



To: Todd Schatzski and Chris Geissler

CC: Dave Cavanaugh, Sebastian Lombardi, and NEPOOL Participants Committee

From: Francis Pullaro, Executive Director, RENEW Northeast

Date: March 15, 2022

Subject: Feedback on Analysis Group's Draft Pathways Study Report

RENEW Northeast ("RENEW")¹ appreciates the opportunity to submit written feedback regarding Analysis Group's ("AG") Draft *Pathways Study: Evaluation of Pathways to a Future Grid* ("Draft Report") published in advance of the March 1, 2022 Participants Committee meeting dedicated to the subject.

We greatly appreciate the time and effort that has gone into this study effort over the past year. We have found both the process of developing this study and the results illuminating, and we think that this study is a good step in understanding potential avenues for incorporating state sponsored renewable energy resources into our markets. Throughout this entire process, Analysis Group has provided detailed insights and explanations regarding their modeling methodologies and results. This clear presentation of information has allowed stakeholders to provide detailed and meaningful feedback which AG has carefully considered and responded to. We again want to thank AG for adjusting their model to account for negative priced offers from resources with Power Purchase Agreements with "clawback" provisions (as described in Section V.B.1 of the Draft Report). This change better aligns the model with industry expectations for market participation by these resources, and we believe had a significant impact on the conclusions that were drawn from this study.

There are two areas of the study that we hope AG will be able to expand upon in the Final Report and include specific references to these items in the Executive Summary, as described in more detail below. The first item relates to the modeling assumption in the Status Quo case that future procurements will follow the existing state decarbonization roadmaps rather than adapting to procure the least cost resources (in accordance with the cost assumptions used in the study). The second item relates to the battery storage "churning" behavior observed by AG in the scenarios with frequent and large negative prices. Additionally, at the March 1, 2022 Participants Committee meeting, Abby Krich asked for clarification in two areas of the study that we also hoped could be included in a future revision of the report and/or presentation.

¹ The comments expressed herein represent the views of RENEW and not necessarily those of any particular member.

Once again, we appreciate the opportunity to provide additional feedback on this important study. We have been impressed and grateful for the collaboration and transparency throughout this study process and we look forward to working with ISO, Analysis Group, and stakeholders as this study is finalized.

Status Quo Case Assumptions

As described in Section IV.B.4 of the Draft Report, the model was designed such that in the Status Quo case state procurements align with state decarbonization studies and plans, with Table IV-2 showing the resource mix assumed from these state roadmaps and plans. Those state decarbonization studies and plans were developed using a different set of assumptions about resource cost trends than what has been assumed in this study. While the AG model is procuring the resources from Table IV-2, it does not consider the relative costs of the different resource types. As explained in the same section, only if the model requires additional resources beyond what is shown in Table IV-2 does it assume that the least-cost resources (according to AG's cost assumptions) are chosen. Clearly this assumption will drive differences between the resulting resource mixes in the different policy approaches. As AG highlights in Section V.A of the Draft report:

“In the 2030s, new renewable capacity is mostly offshore wind and solar. In the Status Quo, these resource decisions reflect state roadmaps and plans. In the other policy approaches, the mix of resources reflects economic factors, with the model determining resource outcomes based on the financial incentives created by each approach with the goal of minimizing social costs. In these cases, the resulting resource mix reflects a combination of factors, particularly new build (capital) costs. These costs change over time due to multiple factors, particularly technological improvements (which lower costs and occur independent of resources developed in New England) and transmission and siting considerations (which increase costs as earlier projects exploit the most favorable (lowest cost) transmission and siting resource opportunities).”

Because of the capital cost assumptions used in this study (see Section IV.B.3 of the Draft Report), this modeling assumption will also impact the Social Cost results of the study. As reflected in the state roadmaps, more offshore wind resources are assumed to be built in the Status Quo case than in any of the alternative market-based approaches. However, AG assumes offshore wind costs remain higher than all other technologies. These higher assumed capital costs result in higher modeled social costs for the Status Quo case.

Future state procurements, should they continue, are not bound to align with the previously developed roadmaps. Rather, they might be expected to evolve in a way that at least attempts to achieve the lowest possible costs. If for example, state procurements were to adapt in the future to align with changing cost trends or were done in a way that promoted competition between renewable technology types, we would ultimately expect a different resource mix than what was contained in the prior roadmaps and assumed in this study. In this way, the

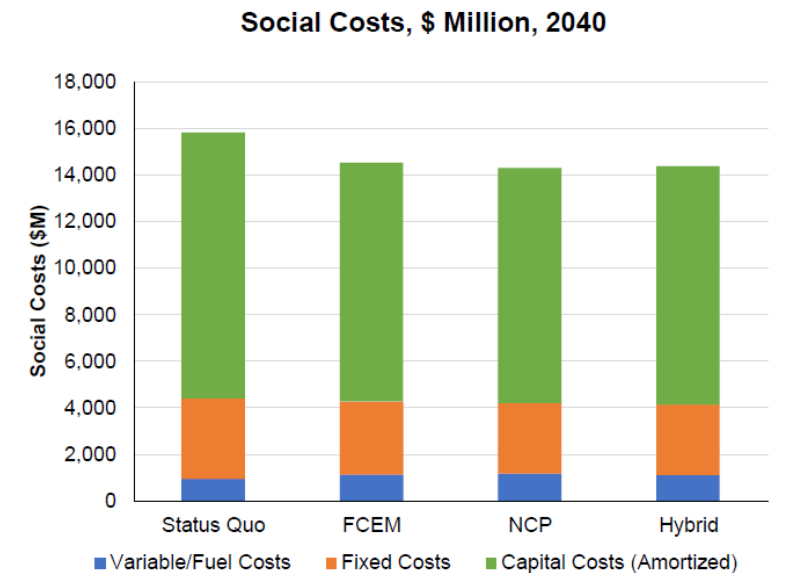
ultimate resource mix that would result from further state procurements may better align with the resource mix observed in the market-based approaches.

We find it hard to discern to what extent the study’s findings, particularly that the Status Quo case results in higher cost than the market based cases, are driven by the assumption that future state procurements will not stray from the previously developed roadmaps and how much they are driven by the nature of the procurements themselves.

We believe that a figure providing a breakdown of social costs by capital costs, variable/fuel costs, and fixed costs, as were presented at past Participants Committee meetings, will begin to help explain these differences.

We appreciate the descriptions of the methodology AG has included in Section IV of the Draft Report and the discussion of the implication of this assumption in Section V of the Draft Report, however we would like to see in the Final Report:

1. A qualitative explanation of how the Status Quo assumption regarding which resources are procured impacts the results and that if state procurements were to diverge from the roadmap assumptions the cost difference between the Status Quo and other cases could change.
2. Inclusion of the figure and description of the breakdown of Social Costs by Variable Costs, Fixed Costs and Capital Costs, as was included in previous AG presentations on the results of the study (see Analysis Group’s presentation to the Participants Committee on December 6, 2021 slide 14, figure copied below for reference)



3. A change to the description of the Status Quo case in the executive summary to specifically address this modeling assumption:

“**Status Quo**, continuing current unilateral state policies based on current state roadmaps and studies, which incent the development of clean energy resources using bilateral power purchase agreements (“PPAs”), with the corresponding costs allocated to electricity consumers;” (redlined language from page ES-1 of the Draft Report, repeated on page 2 on page 2 of the Draft Report)

Battery Churning

While the explanation of the “churning” in Section VI.B.2.b.ii provides a reasonable and detailed explanation of this behavior, we hope that some of the information from this section can also be included in Section I. Particularly, we think that it is worth noting that this effort did not allow for other resources besides batteries to take advantage of negative prices by creating load at these times. This should be abundantly clear even from the beginning of the report because this “churning” behavior potentially has a significant impact on the number of storage resources procured, which in turn could impact the resulting resource mix, total social costs, and environmental compliance.

As described in great detail in Section VI.B.2.b.ii, Analysis Group’s modeling found that Battery Storage Resources cycled in periods of negative energy prices, taking advantage of the energy difference between charging and discharging due to efficiency losses. We are glad that the model produced this result as we think it is beneficial to understand the unintended consequences of this type of policy design and specifically highlight this issue. We agree with AG’s assessment that this is economically inefficient behavior.

As AG writes in Section IV.B.2.b.ii: “This behavior results in some economically inefficient behavior. *First*, batteries are operated to store and then discharge energy, being paid a positive return for consuming the curtailed renewables through energy battery losses — that is, the battery is not storing energy across periods to allow more renewable energy to be used to meet demand in high energy periods, and instead is acting more like traditional energy demand. These energy losses and the associated battery cycling contribute to physical degradation of the battery, which imposes an economic (opportunity) cost. *Second*, the additional return may incent the development of excess battery capacity compared to the economically efficient level.”

However, we are skeptical that this behavior would happen at any significant scale in practice. As this behavior produces no social benefit, we doubt that consumers would tolerate this type of extra investment for the sole benefit of the operators of these facilities. More importantly, we cannot imagine that batteries would be the sole resources taking advantage of the opportunity to increase load during times of negative prices or that battery churning would be cost competitive compared with other resources that might put the energy to some productive use.

We recognize that it is likely too late to perform additional analysis for this particular study, but we hope that if there are any future studies of this nature, scenarios could be run to explore

the effects of resources that can take advantage of negative prices and scenarios where storage resources are limited in their ability to “churn” at negative prices.

With all of that said, while we appreciate the discussion that has already been included in the Draft Report on this topic, we believe that the Final Report could be improved by:

1. Including additional detail regarding the “churning” behavior in the Executive Summary of the report. Particularly we would like to see the following points added:
 - a. That this AG model did not include other technologies that could consume energy in response to negative price signals
 - b. The battery churning behavior impacted battery economics and therefore could have impacted the resource mix and subsequently, environmental compliance (moved from the footnote into the main text in an expanded fashion)
2. Including in Section VI.B.2.b.ii an explanation for why a scenario without this churning behavior could not be performed as part of this study and a qualitative assessment of expected results if this behavior were mitigated.

Requested Clarifications

At the March 1 meeting, Abby had asked about the breakdown between existing generators that were offering at a price of -\$30/MWh and new generators that were offering at a price - \$100/MWh to better understand what quantity and type of resources were modeled with offers at each of these prices. We believe that this is important information to understand, particularly when trying to interpret the results of the economic curtailments (as shown on slide 25 of the presentation from March 1 and on page 50 of the Draft Report). We ask that this information be included in Section V.B.3.a of the Final Report.

Second, Abby had asked for a further explanation of the reasons for the step change in Capacity Market clearing prices around 2033. As Todd explained at the March meeting, Capacity Market prices are some of the most complex results that came from this modeling effort. If AG could provide more discussion around this part of the model and its findings to help stakeholders better understand how these prices are being set, particularly in relation to the large step change, we believe that this would provide stakeholders better insights into this vital part of the New England markets.

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