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ENERGY VISION COMMENTS ON NEW JERSEY'S DRAFT ENERGY MASTER PLAN

Energy Vision is a New York City-based national environmental non-profit research organization that since 2007 has been working to advance low-emissions energy solutions to help combat climate change. We welcome the opportunity to comment on New Jersey's draft Energy Master Plan.

Energy Vision applauds the inclusion in the EMP as an energy resource the biogas produced from organic wastes, including at landfills, wastewater treatment plants and "food waste processing facilities"; and of renewable natural gas, or biogas that has been upgraded to pipeline quality by removing carbon dioxide (CO2) and other impurities.

BIOGAS AND RENEWABLE NATURAL GAS

New Jersey's potential biogas resource is considerable; a 2015 Rutgers University study, which also includes biogas produced from livestock manure, estimates the annual resource at 11.5 million MMBTU of energy, or the equivalent of over 100 million gallons of diesel vehicle fuel.

Biogas is a natural byproduct of everyday human and animal activity. It contains 50% to 60% methane, a greenhouse gas (GHG) 86 times more potent than carbon dioxide at trapping heat in our atmosphere, accelerating the process of climate change. Biogas that is allowed to escape into the atmosphere will do significant damage; biogas that is flared (as often happens at landfills and wastewater facilities) is simply a waste, producing CO2 with no benefit. As a component of meaningful GHG reduction efforts, it is incumbent upon us to capture this perpetually renewed resource and put it to its most effective use.

In its raw state, the potential uses for biogas are relatively limited, and it is generally used to generate electricity, or to fuel combined heat and power (CHP) plants, at its source. However, readily available technologies can be used to "upgrade" biogas by removing CO2, moisture and other impurities. This produces "renewable natural gas" ("RNG") or "biomethane," which is chemically so similar to conventional (fossil) natural gas that it can be used for all the same things—electricity generation, heating, cooling, industrial applications, transportation—with no changes to relevant equipment or transmission lines. But GHG emissions from RNG are at least 40% lower than those from conventional natural gas, and at least 50% lower than from diesel fuel. Depending on the feedstock, RNG/biomethane can be net carbon-neutral, or even *net-carbon negative*—meaning that producing the fuel prevents more GHG emissions than come from combusting it.

PRODUCING AND USING A FLEXIBLE SOURCE OF CLEAN ENERGY

Upgrading New Jersey's biogas resource to renewable natural gas/biomethane will produce a clean, renewable, flexible energy source that can be used to decarbonize the state's energy use in multiple areas—electricity production, utility gas, or transportation. However, to achieve this New Jersey must take action that will promote the production of biogas from all its available in-state resources, and also the upgrading of that gas to flexible, ultra-low emissions RNG. The state must also determine how best to use this limited resource to achieve the greatest impact on overall emissions. *A decade of Energy Vision research indicates that the application with the greatest impact on the state's emissions would be as a fuel for heavy-duty motor vehicles like buses and trucks that normally use diesel.*

COMMENTS ON THE TEXT OF THE EMP

Following are Energy Vision's comments on specific references to biogas and renewable natural gas in the Draft Energy Master Plan.

STRATEGY 1: REDUCE ENERGY CONSUMPTION AND EMISSIONS FROM THE TRANSPORTATION SECTOR (page 27).

(General comment: "Reduce Energy Consumption and Emissions from the Transportation Sector" clearly states that electrification of transportation is the ultimate goal of NJ policy. It has been said that in the fight against climate change there is no silver bullet, but there is silver buckshot; we would encourage the state to maintain a flexible, multi-pronged approach to decarbonizing transport. For instance, to achieve the greatest impact as soon as possible, it may be appropriate to use RNG in key medium- and heavy-duty fleets, as discussed below, while electrification is pursued for lighter fleets. It should be remembered that by capturing fugitive methane emissions that would otherwise escape into the atmosphere, renewable natural gas can actually be ***net-carbon-negative****—cleaner even than renewable electricity.)*

According to the EMP, transportation is the single largest source of GHG emissions in New Jersey, accounting for 46% of the total (compared to 20% from electricity generation). It is appropriate that addressing these emissions is the first of 7 strategies identified in the Plan. And a decade of Energy Vision research indicates that the application most appropriate for renewable natural gas is indeed transportation, particularly as fuel for medium- and heavy- duty vehicles like trucks and buses.

These vehicles are overwhelmingly dependent on the most polluting transportation fuel, diesel. As a result, this small (but critical) portion of the American vehicle population—less than 4.5% of the total—produces about 25% of all transportation related emissions. This means that focusing on a small subset of vehicles can have an outsize impact on overall emissions.

Medium and heavy duty diesel vehicles are challenging to decarbonize because of their duty-related power and torque requirements. So far, electrification has not proven itself up to the task across all duty cycles. But compressed natural gas (CNG) engine technology has, and is being used by logistical fleets like UPS; transit buses in Atlanta, Los Angeles, New York City and other urban centers; and in refuse collection trucks owned by Waste Management and Republic Services. Any CNG vehicle can use RNG; this requires no changes to vehicle or fueling infrastructure, and immediately achieves emissions reductions relative to diesel of 50% or more. The technology is proven, and New Jersey has the option of using it in heavy state and transit fleets, and encouraging its use in private fleets.

Goal 1.1.6: "Continue to improve NJ Transit's environmental performance" (page 32).

Further to NJT bus operations, this section states that *"Clean vehicle technology, such as electric, hydrogen, or renewable natural gas, all have the potential to further improve net greenhouse gas and air pollutant impacts."* **Energy Vision fully supports the use of RNG fuel to decarbonize NJT's largely diesel bus fleet, and encourages NJT to move in this direction.**

However, it is worth noting that two paragraphs later the text goes on to say: *"Electric bus and alternative fuel technologies are still maturing and the agency needs to assess how to incorporate electric and alternative fuel buses into its operations and budgeting…."* Unlike electric and hydrogen vehicles, *renewable natural gas is a mature technology that is ready for deployment immediately*. RNG is available on the

markets, and is being used by several of the fleets mentioned earlier, including UPS; LA Metro's all-CNG bus fleet, half of which now uses RNG; and by private waste haulers Waste Management and Republic Services, who also produce RNG at some of their own landfills. It is also being used by bus fleets in the British cities of Bristol, Nottingham and Reading, and New York City Transit issued an RFP in the summer of 2019 to identify RNG suppliers for its 800 CNG buses.

Further to budgeting considerations, costs associated with deploying renewable natural gas in NJT's buses would be much lower than for electric. While a new CNG bus costs about 15% more than a diesel model, the price differential for an electric model is 40% or more. CNG fueling infrastructure is also less expensive, and does not place any new demands on the electrical grid at a time when the state is trying to reduce emissions from electricity generation. RNG could be piloted out of the agency's existing CNG fueling facility in Howell Township, under its existing relationship with Clean Energy Fuels, which provides RNG as well as CNG.

Goal 1.1.6 also references NJT's continued emphasis on reducing pollution from its fleets. As a readily available alternative to diesel technology, "near zero" natural gas engines have been certified by both the US EPA and the California Air Resources Board as reducing NOx emissions by 90% compared to the most stringent emissions standards for diesel engines. They also significantly reduce emissions of particulate matter.

CNG buses fueled with renewable natural gas represent an *immediately available* opportunity to reduce GHG emissions from New Jersey Transit, and to improve air quality, at a lower cost than converting to electric buses.

Goal 1.3.1: Support electrification of diesel-powered transportation and equipment at the ports and airports.

As with medium and heavy duty transportation generally and NJT's buses, there is room for natural gas vehicles using renewable natural gas at ports and airports; it is possible that this strategy can be deployed sooner, at lower cost and with equal or greater impact on emissions. The state should evaluate where this option can work.

STRATEGY 2: ACCELERATE DEPLOYMENT OF RENEWABLE ENERGY AND DISTRIBUTED ENERGY RESOURCES

Goal 2.3.6: Maximize the use of source separated organic waste for energy production and encourage anaerobic digestion for electricity production or natural gas pipeline injections (page 58).

"In the interest of maximizing the utility of what would otherwise be considered waste emissions, the state should consider requiring source separation of organic wastes from municipal solid waste and incentivizing anaerobic digestion technology for processing wastewater as well as food wastes."

Energy Vision supports the source separation of organics from municipal solid waste to facilitate production of biogas/renewable natural gas. New Jersey businesses and residents generate an estimated 1.4 million tons of food scraps annually, most of which currently goes to landfill. Source separation of organics is a crucial step in diverting these valuable "wastes" from landfills, where the methane they release may escape into the atmosphere instead of being harnessed as renewable energy. Legislation requiring the diversion of food waste from large commercial generators has been returned to the Assembly by Governor

Murphy for revision; a requirement for source separation of residential food wastes would complement that effort.

Energy Vision supports "incentivizing anaerobic digestions technology for processing wastewater as well as food waste." The development of in-state anaerobic digestion capacity to produce biogas/ renewable natural gas is vital to taking advantage of the state's own organic waste resources, supporting New Jersey's energy independence, creating jobs in the state and reducing possible emissions from transmission of gas from out of state. However, as with other renewable energy technologies, initial state support to help germinate growth of the sector is important. As noted on page 10 of the EMP, "In order to promote carbon-neutral energy generation, NJBPU established carve-outs for in-state solar and offshore wind through 2030, but must develop a new incentive delivery system to motivate additional carbon-neutral generation using a competitive approach to stimulating competition and investment."

Nationwide, many wastewater treatment plants are equipped with anaerobic digesters that capture biogas from sewage. Where these systems are not already in place in New Jersey, they should be installed. Where systems are already in place, they should be repaired and/or upgraded to maximize potential biogas capture.

While the development of free-standing food waste digestion infrastructure is certainly a desirable goal, it should be noted that "co-digestion" of food waste with wastewater is an established and growing practice, including at the large Newtown Creek Wastewater Treatment Plant in Brooklyn, NY, where a slurry of commercial food waste is being added to the wastewater to increase biogas production; that biogas will be upgraded on-site to produce RNG, which will be injected in to the local utility grid. The potential for co-digestion of food waste at New Jersey's wastewater facilities should be evaluated.

ADDITIONAL COMMENTS, PER SECTION VI: REQUEST FOR FEEDBACK.

Strategy 1: Reduce Energy Consumption and Emissions from the Transportation Sector (page 95)

Question 5: How can the state work with the private sector to advance the technology for medium- and heavy-duty vehicles and incentivize private sector adoption of alternative fuel vehicles?

Low carbon fuel standards have been adopted in California and Oregon, and are being considered in other states. A low carbon fuel standard establishes a credit-trading system under which alternative fuels receive a greater number of credits the lower their carbon intensity, whereas fuels with higher carbon intensities receive fewer or no credits. Producers of lower carbon fuels are then able to sell surplus credits to producers of higher-carbon fuels. Through market-based mechanisms, such a system actively incentivizes and rewards production of lower carbon vehicle fuels.

Strategy 7: Expand the Clean Energy Innovation Economy (page 97)

Question 26: What industry sectors or job occupations are expected to see growth? Which industry sectors and job occupations are expected to need job training support to ensure an appropriate workforce is available to meet the needs of a growing economy?

The Obama Administration's 2014 "Biogas Roadmap" foresaw the potential for the number of biogas projects around the country to increase by 6.5-fold, from 2,000 to 13,000. The American Biogas Council sees

the potential as higher, with 13,500 new sites ready for development. Clearly the potential for biogas development in the US is considerable.

And the growth in biogas projects that are producing renewable natural gas is real. Working with the US Department of Energy's Argonne National Laboratory, Energy Vision created inventories of RNG projects around the country for the years 2017 and 2018. The number of operational RNG projects across landfills, agriculture, food waste and wastewater increased between the two studies from 60 to 89—growth of 48% in one year, representing an increase in energy production of over 16.4 million MMBTU, or 55%. The number of projects under construction grew from 24 to 38—an increase of 58%. Projects in planning grew from 26 to 93—an increase of 257%. The Coalition for Renewable Natural Gas estimates the number of biogas projects producing enough gas to clear the economic hurdles into RNG production in the thousands.

Anaerobic digester and gas upgrading projects create dozens of jobs across the building trades during construction, as well as a smaller number of permanent, skilled jobs for ongoing operations. Growth sectors will include (varying depending on the type of digester, upgrading technologies and feedstocks) construction, engineering, mechanical, fabrication and manufacturing, waste management, waste water operations, gas and electrical technicians and heavy equipment operators.

A 2017 study by global consulting firm ICF of economic impacts from expanded production of RNG and deployment of low NOx natural gas trucks in California found that regardless of project size and feedstock(s), the development of a new RNG facility can create significant local employment, in the form of design and engineering services, 20-40 local trade positions during construction, and typically 3 to 5 permanent employees for on-site operations.

CLOSING COMMENTS

New Jersey has taken an important and laudable step by making biogas and renewable natural gas features of its Energy Master Plan. We encourage the state and the Board of Public Utilities to support the development and utilization of these important resources to reduce energy-related greenhouse gas emissions in New Jersey, capture fugitive methane emissions and help create a green energy economy based on local resources.

We are happy to answer any questions you may have, or to discuss these comment with you further. Thank you!