Comments on
Nova Scotia Power Incorporated's
Time-Varying Price Tariff Application
Nova Scotia UARB Matter M09777

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1 Introduction

Nova Scotia Power is in the process of rolling out its "smart" meters, which will allow it to offer new classes based on time-of-use. These new rate classes will let Domestic Service, Small General, and General customers benefit from time-of-use billing. The new rate classes are intended to send consumers price signals to:

- Encourage customers of the original rate classes to change to new rate classes, and
- Discourage peak-hour energy consumption.

The new rate classes appear to be in response to Nova Scotia Power's planned increased use of variable renewables (notably wind) and non-firm imports of electricity from NB Power and Hydro Quebec if the Atlantic Loop is completed.

The new rate classes are made possible because of the "smart" metering technology Nova Scotia Power is installing in the province. These meters record when energy is consumed (usually in 15-minute intervals), thereby allowing Nova Scotia Power to vary the price of electricity throughout the day.

In this submission, I am considering the Domestic Services only, not Small General and General.

2 Critical Peak Events

Apart from residential customers using its Domestic Service Time-of-Use Tariff, Nova Scotia Power does not take the time of consumption into account with its other existing tariffs. With its new metering technology, Nova Scotia Power will be able to charge rates based on when the energy is used. A common example is to charge different rates at various times of the day, for example, when demand is highest and relies on more expensive sources of energy for its production. This is referred to as peak demand, and in Nova Scotia, usually occurs in the morning and early evening hours.

To encourage its Domestic Service, Small General, and General tariff customers to move from their existing rates to a new rate structure that loosely resembles a time-of-use tariff, Nova Scotia Power has introduced set of tariffs that can increase the cost of electricity during peak hours under certain conditions determined by the company, such as high demand for electricity, high energy costs, outages caused by generation or transmission failures.

Nova Scotia Power refers to these as *Critical Peak Events*.

The times a Critical Peak Event can occur are listed in Table 1. As with its new Time-of-Use tariffs, peak pricing occurs during the "Winter Season" (1 November to 31 March).

Table 1: Critical Peak Event Hours can occur during

Peak Periods - Weekdays	Critical Peak Event Hours
On-peak (morning)	7:00 am to 11:00 am
On-peak (evening)	4:00 pm to 8:00 pm

Unlike its Time-of-Use tariffs, which have set peak-prices during the peak hours, peaking-pricing occurs only during Critical Peak Events and are at Nova Scotia Power's discretion. Events are announced by Nova Scotia Power no later than 4:00 PM prior to the day of the event and are intended to warn customers that using electricity during a specific critical peak period (either morning or afternoon, not both) will result in a higher charge. If events are not expected, the customer pays the non-critical-peak price for the electricity used.

On the other hand, Critical Peak Event pricing, like Time-of-Use tariffs, is intended to encourage demand reduction during the peak period.

Nova Scotia Power's Tariff Application limits the number of Critical Peak events to 22 during the Winter Season. Critical Peak Events cannot be scheduled during the non-Winter Season (April to October, inclusive). This corresponds to about 20% of the weekdays during the Winter Season.

2.1 Comments

A possible use of Critical Peak Events is to change customer habits and encourage them to use less electricity during the morning and evening peak period. While this idea is an interesting one, there are several points that need clarification regarding Critical Peak Pricing and Critical Peak Events:

1. Nova Scotia Power should be required to justify each Critical Peak Event declared to avoid the perception of arbitrariness.

   Does Nova Scotia Power intend to do this? Will the UARB or some other designated group monitor it?

2. Having 22 Critical Peak Events in a Winter Season seems arbitrary. Why not 21? 23? (The choice of 22 appears to be answer in section 4.1.)

3. Critical Peak Events last the entire four hours of the peak, which again seems arbitrary, since the event could be rectified before the end of the peak; for example, a storm event announced by 4:00pm one day might not materialize during the announced peak and worse, might occur during the next peak when the critical price is not in effect.

   Would Nova Scotia Power still raise the cost of using electricity during the previously announced Critical Peak Event that did not materialize?

On the other hand, if a critical peak were not announced but occurred after Nova Scotia Power's 4:00 PM announcement deadline, would the customer still be charged the peak price?

4. If more than 22 Critical Peaks occurred (for example, during a Winter Season of extreme weather events), how would Nova Scotia Power encourage demand reduction?
5. Announcing the peak by 4:00 PM works only if the customer has the technology to be made aware of the upcoming Critical Peak Event. Anyone unable to have access to, for example, a mobile phone, or someone living in an area of poor mobile phone connectivity could miss out on the announcement. Making the customer responsible for this does little to help Nova Scotia Power's image.

   How does Nova Scotia Power intend to handle these situations?
6. Encouraging a customer to shift demand could result in a game of ping-pong, with the customer shifting demand to the afternoon in response to a morning critical peak and back again if an afternoon critical peak followed. A customer could game the system and do this for all 22 Critical Peaks and take advantage of potentially lower rates.

   Does Nova Scotia Power have a plan to handle customers gaming the system?

3 Example: Domestic Services Tariff vs. Domestic Services Critical Peak Tariff

Nova Scotia Power's existing Domestic Services Tariff is a flat rate tariff, meaning that the cost of the electricity consumed is constant throughout the day, regardless of the generation source or the cost of the energy used to produce it. At present, the Domestic Services Tariff cost is $0.16008 per kilowatt-hour.

The proposed Domestic Services Critical Peak Tariff has two prices, one for Non-Critical Peak hours and the other for when a Critical Peak Event is declared. The two rates are shown in Table 2; the price for non-critical peak hours increase on 1 January 2022.

Table 2: Winter Season Domestic Services Critical Peak Tariff prices

Time	Starting 1 Nov 21	Starting 1 Jan 22
Non-Critical Peak Hours	$0.13189	$0.13395
During a Critical Peak Event	$1.50000	$1.50000

3.1.1 Comments

In their application, one of Nova Scotia Power's concerns is how to get customers to change tariffs. There is a straightforward approach, compare their current energy charges using the Domestic Services Tariff with the Domestic Services Critical Peak Tariff, such as in Figure 1,[1] which shows:

[1] Seasonal peak and non-peak data used Figure 1 and Figure 2 were taken from Nova Scotia Power's April-December 2018 and January-March 2019 hourly load data.

- The horizontal axis represents the consumer's annual energy demand and the vertical axis, the annual cost of the energy consumed.
- The blue dashed line, Existing DST, represents the existing Domestic Services Tariff; the orange line, DSCPT (0 hrs), the Domestic Services Critical Peak Tariff with no Critical Peaks during the year; and the gray line, DSCPT (88 hrs), the Domestic Services Critical Peak Tariff with 22 four-hour Critical Peak Events (the maximum).
- The price per kilowatt-hour used $0.16008 for Existing DST, $0.13395 for non-critical peak hours, and $1.5000 for Critical Peak Event hours.

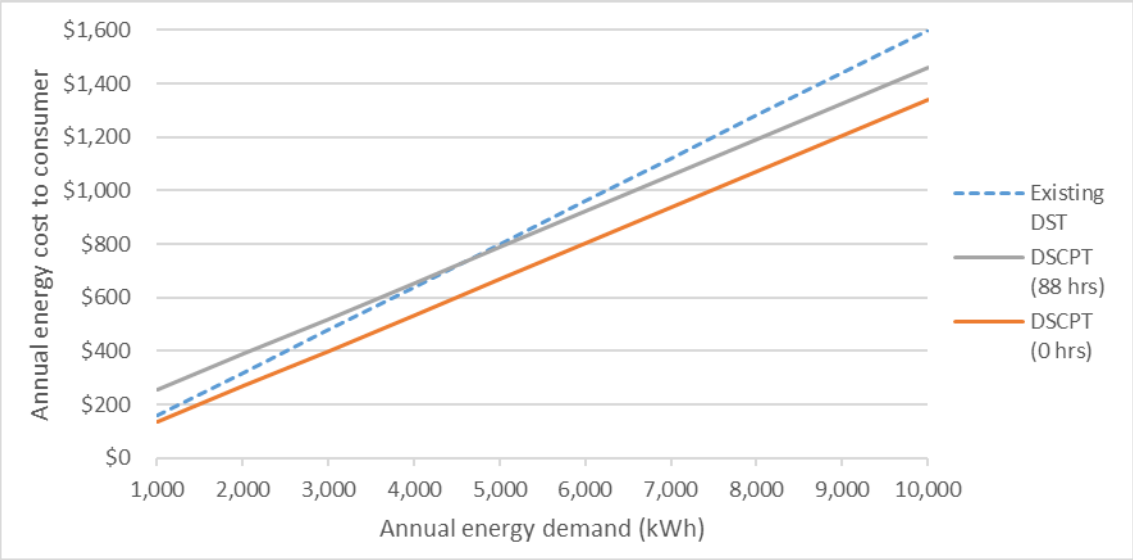

Figure 1: Annual energy costs for customers using existing Domestic Service Tariff and Domestic Service with Critical Pricing Tariff

Unsurprisingly, if there are no critical events, the annual energy cost to the consumer is less using the Domestic Services Critical Peak Tariff than using the Domestic Services Tariff. However, in the worst case, when there are 22 four-hour events, the consumer is better off staying with the Domestic Services Tariff until their annual consumption exceeds 4,600 kWh.

A graph such as this one would allow customers to decide which of the two tariffs they would prefer.

4 Example: Domestic Services Tariff vs. Domestic Services Time-of-Use Tariff

Nova Scotia Power's proposed Domestic Services Time-of-Use Tariff has the same on-peak hours as the Domestic Services Critical Peak Tariff (7:00 am to 11:00 am and 4:00 pm to 8:00 pm) for weekdays only. Starting in January 2021, the Winter Season on-peak price is $0.32957 per kilowatt-hour and $0.16478 per kilowatt-hour for the off-peak price (see Table 3).

Table 3: Nova Scotia Power's Winter Season Domestic Services Time-of-Use Tariff

Time	Hours	Starting 1 Nov 21	Starting 1 Jan 22
On-peak (morning)	7:00 am to 11:00 am	$0.32751	$0.32957
Off-peak	11:00 am to 4:00 pm	$0.16272	$0.16478
On-peak (evening)	4:00 pm to 8:00 pm	$0.32751	$0.32957
Off-peak	8:00 pm to 7:00 am	$0.16272	$0.16478

The non-Winter Season price regardless of the time of consumption is $0.10260 per kilowatt-hour.

4.1 Comments

One of the objectives Nova Scotia Power's Time-Varying Price Tariff Application is to encourage consumers to change from the Domestic Services Tariff to the Domestic Services Time-of-Use Tariff. However, the customer's choice of tariff would depend on their demand and whether they could avoid peak-time consumption, as the graph in Figure 2 shows.

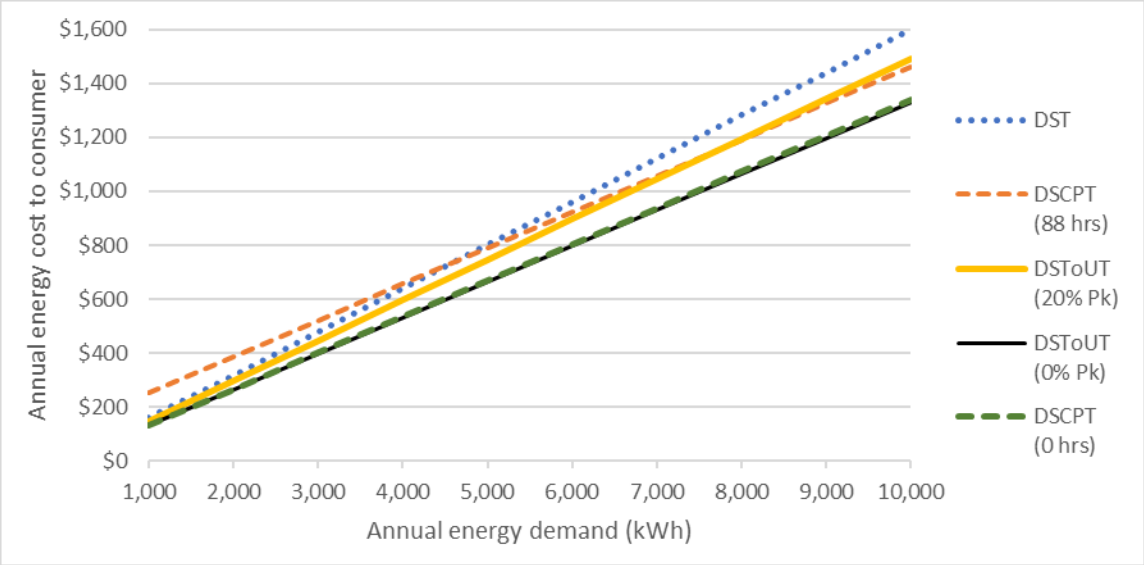

Figure 2: Comparison of Domestic, Critical Pricing, and Time-of-Use tariffs

In Figure 2 we see:

- There are two Domestic Services Time-of-Use Tariff lines, the first for a customer that avoids on-peak usage entirely (DSToUT (0% Pk), back line), and the other for a customer with a 20% on-peak usage (DSToUT (20% Pk), yellow line).
- The Domestic Services Tariff (DST, dotted blue line) is more expensive than all other tariffs except the Domestic Services Critical Pricing Tariff (DSCPT (88 hrs), dashed orange line) at 4,600 kilowatt-hours.

- Nova Scotia Power has designed the Domestic Services Critical Pricing Tariff with no critical events (DSCPT (0 hrs)) to coincide with Domestic Services Time-of-Use Tariff with no on-peak usage (DSToUT (0% Pk)).

7. What incentive is there for a customer using Domestic Services Critical Pricing Tariff who can avoid critical events to change to the Domestic Services Time-of-Use Tariff with no on-peak usage?

- A Domestic Services Critical Pricing Tariff customer who has the maximum of 22 events (88 hours) should use the Domestic Services Time-of-Use Tariff with 20% on-peak usage up to 8,000 kilowatt-hours of annual demand. Beyond that, the customer benefits using the Domestic Services Critical Pricing Tariff.

8. Has Nova Scotia Power taken this into account?

5 General comments

While I support the idea of time-of-use pricing (I have been arguing for it for years), it may be that Nova Scotia Power needs to consider entirely new tariff structures:

9. All non-dispatchable renewables have a capacity value (ELCC or Effective Load Carrying Capability) representing the statistical likelihood that it will be available to serve peak demand. The ELCC is determined from existing production data.

   Has Nova Scotia Power taken in account the possible negative effects on the ELCC of extreme weather events caused by climate change?

10. The COVID-19 pandemic has changed the way many people work and industries operate, with many people working from home.

    Has Nova Scotia Power considered the possible impact of COVID-19 on the on-peak hours?

11. Climate change could cause Nova Scotians to increase their use of air conditioning in the summer, leading the non-Winter season peaks exceeding Winter Season peaks. Has Nova Scotia Power taken this into consideration?

12. Given the availability of smart home appliances, has Nova Scotia Power considered the use of real-time pricing? That is, rather than sending price signals to consumers, price signals are sent to a smart home system?