Rethink METHANE

removing the fossil from the fuel

PROJECT OBJECTIVE

Partnering for a Sustainable Future

Natural Gas | Bioenergy | Solar | Wind | Hydrogen | Fuel Cell

Join us in demonstrating to policymakers how renewable methane can help California:

- Achieve the greenhouse emissions reduction objectives established in SB 32, AB 197 and SB 1383
- Integrate its sustainability goals for solid waste, municipal wastewater, dairy and agricultural waste, and forestry management
- Accelerate the development of a practical, large-scale storage medium for renewable power
- Facilitate the creation of a low-carbon hydrogen supply for a fuel cell future
- Create economic development opportunities for disadvantaged regions of the state

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Objective: Rethink Methane Project

Natural gas, and its primary constituent, methane (CH_4), has long been valued for its clean and efficient combustion properties. In comparison to coal or petroleum, when burned CH_4 emits significantly lower amounts of smog-forming pollutants, toxic air contaminants, and gases that contribute to global climate change. Because it is the cleanest hydrocarbon, methane is the dominant fuel in the U.S. for cooking, heating water, warming our homes, is the primary source of energy for industrial and commercial applications, is a major source of power generation, and is a growing alternative to petroleum in transportation.

For a number of years, environmental activists and air quality regulators advocated for the increased use of natural gas as an alternative to coal and nuclear in power generation, and to petroleum-derived fuels in transportation. In fact, most of the recent reductions in U.S. GHG emissions are attributable to switching from coal to natural gas in power production.[1] Attitudes toward the value of natural gas as the environmentally preferred fuel began to change about 15 years ago when energy companies began to propose the development of large terminals to accept the importation of super-cooled natural gas (also known as liquefied natural gas [LNG]). The need for LNG import terminals was rendered moot when technologies to effectively extract natural gas from local shale formations—a process called hydraulic fracturing, or "fracking"—became widely used. Although the U.S. was able to dramatically increase its domestic supply of natural gas, these fracking techniques became the target of opposition, as questions were raised regarding water quality, increased seismic activity, and land conservation impacts. Most recently, concerns have been raised about the near-term greenhouse consequences of leaks of methane, a powerful climate altering compound, from the production, transportation, distribution, and consumption of natural gas.

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Given this recent history, emerging opposition to the production and increased use of methane may be understood, but it is shortsighted. The U.S. faces the daunting challenge of continuing economic growth while simultaneously mitigating the triple threat of smog, toxic air contaminants, and climate change. While progress has been made on all three fronts, each of these dangers continue to loom large in public consciousness and on lawmakers' policy making agenda.

Even though smog has lessened, most urban areas have yet to meet ozone standards set in 1979, let alone the new limit for ozone of 70 parts per billion set by the U.S. EPA in October 2015. Exposure to toxic diesel exhaust has diminished, yet still remains a major public health threat, particularly around centers for goods movement. Between them, smog and toxic air contaminants are estimated to kill over 200,000 Americans every year.[2] Air pollution from motor vehicles alone is projected to send 53,000 people to an early death every year, 62% more than were killed in auto accidents in 2014.[3]

To address climate change, several steps are underway. In August 2015 the U.S. finalized standards that will require electricity producers to reduce carbon pollution from the nation's fleet of power plants. Many states have established objectives to reduce emissions of greenhouse gases, and California, New York and several other states have begun talks aimed at linking their carbon markets. Most recently, in the one of the most significant and historic international environmental agreements since the Montreal Protocols, over 190 countries attending the 21st Conference of the Parties (COP 21) agreed in Paris to keep global warming to less than 2° Celsius and to meet specific reduction targets. In Paris the U.S. set the goal of reducing its GHG emissions by 26 to 28% below 2005 levels by 2025. The Paris Agreement became international law on November 4, 2016, after 97 countries that account for over two-thirds of the world's greenhouse gas emissions, ratified the accord.[4]

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[1] See International Energy Agency, https://energyindepth.org/national/iea-thanks-natural-gas-u-s-energy-related-carbon-emissions-fell-2-percent-2015/
[2] http://news.mit.edu/2013/study-air-pollution-causes-200000-early-deaths-each-year-in-the-us-0829
[3] The National Highway Transportation Safety Administration reports that 32,675 people died in vehicle related accidents in the U.S. in 2014.
[4] See United Nations Framework Convention on Climate Change, http://unfccc.int/paris_agreement/items/9485.php

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Pressure is building both at home and abroad to make massive and sweeping changes to our transportation, power generation, and manufacturing systems. It is imperative that our nation address all three environmental challenges, but do so in a way that aids, not harms, the overall economy, and prioritizes the health and safety of those most at risk to environmental insults and least able to afford increases in both the cost of energy and mobility.

Methane is critical to achieving these objectives. It is crucial that policymakers not pursue a path that eliminates methane as a key element of the strategy to reach environmental goals; such an outcome would likely make achievement of these objectives more arduous, expensive, and time intensive. Nor should hysteria feed by unusual and unprecedented incidents lead to misdirected conclusions about the valuable contribution that methane can and should play in our energy future. The demonization of CH_4 will only serve to hamper our efforts and prevent the integration of technologies that can deliver public health benefits and carbon reductions in the near term. In short, it is vital that we halt deteriorating opinions and rethink our attitudes toward CH_4.

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Much of the opposition stems from the fact that most of the methane currently consumed is "prehistoric." That is to say, much of the CH_4 in use today is the result of the decomposition of plants and animals that lived millions of years ago that, through natural forces, have been converted into common hydrocarbons—coal, oil, and natural gases. There, in the crust of the earth, this accumulated carbon has been trapped for countless millennia. From a climate perspective, the problem is that we are quickly releasing vast quantities of this sequestered carbon into the earth's atmosphere in a blink of geologic time.

At its full potential, renewable gas could well be the most reliable and most cost-effective renewable energy source.

— *Securing a Role for Renewable Gas report, American Gas Association*

Burning coal and petroleum are far more harmful to the atmosphere than combusting methane, but releasing and burning prehistoric CH_4 is not without consequences, particularly to the climate. So how can we continue using methane while reducing negative impacts? By aggressively displacing prehistoric methane with "contemporary" methane.

Carbon Intensity of Key Transportation Fuels (grams CO_2e per megajoule energy)[5]

Transportation Fuel	Carbon Intensity
Diesel	102.01
Gasoline	98.47
Natural Gas	78.36
Corn ethanol	77.52
Sugarcane ethanol	40.47 to 51.33
Hydrogen Fuel Cell Vehicles	35.33 to 60.40
Electric vehicles	30.95
Biodiesel from Midwest soy beans	19.11 to 54.05
Renewable Diesel	17.29 to 49.88
Landfill gas	**18.11**
Wastewater biogas	**7.75**
Biogas from food and green waste	**-22.93**
Dairy Biogas (*Prospective*)	**-276.24[6]**

Contemporary methane, also known as renewable methane, involves harnessing the CH_4 that naturally cycles through the biosphere. Increasing the use of contemporary methane allows us to recover, reuse and recycle the carbon already in the atmosphere, such as CH_4 that is naturally produced by the treatment of wastewater, municipal solid waste, and agricultural processes. It can also be derived from the gasification of organic waste. Harnessing biomethane not only creates the opportunity to sustainably manage waste products, but it also poses the possibility of developing whole new industries to grow, harvest, and harness new biological feed stocks for anaerobic digestion, such as switch grasses and algae.

[5] Sources: California Low Carbon Fuel Standard: 17 CCR 95488 - Table 6; California Air Resources Board, "LCFS Illustrative Fuel Pathway Carbon Intensity - Determined using CA-GREET 2.0", presented September 17, 2015

[6] Fuels with prospective CIs are not eligible to claim credits under the LCFS. To claim credits, the applicant must provide one quarter of operational data once commercial production has commenced. ARB will then complete an updated lifecycle analysis and make necessary adjustments to the originally certified prospective CI if warranted and certify a provisional CI for the pathway. Only the updated provisional CI can be used to generate LCFS credits. http://www.arb.ca.gov/fuels/lcfs/2a2b/apps/calbio-sum-122115.pdf

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Biological sources of methane (biogas) are crucial to the nation's efforts to reduce the carbon content of transportation fuels. For instance, source of biogas provide the transportation fuels with the lowest carbon content under the California's Low Carbon Fuel Standard (LCFS), a program now being considered by several other states. In some instances, biogas can supply a negative carbon intensity, meaning that using the organically-derived fuel actually removes carbon from the atmosphere. Increased use of biogas as a transportation fuel is an important tool in the effort to protect the climate.

Methane from the storage of renewably generated power (P2G) is a revolutionary, disruptive technology, which not only provides a source of renewable hydrogen and methane, but also enables energy planners to think of renewable power as a baseload technology.

Equally as exciting, renewable methane can also be derived from renewable power, such as wind and solar. One of the biggest obstacles to increasing the use of renewable power is the lack of technology to store this electricity when there is no immediate consumer. Yet across Europe, technologies are currently in place to utilize surplus electricity to produce hydrogen gas through the electrolysis of water. By running an electric current through water, the water molecule (H_2O) decomposes into hydrogen and oxygen. The hydrogen is then captured and is either used directly or mixed with carbon dioxide to create methane. The CH_4 can be injected into existing natural gas infrastructure where it can be stored indefinitely, or used for any imaginable purpose, including power production, vehicle fuel, residential heating and cooking, manufacturing or as an industrial feedstock. This process is called "power-to-gas," or P2G.

P2G is a revolutionary, disruptive technology, which not only provides a source of renewable hydrogen and methane gases, but also enables energy planners to think of renewable power as a baseload technology rather than an undependable intermittent source of electricity. Through P2G, unlimited amounts of renewably-generated power can be stored indefinitely, transported to regions of energy demand, and distributed to virtually any kind of end-use customer. This "synthetic" source of renewable methane may well be a key solution to the barrier impeding the expansion of renewable power generation.

Expanding our supply of renewable CH_4 is essential to realizing the sustainable hydrogen and fuel cell driven transportation system we have been building towards for over a decade.

The development of renewable methane helps offset the consumption of terrestrial methane, while also providing the feedstock for renewable hydrogen. At present, almost all hydrogen comes from the steam reformation of terrestrial natural gas. If we are to take full advantage of the air quality and climate benefits of fuel cell technology—the commercialization of which is essential to the deployment of zero-emission alternatives to diesel in heavy-duty and high horsepower equipment—we will need to dramatically increase supplies of renewable hydrogen and methane.

Policymakers need to take a fresh look at the important role that methane can play in our energy future, particularly CH_4 from renewable sources. Methane is a natural energy carrier, one that can be harnessed to help achieve our sustainable energy, environmental protection and economic development goals. The devaluation of methane will actually do more harm, and delay the attainment of many of the environmental objectives so many are trying so hard to achieve. This is why the Rethink Methane Project was conceived – to increase awareness among policy makers regarding the benefits of renewable methane, to educate them about the ways that they can help promote the production and consumption of this clean, low carbon energy source, and the enable them to network with industry leaders so that they can better understand the policies and incentives that encourage renewable methane and the regulatory and financial barriers than need to be eliminated to accelerate the development of this critical energy resource. Rethink Methane calls for stakeholders in the natural gas, hydrogen, fuel cell, agriculture, power generation, solid and liquid waste management and renewable power industries to band together to form a new coalition to advocate for advancement of renewable gas, and how renewable methane, from both organic and zero emission electrical sources, can and should be part of the foundation of California's energy future.