BEFORE THE NOVA SCOTIA UTILITY AND REVIEW BOARD

In the Matter of an application by Nova Scotia Power Incorporated for approval of CI C0010778 - Smart Grid Nova Scotia Project

(NSUARB M09519)

Evidence of
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On Behalf of
Counsel to Nova Scotia Utility and Review Board

February 19, 2020

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1. INTRODUCTION AND QUALIFICATIONS

Q. Please state your name, title, and employer.

A. My name is Alice Napoleon. I am a Senior Associate at Synapse Energy Economics ("Synapse"), located at 485 Massachusetts Avenue, Cambridge, MA 02139.

Q. Please describe Synapse Energy Economics.

A. Synapse is a research and consulting firm specializing in electricity and gas industry regulation, planning, and analysis. Our work covers a range of issues including integrated resource planning; economic and technical assessments of energy resources; electricity market modeling and assessment; energy efficiency policies and programs; renewable resource technologies and policies; and climate change strategies. Synapse works for a wide range of clients including attorneys general, offices of consumer advocates, public utility commissions, environmental groups, and federal clients such as the U.S. Environmental Protection Agency and the Department of Justice. Synapse has a professional staff of 30 with extensive experience in the electricity industry.

Q. Please summarize your professional and educational experience.

A. Since joining Synapse in 2005, I have provided economic and policy analysis of electric systems and emissions regulations, with a focus on energy efficiency program design, administration, cost recovery, and cost-benefit analysis. In my 14 years at Synapse Energy Economics, I have co-authored dozens of reports and led major projects for the U.S. Environmental Protection Agency on quantifying the benefits of clean energy resources and for the U.S. Department of Energy (DOE) on strategic energy management. I have provided testimony and testimony assistance before public utility commissions across the United States and Canada, including in California, Delaware, Illinois, Kentucky, Missouri, New Jersey, New York, Nova Scotia, South Carolina and Virginia. In Nova Scotia, I provided ongoing expert advice on a range of DSM issues including incentive setting methodologies, cost-benefit analysis, load forecasting, and locational DSM. In

Colorado, Maryland, and South Carolina, I facilitated and provided expert analysis on program costs and benefits for demand-side resource policy working groups.

Before joining Synapse, I worked at Resource Insight, Inc., where I supported investigations of electric, gas, steam, and water resource issues, primarily in the context of reviews by state utility regulatory commissions.

I hold a Master's in Public Administration from the University of Massachusetts at Amherst and a Bachelor's in Economics from Rutgers University. My resume is attached as Appendix A.

Q. Have you previously testified before the Nova Scotia Utility and Review Board?

A. Yes. I provided evidence in Matter Nos. M06247, M08604, and M09096 regarding the 2015, 2019, and 2020-2022 Demand-Side Management Plans on behalf of counsel to the Nova Scotia Utility and Review Board. I also provided evidence in the Advanced Meter Infrastructure cases (Matter Nos. M07767 and M08349). Further, I supported Tim Woolf in Matter No. M06733 regarding EfficiencyOne's 2016 to 2018 demand-side management plan.

Q. On whose behalf are you providing evidence in this case?

A. I am providing evidence on behalf of Counsel to the Nova Scotia Utility and Review Board ("Board").

Q. What is the purpose of this evidence?

A. The purpose of this evidence is to describe, assess, and critique NS Power's proposal to recover $7.1 million in costs associated with implementing a pilot study to manage the impacts of Distributed Energy Resources on the grid using an energy system platform (ESP). In addition, this evidence provides my recommendations to NS Power and to the Board.

2. CONCLUSIONS AND RECOMMENDATIONS

Q. Please describe your conclusions.

A. My conclusions are as follows:

- <u>Pilot study design issues</u>
    - The proposal does not provide a complete pilot study design because it does not do the following:
        - clearly describe the knowledge gaps that the proposed research is intended to address
        - consider whether an alternative, less expensive pilot study design could achieve the same objectives
        - describe how the proposed methodology is the best way to achieve the goals
        - adequately show how the innovation justification criteria are met
    - It is not clear whether the pilot will provide the information needed to make a decision on whether to proceed with a full roll-out of the ESP. For example, NS Power has not presented a case that properly conveys a plan that would compare the costs and benefits with and without the ESP. NS Power is also still considering the metrics to track during the pilot.
    - The Company has not proposed to test time-varying rates in this pilot, even though this may be a good opportunity to learn more about their application in Nova Scotia.
- <u>Value and equity issues</u>
    - The ESP is not competitively sourced. NS Power did not adequately justify why existing resources, which could reduce the cost of the pilot, could not be used.
    - The outcomes of this pilot could set an unwanted precedent for utility ownership of behind-the-meter assets and could negatively impact the development of the private market for distributed energy resources.
    - NS Power may end up captive to Siemens if the learnings from this pilot are not transferable to alternative ESPs and/or other platforms/technologies, which would render this investment sunk or could increase the cost of the full roll-out.

- Because the pilot excludes the use of existing distributed energy resources, NS Power is unnecessarily inflating the total cost of the pilot program while also limiting potential participation in the program. For example, NS Power proposes to exclude electric vehicle (EV) owners who already have Level 2 smart chargers from participating in the program. This will significantly impact the number of EV owners able to participate in the program.

- Future-proofing and risk issues

  - The compatibility of the ESP with future needs is not clear. The current record provides little detail on how NS Power expects the ESP will operate and interface with elements of its system in the future.

  - The plan is not fully formed. Some of the basic requirements such as a statement of work and the master cloud services agreement between Siemens and NS Power are still under development. These elements increase risk that the pilot will experience delays or the cost of the pilot will be higher than projected.

- Reporting issues

  - The filing is silent on what, how, and when the Company will report the results of the pilot.

Q. What are your recommendations?

A. I recommend the following:

- NS Power should submit a revised application that addresses the issues identified in the body of this evidence.

- Prior to approving the pilot, the NSUARB should open an investigatory docket to consider how other jurisdictions are supporting third-party markets for distributed energy resources side-by-side with utility investments, and what is the right approach for Nova Scotia.

- The Company should use this pilot to test time-varying rates and alternative rate designs, which could be used to maximize benefits of the ESP. Piloting time-varying rates in this pilot could provide information on a wider roll-out that leverages the capabilities of the Advanced Metering Infrastructure system that NS Power is currently installing.

- At the end of the 4-year pilot study, the Company should be required to publish a report quantifying the net benefits of the pilot and the ESP to all customers on the grid, relative to a scenario with no pilot. Further, the Company should adjust rates as necessary, given that this pilot is expected to reduce upward pressure on the revenue requirement (page 4 of Application). The Company should also be required to provide intermittent reporting on program costs and savings throughout the pilot.

3. BACKGROUND AND OVERVIEW

Q. Please provide an overview of the proposal.

A. NS Power proposes investments in a community solar garden, distributed solar and storage, EV chargers, EVs, and the ESP. The pilot has a number of partners, including the federal and provincial governments; New Brunswick Power; Siemens Canada, a private company; the Town of Amherst, Nova Scotia; and Nova Scotia Community College (Application, p. 3). NS Power seeks to recover a portion of the pilot costs from ratepayers, $7.1 million, with the remaining $11.9 being contributed by pilot partners (Application, p. 33).

Q. Have you identified issues with the proposal?

A. Yes, I have. My concerns relate to the pilot study design, value and equity issues, risks related to the nascent status of the pilot, the flexibility of the proposed solutions to adapt to future grid conditions, and reporting. I describe these concerns in the following four sections.

4. PILOT STUDY DESIGN ISSUES

Q. What is the regulatory framework under which NS Power proposes this pilot?

The innovation justification criteria are as follows:

> ***17.2 Innovation***
>
> ***Justification Criteria***
>
> *Innovation capital projects are justified on the basis that there is a reasonable expectation that they will provide customer*

> *value in some or all of the areas of reducing upward pressure on revenue requirement, reliability and grid stability, government policy compliance, and customer experience, through the deployment of proven technologies in innovative ways. In addition,* ***innovation capital investments may be justified on the basis that they are reasonably expected to allow for testing before deploying at scale, provide valuable data and learnings, or aid in the development of business cases where applicable.***
>
> *(emphasis added by NS Power) (Application, p. 26–27)*

NS Power maintains the pilot is justified largely under the latter category of criteria above: "the scope of this Project is designed to test the value of innovation solutions before deploying at scale, provide data or learnings on the innovation solution, and aid in the development of a business case for the innovation solution" (Application, p. 27).

In addition, NS Power claims that the investment is reasonably expected to achieve benefits pertaining to sustaining reliability and grid stability, as well as reducing upward pressure on revenue requirement (Application, p. 27).

Q. Is the proposed pilot sufficiently justified under the innovation criteria?

A. No. The filing should provide a preliminary impact assessment of how the pilot will contribute to the above criteria. More specifically, the filing should elaborate on the following justification criteria (Application pg. 26–27):

- Inform testing plans before deploying at scale,
- Contribute to valuable data and learning, and
- Aid in the development of the business case.

The pilot study design is a critical step for articulating the goals of the pilot as they relate to the innovation criteria, and how progress toward these goals will be measured.

To a certain extent, NSUARB IR-25 does outline some metrics associated with the justification criteria (reliability, grid stability, and revenue requirements).

However, the lack of information regarding metrics in the initial Application have limited the opportunity for discovery and a comprehensive understanding of the pilot.

In addition, based on the innovation criteria that NS Power claims justify the pilot, the pilot should be reasonably expected to allow for testing before deploying at scale. Deploying at scale implies that the smart grid pilot would be expected to be compatible with existing installations. However, the current pilot is only testing new installations, and the testing of existing installations has not been addressed. Further, NS Power will only be testing the compatibility of existing installations following the development and pilot testing of the ESP (NSP(CA) IR-23). Based on this, the pilot does not appear to meet the requirements of the innovation criteria as outlined above.

Q. Has NS Power provided a clear pilot study design?

A. No. NS Power has not formalized all elements of its research agenda.

A pilot study design should clearly indicate the following topics, many of which are missing from or poorly justified in NS Power's application and in the IR responses:

- What has already been learned from previous research, and how these past and potentially ongoing learnings will relate to the currently proposed research.
- What the gaps are in understanding that the current proposed research proposes to fill.
- What alternative approaches could be used to fill in these knowledge gaps, and why the proposed approach is better than alternatives.
- How the metrics and data collected will enable NS Power to decide whether to recommend a full roll-out.
- The logic for the pilot study design, including why distributed energy resources are being deployed in the specified locations.
- Whether there are opportunities for learning on other, related issues, such as on time-varying rates.

Learnings from Previous Research

Q. Please provide details on any previous research conducted by NS Power.

A. The Intelligent Feeder Project (IFP) was approved by the Board in August 2017 in CI 49787 (NSP(CA) IR-22, Attachment 3). For this project, NS Power partnered with a private firm, Opus One, on the development and testing of Grid OS control software (NSP(Synapse) IR-8). NS Power deployed a feeder-level microgrid to test Opus One's software. The IFP was conducted to provide learnings in relation to integrating wind energy and investigating energy storage options (NSP(CA) IR- 21). In addition, NS Power procured assets under the IFP for the purpose of this research. The assets procured included battery storage systems (a Tesla Powerpack and ten Tesla Powerwalls), (NSP(CA) IR-22).

Q. **What has NS Power learned from the IFP research?**

A. As indicated by NS Power, the IFP is a three-year pilot that studied energy storage at a feeder and residential level to better understand storage technology and its interactions with the grid (NSP(CA) IR-22, Attachment 3 and 4). Through implementation of the pilot in 2018 and 2019, NS Power claims that the IFP has provided learnings which can be applied to improve project planning and execution of subsequent battery projects (NSP(CA) IR-22, Attachment 4). The learnings from the project are broad and relate to integration of assets, challenges to full scale deployment, and technology functionalities.

Q. Would the proposed pilot overlap with the IFP research?

A. Possibly, yes. From a research perspective, both the IFP and the pilot involve procuring hardware assets for the purpose of testing compatibility with a new software platform. In addition, the natures of both the IFP and the pilot are similar in that they are expected to provide significant learnings at the pilot stage for purpose of deploying to scale.

Both the IFP and the Smart Grid pilot have a strong focus on energy storage technologies and their interaction with the grid. However, NS Power has not addressed the interaction and compatibility of the ESP and the Smart Grid pilot with investments made under the IFP, despite the overlaps between the IFP and

the pilot. NS Power has not justified why the assets under the IFP could not be leveraged towards this Smart Grid pilot. NS Power has suggested that "while not part of the initial scope of the Project, NS Power understands it is possible for the ESP to control the IFP batteries and will consider controlling the IFP batteries with the ESP after initial deployment" (NSP(CA) IR-21). This suggests that NS Power may not have fully considered leveraging the existing assets, particularly those that were procured through the IFP. This leaves questions unanswered in relation to the compatibility of the Smart Grid pilot with the existing assets under the IFP and the availability of additional cost savings to ratepayers that may be available by leveraging the IFP assets. The issue of cost of the pilot and additional cost savings that may be available to ratepayers will be discussed in more detail later.

In addition, as discussed in the section of this evidence on compatibility of the ESP with the future grid, if NS Power deploys the ESP platform to scale, then the ESP will be required to interact with legacy systems like the Grid OS. However, NS Power has not addressed the interaction of the ESP platform with the Grid OS platform.

Q. How will the learnings of the IFP be leveraged towards the Smart Grid pilot?

A. It is not clear how the learnings from the IFP will be leveraged to the Smart Grid pilot. NS Power intends to leverage the data and learnings from the IFP for the benefit of the Smart Grid Nova Scotia pilot (NSP(NSUARB) IR-21), however the Company has not elaborated on its plans for leveraging the learnings from the IFP. It is also not clear whether all the learnings and data from the IFP will be available prior to implementation of the Smart Grid pilot. NS Power has stated that the same internal resources from the IFP project team will also be working on the storage portion of the Smart Grid Nova Scotia pilot (NSP(NSUARB) IR-21), however no further details on the synergies between these two projects have been addressed.

Q. Do other projects share objectives with the proposed pilot?

A. Yes. The Solar Homes program, administered through Efficiency Nova Scotia, and the Solar for Community Buildings program, administered through the Nova Scotia government, may have data, assets, and research that could be leveraged for NS Power's research. NS Power states that it "does not have access to data from either of these programs" but does not elaborate on whether it pursued a collaboration with either of these entities (NSP(NSUARB) IR-17).

Knowledge Gaps

Q. Has NS Power adequately explained where the knowledge gaps lie?

A. No. NS Power has not elaborated on any knowledge gaps in the context of NS Power's own territory. NS Power has described, in general terms, the challenges of the growth of distributed energy resources on the grid in terms of grid stability, reliability, and affordability; but it has not indicated any specific gaps in knowledge that require research.

Q. Will the proposed NS Power research fill the knowledge gaps?

A. This is unclear. NS Power has provided an overview of market trends that demonstrate, in broad terms, challenges associated with distributed energy resources that the Company is likely to face in the future. However, since the knowledge gaps have not been adequately described, it is difficult to see whether the proposed pilot fills in those gaps.

Alternatives to the Proposed Pilot

Q. Has NS Power assessed any available alternatives to the proposed pilot?

A. No. NS Power has not assessed any available alternatives to the proposed pilot (NSP(Synapse) IR-5). NS Power claims that there are no alternatives to the proposed pilot. However, NS Power has not presented any analysis justifying this statement. Particularly, in the context of the ESP, NS Power has not provided a comparison of other similar platforms/systems in the market that provide similar benefits and value streams, especially those that are already tested and deployed in other jurisdictions.

As one example of a potential alternative that was not considered, NS Power indicates that currently available Distributed Energy Resources Management Systems (DERMS) are utility-only, apparently meaning that they only interface with the utility. NS Power suggests that there are benefits to the ESP, which interfaces directly with the customer, beyond the benefits of the utility-only DERMS solutions (NSP(NSUARB) IR-10). However, NS Power has not provided a comparison of the functionality and the costs of a customer-facing ESP versus the utility-only DERMs. This comparison should include a discussion of the value streams and cost savings associated with "utility only" solutions versus "customer level interface" solutions such as ESP. Similarly, NS Power has not outlined the difference between an enterprise-wide approach to distributed energy resource management as opposed to feeder-level control in terms of the value streams, cost effectiveness, and capabilities (NSP(CA) IR-6).

Without consideration of alternatives to the pilot and to the ESP, the Board has no way of knowing whether NS Power's proposal is the best option.

How Performance of the Proposed Approach Will Be Measured

Q. Did the Application indicate how the pilot will be assessed?

A. Not adequately. NS Power provided some metrics in response to discovery (NSP(NSUARB) IR-25 to 29). However, by not including these critical aspects of the pilot study design in the Application, there has not been a full opportunity to explore and vet the metrics through the discovery process. Furthermore, NS Power has not proposed a full, finalized set of metrics. The Company indicated that metrics for the pilot will be developed in the initial phases of the project concurrent with the pilot design and deployment of the assets. Furthermore, NS Power only intends to provide the full set of metrics to the UARB once they have been developed and finalized in greater detail (NSP(NSUARB) IR-25).

Q. Has the Company demonstrated how the data collected during the Pilot is necessary for determining whether to roll out the ESP system-wide?

A. No. It is not clear whether the pilot will provide the information needed to make a decision on whether to proceed with a full roll-out of the ESP.

For example, NS Power has not presented a case that properly conveys a plan to compare the benefits with and without the ESP. The comparison should account for other factors that would impact attainment of study goals independent of the pilot. For example, distributed energy resources may reduce the need for investments in the distribution system even without an ESP. NS Power has not provided clarity on how it is going to isolate external, non-pilot impacts for assessing the financial and grid performance impacts of the ESP, especially since NS Power does not propose to use a control group (NSP(Synapse) IR-14).

Q. What do you recommend NS Power do to sufficiently measure the cost impacts of the proposed pilot program?

A. Before considering whether to approve the pilot, NS Power should clarify, or the Board should require NS Power to clarify, how the baseline will be established in order to measure the benefits of the ESP. Prior to implementation, it is important that NS Power provide information that ensures that the testing and evaluation will measure the incremental benefits of the ESP. To my knowledge, NS Power has not provided a full plan for evaluating the benefits that are attributable solely to the ESP.

The Logic for the Proposed Pilot Study Design

Q. Has NS Power provided the logic for the design?

A. Not in detail. For example, the Company provided no indication of why distributed energy resources are being deployed in the specified locations (NSP(E1) IR-7).

Additional Research Opportunities

Q. Do you have other comments on the pilot study design?

A. Yes. The plan should also consider whether there are opportunities for learning on other, related issues, such as on time-varying rates.

In this pilot, the Company is proposing to keep EV customers on their existing rate structure (Domestic, Small General, etc.) (NSP(CA) IR-13). There is no time-varying rate available for EV customers currently. The Company could offer a time-varying rate option to EV charging participants, in addition to the managed charging option NS Power has proposed in this Smart Grid pilot. Implementing time-varying rates is commonly cheaper than implementing managed charging programs, provides comparable benefits to the electric grid, and could potentially be more desirable to the customers that already own a Level 2 smart charger and would therefore be precluded from participation in this pilot. If such a time-varying rate is found to be effective in this pilot, I recommend that this rate structure be offered to all EV owners at the end of the trial period.

As mentioned previously, any trial of new rate structures that occurred in conjunction with the ESP pilot would necessarily call on the Company to carefully tease apart the many different variables at play. This will be needed to account for the synergistic benefits of the new rates and ESP separately from those benefits that would arise from implementing the new rates independent even if an ESP were not installed.

5. VALUE AND EQUITY ISSUES

Cost Issues

Q. What are the costs associated with the pilot?

A. The total cost of the pilot is $19 million, as shown below.

Expense Type	Cost ($ millions)
Labour	$1.6
Consulting/External Contractors	$4.8
Materials/Application Software (ESP)	$9.2
Administrative Expenses	$1.1
Other Goods and Services	$2.0
AFUDC	$0.3
Total	**$19.0**
Contributions	$(11.9)
NS Power total	$7.1

Source: Application, Figure 9.

It is unclear what the total cost of the ESP for the Smart grid pilot is. Based on the above, the total cost of the "Materials/Application Software (ESP)" is estimated to be $9.2 million and amounts to approximately half the cost of the entire pilot (Application, p. 33, Figure 9). NS Power has not provided any data or supporting information that references the full cost estimate of the ESP (e.g., budgetary quotations or cost breakouts) across the entire pilot. Although NS Power had provided an overall breakdown across funding entities for the entire pilot, it has not provided similar details for the breakdown of the ESP costs across the funding entities (NSP(Synapse) IR-2).

Q. Do you have concerns about the cost of the plan?

A. Yes. The evidence does not support a conclusion that the plan is a least-cost solution. In particular:

- a competitive procurement process was not used for the ESP;
- in some cases, participants will not be asked to share costs;
- existing resources are not included;
- the minimum level of investment was not justified; and

- no alternatives to the pilot were considered, as discussed in the previous section.

Q. What is your concern about how the ESP was procured?

A. The ESP was not procured through a competitive process (NSP(SBA) IR-4). Not using a competitive procurement process may produce costs that are higher than necessary.

Q. Turning to your second point on costs, what are your concerns about NS Power's proposal for participant contributions?

A. Commercial hosts will not pay for onsite solar and batteries but will continue to pay normal energy rates for all energy consumed, whether from distributed energy resources or the wider grid (NSP(CA) IR-19). Residential hosts are to pay a fee for their batteries, but presumably they will benefit from free energy (NSUARB IR-18). It is not clear why the funding arrangements are different for commercial vs. residential host sites. If commercial customers could bear more of the costs of the distributed energy resources, or residential customers bear more of the cost of the energy, costs to other ratepayers might be reduced.

Q. Turning to your third point, why are you concerned about excluding existing resources?

A. NS Power proposes to invest in new distributed energy resources (solar, batteries, and EV chargers) exclusively rather than using existing ones. The Company indicates that leveraging existing rooftop solar would require additional assessments and a potential modification of inverter devices to allow for appropriate communication and controls. This may also require NS Power to compensate owners to account for any impact on the benefits that customers normally see from solar installations. In addition, NS Power claims that using existing resources would also introduce potential volatility into the pilot study, and delays in testing would compromise learnings (NSUARB IR-15).

NS Power's justification for investing only in new distributed energy resources, rather than using existing ones in part or full, is not compelling. The Company has not shown that the costs of the impediments to using existing distributed energy resources in this pilot are greater than the costs of purchasing new distributed

energy resources. In addition, NS Power has not addressed how the challenges with existing resources will be addressed at the time of full-scale deployment. As discussed above, NS Power has made investments in assets under the IFP. However, it does not appear that NS Power has sufficiently considered leveraging the assets under the IFP towards this Smart Grid pilot (NSP(CA) IR-21). Thus, cost reductions could potentially be achieved by replacing some or all of the new distributed energy resources with existing ones.

Q. Has NS Power sufficiently justified the minimum investment required to test ESP?

A. No. NS Power indicated the need for a certain minimum number of installations to vet and test the ESP (NSP(NSUARB) IR-15). However, NS Power has not provided studies or information that justifies the minimum amount of installations/investments that are required to effectively vet and test the ESP. This raises concerns that the investments may not be sufficiently justified. In lieu of such an analysis, this also raises concerns that there will be a requirement for more investments to carry through with the full testing and evaluation.

Q. The costs of the pilot are being jointly borne by a number of partners. How were costs allocated to NS Power?

A. The capital work order provided in Appendix A estimates the Computer Application Software at ~$2 million, which is assumed to include NS Power's share of the ESP. NS Power has provided neither the logic for allocating the full cost of the ESP to the different contributors, nor how the Company's specific share was determined. This prevents assessment of whether the share allocated to NS Power is reasonable, or whether a reduction in total costs associated with the pilot program would flow through to ratepayers.

Q. Would reductions in total costs result in reduced costs for NS Power ratepayers?

A. Perhaps. Before the pilot is approved, NS Power should provide details on how costs were allocated and whether a change in the pilot design would flow through to ratepayers.

Issues Related to the Market

Q. Do you have any concerns related to impacts on the market for distributed energy resources?

A. Yes. While NS Power is only proposing a small-scale investment at this time, the Company is contemplating a roll-out of the ESP enterprise-wide. Implementing the ESP throughout the territory would limit the private market's ability to offer compatible systems and technologies. Regulators and stakeholders have not had the opportunity to discuss the implications of the pilot, which may limit the opportunities for a larger roll-out and in turn have long-lasting impacts on the development of the market for services and assets.

Q. Do you have concerns about utility ownership of customer-sited assets?

A. Yes. The outcomes of the pilot could set a precedent for utility ownership of assets that are behind the meter. Customer-sited utility investments raise market power concerns. If the utility rate-bases the services and assets, private firms that could otherwise provide these goods at a lower cost to society will not be able to compete.

Q. Are there other concerns related to rate-basing the assets?

A. Yes. NS Power is proposing to depreciate the investment and may be seeking a return on its investments in the pilot. It may not be proper for NS Power to earn a return on pilot expenditures (platform and distributed energy resources), given that NS Power has not provided a benefit-cost analysis and is using the pilot in order to inform a future business case that will lead to return-bearing investments.

Q. What do you recommend on these points?

A. Prior to approving the pilot, the NSUARB should open an investigatory docket to consider how other jurisdictions are supporting third-party markets for distributed energy resources side-by-side with utility investments, and what is the right approach for Nova Scotia.

Targeting Participants

Q. What does NS Power propose for eligibility requirements for participants in the EV charger component of the pilot?

A. The Company plans to allow only participants who already have an EV and have space for a smart charger (NSUARB IR-6-c).

Q. What are your concerns with the proposed eligibility criteria for participants in the EV charger component of the pilot?

A. Because the pilot requires participants to already own an EV, it is very likely that the potential residential participants will already have in-home chargers to charge their EVs. These residential customers will either have Level 1 chargers, Level 2 chargers without WiFi connection, or Level 2 chargers with WiFi connection (i.e., L2 smart chargers) to charge their vehicles. The motivation of existing EV customers to participate in this pilot program will vary depending on which type of EV chargers they currently own. The following points discuss the benefits of joining the pilot program to each of these classes of EV owners:

- An EV owner with a Level 1 charger would have an incentive to join the pilot program and purchase an L2 smart charger (through cost-share with the utility), because they would benefit from faster EV charging. These customers will likely participate in the pilot program.
- An EV owner with a Level 2 charger that does not have WiFi connection would not have an incentive to participate in this pilot. They would have to pay the upfront cost of an L2 smart charger (likely in a cost-share with the utility) as well as installation costs but would not reap any benefits from the upgrade (e.g. charging speed or monthly electricity costs). These customers will not likely participate in the pilot program.
- An EV owner with a Level 2 smart charger (and any other technical requirements listed in CA IR-10) already have the equipment offered as a benefit through this pilot program, and therefore would not have an incentive to participate in this pilot as it is currently designed. These customers will not likely participate in the pilot program.

With the current design of the pilot program, NS Power is missing an opportunity to encourage participation from EV owners who already own Level 2 smart chargers. Based on the reasons listed above, NS Power will likely have challenges

with participation in the EV charger portion of the pilot program. Without adequate participation, the EV charger portion of the pilot program will not collect enough data to understand the potential benefits of the program. Without sufficient data to assess the program, the upfront costs of this ESP program that are borne by ratepayers will be unjustified.

Q. What do you recommend NS Power do to avoid the challenges of low program participation?

A. To increase participation in the EV charger portion of the pilot program, the Company should allow residential EV customers who already own Level 2 smart chargers to participate in the program using their existing equipment. These customers should be incentivized to participate by offering them monthly incentive payments equivalent to the value they provide to the grid. As mentioned in the section above on Cost Issues, allowing customers with existing distributed energy resource equipment to participate will also reduce the overall costs of the program.

Q. Do you have any other concerns regarding participation in the EV program?

A. Yes. The program, as it is currently designed, does not provide specifics on the incentives offered to program participants. Without early transparency about the incentives and how they are calculated, customers will not be motivated to participate in the program.

Q. What do you recommend NS Power do regarding communication of incentives to potential program participants?

A. The Company should conduct a thorough calculation of the savings that a smart charger would provide to the grid, to determine the appropriate cost-share for the purchase of smart chargers (NSUARB IR-18-c). As mentioned above, smart charger cost-share will likely only be appealing to EV customers who currently have a Level 1 charger at home.

As early as possible, this calculation should be communicated to potential pilot participants for full transparency of benefits their charger will provide to the grid.

If NS Power allows EV customers who already have smart chargers to participate in this program, the Company should conduct a similar calculation of the incentives for that class of customers as well. I recommend that the Company provide a monthly incentive payment to each customer that reflects the full value that their smart charger provides to the grid each month. This value should be calculated and communicated to potential customers prior to the start of the pilot program.

Q. Would there be impediments to customers to participate?

A. Given that only customers who own an EV are allowed to participate in the program (NSUARB IR-6-c), low-income customers who do not already own an EV will not be able to afford to participate. EVs can provide substantial value to the system. As just one example, EVs increase sales and can put downward pressure on rates by spreading fixed costs over more sales. For this reason, policies or programs that support EV adoption by low-income customers may pay for themselves over the long run. Whether or not the Board elects to approve the pilot, NS Power should immediately undertake a study to better understand barriers to low-income Nova Scotians in adopting EVs and consider the best ways to address those barriers in the province.

6. FUTURE PROOFING AND RISK

Risks in Pilot Stage

Q. Are you concerned about risks in pilot stage?

A. Yes, the pilot is in very preliminary stages which creates high risks. Some of the basic requirements such as a statement of work and the master cloud services agreement between Siemens and NS Power are still under development – the pilot and development are in a very preliminary stage (NSP(CA) IR-1). This means there is potential for cost overruns and delays.

In addition, Siemens, a private firm, approached NS Power to pilot the ESP technology as a part of an application to the Government of Canada's Innovative

Superclusters Initiative (NSP(SBA) IR-4). The pilot was not funded by the Superclusters Initiative, but it was approved under three other federal funding programs. I note that NS Power did not provide information on the reasons that the proposed pilot was rejected under the Superclusters Initiative. NS Power should explain why the pilot was rejected before NS UARB approves the current application, in case the rejection was due to a deficiency or problem with the concept that still underlies the current proposal and could create a risk in the future.

According to the response to E1 IR-3, the ESP has not been deployed or evaluated anywhere. The evaluation of the ESP is in very preliminary stages, and NS Power has not determined its compatibility with other programs (such as demand response) or technologies currently deployed or likely to be deployed by NS Power in the future. There are multiple demonstration projects in which the distribution energy management system (DEMS) from which the ESP is being developed is being used to provide one service, but this will be the first time that Siemen's platform will be used for multiple business services (NSP(Synapse) IR-7). Most of the current deployments are in "production operation."

Risks with Full Roll Out

Q. What will happen when the pilot is over?

A. NS Power plans to assess whether the ESP can be rolled out enterprise-wide (NSP(CA) IR-1).

Q. Are you concerned about risks with a roll out of the ESP to NS Power's entire system?

A. Yes. NS Power has not fully outlined the risks associated with testing and full-scale deployment of the ESP. Based on the response to CA IR-1, there is a risk that the ESP will not be viable for full-scale deployment. NS Power should provide more information describing this possibility and the level of risk. In addition, compatibility with existing installations will only be confirmed through this pilot study (NSP(CA) IR-23). Since the pilot does not test the range of distributed energy resources that are likely to be on NS Power's system in the

future (e.g., by including existing resources in the pilot), there is nothing to say that the ESP will work enterprise-wide.

Some of the additional concerns associated with full scale deployment of the ESP include uncertainty in the need for foundational hardware and software investments. Based on the response to CA IR-2, it appears that additional hardware and software needs have not been identified at this stage. The uncertainty in the cost estimates for full scale deployment of the ESP contribute to the overall risks of the pilot.

Q. Will outside funding be available for a full roll-out?

A. NS Power has provided very few details related to partner contributions and funding and the conditions for receipt of that funding, for the pilot or for the full roll-out. Although NS Power has expressed concern about meeting federal project funding deadlines (NSP(UARB) IR-15), rushing to meet these time constraints might lock in a technology that could prove excessively expensive, stranded, or obsolete just a few years into the future. To my knowledge, only the pilot is being funded by third parties; there has been no indication that there will be funding available for full scale deployment of the ESP. Based on NSP(CA) IR-4, NS Power has not investigated other funding options at the time of the pilot proposal.

Compatibility with the Future Grid

Q. When other jurisdictions consider modernization and DERMs investments, how do they consider compatibility with future technologies and system needs?

A. In other jurisdictions, utilities are currently undertaking grid modernization investments such as a distribution management system (DMS) or advanced distribution management system (ADMS). These grid modernization investments sometimes include elements such as Conservation Voltage Reduction (CVR), Var/voltage optimization (VVO), and distribution automation at the substation/feeder level. In these processes, these investments are considered collectively, because each one would have impacts on both the compatibility and the effectiveness of other individual investments. For example, if a utility decides

to invest in an ADMS, then it is necessary that other assets made on the distribution system going forward are also compatible with utility-operated ADMS. Similarly, if a utility deploys hardware and software to implement a voltage optimization system, the benefits obtained from such a system that is integrated with an ADMS could be significantly more and allow for a more sophisticated voltage optimization approach. Therefore, synergies with other hardware and software investments are important when making system-wide investments. Although NS Power has stated that the ESP will not limit the choice of technology (NSP (CA) IR-2), it is unclear the extent to which future investments in the system and their compatibility with ESP have been considered.

Q. How will the ESP interface and operate in light of future upgrades to the system?

A. This is not clear. Based on the current proposal, NS Power has not provided any detail on how it expects the ESP will operate and interface with elements of its system in the future. Also, NS Power has not addressed overlaps in the investments that may occur between the proposed smart grid initiative and other, possible future grid modernization investments. I am concerned that a full-scale deployment of ESP will have implications for longer term grid modernization.

It is not even clear whether the ESP platform deployed enterprise-wide would interact with legacy systems like the IFP Grid OS. NS Power has not provided clarity on how the ESP platform will integrate and/or interact with the Grid OS Control software.

Captivity

Q. After the pilot period, will NS Power be free to choose a lower-cost ESP?

A. Maybe not. I am concerned that NS Power may end up captive to Siemens if the learnings from this pilot are not transferable to alternative ESPs and/or other platforms/technologies. This condition could be aggravated if any of the following were true:

- Upon completion of this pilot, NS Power would be required to make additional investments in the Siemens ESP or required supportive technologies.
- Adoption of the Siemens ESP would impose limits on procurement of other grid infrastructure, due to compatibility requirements (e.g., by only working with certain grid modernization equipment).
- Should the pilot not be deemed a success, there will be no useful learnings.

In light of the above, NS Power should clarify how it will determine if the pilot is successful, and also how it will determine if it is to opt for the Siemens ESP as a permanent solution.

7. REPORTING ISSUES

Q. How does NS Power propose to communicate and report on the pilot study?

A. The Company does not propose any specific process for reporting the results of the pilot study. According to Appendix E, Nova Scotia Community College (NSCC) will have a role with "publishing technical papers on the results, as well as assisting with public and media outreach to disseminate the results of the work." In response to discovery, NS Power indicates that a "data collection and metrics evaluation process will be compiled and documented in project interim and final reports" (NSP(CA) IR-27). However, it is unclear when and with whom these reports will be shared. Further, it is not clear what these reports would contain, in part because the Company has not finalized its metrics.

Q. Do you have any recommendations with respect to reporting?

A. Yes. At the end of the 4-year pilot study, the Company should be required to publish a report describing the pilot's performance in terms of tracked metrics and quantifying the net benefits of the ESP to all participants on the grid. It should then adjust rates as necessary, given that this pilot is expected to reduce upward pressure on revenue requirement (Application, p. 4). The Company should also be required to provide intermittent reporting (annually or more frequently) on pilot status, costs, and savings.

Q. Does this conclude your evidence at this time?

A. Yes, it does.

APPENDIX A: RESUME

Alice Napoleon, Senior Associate

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PROFESSIONAL EXPERIENCE

Synapse Energy Economics, Inc., Cambridge, MA. *Senior Associate*, June 2013 – present; *Associate*, July 2008 – June 2013; *Research Associate*, April 2005 – July 2008.

- Provide expert analysis, ongoing stakeholder support, and consulting services in regulatory proceedings regarding energy efficiency program design and performance, funding and incentive mechanisms, evaluation, cost-effectiveness screening, avoided costs, potential studies, and plans. Develop and sponsor testimony and formal comments on electric and natural gas energy efficiency plans, advanced metering infrastructure (AMI) proposals, and innovative programs and regulatory structures.
- Develop a cost effectiveness tool, program designs, and case studies to facilitate incorporating strategic energy management programs into energy efficiency program administrators' portfolios for commercial and industrial customers.
- Design research approach, manage team, and conduct a sweeping analysis of energy efficiency potential studies from utilities, states, and regions across the U.S.
- Conduct extensive research on low-income energy efficiency efforts in U.S. states. Analyze energy burden differences between low-income and non-low-income households, and across factors that can impact participation in and efficacy of energy efficiency programs, to inform efficiency program design and targeting efforts. Provide consulting services and testimony on low-income energy efficiency programs and proposals.
- Facilitate residential, commercial, and industrial policy working groups and manage technical analysis of working group recommendations to reduce greenhouse gas (GHG) emissions in Colorado, South Carolina, and Maryland.
- Research and analyze historical emissions of criteria and hazardous air pollutants, greenhouse gases, and coal combustion wastes. Research and develop potential state and local emissions mitigation strategies, such as strategies for reducing ambient fine particulates in New York City.
- Conduct surveys of regional, state, and utility policies and practices regarding ratemaking for energy efficiency, power procurement, risk management, and fuel diversity. Research federal, regional, and state policies and case histories on integrated resource planning, power procurement, power plant operations, renewable portfolio standards, and market power.
- Conduct research for modelling macroeconomic impacts of policies that reduce oil production.

Resource Insight, Inc., Arlington, MA. *Research Assistant*, 2003-2005.

Responsible for conducting research and analysis of electric, gas, steam, and water resource issues. Conducted discounted cash flow analysis for asset valuation. Developed market-price benchmarks for analysis of power-supply bids including energy, capacity, ancillary services, transmission, ISO services, losses, and adjustment for load shape. Prepared discovery responses, formal objections, comments, and testimony; collaboratively wrote and edited reports; created and formatted exhibits. Participated in drafting an Energy Plan for New York City. Edited solicitation for competitive power supply to serve aggregated municipal load.

University of Massachusetts, Amherst, MA. *Teaching Assistant*, 2001-2002.

Developed and taught lessons on applied math to a diverse group of incoming graduates; tutored students in microeconomic theory and cost benefit analysis; graded problem sets and memoranda.

International Council for Local Environmental Initiatives, Berkeley, CA. *Cities for Climate Protection Intern for the City of Northampton, MA*, 2001.

Compiled primary and secondary source data on energy consumption and solid waste generation by the municipal government, city residents, and businesses; applied emissions coefficients to calculate total GHG emissions; identified current and planned municipal policies that impact GHG emissions; researched the predicted local effects of global warming ; gathered public feedback to provide acceptable and proactive policy alternatives. Composed a GHG emissions inventory describing research findings; wrote and distributed a policy report and press releases; gave newspaper and radio interviews; addressed public officials and the public during a televised meeting.

University of Massachusetts, Amherst, MA. *Research Assistant*, 2000-2001.

Located federal data sources, identified changes, and updated a research database to evaluate the Habitat Conservation Program; proofread articles and white papers; composed a literature review on land use modelling. Collaboratively administered, tested, and proposed interface enhancements for a web-based data warehouse of regional habitat change research; formally presented the system to an independent research group.

Court Square Data Group, Inc., Springfield, MA. *Administration Manager*, 1998-2000; *Project Administrator*, 1996-1998.

As Administration Manager, analysed profitability and diversity of income sources; managed cash flow, expense, and income data; created budgets; devised and implemented procedures to increase administrative efficiency; implemented new accounting system with minimal disruption to workflow.

As Project Administrator, coordinated implementation of software features; identified opportunities for future development; monitored problem resolution; wrote and coordinated production of a user's manual and questionnaires; edited technical proposals and a business plan.

EDUCATION

University of Massachusetts, Amherst, MA
Master of Public Administration, 2002

Rutgers University, New Brunswick, NJ
Bachelor of Arts in Economics, 1995

Syracuse University, Syracuse, NY, 1994

PUBLICATIONS

Napoleon, A., B. Havumaki, D. Bhandari, T. Woolf. 2019. *Review of New Brunswick Power's Application for Approval of an Advanced Metering Infrastructure Capital Project: In the Matter of the New Brunswick Power Corporation and Section 107 of the Electricity Act; Matter No. 452.* Synapse Energy Economics for the New Brunswick Energy and Utilities Board Staff.

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Hall, J., J. Kallay, A. Napoleon, K. Takahashi, M. Whited. 2018. *Locational and Temporal Values of Energy Efficiency and other DERs to Transmission and Distribution Systems.* Synapse Energy Economics.

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Nova Scotia Utility and Review Board (Case No. M07767): Direct evidence in the matter of the Nova Scotia Power Advanced Meter Infrastructure Pilot. On behalf of Counsel to the Nova Scotia Utility and Review Board. February 16, 2017.

Public Service Commission of South Carolina (Docket No. 2016-223-E): Direct Testimony of Alice Napoleon regarding South Carolina Electric and Gas Energy Efficiency Efforts. On behalf of South Carolina Coastal Conservation League. September 1, 2016.

Nova Scotia Utility and Review Board (Case No. M06247): Direct evidence in the matter of an application by Efficiency Nova Scotia Corporation for approval of its electricity demand-side management plan for 2015. On behalf of Counsel to the Nova Scotia Utility and Review Board. July 14, 2014.

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Public Service Commission of South Carolina (Docket No. 2017-2-E): Direct Testimony of Thomas Vitolo, PhD regarding Avoided Cost Calculations and the Costs and Benefits of Solar Net Energy Metering for

South Carolina Electric & Gas Company. On behalf of South Carolina Coastal Conservation League and Southern Alliance for Clean Energy. March 22, 2017.

State of New Jersey Board of Public Utilities (Docket No. ER16060524): Direct testimony of Tim Woolf regarding the Petition of Rockland Electric Company for Approval of an Advanced Metering Program, and for Other Relief. On behalf of New Jersey Division of the Ratepayer Advocate. September 9, 2016.

Nova Scotia Utility and Review Board (Matter No. M06733): Direct testimony of Tim Woolf regarding EfficiencyOne's 2016-2018 demand-side management plan. On behalf of the Nova Scotia Utility and Review Board. June 2, 2015.

Missouri Public Service Commission (File No. EO-2015-0055): Rebuttal and surrebuttal of Tim Woof on the topic of Ameren Missouri's 2016-2018 Energy Efficiency Plan. On behalf of Sierra Club. March 20, 2015 and April 27, 2015.

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State of New Jersey Board of Public Utilities (Docket No. GO12070640): Direct testimony of Robert Fagan regarding New Jersey Natural Gas Company's petition for approval of the extension of the SAVEGREEN energy efficiency programs. On behalf of the New Jersey Division of the Ratepayer Advocate. October 26, 2012.

State of New Jersey Board of Public Utilities (Docket No. GO11070399): Direct testimony of Robert Fagan regarding Elizabethtown Gas Company's Proposed Energy Efficiency Program. On behalf of New Jersey Division of the Ratepayer Advocate. December 16, 2011.

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State of New Jersey Board of Public Utilities (Docket No. GR10030225): Direct testimony of David Nichols regarding New Jersey Natural Gas Company's Proposed Energy Efficiency Program. On behalf of New Jersey Division of the Ratepayer Advocate. July 9, 2010.

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Illinois Commerce Commission (Docket 05-0159): Direct testimony of William Steinhurst regarding Commonwealth Edison's Proposal to implement a competitive procurement process. On behalf of Illinois Citizens Utility Board and Cook County State's Attorney's Office. June 8, 2005 and August 3, 2005.

Resume updated December 2019