An Assessment of Nova Scotia Power's Proposed Extra Large Industrial Active Demand Control Tariff

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I. Introduction

Nova Scotia Power ("NS Power") is proposing to introduce a new tariff, known as the Extra Large Industrial Active Demand Control ("ELIADC") Tariff for its largest customer, Port Hawkesbury Paper ("PHP"). PHP accounts for approximately 10% of system load.

The ELIADC tariff, by providing greater control to NS Power over PHP's load, will provide NS Power with improved system flexibility, which is going to become increasingly important as a means of effectively integrating intermittent renewable generation resources once renewable energy imports become a bigger part of the resource mix in the province, displacing existing fossil fuel based generation. NS Power forecasts that the improved load flexibility enabled by the ELIADC tariff will lead to overall system cost savings which cannot be achieved under the existing PHP Load Retention Tariff (LRT).

In this report, we provide an assessment of NS Power's proposed ELIADC tariff. First, we present our understanding of the key features that differentiate the proposed ELIADC tariff from the existing LRT and explain the advantages of the ELIADC tariff. Second, we discuss an emerging industry trend toward "load flexibility" programs similar to the ELIADC tariff. Third, we conclude with our assessment of the ELIADC tariff.

II. Overview of the ELIADC Tariff

Under the LRT, PHP pays NS Power the sum of:

1. The hourly incremental cost of electricity
2. Incremental operating and capital costs of providing service to PHP
3. A contribution to utility fixed costs

The LRT also includes elements of an “interruptible tariff,” which allows NS Power to interrupt PHP’s load when system reliability is threatened.

NS Power has proposed to replace the LRT with the new ELIADC tariff to improve the value of the tariff to the NS Power system. The ELIADC tariff gives NS Power direct control over PHP’s load. NSP forecasts that direct load control will yield greater benefits to NS Power’s other customers through reduced system costs. The new tariff also provides PHP with more price certainty, in the form of a flat rate. Key differences between the current LRT and the proposed ELIADC tariff are summarized in Table 1.

Table 1: Key Differences between LRT and ELIADC Tariff

	LRT	ELIADC Tariff
Load control	PHP is a Priority Interruptible customer during periods of system constraint During non-system-constrained periods, customer responds to price signals at its discretion	PHP is a Priority Interruptible customer during periods of system constraint During non-system-constrained periods, Daily/Hourly operating schedule provided by NS Power to PHP
Price signal	Hourly prices forecast on a Day Ahead and Real Time basis and finalized through ex post analysis of marginal system costs	Flat price, based on one-year forecast of cost of serving PHP’s load
Fixed cost recovery	Under the LRT, PHP contributes to a portion of the fixed costs as determined in the tariff	PHP pays a larger share of costs than under the LRT

Benefits to other customers	PHP costs are reduced through PHP's load flexibility in response to realtime energy prices. Benefit of the LRT to other customers is limited to PHP's contribution to fixed costs.	The reduction in overall system costs resulting from control of PHP's load will be calculated by NS Power. PHP receive 25% of the cost savings. The remaining 75% will accrue to all other customers.
Shut down days	PHP schedules their own shutdown days, without accounting for NS Power system needs.	A portion of forecasted shutdown days will be scheduled collaboratively to maximize benefit to the overall system.

PHP has provided NS Power with a set of nine operating modes for system modeling purposes. These operating modes consist of combinations of three production lines, bleacher plant, and the paper machine, each of which come with specific load profiles and specific constraints on minimum and maximum operating hours. NS Power will schedule PHP's operations, choosing from the specified operating modes and respecting the constraints, to optimize system operations in the presence of intermittent renewable energy resources and high levels of import energy.

NS Power will perform this scheduling each business day, generating a load profile for the following week. Additionally, NS Power (through the Nova Scotia Power System Operator) can request changes hour by hour if system conditions change. During periods of supply shortfalls, NS Power can interrupt PHP's load on a priority basis. This scheduling, which is analogous to day-ahead and hour-ahead scheduling in deregulated energy markets, allows NS Power to build load when there is wind generation and minimize load when there is not. The timeframes of the agreement allow for quick adjustments if, for example, wind forecasts are proven to be incorrect. This scheduling flexibility is expected by NS Power to allow the utility to effectively lower costs relative to the current LRT. NS Power will be able to optimize its system to avoid the curtailment of non-dispatchable renewables and reduce load during the times of day when the cost of serving load is otherwise high. Alternatively, under the present LRT arrangement, PHP is allowed to run the plant as needed to finish production runs.

A transparent method is being used to define PHP's baseline energy consumption (i.e., consumption in the absence of the ELIADC tariff). The baseline is defined as a flat load profile, with full-day outages. By using the flat baseline, NS Power's methodology is transparent and minimizes administrative overhead.

NS Power will calculate the system cost savings attributable to the ELIADC tariff through a year-end comparison of the flat baseline and PHP's actual load under ADC in each hourly interval. The difference between these two load profiles will be valued at the actual system marginal cost in each hourly interval. Following the assessment of ADC benefit to the system, 25% of these benefits will be provided to PHP in the form of an incentive payment, with the remaining 75% of the accrued benefit remaining with other customers. According to NS Power's calculations, the system-wide cost reduction attributable to the ELIADC tariff, relative to the flat baseline, is expected to ~~be approximately $4.5 million in 2020, and~~ averaging approximately $10 million per year over the period from 2020 through 2023.

It is important to note that, while the currently applicable LRT also provides cost savings to PHP through load shifting, higher savings are expected by NS Power to be realized for all customers under the proposed ELIADC tariff. Under the LRT, revenues from PHP have exceeded the costs of serving PHP by approximately $3 million per year. Under the ELIADC tariff, revenues from PHP are expected to exceed fuel costs by $6 to $13 million per year. Based on NS Power's calculations, net revenues are expected to be higher under the ELIADC tariff due to greater cost savings associated with NS Power's improved control over PHP's load around-the-clock.

III. The Industry Trend Toward Load Flexibility

NSP's proposed ELIADC tariff is consistent with a broader industry trend toward an increased emphasis on load flexibility. A recent Brattle assessment of the U.S. potential for cost-effective load flexibility programs identified three factors that are leading to increased interest in programs similar to NS Power's ELIADC tariff:

1. Growth in renewable energy resources
2. Grid modernization
3. Electrification

These issues, and their relevance to the need for load flexibility, are summarized in Figure 1.

Figure 1: Industry Mega-Trends Contributing to the Need for Load Flexibility[1]

Mega-trend	Challenges	Load Flexibility Solution
Renewables growth	• Low net load leads to renewables curtailment and/or inefficient operation of thermal generation • Intermittency in supply contributes to increased need for grid balancing	• Electricity consumption can be shifted to times of low net load • Fast-responding demand response can provide ancillary services
Grid modernization	• Costly upgrades are needed to improve resiliency and accommodate growth in distributed energy resources	• Geographically-targeted demand response can help to defer capacity upgrades
Electrification	• Rapid growth in electricity demand may introduce new capacity constraints	• Controlling new sources of load can reduce system costs while maintaining customer comfort and adding value to smart appliances and electric vehicles

A recent study by the Smart Electric Power Alliance (SEPA) also highlights the industry transition toward a new, more flexible form of demand response (DR). The SEPA study surveys annual DR developments across North America and internationally. According to the study, "DR is playing a growing role in helping to balance fluctuations in energy production in areas with high levels of renewable generation (e.g., reverse DR and load shifting pilot measures)."[2]

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1 Ryan Hledik, Ahmad Faruqui, Tony Lee, and John Higham, "The National Potential for Load Flexibility," The Brattle Group report, June 2019. https://brattlefiles.blob.core.windows.net/files/16639_national_potential_for_load_flexibility_-_final.pdf

2 SEPA, "2018 Utility Demand Response Market Snapshot," September 2018, page 11.

Among commercial and industrial (C&I) customers, the SEPA study notes that automated load control accounts for a significant share of the segment's total DR capacity. The study specifically highlights a cutting-edge program being offered by HECO in Hawaii, through which automated load reductions can be achieved with short notice. The program is similar to the ELIADC tariff both in terms of the short response time and the options available to the utility for controlling customer load.[3] HECO received regulatory approval in 2017 to increase the size of this pilot project from 0.2 MW to 5 MW on Maui (with an additional 7 MW on Oahu), signaling success with the program.

Similar programs being offered by utilities in other jurisdictions also share common elements with the ELIADC tariff. In California, the three investor-owned utilities, PG&E, SCE, and SDG&E, each offer eligible commercial and industrial customers incentives of up to $200 per dispatchable kilowatt of demand for the purchase and installation of automated demand response measures. Once installed, those measures can connect to and control lighting, air conditioning/heating units, and temperature controls.[4] Customers may then earn additional incentives for energy savings during demand response events.

NS Power's ability to utilize the ELIADC tariff to *increase* load during times of renewables curtailment is also a program characteristic than has been observed in utility offerings in other jurisdictions. In Great Britain, National Grid (the electric system operator) recently implemented a Demand Turn Up (DTU) program. The DTU program pays large energy users to increase demand (through load shifting) during times of high renewable output when net demand is low.[5]

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[3] Hawaiian Electric, "Fast Demand Response," https://www.hawaiianelectric.com/products-and-services/demand-response/fast-demand-response.

[4] SCE, "Automated Demand Response," https://www.sce.com/business/savings-incentives/automated-demand-response-with-open-adr; PG&E, "Automated Demand Response Program Fact Sheet," https://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/demandresponse/fs_autodr.pdf; San Diego Gas & Electric, "Technology Incentives," https://www.sdge.com/businesses/savings-center/energy-management-programs/demand-response/technology-incentives.

[5] National Grid ESO, "Demand Turn Up," https://www.nationalgrideso.com/balancing-services/reserve-services/demand-turn.

IV. Conclusion

Conceptually, the ELIADC tariff offers a number of advantages over the current LRT. The ELIADC tariff provides NS Power with greater control over PHP's load-around-the-clock. This is expected to yield greater system cost savings and better align with NS Power's operational needs in an environment of growing renewables adoption and a significant shift to imported energy. Additionally, the ELIADC tariff provides an explicit savings sharing mechanism which ensures that the majority of the cost savings – 75% – associated with this improved load flexibility will accrue to other customers.

NS Power's proposal is well aligned with an emerging industry trend toward developing customer offerings that increase load flexibility. Elements of NS Power's proposal – such as the operational capability to increase load to avoid renewables curtailments while maximizing energy imports, and the control of end uses with short notice – have been observed in other programs recently introduced in other jurisdictions. Based on this consistency with industry practice, and the distinct advantages of the ELIADC tariff relative to the current LRT offering, we expect NS Power's proposed ELIADC tariff will create significant value for all NS Power customers.

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