Thermal Collaborative Energy Buyer’s Statement

## **I. Low Carbon Fuel Solutions**

This section is focused on opportunities to take advantage of renewable gas, existing infrastructure, and green hydrogen to meet California’s carbon neutrality goals.

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<sup>1</sup> Energy Futures Initiative, Optionality, Flexibility, & Innovation. Pathways for Deep Decarbonization in California. 2019. Available at: [https://energyfuturesinitiative.org/s/EFI\\_CA\\_Decarbonization\\_Full-b3at.pdf](https://energyfuturesinitiative.org/s/EFI_CA_Decarbonization_Full-b3at.pdf) at page xix.

## **A. Renewable Gas**

SoCalGas believes the state should prioritize the development and use of RG and other low-carbon energy resources as they can provide immediate reductions of GHG emissions for the industrial sector. CARB has extensively evaluated in-state RG, or “biomethane”, as part of the Short-Lived Climate Pollutant Plan. There are multiple advantages to developing this market—reducing California GHG emissions, in-state job creation, and air quality co-benefits. However, CARB should also consider the significant amount of RG available nationally as another resource for the industrial sector. CARB’s Low Carbon Fuel Standard already provides economic incentives for RG to be delivered through the interstate natural-gas pipeline system.<sup>2</sup> There is considerable potential for additional out-of-state RG to replace fossil natural gas for use in California’s industrial sector.<sup>3</sup>

## **B. Existing Infrastructure**

Former Secretary of Energy under President Obama, Dr. Ernest Moniz and his research team, the Energy Futures Initiative (EFI), recently released a report titled, “Optionality, Flexibility and Innovation: Pathways for Deep Decarbonization in California,” (EFI report) which analyzed the options (within the parameters of existing state policy) by sector for meeting California’s near- (2030) and long-term (2050) carbon emissions reduction goals.

The research team found that meeting California’s carbon reduction goals by 2030 will require a range of clean energy pathways across all economic sectors because of the uncertainty of each approach. Specifically, the industrial sector (in addition to transportation and agriculture) has not seen measurable emissions improvements in recent years and therefore could significantly benefit from increasing energy efficiency, implementing best practices, and utilizing existing technologies. Additionally, “there is a large technical potential for GHG emissions reductions across a range of mitigation options that can help decarbonize the Industry sector. Given the complexity and heterogeneous nature of many industrial processes, however, an effective decarbonization strategy will necessitate tailored solutions that account for the unique challenges and opportunities in each subsector.”<sup>4</sup>

The EFI report states that “clean fuels” (e.g., renewable natural gas [RG], hydrogen, biofuels) are critical clean energy pathways due to the enormous value of fuels in providing flexibility and reliability for energy systems. Fuels that are durable, storable, and easily transportable play a fundamental role in ensuring that all sectors can operate at the scale, timing, frequency, and levels of reliability that are required to meet social, economic, and stakeholder needs.”<sup>5</sup> The

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<sup>2</sup> Over 90% of California’s current natural gas supplies are transported over interstate pipelines from out-of-state producing regions. This gas can be displaced by RG.

<sup>3</sup> ICF estimates there is roughly 9 trillion cubic feet per year of domestic RG potential based on the U.S. Department of Energy’s Billion Ton Study. See page 10 of the ICF whitepaper “Design Principles for a Renewable Gas Standard” available at [https://www.icf.com/-/media/files/icf/whitepaper/2017/icf\\_whitepaper\\_design\\_principles.pdf](https://www.icf.com/-/media/files/icf/whitepaper/2017/icf_whitepaper_design_principles.pdf).

<sup>4</sup> *Ibid.* at page 128.

<sup>5</sup> Energy Futures Initiative, Optionality, Flexibility, & Innovation. Pathways for Deep Decarbonization in California.

researchers rightly point out that the development of RG has multiple, tangible benefits including the fact that it's carbon neutral; it diverts methane that would otherwise be released into the atmosphere, it enables major emissions reductions from difficult-to-decarbonize sectors; and it leverages existing infrastructure, potentially avoiding stranding these assets and their associated workforces, as well as their time-consuming and costly replacement.<sup>6</sup>

By leveraging California's existing energy infrastructure, technological expertise, and skilled workforce, we can transition to a deeply decarbonized economy. The EFI researchers provide examples of repurposing natural gas infrastructure to decarbonize the energy industry—leverage pipeline rights-of-way for biofuels; blend hydrogen in system ( $\leq 15\%$  w/minor upgrades); carbon capture technologies for negative-emissions technologies/carbon storage; and use pipelines to transport carbon dioxide to sequestration sites.<sup>7</sup>

The EFI report also found that meeting California's 2050 goals will be extremely difficult (if not impossible) without energy innovation. In addition to leveraging carbon infrastructure and expertise, the researchers present large-scale carbon management (including carbon capture, utilization and/or storage); smart systems and platforms (i.e. the use of data, connectivity, and analytics); and utilizing hydrogen applications as cross-cutting technologies that can help meet large-scale decarbonization requirements.

### **C. Hydrogen Opportunities**

With regard to hydrogen, the EFI researchers point out that it—as well as capture, utilization and storage, and RG—could be used for making high-temperature process heat for industry and/or as a seasonal storage medium for electricity. They also list hydrogen from electrolysis as a technology priority with long-term breakthrough potential that California should develop.<sup>8</sup>

Hydrogen has been extensively employed as a process feedstock in the chemical industry and it can play a significant role elsewhere within the industrial sector. To take on a decarbonization role, hydrogen will have to be produced from renewable sources, like water electrolysis using carbon-free electricity, RG from landfills and dairy feedstocks, and/or from natural-gas steam reforming using carbon capture and storage. Hydrogen produced from these renewable or low-carbon feedstocks can then contribute to the decarbonization of various sectors. This includes hydrogen energy storage in the power sector to accommodate the integration of intermittent and variable energy sources; as an energy carrier in transport heating; blending with natural gas for end-use applications in the residential, commercial, and industrial sectors; and as a process feedstock for industries such as chemicals, refining, steel manufacturing, food processing, etc.

Zero- or low-carbon hydrogen can be used by the industrial sector via deliver from existing natural gas infrastructure and use of existing or “within reach” emerging technologies.

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2019. Available at: [https://energyfuturesinitiative.org/s/EFI\\_CA\\_Decarbonization\\_Full-b3at.pdf](https://energyfuturesinitiative.org/s/EFI_CA_Decarbonization_Full-b3at.pdf) at page xix.

<sup>6</sup> *Ibid.*

<sup>7</sup> *Ibid.*

<sup>8</sup> *Ibid.*

Several examples of hydrogen energy and technology integration options are provided in Appendix A to illustrate its decarbonization potential, including: hydrogen blending with natural gas, large-scale hydrogen production and utilization projects<sup>9</sup>, and tri-generation technologies.

## **II. Technology Solutions**

The following section is focused on energy efficiency and emerging technologies, SoCalGas' RD&D program, and opportunities for on-site energy generation.

### **A. Energy Efficiency and Emerging Technologies**

Increasing energy efficiency is first in California's loading order, which was established in 2003 to articulate how California would invest to meet future energy needs and continues to be a very good way to reduce GHG emissions. SoCalGas' experience with industrial customers indicates there is still a large opportunity to reduce energy use, and thus GHG emissions, using existing, modern technologies available to customers now.

The capital requirements of industrial equipment replacement discourages many projects. Competitive pressures often prevent customers from purchasing replacement equipment unless it is clearly cost effective, increases production, and has a high return on investment. Opportunities to save energy using available modern technologies include: heat recovery; insulation of piping, storage tanks, and fittings; heating and process controls; and upgrading to modern, higher efficiency boilers and burners. With appropriate incentives, customers will upgrade to proven technologies, invest in energy efficiency, and replace aging equipment much sooner than they would otherwise.

SoCalGas offers a variety of industrial energy-efficiency incentives designed to save customers energy and money. We also work to bring new energy-efficient technology to customers. Appendix B contains examples of both existing technologies for which SoCalGas offers incentives and some emerging technologies that were developed for industrial customers.

SoCalGas' Emerging Technologies group focuses on commercialized or near-commercialized solutions, many fed internally from our upstream RD&D results, as well as externally from other innovators and partners. SoCalGas also collaborates with the other California utilities and the California Energy Commission (CEC) to fund a variety of emerging technologies. We provide an illustrative list of funded technologies and brief descriptions of projects for industrial customers in Appendix B.

SoCalGas recommends that CARB balance what is achievable in the near- and long-term planning horizons and prioritize near-term GHG emission reductions using existing and emerging technologies. In this vein, the state should incentivize technologies, especially those

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<sup>9</sup> Fuel-cell power plants can be configured to simultaneously generate three value-streams—power, hydrogen, and heat—by reforming hydrogen-rich fuels such as natural gas or renewable biogas.

that are most cost-effective, that have been developed through existing RD&D programs at the CEC, U.S. Department of Energy's national laboratories, Gas Technology Institute (GTI) and SoCalGas' RD&D, Emerging Technologies and Energy Efficiency programs.

## **B. SoCalGas' Research Development & Demonstration**

SoCalGas' RD&D program identifies and advances new technologies and research activities that benefit customers through improved reliability and safety, environmental benefits, and operational efficiencies. To guide our research efforts, staff collects market information from customers and equipment manufacturers, and prepares techno-economic analyses to evaluate the attributes of energy technologies in terms of costs, benefits, risks, uncertainties, and timeframes. Our RD&D program defines success as commercial adoption and the resulting benefits: environmental improvement; public and employee safety; conservation by efficient resource use or by reducing or shifting system load requirements; development of new renewable resources and processes; and improvement of operating efficiency and reliability or reduced operating costs.

SoCalGas has provided examples of several research projects being demonstrated for industrial customers in Appendix C. Two demonstration projects are highlighted – Hyperlight Energy/Genifuel Corporation project and FuelCell Energy's tri-generation project. There are also descriptions of four other technologies that SoCalGas is currently demonstrating with GTI.

## **C. On-site Electric Generation**

SoCalGas encourages CARB to coordinate its efforts on decarbonizing the industrial sector with its sister agencies. Importantly, as required by Senate Bill (SB) 700 (Wiener) the Self-generation Incentive Program (SGIP) will require that all on-site generation technologies use 100% renewable fuel by January 1, 2020. In the past, many of the generation projects funded through SGIP have been installed at industrial facilities.<sup>10</sup> Moving forward, the availability of RG will be crucial for on-site generation in the industrial sector. RG from currently flared landfill-gas can provide the necessary RG to this subset of customers.<sup>11</sup> By developing the RG market, industrial customers will have more decarbonization options that can be easily adoptable, with minimal operational impacts. Further, generation technologies, such as combined heat and power, can provide incremental decarbonization benefits by using the waste heat produced with RG to offset industrial fossil natural gas use.

Fuel cells provide an opportunity to improve the resiliency of the energy system, decarbonize the energy supply and improve local air quality. There have been a number of compelling projects nationally and in California that utilize fuel cells in microgrid applications, primary power for critical loads, emergency backup and dispatchable load following. In California, we've seen

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<sup>10</sup> Self-generation Incentive Program Resources Website. Available at: <https://www.selfgenca.com/home/resources/>

<sup>11</sup> Reply Comments of Southern California Gas Company (U904G) to Assigned Commissioner's Ruling Seeking Comment on Implementation of Senate Bill 700 and Other Program Modifications. Page 3; Available at: <http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M299/K659/299659999.PDF>

large commercial applications at hospitals and grocery stores. For example, the University of California, Irvine (UCI) installed a fuel cell at their medical center that produces 30% of the facility's power and produces high quality useable heat captured by an absorption chiller and used for facility air conditioning.<sup>12</sup> The Sierra Nevada Brewery in Chino, California, has four 250 kW fuel cells operating off natural gas and biogas providing base load energy with the waste heat used in the brewing process and other heating applications at the facility.<sup>13</sup> These commercial and food processing applications should be further evaluated to identify opportunities for expanding their use in the industrial sector.

SoCalGas recommends CARB engage with the National Fuel Cell Center at UCI and the California Stationary Fuel Cell Collaborative to better understand the applications of fuel cells to decarbonize energy supply and to identify policies that will increase the deployment of fuel cell technologies.

### **III. Economic Considerations of Industrial Emission Reductions**

The following section provides information on economic considerations, market principles, as well as energy reliability and resiliency.

#### **A. Economic Considerations**

Economics play a significant role in California's ability to reduce emissions in the industrial sector, perhaps more than any other area. Industrial processes are energy intensive. If energy or compliance costs increase significantly for an industrial business, operation may no longer be viable at their current location. Thus, a key consideration in developing policies to reduce GHG emissions from this sector is "leakage," which occurs when businesses move their facilities or production across state borders or even to other countries as SoCalGas has seen with several industries, including textiles, metal manufacturing, paper manufacturing, and food processing. Policies that result in pushing industries out of California to regions with less stringent environmental regulations will not result in a net decrease of GHG emissions; rather, they would likely cause a net increase and slow California's economy.

The importance of innovation to reduce the cost of decarbonization is particularly significant for the Los Angeles area, which is home to the largest industrial manufacturing sector in the U.S. For example, reducing emissions from manufacturing processes that require combustion and therefore cannot readily make use of solar- or wind-generated renewable electricity may require radically redesigned processes. These processes include cement manufacturing, food processing, glass production, and steel fabrication, which together produce about \$40 billion in direct industry output in California alone.<sup>14</sup>

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<sup>12</sup> [http://www.nfcruc.uci.edu/3/NewsandEvents/CurrentNews/News\\_05032016-MEDctrFUELCELL.aspx](http://www.nfcruc.uci.edu/3/NewsandEvents/CurrentNews/News_05032016-MEDctrFUELCELL.aspx)

<sup>13</sup> [https://building-microgrid.lbl.gov/sites/default/files/dercam\\_casestudy\\_sierranevada\\_brewery\\_v1\\_2%5B1%5D.pdf](https://building-microgrid.lbl.gov/sites/default/files/dercam_casestudy_sierranevada_brewery_v1_2%5B1%5D.pdf)

<sup>14</sup> National Association of Manufacturers, "State of Manufacturing Data," April 2017. Available at: <https://www.nam.org/state-manufacturing-data/2019-california-manufacturing-facts/>



## **B. Market Principles**

Transitioning the industrial sector to low carbon resources and new technologies will require the development of policies to address their unique market challenges. The Renewable Thermal Collaborative (RTC)<sup>15</sup> has identified six priority areas of engagement to expand and accelerate the renewable thermal energy market:

- Accelerate Cost-Effective Renewable Thermal Technologies
- Create Market Approaches and Instruments
- Increase Market Transparency
- Standardize Renewable-Thermal Energy Products
- Create Innovative Financing and Project Structures
- Expand Collaboration Among Market Stakeholders

These principles, collectively called the Renewable Thermal Buyers' Statement, are attached as Appendix D. SoCalGas respectfully suggests CARB further evaluate these principles to find areas where California policy can be aligned to advance the renewable thermal market.

## **C. Energy Reliability and Resiliency**

The industrial sector is particularly sensitive to the reliability of the energy system. Disruptions in energy can have economic and safety implications. Therefore, it is critical that we prioritize reliability and resiliency of the energy system as we transform energy use in the industrial sector. The workshop panelist from the Electric Power Research Institute (EPRI) presented a study where they considered the potential to electrify a wide range of industrial applications, which would add 20 TWh of electric demand at a cost of over \$12 billion.<sup>16</sup> However, it is unclear if their study considered the cost of expanding and hardening the electric grid to fire danger and the very real challenges that California faces with regard to maintaining reliability as it implements programs to achieve California's climate goals.

Earlier this week, the California Independent System Operator (CAISO) submitted a filing in the CEC 2019 Integrated Resource Plan proceeding that indicates the agency faces a 2,000 MW capacity shortfall in 2021.<sup>17</sup> In discussing the reasons for this, CAISO noted that the previous modeling did not reflect potential growth in transportation and building electrification. They have not even contemplated the resources needed to meet the electricity demand envisioned by the EPRI study. Before adopting electrification policies, CARB should look at the cost to the grid of the incremental load, and the potential impact on grid reliability of adding these loads.

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<sup>15</sup> Renewable Thermal Collaborative is a coalition for organizations committed to scaling up renewable heating and cooling at their facilities and dramatically cutting carbon emissions.

<sup>16</sup> Electric Power Research Institute. Prospects for Decarbonizing California Industry Through Electrification. July 2019. Available at: [https://ww3.arb.ca.gov/cCac/scopingplan/meetings/070819/panel2-3\\_epri.pdf](https://ww3.arb.ca.gov/cCac/scopingplan/meetings/070819/panel2-3_epri.pdf)

<sup>17</sup> Comments of the California Independent System Operator Corporation on R. 16-02-007 dated July 22, 2019. Available at <http://www.caiso.com/Documents/Jul22-2019-Comments-PotentialReliabilityIssues-R16-02-007.pdf>



Natural gas deliveries to industrial customers in California are already very reliable and resistant to weather-related service interruptions.<sup>18</sup> Replacing fossil natural gas with RG utilizes the same infrastructure and will maintain the reliable service currently experienced by customers. Furthermore, maintaining a diverse portfolio of energy resources provides greater resiliency of our overall energy delivery system.

#### **IV. Conclusion**

As CARB plans for meeting the State's aggressive climate goals, SoCalGas encourages staff to consider an inclusive approach—one that is technology neutral, welcomes all ideas, considers all forms of energy, encourages and allows for current and future innovation, and factors in the cost and affordability of energy. Achieving the State's environmental goals cannot come at the price of deepening the state's affordability crisis, increasing income disparities or accelerating economic leakage. We strongly believe that a diverse energy portfolio that includes multiple fuels and technologies is necessary to meet California's energy needs and environmental policies in a cost-effective and feasible manner.

Creating an integrated, multi-faceted strategy will provide the innovation necessary to realize California's bold vision and facilitate national and global adoption. Making this vision a reality will require business leaders, non-governmental organizations, and policy makers to work together to reimagine how California's energy infrastructure can operate as an integrated system that maximizes emissions reductions and minimizes waste.

SoCalGas appreciates the opportunity to provide comments on the July 8 workshop: The Role of the Industrial Sector in Meeting California's Carbon Neutrality Goals. We would like to further engage with CARB and CEC staff to discuss our RD&D program, balanced energy approaches, and share the latest advancements in the RG and hydrogen sectors. We will follow-up to schedule meetings with appropriate staff members.

Sincerely,

*Tim Carmichael*

Tim Carmichael  
Agency Relations Manager

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<sup>18</sup> Natural Gas Council. July 2017. *Natural Gas Systems: Reliable and Resilient*. Available at: <https://tinyurl.com/y7ffswse>