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July 7, 2022

British Columbia Utilities Commission
Suite 410, 900 Howe Street
Vancouver, B.C.
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Attention: Mr. Patrick Wruck, Commission Secretary

Dear Mr. Wruck:

Re: FortisBC Inc. (FBC)

2021 Long-Term Electric Resource Plan (LTERP) and Long-Term Demand-Side Management Plan (LT DSM Plan) (Application) – Project No. 1599244

Response to the British Columbia Utilities Commission (BCUC) Information Request (IR) No. 3 on Rebuttal Evidence

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On August 4, 2021, FBC filed the Application referenced above. In accordance with the regulatory timetable established in BCUC Order G-130-22 for the review of the Application, FBC respectfully submits the attached response to BCUC IR No. 3 on Rebuttal Evidence.

If further information is required, please contact the undersigned.

Sincerely,

FORTISBC INC.

Original signed:

Diane Roy

Attachments

cc (email only): Registered Parties

63.0 Reference: FBC Rebuttal Evidence

Exhibit B-9, CEC IR 38.1; Exhibit B-21 (Rebuttal Evidence), Section 3, p. 6

Section 3: FBC's Approach to Resiliency is Comprehensive and Proactive

On page 6 of the Rebuttal Evidence, FortisBC Inc. (FBC) states:

> Section 2.1.1 of Appendix M (2021 Planning Reserve Margin Report) to the LTERP [Long-Term Electric Resource Plan] also discusses FBC's Imbalance Agreement with BC Hydro. Although the Imbalance Agreement is not a service or reliability planning tool, imbalance energy may transfer between the FBC and BC Hydro systems during unexpected conditions. If an unexpected condition occurs, FBC is required to avoid, minimize, or end as soon as possible the transfer of imbalance energy, including cutting export schedules or buying in the market as necessary, but not including curtailing domestic customers or other Canal Plant Agreement (CPA) Entitlement Parties. Therefore, the Imbalance Agreement provides some resiliency benefits to FBC customers in low probability, but high consequence events.

63.1 Please provide a summary of FBC's reliance on the Imbalance Agreement with British Columbia Hydro and Power Authority (BC Hydro) over the past 10 years. For each instance that the Imbalance Agreement was exercised, please describe why it was required and include the date, duration and total energy requirement.

Response:

The following table describes each hour during which FBC utilized the Imbalance Agreement since its inception.

Date	Hour Ending[1]	Total Energy Required (MWh)	Description
4-Aug-14	9	7	Adjustments were made after-the-fact by FBC to reflect generation unit outages. This resulted in imbalance energy transfers from BC Hydro to FBC.
5-Aug-14	10	27	
6-Aug-14	11	23	
3-Dec-16	17	4	Adjustments were made after-the-fact by FBC to reflect generation unit outages. This resulted in imbalance energy transfers from BC Hydro to FBC.

[1] Hour Ending (HE) means a consecutive sixty-minute period ending at :00. For example, HE 7 means the period from 6:01 am Pacific Prevailing Time (PPT) through 7:00 am PPT.

Date	Hour Ending[1]	Total Energy Required (MWh)	Description
18-Mar-17	11	9	Larger than expected hourly load forecast variance.
18-Mar-17	12	9	Larger than expected hourly load forecast variance.
21-Mar-17	18	15	Adjustments were made after-the-fact by FBC to reflect generation unit outages. This resulted in imbalance energy transfers from BC Hydro to FBC.
12-Aug-17	12	48	Unit outage and subsequent FBC scheduling error.
13-Aug-17	18	1	Larger than expected hourly load forecast variance.
31-Oct-17	10	10	Unit outage and subsequent FBC scheduling error.
16-Mar-18	12	42	Unit outage and subsequent FBC scheduling error.
16-Mar-18	13	38	
24-Mar-18	11	8	Larger than expected hourly load forecast variance.
4-Jul-18	18	6	Larger than expected hourly load forecast variance, unexpected independent power producer (IPP) load.
19-Jul-18	18	21	Unit outage and issue with tight power scheduling timelines.
20-Jan-20	8	86	Unit outage and subsequent FBC scheduling error.
20-Jan-20	9	92	
12-May-20	13	3	Late in-hour unit outage with not enough time to purchase energy under standard energy scheduling timelines, resulting in imbalance energy transfers to FBC.

63.2 Please discuss whether there have been instances where resources have been unavailable under the Imbalance Agreement when they were needed by FBC. If yes, please describe the system conditions in these instances.

Response:

There have been no instances where resources have been unavailable under the Imbalance Agreement when they were needed by FBC.

On page 6 of the Rebuttal Evidence, FBC states:

> The June 2021 heat dome event resulted in record-high customer loads, which FBC was able to meet with minimal customer outages due to the depth and flexibility of its capability to meet unplanned load on an operational basis, as discussed in the response to CEC IR1 38.2. FBC was also able to meet the new record-high loads associated with the December 2021 cold snap with no major outages.

In response to Commercial Energy Consumers Association of BC (CEC) information request (IR) 38.1 FBC stated:

> In order to meet the June 2021 peak load of 764 MW, which occurred during the heat dome event, FBC used capacity resources as outlined in the table below:

FBC Existing Resources	Capacity (MW)
FBC CPA Entitlements	175
BPPA	115
BRX	35
PPA Capacity	200
Market	265
WAX (net of RCA)	0
Total	790

63.3 For the December 2021 cold snap referenced above, please provide the: (i) December 2021 forecasted peak demand; (ii) actual December 2021 peak demand; and (iii) capacity resources used in a similar format to the table above provided for the June heat event.

Response:

In order to meet the December 2021 actual peak demand of 777 MW, which was 86 MW over the forecast peak demand of 691 MW,[2] FBC used the capacity resources outlined in the table below.

FBC Existing Resources	Capacity (MW)
FBC CPA Entitlements	208
BPPA	138
BRX	38
PPA Capacity	133
Market	115
WAX (net of RCA)	232
Total	864

[2] As per the annual load forecast used for 2021 revenue requirement purposes.

64.0 Reference: FBC Rebuttal Evidence

Exhibit B-1 (Application), Section 11, p. 175; Exhibit B-21, Section 6, p. 11

Section 6: Evaluation of Resiliency in Future LTERPs

On page 11 of the Rebuttal Evidence, FBC states:

> While FBC's approach to resiliency has been appropriate and effective (as discussed in the previous responses), in light of the extreme and unpredictable weather events that have occurred in the recent past, FBC considers that it should expand its approach to more systematically considering resiliency in its next LTERP. This could include enhancing the LTERP portfolio analysis through the development of "extreme" or "surprise" events and evaluating various resource portfolios against these to assess, or stress-test, the portfolios' resiliency. FBC would need to develop an evaluation criteria for its portfolio analysis and likely need to include resiliency in its LTERP planning objectives.

On page 175 of the Application, FBC states:

> FBC's portfolio model incorporates an optimization routine to find the lowest power supply revenue requirement of satisfying the forecast load requirements given a set of constraints, which lead to what new resources should be acquired and when.

64.1 Please discuss whether FBC anticipates incorporating resiliency criteria as part of its optimization routine in a future LTERP. Please discuss why or why not and how this may be accomplished.

Response:

FBC does not expect to incorporate resiliency criteria into the resource portfolio optimization routine in a future LTERP. As "extreme" or "surprise" events are considered to be short-term (and low probability), FBC does not believe that the optimization routine would be well suited for this type of analysis.

As described in the response to BCUC IR1 30.1, the optimization routine seeks the lowest power supply revenue requirement to satisfy the Reference Case load forecast over the entire 20-year planning horizon given a set of constraints, and identifies what, and when, new resources should be acquired. The reliability of the resulting portfolio is then separately evaluated against Planning Reserve Margin (PRM) criteria and increased resources as required until the portfolio meets the PRM criteria. A portfolio that meets a "1 day in 10 years" Loss of Load Expectation (LOLE) is anticipated to have shortfalls that occur at a rate less than or equal to the reliability target. The LOLE reliability criteria is binary, meaning the portfolio is either considered reliable or it is not.

A resiliency analysis investigates how well the system can minimize the impact of, and recover from, a low-probability but high-consequence event. It is by its nature non-binary since the issue is not if a loss of load was avoided, but how much was lost and how long did it take to recover. In other words, some portfolios will be relatively more resilient than others when compared to each other. FBC expects it would stress test alternative portfolios that meet reliability requirements against various resiliency events and discuss the portfolio attributes that are likely to make one portfolio more resilient than another.

64.2 Please discuss when FBC considers it would be possible to file its next LTERP, including a more systematic consideration of resiliency.

Response:

As discussed in the response to BCUC IR1 9.3, FBC expects that it would submit its next LTERP in approximately five years from the submission date of this LTERP (i.e., in 2026). However, if FBC's periodic assessment of the load-resource balance indicates the need for new resources sooner than contemplated in this LTERP or if FBC's access to market energy changes such that it is no longer reliable or cost effective, FBC would likely submit an LTERP or supplemental update filing earlier than five years from the submission of this LTERP in order to meet the LTERP objectives in the interests of its customers. As discussed on page 11 of its Rebuttal Evidence, FBC considers that it should expand its approach to more systematically consider resiliency in its next LTERP.

65.0 Reference: RCIA Evidence

Exhibit C8-6, p. 11 of pdf; Exhibit C8-7, BCSEA IR 5.10

June 2021 RPAG Session

On page 11 of its evidence, Residential Consumer Intervener Association (RCIA) states:

> It may be the case that "geographic diversity" and "operational flexibility" enhance resiliency in the face of certain events (e.g., a major earthquake, fire, or flood), but without defining the scenarios under which these events occur, it is impossible to adequately evaluate the comprehensiveness and robustness of FortisBC's claims. This is unfortunate, because during the Resource Planning Advisory Group ("RPAG") session held on June 15, 2021, which the RCIA attended, FortisBC staff discussed in some detail events that could lead to resiliency type events that pushed resources to the extremes of the load duration curve[16]. The discussion was informative and helped explain why Simple Cycle Gas Turbines ("SCGTs") (with and without Renewable Natural Gas ["RNG"]) were necessary solutions (beyond what could be provided by batteries) to deal with extreme events, events that were regrettably not represented by the "boundary" scenarios FortisBC provided in its LTERP filing. Despite the resiliency information provided by FortisBC during the RPAG session, discussion of these matters is notably absent or underdeveloped in the filing.
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> [16] Personal notes of Peter Helland from the RPAG session on 15 June 2021.

In response to BC Sustainable Energy Association (BCSEA) IR 5.10, RCIA stated:

> RCIA suspects, although there is little Application evidence, that Operational Flexibility is attempting to address FBC's undocumented concerns about extended outages that push resources beyond normally occurring reliability events to the extremes of their load duration curve:

On page 5 of the Rebuttal Evidence, FBC states:

> FBC's preferred portfolio C3 includes one with a geographically diverse mix of energy and capacity resources able to handle unexpected events and longer-term deviations from the Reference Case load forecast.

On page 9 of the Rebuttal Evidence, FBC states:

> Portfolio theory demonstrates that the performance of a portfolio, in terms of resiliency, improves with the combination of non-correlated assets. In other words, a more diverse mix of resources options in a portfolio can improve the overall resiliency of the portfolio. While FBC has not utilized this method directly, the LTERP portfolio analysis does consider resource diversity and geographic locational diversity in assessing the various portfolios. FBC's preferred portfolios

include a diverse mix of non-correlated energy and capacity resources, including PPA, market, wind, solar, battery storage and SCGT plants. These resources each have different energy and capacity profiles and different locational characteristics on FBC's system. While FBC has not explicitly performed analysis relating to portfolio theory, the mix of non-correlated resources in the preferred portfolios in the LTERP reflect its intent.

65.1 Please explain the types of events FBC discussed at the June 2021 RPAG meeting, which could lead to resiliency type events in FBC's service territory.

Response:

FBC's representatives do not recall the specific discussion at the June 2021 RPAG meeting regarding the types of events which could lead to resiliency type events in FBC's service area. FBC expects these types of events could include wildfires, flooding, and extreme weather events (including windstorms), as these are considered the highest risks for the FBC service territory (FBC's Rebuttal Evidence, page 5).

65.2 Please expand on why SCGTs are necessary solutions to deal with extreme events.

Response:

FBC does not believe that SCGTs are the only possible solution to address extreme events in the future, as there are always alternatives with varying trade-offs in terms of cost, environmental, economic, operational, and resiliency attributes. FBC's preferred portfolio C3, which contains an RNG SCGT, provides a balance among all the planning criteria while providing comparatively greater resiliency benefits.

FBC portfolios that include an SCGT plant are assessed as having greater operational flexibility and geographic diversity, which are attributes that can help respond to and recover from extreme events. An SCGT plant has operational flexibility as it is both dispatchable (i.e., the utility controls the fuel source) and is not duration constrained. Further, SCGT plants would bring geographic diversity to FBC's supply portfolio if sited outside the Kootenay region, where FBC's current generation resources are located, and closer to the Okanagan region, where the majority of FBC's load is located.

To better understand the advantages of portfolio C3 it is useful to look at differences between portfolios C3 and C4 in greater detail. In contrast to portfolio C3, portfolio C4 includes additional clean and renewable resources, but excludes SCGT plants. The portfolios without RNG SCGTs require a large and diverse number of renewable resources to replace the year-round dependable capacity that would be provided by the SCGT plant. Generally speaking, within portfolio C4, wind resources provide capacity during the winter peak, solar resources provide capacity during the summer peak, and the portfolio is supported by larger battery storage.[3]

Solar and wind are similar intermittent resources in that they do not have consistent output over the year, may or may not provide energy during peak hours, and require the utility to take power when it is produced, which may vary from when it is needed. While the geographic diversity of portfolio C4 does provide some resiliency benefits as cited in the preamble, there is little to no operational flexibility. Other generation types that provide year-round dependable capacity, such as biomass or geothermal, generally operate as baseload resources with high load factors and therefore do not increase operational flexibility and are generally more costly.

In contrast, not only can an SCGT be ramped up quickly to produce energy when it is needed, it can also be shut down when not required. Furthermore, intermittent resources are located and interconnected to the system where climate conditions are best for energy production, rather than where it best meets system load requirements. Although the locational benefits of an SCGT are dependent on where it could be sited on the system, the constraints are driven by policies and zoning, rather than climate patterns.

FBC's existing generation entitlement resources and the PPA are flexible and able to respond to many events. However, under the existing portfolio scenarios, most of the capability of these resources is already allocated to meet expected load. Additional operational flexibility could be created by obtaining new resources that displace the need to fully utilize these existing flexible resources, but this would not be a lowest-cost optimal portfolio. Furthermore, increasing availability of these existing resources would address operational flexibility, but not geographic diversity. The electric system, including FBC's, typically has aboveground transmission and distribution infrastructure that is more exposed to extreme events such as severe weather, fires, or floods that can cause significant damage. An SCGT plant that is located and interconnected in the Okanagan could provide prolonged local back-up power after an event that damages transmission infrastructure[4] or during periods of extreme peak power demand.

The other resource in portfolio C4, as compared to portfolio C3, is larger battery storage. While batteries are a flexible and dispatchable resource in normal operations, during extreme events it may be very difficult to recharge the battery as often and as quickly as needed. If the battery cannot be recharged, it ceases to be a resource for the remaining duration of the event. Batteries may become limited by charging cycles during heat waves and cold snaps, as discussed in the response to CEC IR1 44.2. Batteries are an effective tool to help manage the daily load shape but do not have sufficient energy storage to provide power throughout an adverse system event that takes multiple days to repair.

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3 LTERP, section 11.3.3, pp. 183 and 184.

4 This potentially impacted transmission infrastructure includes both FBC-owned and operated facilities, as well as BC Hydro infrastructure that is used to wheel power from FBC's generation resources to other FBC load areas.

To illustrate, consider the hypothetical scenario where an extended extreme cold weather event in January covers BC, as well as the western portion of the US, resulting in a general lack of both energy and capacity throughout the region. It is unlikely that solar or run-of-river resources would provide much, if any, generation during the peak hours as the sun usually sets before the evening peak and run-of-river resources may be frozen. Wind may provide moderate generation, but there is no guarantee the wind speed will be substantial. Baseload generation such as biomass would be valuable but utilized as a baseload resource and unable to ramp up generation further to provide extra energy during peak hours. Battery storage would be valuable if sufficiently charged, which may or may not be possible depending on the dispatch earlier in the day. Furthermore, if there is damage affecting the transmission system, the battery may not be able to charge until repairs are complete. On the other hand, provided fuel supplies are available, an SCGT would be able to ramp up production to help meet peak loads plus run during non-peak hours to provide extra localized energy if it is needed. A portfolio without SCGTs would need to rely on market power as well as a fully operational transmission path, which may or may not be available. Transmission aside, market power would likely be provided by a third-party SCGT, as opposed to wind or solar, during an extreme event, as gas-fired generation is generally the marginal resource at the top of the regional resource stack.

In summary, SCGTs have the operational characteristics that make them more likely to provide dependable generation during extreme events while solar, wind, run-of-river, biomass, and batteries have limitations making them comparatively less dependable. Therefore, FBC believes that during extreme events, portfolio C3 with an SCGT will perform better than portfolio C4. Depending on the extreme scenario used to evaluate resiliency, both portfolios may still result in customer outages due to lack of supply, but the size and duration of these outages is likely to be lower under portfolio C3.

65.3 Please confirm if FBC agrees with RCIA's view that Operational Flexibility is attempting to address concerns about extended outages, or discuss otherwise.

Response:

FBC agrees with RCIA's view that operational flexibility encompasses the ability to help mitigate the potential for extended outages. More broadly, operational flexibility refers to the dispatchability of the resource, meaning the utility can ramp up and ramp down generation on short notice. This capability to adjust generation output to match load requirements enhances the ability of the utility to respond to disruptive events. In contrast, the utility cannot control intermittent generation, such as wind and solar; instead, the utility must accept and manage the energy and capacity as it is generated.