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Comments Submitted to the New Jersey Board of Public Utilities

Relating to 2019 Energy Master Plan

Clean and Renewable Power

The National Biodiesel Board

The National Biodiesel Board (NBB) is the national trade association that represents the biodiesel and renewable hydrocarbon diesel industries as the coordinating body for research and development in the U.S. It was founded in 1992 and has developed into a comprehensive association that coordinates and interacts with industry, government and academia. NBB's membership is comprised of biodiesel producers, feedstock and feedstock-processor organizations, fuel marketers and distributors, and technology providers.

Comments

NBB commends the New Jersey Board of Public Utilities for implementing a comprehensive stakeholder communication process while preparing its 2019 Energy Master Plan. We believe that the process will be a highly valuable means for charting a successful path forward to a sustainable energy future.

NBB is supportive of the 2019 Energy Master Plan initiative and wishes to offer the following comments and suggestions relating to the topic of Clean and Renewable Power.

Biodiesel instead of Fossil Fuel

Biodiesel can be easily blended with ASTM D396 heating oil (including no. 2 through no. 6 heating oils) to displace imported petroleum and to improve the emissions and energy performance of oil-fired, steam-cycle power generation systems and combustion turbines. Biodiesel can also be co-fired with natural gas, as well as substituted entirely in place of natural gas, in many power generation applications.

Significant laboratory research and field testing at multiple power plant locations in the United States, including especially New York and Hawaii, have been performed over the past 10 years to show that biodiesel is a practical and environmentally-friendly fuel for power generation.

A significant percentage of existing, gas-fired, combined-cycle power plants in the northeastern United States already have the ability to operate with biodiesel. Major manufacturers of combustion turbine

systems such as GE Power Systems offer full technical and warranty support for the use of B100 and biodiesel blends in their equipment. The use of biodiesel in combined-cycle power generation offers a huge opportunity for replacing natural gas and thereby reducing greenhouse gas emissions in the power sector.

Emissions Benefits of Biodiesel

Recent testing has shown further that B100 biodiesel can be used in many boiler and combustion turbine systems with only limited modifications to fuel storage systems and burners. The moderate solvency effect of biodiesel has also been shown to be effective in keeping large, oil-fired combustion systems (especially air swirl vanes on no. 6 oil burners) clean and free of carbon deposits, thus contributing to reduced, smoky exhaust emissions during operation.

Laboratory and field testing has shown that biodiesel can also help to reduce NOx emissions in power generation. The natural, 10-12 % oxygen content of the biodiesel molecular structure can reduce fuel-rich pockets and peak temperatures, the primary culprits for NOx formation, within the combustor.

Economic Benefits of Biodiesel

The use of biodiesel as a low carbon fuel in gas turbine power systems could also enable the continued operation of such systems in a carbon-constrained economy. This would resolve the potential problem of stranded capital assets if such power systems were to otherwise be forced into retirement due to curtailed use of fossil fuels such as natural gas.

The ability of existing natural gas-fired power plants to “stay alive”, through conversion to the use of biodiesel, in a carbon-constrained economy, would provide enormous economic benefits to the New Jersey power generation market by offsetting much of the growth in capacity that would otherwise be necessary for other types of renewable power facilities that have intensive, upfront capital costs.

The use of biodiesel in existing oil and gas-fired power plants, and capture of electric REC values, would likewise offer economic benefits to Day-Ahead and Real-time auction processes by reducing the operating cost of power plants that bid at or near the market clearing price for any given period. Such power plants will be able to reduce their bids, which in turn will directly reduce the market clearing price.

Since all power generators in the Day-Ahead and Real-time auction processes receive the market clearing price, rather than their individual bid amounts, for generating power, the cost savings of a reduced market clearing price would apply across the entire range of wind, solar PV, combined-cycle, simple-cycle turbine and steam-cycle bidders.

This would create a substantial multiplier effect in terms of the entirety of cost savings across the capacity portfolio as compared to the specific savings of power plants that operate near the market clearing price.

The bottom-line message is that operating cost reductions by the most expensive power plants can yield attractive savings to the entire rate base.

Need for Policymaker Understanding of Power Grid Operations

It is apparent from recent ISO New England and New York ISO discussions about reducing the carbon intensity of power generation that a solid understanding of grid operations is necessary for establishing successful policies and programs for renewable heating of buildings. We expect that the same will hold true for New Jersey. We would therefore suggest that all policy staff in New Jersey state agencies, corporations and not-for-profit organizations take advantage of training resources that are available through their respective ISO organizations.

Some important points that would become evident during such training include the following:

1) As grid loads increase during cold weather due to temperature-dependent heating loads, the additional power plants that come online at the margin are typically steam-cycle stations or peaker combustion turbines, not combined-cycle plants, solar PV or wind resources, which would normally already be in operation to handle base loads.

2) As grid loads increase to meet thermal loads, the efficiency of power generation will decrease. At the same time, heat pump efficiency will also drop due to lower outdoor temperatures, thus increasing the amount of generation output that is necessary. The fuel-to-electric operating efficiency (startup plus production) of many power plants at the margin can drop to well below 30 percent. This negates the common claim that heat pumps achieve greenhouse gas savings compared to fuel-fired systems.

3) Locational Marginal Prices (LMPs) are based on the market clearing price set by the power plant at the margin, which by definition will have the highest bid price.

4) The LMP is then paid to all operating generators within a control zone. This means that the total cost of power to customers is set by the most expensive generator to clear the auction, not the average of the costs bid by the aggregate of generators. Increasing grid loads mean higher $/kWh costs for everybody.

5) The slope of the curve of LMP vs. grid load can be fairly steep at the margin during cold weather due to the rapid decline in power generation efficiency vs. load, and also due to the additional strain on the natural gas pipeline system. The cost surcharge to ratepayers due to added thermal load will be the delta LMP times the entire number of MWh sold within a control zone, not just the MWh sold for heat pumps. So the economic penalty of adding load to the grid during already high demand periods can be a substantial economic burden to ratepayers.

The above fundamental principles need to be recognized and addressed during the New Jersey Energy Master Plan consideration of heat pumps and other electrification measures.

Benefits of Biodiesel in Power Generation at the Margin

Much of the grid problem relating to carbon intensity and electricity pricing, as described above, could, however, be resolved if New Jersey were to use renewable fuels (e.g., biodiesel or biogas) instead of fossil fuels in existing power generation facilities that operate at the margin. But until such policy shift might be accomplished, we need to recommend that that the operation of electrically-driven heating equipment, especially air-source heat pumps, be limited by New Jersey incentive programs and utility

tariffs to periods of low grid loads when renewable or highest-efficiency (i.e., modern, combined cycle) generation facilities are indeed in operation at the margin.

Smart Fuel Switching to Biodiesel by Power Generators and Large Industrial Customers During Natural Gas Supply Shortages

Recent winters have shown that natural gas pipeline capacity shortages can have significant economic consequences on all classes of electric and natural gas ratepayers. In lieu of further natural gas pipeline expansion, we would recommend that New Jersey encourage weather-predictive, early fuel switching to biodiesel by power generators and large industrial customers during periods of peak thermal and electric loads.

Such fuel switching could be incentivized for power generators by the existing electric RPS program if Class 1 participation by renewable fuel-fired generators were to be actively permitted by the New Jersey Department of Environmental Protection. Smart fuel switching by industrial customers could likewise be incentivized by Renewable Energy Credits (RECs) if a thermal RPS program, similar to programs in effect in several New England states, were to be established in New Jersey. Based on the current economic characteristics of biodiesel, and typical values of thermal RECs in other states, the threshold, city gate natural gas price for such fuel switching would be about $8 per MMBtu.

Smart fuel switching would serve as a circuit breaker that could prevent the city gate price spikes into the typical $10 to $20 range, and even higher, which have been seen in recent years. Resulting cost savings for natural gas would benefit the entire electric and natural gas rate-base.

The Biodiesel Industry is Creating Green Jobs and Making a Positive Contribution to the Economy

Biodiesel can be made from a wide variety of feedstock materials. The fuel is produced in accordance with the D6751 fuel specification set forth by the American Society for Testing of Materials (ASTM International). Yellow grease (used cooking oil) and brown (sewer) grease, as well as animal fats, are economical feedstock materials. Several different types of plants, including soybeans, canola, and pennycress, can also provide the base oil for biodiesel production. Biodiesel offers an especially effective outlet for fat-based waste streams that can cause substantial cost for disposal.

New Jersey, like most states, is a significant producer of waste cooking oil and has ready access to other, agriculturally-derived feed stocks via economical rail and water transportation, and could thus develop a significant biodiesel production industry if energy policies were to be favorable toward renewable fuels.

Increasing Availability in the Marketplace

Biodiesel is a renewable, low-carbon, diesel replacement fuel that is widely accepted in the marketplace. It is the only commercial-scale Advanced Biofuel under the U.S. EPA Renewable Fuels Standard (RFS2) program. Biodiesel is one of the best-tested alternative fuels in the country and the only alternative fuel to meet all of the testing requirements of the 1990 amendments to the Clean Air Act. There are currently more than 150 biodiesel plants in the U.S. with a combined production capacity of over 3 billion gallons.

Current Northeast regional biodiesel production is estimated to range from 80 to 100 million gallons per year.[1] The capacity of regional biodiesel operations is estimated to be 50% greater than current production. Biodiesel offers regional fuel diversity that supports structural resiliency efforts. The Northeast is importing all of its petroleum fuels from refiners in the Gulf Coast and New Jersey. The large bulk of distillate fuel is imported into the region via pipeline and then further distributed via barge. Biodiesel availability can be considered 2-3 times greater than regional production by including available supplies via barge from the Gulf Coast. In times of massive storms, over reliance on any one fuel or distribution network (as in the case of Sandy or Harvey) decreases. For example, during Hurricane Harvey, 25% of US refining capacity was temporarily shut down.[2] A program that supports biodiesel consumption also supports regional resiliency and climate adaptation. Clear market signals with policy stability have correlated strongly with increases of regional biodiesel production. Current cost from Midwest producers to ship product to the Northeast is estimated to be 25 to 35 cents above production costs. These costs can be overcome by carbon policies. In time, these policies can incentivize increased regional production.

Biodiesel is primarily marketed as a blending component with conventional diesel fuel and heating oil in concentrations between two (B2) and twenty percent (B20). It is distributed utilizing the existing fuel distribution infrastructure with blending occurring both at fuel terminals and "below the rack" by fuel marketers. Certain fuel distributors have also begun to market B100 biodiesel for thermal applications in the residential, commercial and industrial sectors.

Biodiesel is Good for the Environment

Biodiesel is environmentally safe and is the most viable renewable fuel for transportation, power generation and thermal applications, based on its low carbon footprint and favorable air quality characteristics. A full life-cycle analysis performed by U.S. EPA for RFS2 shows that biodiesel reduces greenhouse gas emissions by as much as 81 percent compared to traditional heating oil and diesel fuel.

Biodiesel generally produces NOx emission levels in power generation applications that are substantially lower than for no. 2 diesel fuel. In combustion turbine applications, recent testing performed by GE Power Systems has shown NOx emission levels for biodiesel which are indeed closer to those of natural gas rather than diesel fuel when the turbine is operated below 90 percent of capacity. When biodiesel is co-fired at a 20% blend rate with natural gas, the NOx emissions were found to be nearly the same as for natural gas.

When a power generation system incorporates Selective Catalytic Reduction (SCR) and Oxidation Catalyst (OC) pollution control technologies, the resulting NOx emission levels with biodiesel will fall within the same, ultra-low, 2 to 5 ppm range that is typically mandated for natural gas and oil firing under the Title V air permitting processes implemented by state environmental agencies.

[1] National Biodiesel Board Plant list http://biodiesel.org/production/plants/plants-listing

[2] Colonial Pipeline to shut U.S. Northeast fuel lines due to Harvey: https://www.reuters.com/article/us-storm-harvey-colonial-co-northeast-idUSKCN1BA2Z6

The Biodiesel Industry Stimulates Development of New Low Carbon Feedstocks

The feedstock used to produce U.S. biodiesel has become increasingly diversified, with waste products such as animal fat and used restaurant cooking oil (yellow grease) making up a larger portion of feedstock used to produce fuel. The National Renewable Energy Laboratory (NREL) recently conducted an extensive report on the availability of yellow and brown grease. That report concludes that 9.4 pounds of yellow grease and 13 pounds of brown grease are available on an annual, per capita basis throughout the U.S. These figures should be used to more accurately forecast the amount of feedstock available in the Northeast and Mid-Atlantic states. NBB estimates that, nationally, these feedstocks can produce more than 900 million gallons of biodiesel. In addition, a report commissioned by the NBB addresses the use of animal fat, which has also become a major contributor of waste feedstock.

Biodiesel production is currently the most efficient way to convert sustainable biomass into low carbon diesel replacement fuel. As a result, industry demand for economical, low carbon, reliable sources of feedstock oils is stimulating promising public, private, and non-profit sector research on so-called "second generation" feedstocks such as algae. The NBB is participating in this effort by making substantial investments in algae research in collaboration with the Donald Danforth Plant Science Center. It is estimated that for every 100 million gallons of biodiesel produced from algae, 16,455 jobs will be created and $1.461 billion will be added to the national gross domestic product.

Algae's potential as a source of low carbon fuel has been well documented, and a stable, growing biodiesel end-use industry is necessary if the U.S. is to eventually benefit from the commercial scale production of algal-based biofuels. The NBB estimates that for every 100 million gallons of biodiesel produced from algae, 16,455 jobs will be created and $1.461 billion will be added to the GDP.

While soybean oil is considered a co-product rather than a waste feedstock, further discussion of this raw material is merited since farmers in several Northeast and Mid-Atlantic states produce soybeans. In 2007, approximately 39 million bushels of soybeans were grown in the states of Delaware, Maryland, New Jersey, New York, and Pennsylvania. The oil derived from this crop should be considered a sustainable, regional feedstock.

It is important to understand that demand for protein meal used as livestock feed is the primary driver for the planting of soybeans since 80 percent of a soybean is comprised of protein meal. Only 20 percent of the bean is comprised of oil. Historically, the demand for protein meal has driven soy production, resulting in a supply of soybean oil that exceeds the demand for food uses (primarily deep frying foods and baking products). The biodiesel industry helps to make economical use of this excess oil. By creating a market for this excess oil, the price of the protein meal is reduced on a proportional basis.

Biodiesel Increases Energy Security and Competition

Biodiesel is produced in geographically diverse, local facilities that are often located in close proximity to end-use markets. Production facilities are not concentrated in any particular region and are thus less vulnerable than many other types of energy resources to widespread disruption during weather disasters.

Co-products Have Important Sustainability Benefits

The co-product relationship between soybean oil and soybean meal delivers environmental benefits because no crop land and no inputs, such as water, nutrients, and energy, are used solely for the production of renewable fuel. The co-product relationship optimizes the beneficial uses from crops that will be planted anyway to satisfy demand for livestock feed and other uses. Growth in biodiesel volumes will come from more efficient utilization of existing wastes and additional vegetable oil produced as a result of yield increases on existing acres, the growing demand for livestock feed, and decreasing demand for high-trans-fat vegetable oils.

The federal RFS2 program explicitly prohibits land conversion for the purpose of producing renewable fuel. U.S. EPA requirements notwithstanding, basic economics dictate that the production of oilseed crops must correlate to the demand for protein meal, and cannot expand solely in response to demand for vegetable oil. It is impossible for oil demand alone to drive the planting of oilseed crops in North America.

Conclusion

The National Biodiesel Board urges the New Jersey Board of Public Utilities to encourage a significant role for biodiesel under its Energy Master Plan deliberations for power generation. Biodiesel can enable New Jersey to achieve environmental sustainability while realizing the economic benefits that come from new job creation and reduced dependence on fossil fuel.

The National Biodiesel Board would be pleased to work with the New Jersey Board of Public Utilities and other state agencies to further explore the issues that we have described above.

Sincerely,

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National Biodiesel Board