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Ms. Samantha Meserve
Deputy Director, Renewable and Alternative Energy Division
Massachusetts Department of Energy Resources
100 Cambridge Street, 10th Floor
Boston, MA

Subject: Icetec Comments on APS

Dear Ms. Meserve,

In response to the Daymark study, as well as to the questions put forth by the Massachusetts Department of Energy Resources (DOER) in the proceeding concerning the future of the Alternative Portfolio Standard (APS), Icetec respectfully submits the following comments for consideration. We appreciate the opportunity to provide input into this critical program's design.

Background

Icetec is a Delaware based company operating throughout the Northeast. We are a technology provider; we design and create custom, intelligent dispatch systems to help our customers – a diverse group of power and gas end users – meet their energy goals, whether anchored in economics, emissions, efficiencies, or some combination therein. We have a strong presence in Massachusetts, and have integrated at leading Universities, Hospital campuses and manufacturing facilities that have distributed resources, like Combined Heat and Power (CHP).

Our in-depth understanding of both the operating parameters and tradeoffs of the distributed generation technologies and, how they play into our customers' campus energy needs today equip Icetec with a unique perspective on the APS; specifically, how future program design could further align innovative end users' energy plans with the policy objectives of the DOER, unlocking additional potential for greenhouse gas reductions.

Our primary ask is for the DOER to consider expansion of the APS in scope as well as size; that the APS pivot to a more dynamic model of grid and resource emissions in which all technologies are incentivized to produce more electrical or thermal output when doing so reduces grid emissions based on real-time metrics. In addition, we ask that APS qualification and monetization also consider ancillary benefits of CHP, namely resiliency provided to critical loads in densely populated load zones.

Discussion

1. **The Daymark Report utilizes a static picture of grid CO2 levels**

The Daymark study compares each technology to a counterfactual case of utility provided heating, cooling and electricity, estimating a differential between utilizing the technology and "base case" scenarios, as it relates to greenhouse gases, which imputes an average carbon metric summarizing a year timeframe. However, this does not adequately capture the impact of CHP operating in a constrained, densely populated area during grid peaks when additional MWh of load will require the ISO to dispatch oil or simple cycle natural gas peaking units. In short, the analysis does not consider the role of each respective technology in reducing the grid emissions rate in real-time.

The average grid emission rate, while a powerful data point for feedback on widespread adoption of and investment in cleaner technologies, does not best reflect the impact of specific operations on grid emissions. Any annual average of grid emissions obscures the wide range of variation that is historically observed in the CO2 rate on the grid, which on an hourly basis, may be as low as 200 lbs./MWh or as high as 1,400 lbs./MWh. To evaluate the impact of CHP on grid emissions in real time, a marginal emission rate needs to be considered, since this is the rate at which CO2 would increase if load increased by a MW, or, similarly, if distributed generation were decreased by a MW.

An efficient CHP plant burning natural gas will recover anywhere from 35 - 44% of the btu from electricity production which displaces the need to burn additional fossil fuels for heating needs. For illustrative purposes, decreasing – or crediting - the emission rate of CHP by the avoided emissions from alternative thermal heating, even from a very efficient boiler, results in an *equivalent* emission rate ranging from 550 – 750 lb./MWh. On average, comparing to the load-weighted average from the most recent year reported – 745 lbs./MWH in 2018 respectively[1] - we would expect efficient CHP plants to reduce grid emissions by increasing output in most hours once recovered thermal is considered.

As with the average grid CO2 intensity, the annual *average* marginal grid emission rate obscures significant variation, driven by fluctuations in load. The marginal grid emission rate on High Electric Demand Days (HEDD) from any cross section of marginal resources (emitting or all inclusive) has been higher than the emission rate[2] that would be expected from an efficient CHP plant once replacement boiler gas is considered. The table below shows the average emission rates from the 2018 HEDD days according to the most recent emissions report published by ISO New England.[3] When a more dynamic approach to emissions is defined, distributed asset owners can identify and target times when increased generation has the most pronounced impact on grid emissions.

1 https://www.iso-ne.com/static-assets/documents/2020/05/2018_air_emissions_report.pdf
2 https://www.iso-ne.com/system-planning/system-plans-studies/emissions/
3 https://www.iso-ne.com/static-assets/documents/2020/05/2018_air_emissions_report.pdf

High Electric Demand Day LMU Marginal Emission Rates (lbs/MWh)

HEDD LMU Marginal Emission Rate (lbs/MWh)				
	Time-Weighted		Load-Weighted	
	All LMUs	Emitting LMUs	All LMUs	Emitting LMUs
NO_x	0.60	0.82	0.61	0.83
SO_2	0.57	0.72	0.59	0.74
CO_2	902	1,201	933	1,209

2. **The Daymark Report utilizes a static picture of CHP Operations**

An average or static picture of grid emission levels compared to an average efficient CHP emission rate leads to a binary conclusion about the ability of CHP to contribute to a cleaner electricity grid. However, this assumes binary CHP operations as well. In fact, CHP plants operate much more dynamically than in the past. The annual capacity factor of CHP is a function of many things that change over time, including extreme weather, the spark spread, variable maintenance costs, campus demand and organizational energy goals. We work with many clients that integrate a dynamic operating model based on economics of time varying rates and attribute carbon rates based on the real-time grid emission rate. A CHP plant may be sized for resiliency, for meeting some critical portion of the customer load during reliability events, but daily operations require a complex optimization of the various options for and associated costs of meeting the host power and thermal loads. The equivalent emission rate for comparison changes based on a number of factors, such the ability to fire a duct burner, and the ability to meet thermal needs in using alternative equipment and the respective efficiency of that equipment. The captured thermal has a different Carbon implication based on the season; recovered thermal for heating season has more direct use than steam captured for a chilled water process in which the alternative case is an electric chiller. Increasingly, end users are insisting this optimization provide feedback on, if not explicit consideration of, the carbon impacts of operating at higher and lower loading points on the CHP plant.

More data is available today than at the start of the APS about the characteristics of these marginal units and the respective emissions associated, about how the location of the resource factors into the relative impact of marginal grid emission rates. Real-time data on marginal fuel type is publicly available, and many institutions are collecting this data and using it as an input to optimal operations. For example, clients are requesting several modes of operations that would call for more import power – by reducing distributed CHP output levels - when marginal grid emission rates are lower than the equivalent emission rate of the central plant operations. There are both economic considerations and operational risks for operating to minimize system marginal emissions, and the inputs are ever changing, dependent on fuel and electricity prices, equipment efficiencies and grid emission levels. Institutions weigh these risks against the priority of their own initiatives towards a minimized Carbon footprint.

An explicit incentive in the APS to identify periods when a technology is lower emitting than the marginal grid emission rate and thereby increase production would allow institutions invest in operational changes that target real-time response. It would provide a business case that would permeate to a greater number of organizations of varying size and sector. Further, this incentive would expand the leverage of the APS to align the types of dispatch-capable resources that are adopted with the State's greenhouse gas initiatives. Such an initiative may require additional coordination between the ISO and the DOER.

3. **Resiliency benefit should be recognized**

Many distributed generation technology installations are designed with resiliency as an explicit objective. This often includes additional hardware, engineering and system control costs to (1) identify and isolate critical loads, (2) build in redundant power distribution and/or (3) manage a complex sequence of operations in the loss of utility. The benefits of such investment are far reaching, both for the end user, and, for the surrounding community. The end user proactively manages the reliable delivery of utilities during times of electric system stress or natural disaster, which allows the continuous operations for essential services. Cutting edge scientific research with strict thermal requirements, community hospitals and manufacturing processes vital to the economy are secured against catastrophic weather conditions as an aging grid infrastructure continues to be tested and rebuilt. This locational element of siting distributed generation in close proximity to local load pockets intersects with marginal unit analysis since an increase in lower emitting generation close to dense load pockets appears to have a more pronounced impact on the marginal grid emission rate than a non-emitting resource with less dispatchability located further from the load pocket.[1]

Conclusion

The Alternative Portfolio Standard (APS) Program has significantly contributed to the adoption of new technologies that have decreased the aggregate CO2 levels across the grid, as evidenced by the decreased average CO metric ton per MWh on the grid, and it will continue to do so into the future. However, the bulk electric system is designed to respond to volatility, to meet peaks, and to minimize likelihood of a loss of load scenario within an acceptable statistical range. To meet these objectives, the grid requires a wide range of dispatchable resources. While non-emitting resources are not mutually exclusive with dispatchable resources, the vast majority of dispatch-capable MW on the grid today and in the near term will account for some emissions. CHP technology acts as a bridge to a more renewable future by providing dispatch capability at a lower equivalent emission rate than the grid, while also providing resiliency for local essential industries.

The Daymark Report offers two options for the continued participation for CHP: either freezing current participation levels or phasing out the technology over time. We would offer a third for consideration:

1 https://www.iso-ne.com/static-assets/documents/2020/05/2018_air_emissions_report.pdf

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pivot towards a dynamic approach to CHP in which distributed resource owners are incentivized to produce more when it demonstrably lowers grid emissions. Finally, we believe the APS should value investments made in community resiliency.

We appreciate your consideration of these comments and look forward to further discussions and participation in this process.

Respectfully,

John Webster
Director, Markets
Icetec Energy Services