Bloomenergy

September 14, 2016

Chair Mary Nichols
Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: 2030 Target Scoping Plan Update – Energy Sector Workshop

Dear Chair Nichols,

Bloom Energy appreciates the opportunity to provide comments in response to the 2030 Target Scoping Plan Update Energy Sector Workshop. We applaud the cross sector approach to emissions reductions described in the workshop and provide specific comments illustrating the ways in which all-electric fuel cells contribute to the unifying goal to reduce greenhouse gases (GHGs) to 40% below 1990 levels by 2030 and the Air Resource Board's (ARB) desire to design strategies that maximize synergies among different sectors and to plan for a future of reduced dependence on fossil fuels.

All-electric fuel cells are a unique clean distributed electricity resource

Bloom Energy is a provider of a breakthrough all-electric solid oxide fuel cell technology that produces reliable power using a highly resilient and environmentally superior non-combustion process. Bloom's fuel cells are fuel flexible and can operate on either natural gas or biogas. Our all-electric solution allows fuel cell systems to be deployed at sites where it is not necessary to match an on-site thermal load thereby expanding the opportunities available to address energy needs with clean, reliable on-site distributed generation.

Bloom Energy Servers efficiently convert fuel into electricity through an electrochemical process without combustion. By virtue of the non-combustion process, Bloom Energy Servers virtually eliminate emissions of criteria air pollutants including NOx, SOx, CO, VOCs, and particulate matter that are associated with combustion. The result is a significantly lower air emissions profile as compared to combustion-based distributed or central station power generation.

The high power density of Bloom Energy Servers leads to a small footprint required for the local generation of clean electricity, in turn resulting in reduced system-wide transmission losses. In addition, the fuel cells require only a small amount of water on start-up and consume no water during normal operation. They can help mitigate environmental impacts by displacing high water usage options with a clean and water-free alternative resulting in direct environmental benefits within local watersheds and reduced need within the energy sector to draw on California's increasingly limited supplies of water.

Importantly, on any fuel source, Bloom Energy Servers reduce CO_2 emissions compared to the grid. Bloom's CO_2 emissions per MWh are about 20% lower than the California marginal emissions rate when run on natural gas and are zero emission on biogas.

Addressing cited policy drivers for GHG reduction in the Energy Sector

Through the attributes described above, all-electric fuel cells can directly contribute to strategies addressing many of the policy drivers discussed at the workshop as driving GHG reductions in the energy sector.[1]

- ***Senate Bill 350:*** When run on biogas, all-electric fuel cells are RPS-eligible resources that the State can leverage to achieve the 50% RPS target. Reductions in the environmental impacts of the 'other 50%' can be realized by increasing deployment of clean generation technologies such as all-electric fuel cells run on natural gas. In the future as more renewable fuels are available, non-renewable fuels may be replaced by renewable fuel sources in a straightforward manner. In this way, fuel-flexible resources such as all-electric fuel cells are ideal solutions to both a cleaner energy sector now, and a renewable energy sector in the future.

- ***Reduce dependence on fossil fuels:*** Bloom's all-electric fuel cells are the most efficient technology for converting methane into electricity, thereby serving the same electric load with a reduced volume of fuel. Further, as previously mentioned, as renewable fuel becomes available as a cost-effective alternative, all-electric fuel cells can take advantage of that fuel supply and drive further GHG reductions by diverting methane that would have otherwise been vented into the atmosphere.

- ***Short-Lived Climate Pollutant (SLCP) Strategy proposed actions:*** Bloom's all-electric fuel cells are a non-combustion technology which means that the air pollutant profile normally associated with the use of methane to generate electricity (i.e. combustion) is avoided while still providing a firm source of power generation. All-electric fuel cells can contribute to strategies outlined in the Short-Lived Climate Pollutant Reduction Strategy released April 2016. For example, with respect to encouraging dairy methane capture and biogas project development:

  "Utilizing newer and clean technologies can help to overcome air quality permitting issues that have previously hindered project development. In particular, technologies or strategies that reduce or eliminate criteria pollutant and toxic emissions should be encouraged in both incentive and regulatory programs, particularly in areas with severe or extreme air pollution. For example, using ARB-certified distributed generation technologies, such as microturbines or fuel cells, can significantly cut NOx emissions compared to internal combustion engines."[2]

  Increasing the air quality benefits beyond reductions in NOx, all-electric fuel cells can also contribute to significant cuts in SOx, VOC, CO, and particulate matter emissions. Because of this, all-electric fuel cells should also be considered as part of the State's planning efforts to reduce the effects of

[1] "Public Workshop on the Energy Sector to Inform Development of the 2030 Target Scoping Plan Update," August 23, 2016, slide 13.
[2] "Proposed Short-Lived Climate Pollutant Reduction Strategy," April 11, 2016, page 66.

stationary fuel combustion[3] in addition to being viewed as an innovative technology to use methane captured from renewable sources.

Discussion of Cross Sector Impacts

Bloom supports a cross sector approach to maximizing GHG reductions since many programs designed for one specific purpose may have significant carryover effects into other sectors. In particular, we describe below areas where including all-electric fuel cells in programs and other strategies can provide benefits beyond the energy sector both in support of the current thinking outlined during the workshop[4] as well as through approaches that may not have been considered.

- ***Transportation:*** The comprehensive mobile source strategies outlined by the ARB will provide even more environmental benefit if combined with clean electricity sources to support electrification of California's vehicle fleet. All-electric fuel cells provide a cleaner power source than the current grid from both GHG and criteria air pollutant and particulate matter perspectives.

- ***Natural & Working Lands:*** The small footprint necessary for all-electric fuel cell installations can help to avoid the cited tradeoff of new clean energy resources negatively impacting land conservation efforts.[5] Optimal increased acreage for habitat restoration and preservation can be realized by utilizing high energy density, clean power generation technologies as part of the future energy portfolio.

- ***Agricultural:*** As a complement to other approaches in the Short-Lived Climate Pollution Reduction Strategy to reduce methane through dairy manure management, support for integrating dairy manure as a renewable resource for methane-fueled technologies can be a significant source of synergy between the energy and agricultural sectors. All-electric fuel cells can currently run on biogas, so this represents an immediate benefit that may be realized if cost-effective and accessible renewable biogas supplies are made widely available.

- ***Water:*** As noted above, all-electric fuel cells use no water during normal operation, and therefore represent an energy sector contribution to the ARB's water sector goal of highly efficient use of water supplies. Additionally, water treatment plants can be another source, along with dairy manure, for renewable methane generation and capture that can be used to fuel ultra-clean electricity generation by fuel cells.

- ***Waste Management:*** While the current thinking in the waste management sector is primarily focused on diversion of organics from landfills, a complementary strategy for reducing methane emissions is to capture and use landfill methane. In a similar fashion to the agricultural and water sector strategies mentioned above, landfill methane contributing a cost-effective

[3] "Proposed Short-Lived Climate Pollutant Reduction Strategy," April 11, 2016, page 45.
[4] "Public Workshop on the Energy Sector to Inform Development of the 2030 Target Scoping Plan Update," August 23, 2016, slides 79-86.
[5] *Ibid,* slide 86.

and readily available state-wide renewable methane supply can allow technologies available today to provide immediate environmental benefits.

- ***Green Buildings:*** Bloom agrees with the ARB that the energy sector can provide clean on-site distributed generation for electricity needs for a wide variety of building classes. While we look forward to a robust supply of renewable methane in the future, we appreciate the focus on clean vs. renewable to allow all resources that are cleaner than the grid to contribute to achieving this goal. In addition, clean on-site distributed generation resources that provide reliable primary power can replace diesel gen sets that building occupants currently use for back-up power thereby realizing both GHG and criteria air pollutant benefits. For example, Bloom has several data center customers that use our high reliability all-electric fuel cell systems as primary power resulting in avoided real estate and monetary investments that a fleet of diesel powered back-up generators would have required with the significant co-benefit of reducing environmental impact.

Supporting substitution of fossil fuel resources with renewables

Bloom stands ready to further contribute to strategies aimed at achieving the State's ambitious climate and energy goals through the use of renewable fuels. Bloom's fuel cell technology is the most efficient at converting methane to electricity and is able to run on biogas produced from sources such as dairies, landfills, and wastewater treatment plants. As a reliable source of firm 24x7 power, Bloom can significantly contribute to overall reductions in methane emissions from these sectors while providing a reliable, onsite power source to our customers.

Bloom has over 20 MW installed in California running on biogas, however increasing the number of these ultra-clean projects and expanding our positive environmental benefits has been stunted by limited availability of biogas. Therefore, we fully support the ARB's goal to explore options that will accelerate biogas projects and access to pipeline injection in order to make this an economical option available for our customers.[6]

All-electric fuel cells represent an innovative technology that provides both GHG and air pollutant benefits with cross-cutting effects across many sectors. Bloom Energy thanks the ARB for its work on the 2030 Target Scoping Plan Update and looks forward to further engagement as this multi-sector strategy continues to be developed.

Respectfully,

Erin Grizard
Director, Regulatory and Government Affairs

[6] "Public Workshop on the Energy Sector to Inform Development of the 2030 Target Scoping Plan Update," August 23, 2016, slide 65.