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Re: Renewable Industry Response to Revised Draft Tier 1 Inventory Report by Exeter & BCS For RPS Study Group

The enclosed comments and analysis represent the views of a coalition of industry representatives and participants in the RPS Study Group process including AWEA, MDV-SEIA, MAREC & USSEC (the "Coalition"). We thank PPRP for the opportunity to provide feedback on the August 2018 revised draft of the 2017 Inventory of Renewable Energy Generators Eligible for The Maryland renewable Energy Portfolio Standard.

The updated inventory (the "Report") produced by Exeter Associates, Inc. (Exeter) and BCS, Inc. (BCS) corrects numerous methodological errors in the prior draft and is largely methodologically sound in its approach to calculating estimated supply of PJM Tier 1 RECs through 2030. We applaud the PPRP and Exeter for making these methodological improvements.

However, we take significant issue with the Report's conclusions which is driven by a number of the Report's key assumptions. These assumptions are based on obsolete data now contradicted by publicly-available data, industry feedback, and even by elements of the Report itself. In short, despite a range of assumptions identified in the report that result in divergent conclusions about the trajectory of PJM Tier 1 supply vs. RPS demand, the Report's conclusions of projected undersupply are entirely based on what is an unrealistic worst-case-scenario vs. the reasonably expected outcome. **Consequently, the Report's conclusion that Maryland will be unable to satisfy its RPS goals with PJM-sourced RECs is incorrect.**

Exhibits 1 and 2 below highlight four scenarios of Tier 1 REC supply: two scenarios explored in the Report and two additional scenarios offered by the Coalition based on a more realistic set of assumptions. Three of the below four scenarios, including the Coalition scenarios and one of the two scenarios in the Report, forecast a Tier 1 REC market in balance through 2030 with periodic oversupply. The fourth scenario in the Report, used as the basis of the Report's conclusions, data tables, and exhibits, is an outlier based on overly conservative assumptions that projects Tier 1 REC undersupply. The assumptions that drive the various scenarios are discussed below the two Exhibits.

Exhibit 1: PJM Tier 1 Supply Scenarios vs. Demand Under 50% MD RPS (2030)

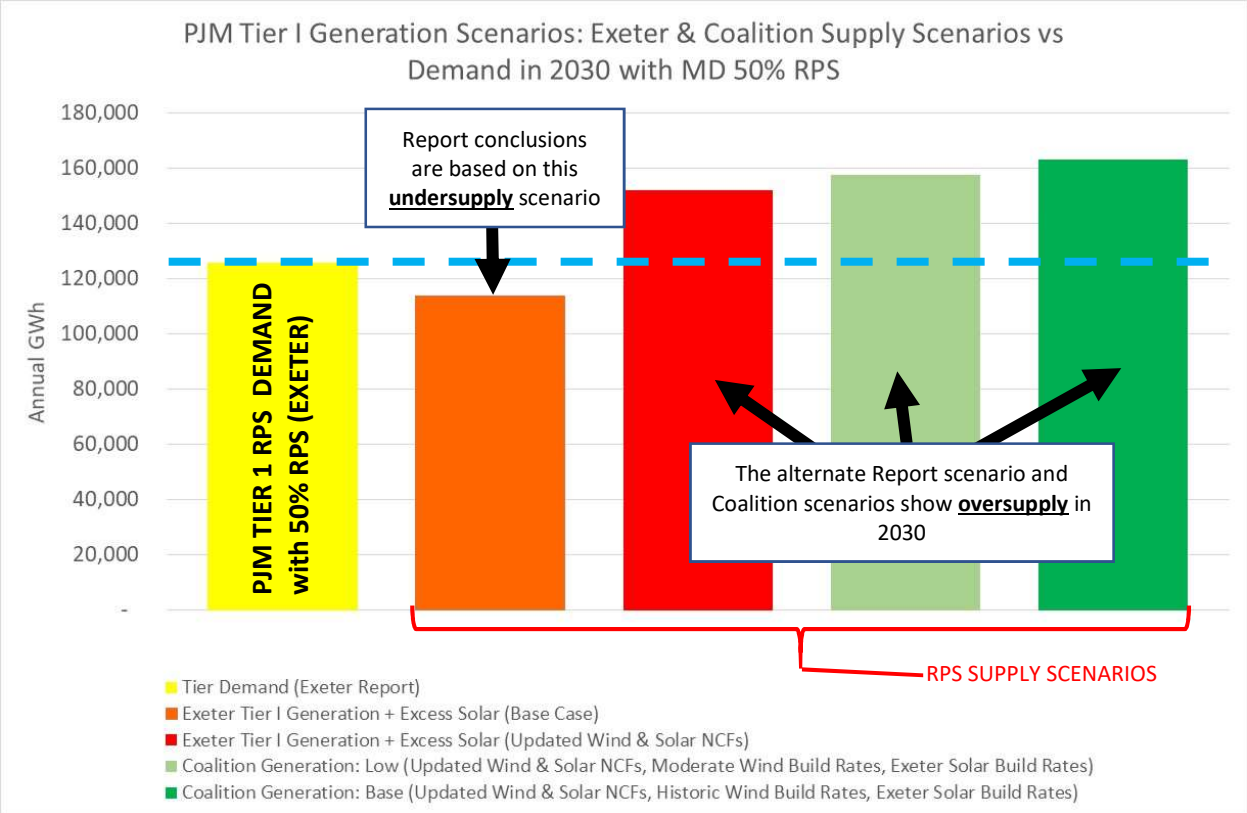
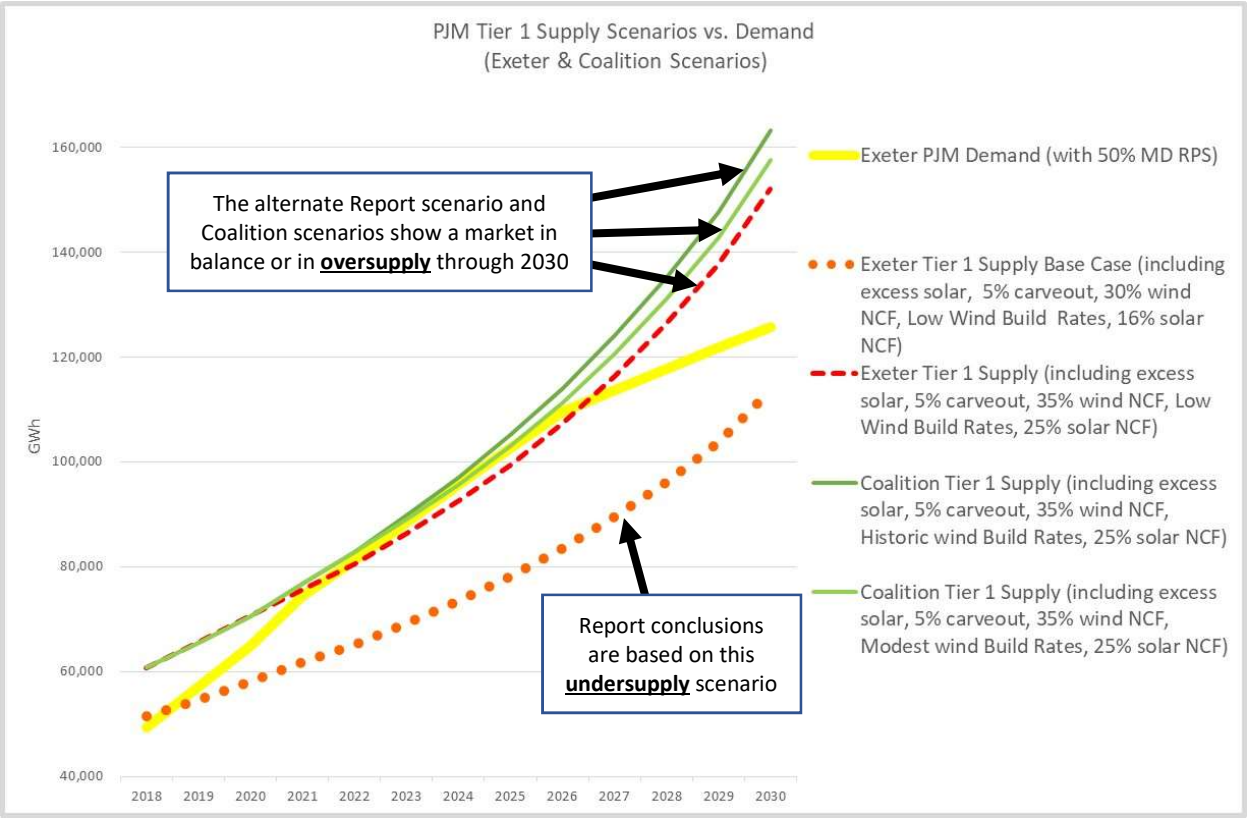


Exhibit 2: PJM Tier 1 Supply Scenarios vs. Demand Under 50% MD RPS (2018-2030)



In the above Exhibit 1, the yellow bar represents the Report's estimate of PJM Tier 1 Demand in 2030 and includes both the recent 50% NJ RPS expansion and an expansion of the Maryland RPS to 50% as contemplated in legislation proposed in the 2018 Maryland legislative session. The orange bar represents the conservative scenario that is the basis of the Report's conclusions. The red bar and green bars assume updated net capacity factors ("NCF") for wind and solar that are representative of today's technology and defensible via multiple credible third-party sources. The green bars also reflect increased annual wind addition rates, with the highest scenario on the right-hand side assuming the average historical wind addition rates from the past 10 years (725 MW/year). Exhibit 2 utilizes the same color scheme and shows annual Tier 1 supply projections in each scenario vs demand through 2030.

The key assumptions that differentiate these four scenarios are discussed below.

Key Assumptions Driving the Report's Flawed Conclusions

The Report acknowledges the use of conservative assumptions in drawing its primary conclusions. For example, on page B-5, the Report addresses the artificially low solar NCF used in projecting solar generation as follows: "*This analysis conservatively assumed the NREL lower bounds of 16 percent for solar PV capacity factor*." And in the Executive Summary, the Report addresses one of the two scenarios explored that project no Tier 1 undersupply, as follows:

> "*A separate analysis was conducted of whether state RPS requirements in PJM would be met if wind and solar capacity factors were higher, at 35 percent and 25 percent, respectively. The results show that both the solar carve-out in the Maryland RPS and all state non-carve-out Tier 1 RPS policies within PJM would be satisfied*."

Despite these caveats, the bulk of the Report's conclusions are based on erroneous assumptions that do not reflect the expected reality of outcomes based on factors that will drive PJM Tier 1 inventory over the next decade. Adjustments to these key assumptions are the basis of the three scenarios in Exhibits 1 and 2 that contradict the Report's conclusions and project oversupply. The key assumptions driving the Report's flawed conclusion that Maryland will expect undersupply under a 50% RPS expansion are:

1) Wind NCF that is lower than forecasted
2) Wind expected annual addition rate that is lower than forecasted
3) Solar NCF that is lower than forecasted

Wind Net Capacity Factor (NCF) Assumption

The Report assumes wind projects will achieve an average capacity factor of 30%. This assumption is based on historical production rates for turbines located within the PJM footprint. The problem with looking at all wind projects in PJM is that many projects within PJM use older generation wind technology and are not representative of the performance profile of new wind turbines that will be deployed going forward. Wind technology has improved dramatically over

that past decade, resulting in cost reductions and performance improvement. Based on EIA project specific generation data, wind projects built in PJM between 2012 and 2017 operated at an average capacity factor of 35%. Using a 35% capacity factor for new wind additions between 2018 and 2030 would be more indicative of the performance of future wind projects in PJM.

Wind Expected Rate of Annual Additions

The Report continues historic wind addition rates of 725 MW/year only through 2019 and reduces the annual addition rate to 362.5 MW/year thereafter, resulting in a total wind build projection across PJM of ~5800 MW over 13 years. In context, there are ~18,000 MW of wind currently in the PJM queue under study, and numerous third-parties projection more wind additions than assumed in the Report. For example, Bloomberg New Energy Finance forecasts 5900 MW of wind build in PJM through 2025, with 4.2 GW added by 2021 before dropping to an annual rate of additions of 500 MW. The Report's justification of the reduction in assumed annual additions after 2019 is that the Federal PTC ramps down starting in 2020. There are numerous flaws in this logic. First, wind technology costs continue to decline and the phase-out of the PTC was designed in coordination with the wind industry with the expectation that improving wind economics can increasingly compete without the Federal PTC. Second, even if it were reasonable to expect a slowdown in historic annual wind build rates in PJM due to the ramp-down in the PTC, the safe harbor and IRS "start of construction" provisions allow for utilization of the PTC for projects that are operational by 2023. Third, PJM Tier 1 prices are a function of supply and demand and can thus make up any difference due to the loss of the PTC value.

Solar Net Capacity Factor (NCF) Assumption

The Report assumes the lowest value, 16%, in a range of national solar capacity factors provided by NREL. In the context of a PJM-wide inventory where certain large states like Virginia, Ohio, and North Caroline have relatively strong solar resource, reliance on a 16% assumption for the Report's modeling is far lower than projections of solar capacity factor by various third parties, especially considering continued improvements in solar technology (ex. increases in efficiency, bifacial modules, single-axis tracker developments, etc.) For example, Dominion Virginia's 2018 IRP assumes an average of 26% capacity factor for Virginia solar facilities, of which there are over 8,000 MW in the PJM queue.

A 16% NCF should only apply to the relatively low volume of historic additions in PJM, particularly distributed fixed-tilted racking projects found in areas with lower solar irradiation than the PJM average, such as in New Jersey. In contrast, it is expected that the vast majority of non-carveout solar additions over the next decade will be in the higher resource PJM states (i.e. NC, VA, OH, etc) and will be installed using a single-axis tracking solution which have significantly higher NCFs. **Simply put, the 16% NCF is not representative of the solar MWh production that is expected over the next decade in PJM.**

Other Concerns With the Report's Assumptions and Conclusions

Failure to Recognize Market Dynamics in Meeting RPS Demand

The Report states on page ES-11 that "Market dynamics…can be expected to resolve much, if not all, of the potential shortfalls in non-carve-out Tier 1 renewable resource availability over time." While our comments and analysis above show that no such shortfalls should be reasonably expected given more appropriate assumptions about wind and solar NCFs and wind build rates, the reference to this expectation of market dynamics addressing the Report's projected shortfall contradicts the Report's central conclusion that there will be an "expected shortfall of PJM non-carve-out Tier 1 resources to fully meet the RPS requirements of the PJM states with RPS policies." The juxtaposition of this observation about market dynamics with the conclusion of expected market shortfall highlights the erroneous nature of the Report's assumptions and conclusions.

5% Solar Carveout vs. 14.5% Solar Carveout

The Report's stated purpose is "to provide a comprehensive assessment as to whether Maryland can reasonably meet its RPS requirements in coming years," yet uses a 5% solar carveout to explore the impact of a potential increase of the RPS to 50%. This will provide limited value to legislators and other key stakeholders, since the General Assembly is considering a much higher carve-out to accompany future RPS requirements. In 2018, a single bill, the Clean Energy Jobs Act (SB 732/HB 1453) proposed expansion of Maryland's RPS to 50% and was introduced in both houses of the Maryland Legislature, having been cosponsored by a majority of Maryland Delegates and Senators. The Clean Energy Jobs Act included a 14.5% solar carveout and will be reintroduced in the 2019 session. No other bill proposed to increase the RPS to 50% or contained a 5% solar carveout. It would thus seem prudent for the Report to use 14.5% vs. 5% as the basis for assessing solar inventory (it should be noted that the conclusions will not change given the tradeoff between Tier 1 demand and solar carveout demand under a 50% RPS ceiling).

Conclusion

The above analysis highlights the reasons why the Report's framing and conclusions are fundamentally incorrect, leaving the reader with a false sense that it is reasonable to expect that Maryland will face challenges in achieving requisite Tier 1 generation thresholds under a 50% RPS. The employment of a more reasonable set of assumptions would result in opposite conclusions in the Report. We encourage PPRP, Exeter, and BCS to closely consider the above analysis, and we call for a re-write of the Report based on the conclusion that Maryland can reasonably expect to meet obligations of a 50% RPS under a range of reasonable scenarios.