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May 12, 2022

Patrick Wruck
Commission Secretary and Manager
Regulatory Support
British Columbia Utilities Commission
Suite 410, 900 Howe Street
Vancouver, BC V6Z 2N3

Dear Patrick Wruck:

**RE: British Columbia Utilities Commission (BCUC or Commission)
British Columbia Hydro and Power Authority (BC Hydro)
Annual Reporting of Reliability Indices
Annual Response to Directive 26 of BCUC Decision on
Fiscal 2005 to Fiscal 2006 Revenue Requirements Application
(F05/F06 RRA)**

BC Hydro writes to provide an annual reporting of reliability indices, as required by Directive 26 of BCUC Order No. G-96-04 on BC Hydro's F05/F06 RRA.¹

Directive 26 states that BC Hydro is expected to present reliability indices (SAIFI, SAIDI, CAIDI, ASAI, SARI, MAIFI, generation forced outages, availability, and generation outage rates), both combined and disaggregated (where applicable), on an annual basis with comparisons to the Canadian Electricity Association (**CEA**) averages.

In this filing, BC Hydro is providing reliability indices for distribution, transmission and generation performance through fiscal 2022. As in previous years, BC Hydro's reliability statistics are provided on a fiscal year basis and are compared with the CEA calendar year data.

¹ BC Hydro submitted its initial distribution and generation reliability indices compliance filing in September 2005, and subsequently reported the available reliability indices in May 2006 as part of the F2007 to F2008 Revenue Requirements Application. Starting in May 2007, BC Hydro began filing annual reports with the BCUC on these reliability indices. Transmission system reliability indices for the years prior to fiscal 2012 were provided separately by the British Columbia Transmission Corporation (**BCTC**) in its Transmission System Capital Plan filings. BC Hydro provided the transmission system reliability indices starting in fiscal 2012, subsequent to the integration of BC Hydro and BCTC in fiscal 2011.

Distribution and Transmission Update

The most recent annual CEA reports for distribution and transmission performances are the 2020 Annual Service Continuity data on Distribution System Performance in Electrical Utilities and the Bulk Electricity System. CEA data on distribution and transmission performance for the 2021 calendar year are not yet available. The comparative reliability indices, both combined and disaggregated, for BC Hydro's distribution and transmission systems, are presented in Attachment 1, in tabular and graphical form through to fiscal 2022.

Generation Performance Update

The most recent annual CEA report on generation performance is the 2020 Generation Equipment Status Annual Report. CEA data on generation performance for the 2021 calendar year are not yet available.

The comparative reliability indices, both combined and disaggregated, for BC Hydro's generation system are presented in Attachment 2, in tabular and graphical form for the ten-year period ending fiscal 2021.

To reflect BC Hydro's investment strategies and operating practices of prioritizing Key Generating Facilities (large MW capacity units) over Available Generating Facilities (small MW capacity units), weighted averages of the reliability indices are also included in Attachment 2. CEA weighted average failure rate was not available at the time of submission and will be provided for comparison in future reports.

Reliability Indices Performance Highlights

BC Hydro highlights the following with regard to its reliability indices performance through fiscal 2022:

- BC Hydro's SAIFI results continue to perform better than the CEA average;
- BC Hydro's average SAIDI performance from fiscal 2013 to fiscal 2022 is 6.18 hours and is better than the CEA average SAIDI of 6.82 hours;
- BC Hydro's distribution system reliability performance improved slightly while overall reliability performance declined slightly in fiscal 2022 compared to fiscal 2021 due to higher transmission line outages;
- The lower Availability factor in fiscal year 2022 was a result of deferred planned outages from fiscal year 2021 due to the COVID-19 pandemic;
- On average, BC Hydro's availability factor is lower than the CEA average by 5 per cent to 7 per cent as BC Hydro spent more time than the CEA average on planned outages; and

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- The 60-Month Rolling Forced Outage Factor for Key Facilities, which is included as one of BC Hydro's Service Plan metrics, was 1.03 per cent at the end of fiscal 2022, which meets the Service Plan target of less than or equal to 1.8 per cent.

For further information, please contact Alicia Henderson at 604-623-4381 or by email at bchydroregulatorygroup@bchydro.com.

Yours sincerely,



Chris Sandve
Chief Regulatory Officer

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Enclosure

**F05/F06 Revenue Requirements Application
Annual Response to Directive 26 of BCUC Decision**

F2022 Annual Reporting of Reliability Indices

Attachment 1

Distribution and Transmission Reliability Indices

This section includes the following distribution and transmission indices:

SAIFI	a measure of the number of sustained interruptions (longer than one minute) an average distribution customer will experience in a year
T-SAIFI-MI	a measure of transmission interruptions of less than one minute in duration that a delivery point experiences in a year
T-SAIFI-SI	a measure of transmission interruptions of one minute or more that a delivery point experiences in a year
T-SAIDI	a measure of the average total interruption duration, in hours that a delivery point experiences in a year
SAIDI	a measure of the amount of time, in hours, an average distribution customer is without power in a year
CAIDI	a measure of the average interruption, in hours, per interrupted distribution customer in a year
%ASAI	a measure of the percentage of time service is available in the year
CEMI-4	percentage of customers experiencing four or more outages in a year
MAIFI	a measure of the frequency of momentary (less than one minute) interruptions per distribution customer served in a year
DPUI	a measure of overall bulk electricity system performance in terms of a composite index of unreliability expressed in system minutes in a year. It takes into account all forced and planned outages except interruptions attributed to generators
SARI	a measure of the average restoration time, in hours, for each transmission delivery point in a year

As noted in Provision 9x of the F2011 Revenue Requirements Application Negotiated Settlement Agreement, BC Hydro is also reporting its CEMI-4 reliability metric, and SAIFI, SAIDI, CAIDI, ASAI, and CEMI-4 metrics normalized using the IEEE 2.5 Beta method. CEMI-4 is not benchmarked externally as utilities are at varying stages in their development of this metric.

Table 1 Reliability Indices – BC Hydro Overall and CEA Overall (All-Event Indices, Not Normalized)

Year	BC Hydro Overall				CEA Overall			
	SAIFI	SAIDI	CAIDI	%ASAI	SAIFI	SAIDI	CAIDI	%ASAI
F2013	1.59	3.70	2.33	99.958	2.54	4.66	1.83	99.947
F2014	1.83	5.19	2.83	99.941	2.72	9.49	3.49	99.892
F2015	1.72	5.11	2.97	99.942	2.39	6.38	2.67	99.927
F2016	2.29	10.69	4.66	99.878	2.32	5.08	2.19	99.942
F2017	2.17	5.50	2.53	99.937	3.10	5.65	1.82	99.936
F2018	2.13	6.56	3.08	99.913	2.61	7.91	3.04	99.910
F2019	1.90	8.58	4.51	99.902	2.84	8.46	2.98	99.903
F2020	1.96	4.78	2.44	99.945	2.65	8.38	3.16	99.904
F2021	1.98	5.73	2.90	99.935	2.39	5.33	2.24	99.939
F2022	2.00	6.00	3.00	99.932	n/a	n/a	n/a	n/a

Table 2 Reliability Indices – BC Hydro (Distribution) and CEA (Distribution) (All Event Indices, Not Normalized)

Year	BC Hydro (Distribution)				CEA (Distribution)			
	SAIFI	SAIDI	CAIDI	%ASAI	SAIFI	SAIDI	CAIDI	%ASAI
F2013	1.06	3.08	2.92	99.965	1.86	4.13	2.22	99.953
F2014	1.45	4.66	3.20	99.947	2.05	8.59	4.19	99.902
F2015	1.34	4.44	3.31	99.949	1.79	5.67	3.16	99.935
F2016	1.91	10.13	5.30	99.884	1.79	4.54	2.53	99.948
F2017	1.74	4.83	2.77	99.945	2.44	5.08	2.08	99.942
F2018	1.69	5.82	3.44	99.934	2.05	5.33	2.60	99.939
F2019	1.63	8.08	4.95	99.908	2.23	7.16	3.21	99.918
F2020	1.41	3.83	2.71	99.956	2.10	7.51	3.57	99.914
F2021	1.61	4.91	3.05	99.944	1.85	4.59	2.48	99.948
F2022	1.54	4.78	3.11	99.945	n/a	n/a	n/a	n/a

Table 3 Reliability Indices – BC Hydro Overall – Normalized using IEEE 2.5 Beta Method

Year	BC Hydro Overall – Normalized using IEEE 2.5 Beta method				
	SAIFI	SAIDI	CAIDI	CEMI-4 (%)	%ASAI
F2013	1.46	3.33	2.28	10.45	99.962
F2014	1.68	4.14	2.46	12.52	99.953
F2015	1.35	3.37	2.49	10.13	99.962
F2016	1.60	3.42	2.14	14.00	99.961
F2017	1.88	4.37	2.33	16.43	99.950
F2018	1.67	3.94	2.36	14.55	99.955
F2019	1.39	3.21	2.32	10.65	99.963
F2020	1.68	3.56	2.12	14.59	99.959
F2021	1.56	3.52	2.25	14.35	99.960
F2022	1.74	4.59	2.63	16.38	99.948

Table 4 Reliability Indices – BC Hydro CEMI 4 Overall (All-Event Indices, Not Normalized)

Year	BC Hydro Overall
	CEMI-4 %
F2013	12.88
F2014	15.10
F2015	15.15
F2016	23.77
F2017	19.45
F2018	20.87
F2019	17.14
F2020	18.39
F2021	20.17
F2022	19.31

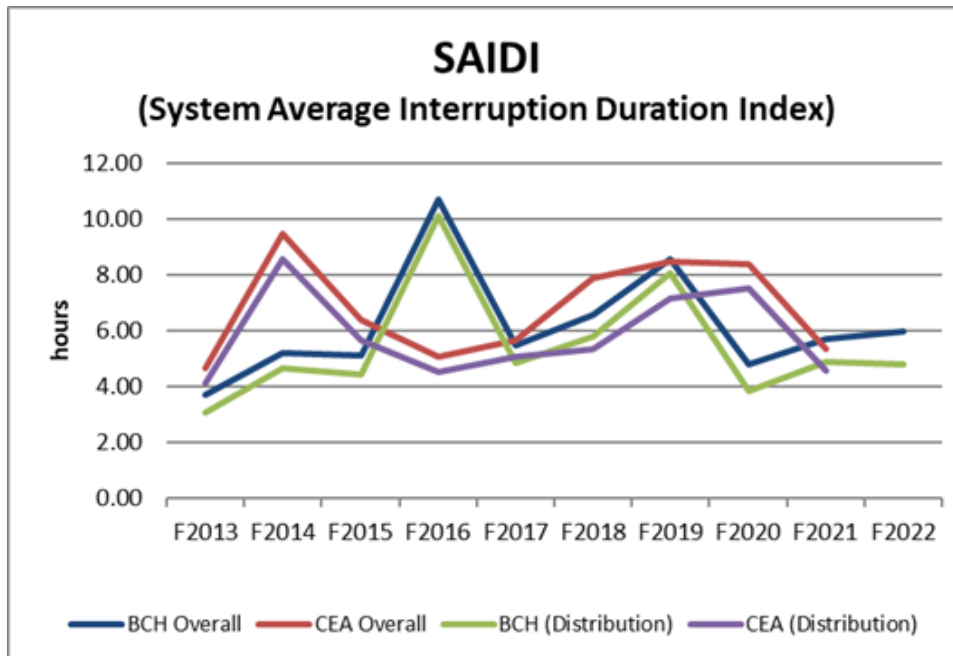
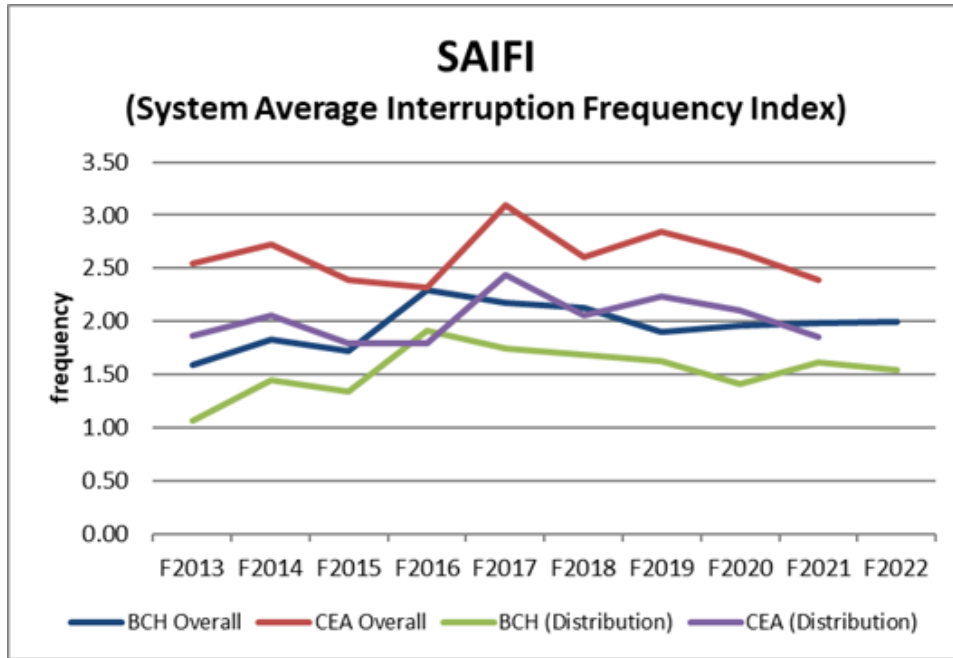
Note: CEA does not survey for CEMI-4 or IEEE 2.5 Beta.

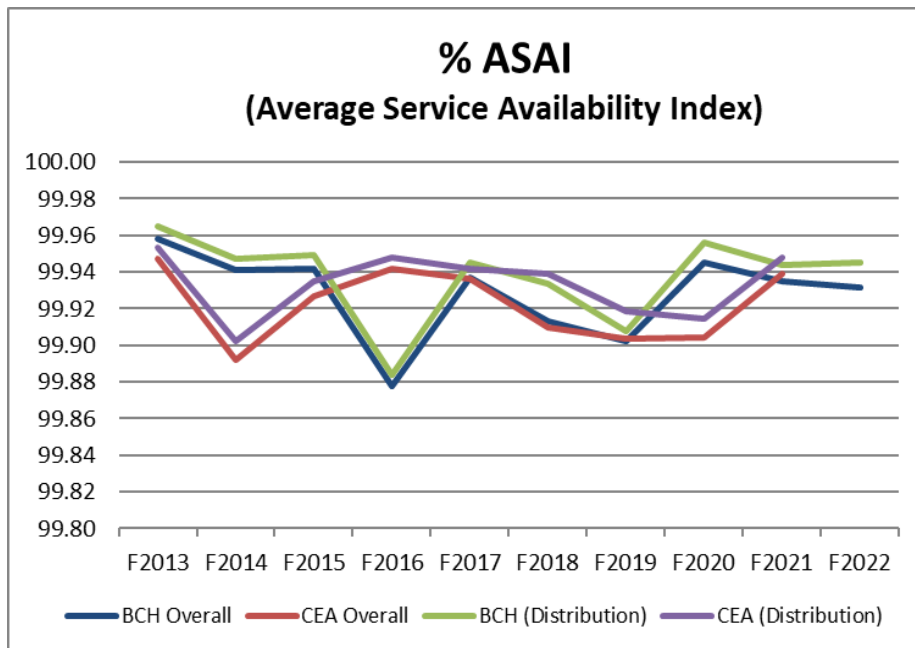
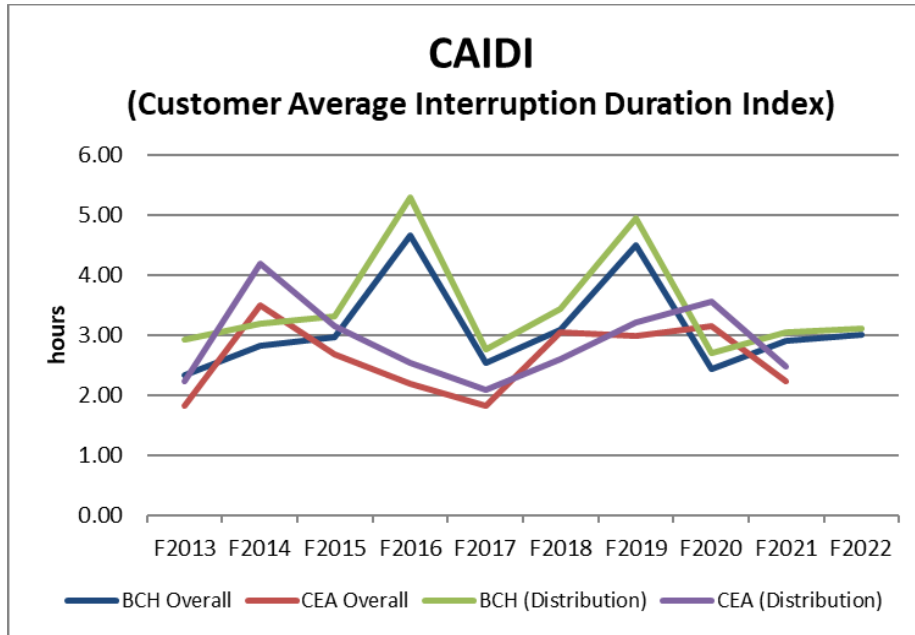
Table 5 Reliability Indices – BC Hydro (Transmission) and CEA (Transmission) (Forced Data) (All-Event Indices, Not Normalized)

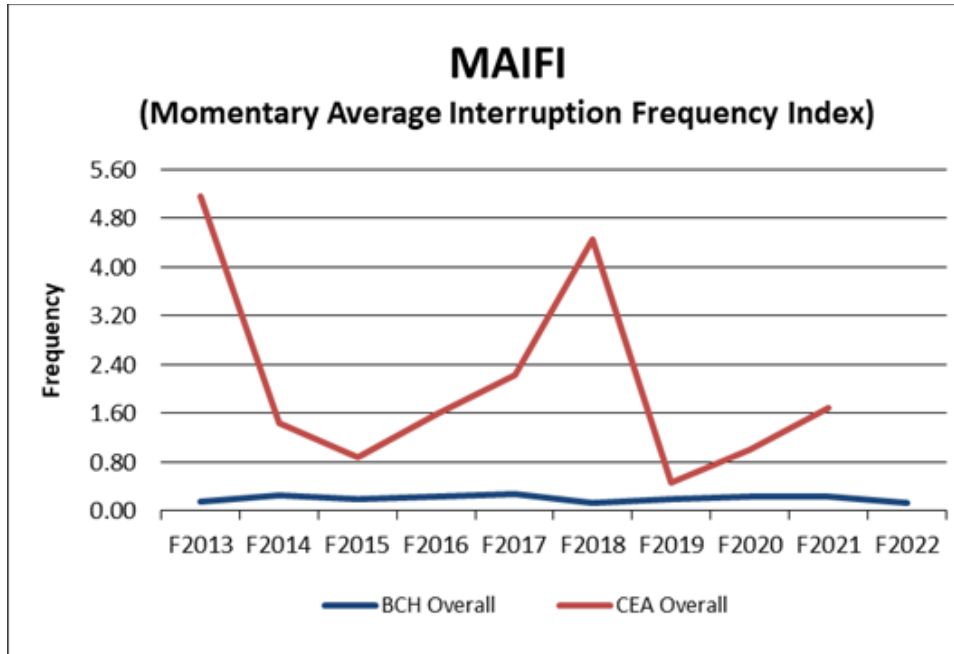
Year	BC Hydro (Transmission) (Forced)					CEA (Transmission) (Forced)				
	T-SAIFI-MI	T-SAIFI-SI	T-SAIDI	DPUI	SARI	T-SAIFI-MI	T-SAIFI-SI	T-SAIDI	DPUI	SARI
F2013	0.56	0.74	1.64	17.16	2.19	0.84	0.90	4.48	51.18	4.98
F2014	0.74	0.87	2.57	25.18	3.01	0.86	0.83	2.59	27.07	3.11
F2015	0.83	0.74	2.11	26.41	2.86	0.72	0.83	2.56	19.24	3.10
F2016	0.79	0.63	2.46	27.77	3.90	0.85	0.74	2.15	15.60	2.90
F2017	0.63	0.61	2.52	33.61	4.13	0.70	0.75	1.93	22.33	2.58
F2018	0.30	0.69	2.50	30.13	3.62	0.55	0.77	2.24	20.02	2.90
F2019	0.57	0.34	0.92	7.61	2.71	0.65	1.06	3.48	33.87	3.27
F2020	0.90	0.89	2.74	46.30	3.08	0.82	0.89	2.63	30.07	2.94
F2021	0.70	0.65	3.76	44.42	5.78	0.66	0.75	1.94	21.14	2.57
F2022	0.57	0.70	4.75	65.93	6.79	n/a	n/a	n/a	n/a	n/a

Note: The CEA Bulk Electricity Study program reports only on forced outage results as not all the participating utilities report planned outages.

Distribution Graphs

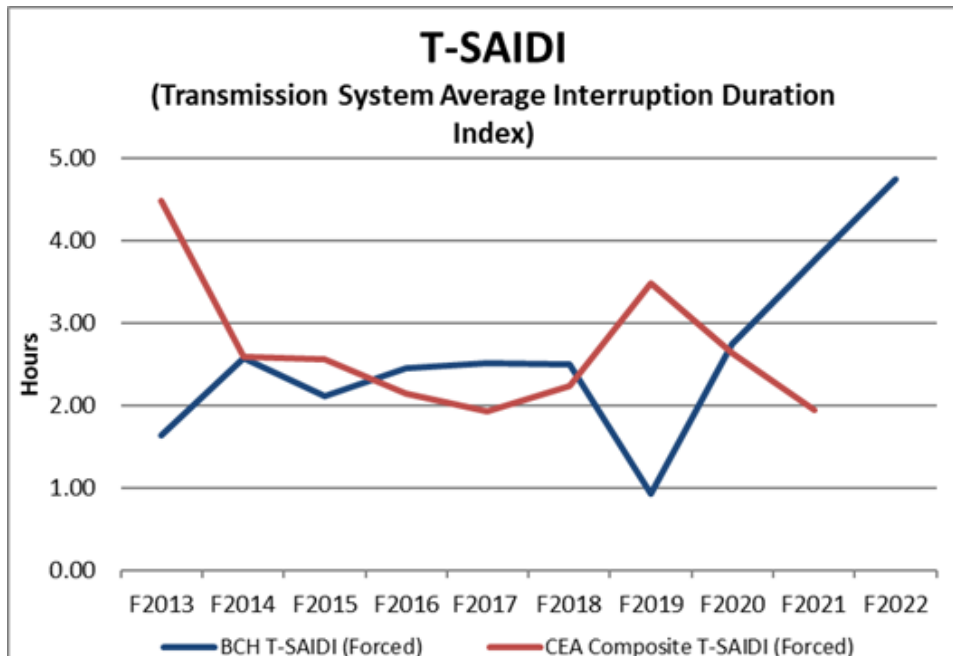
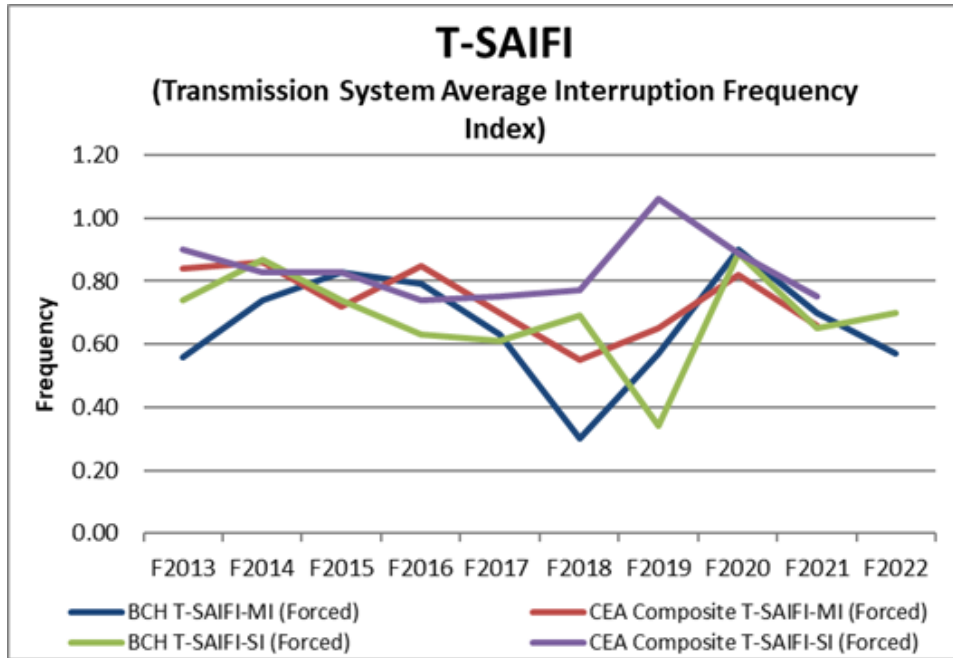


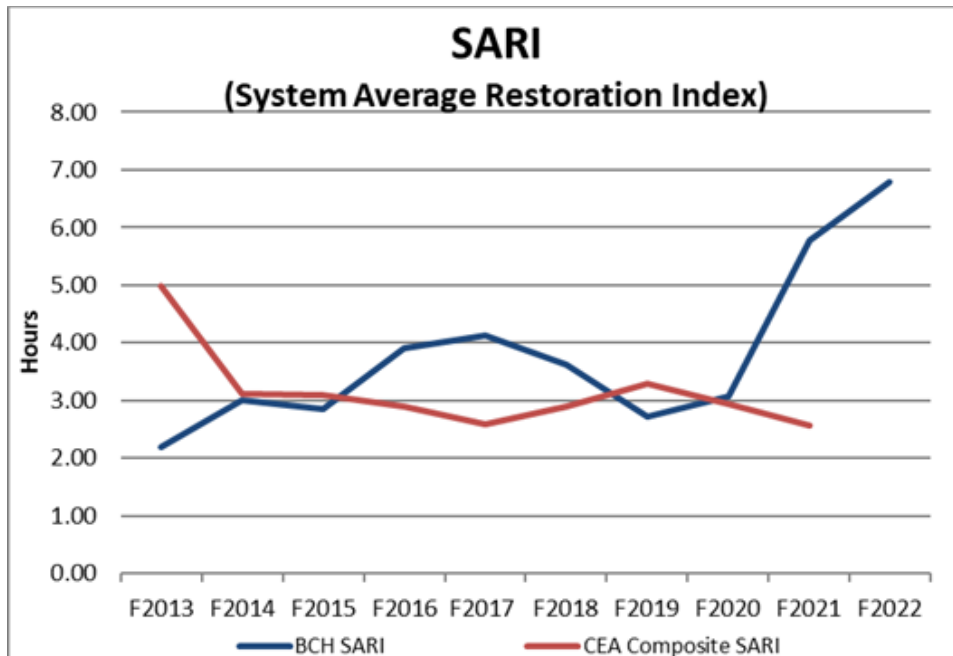
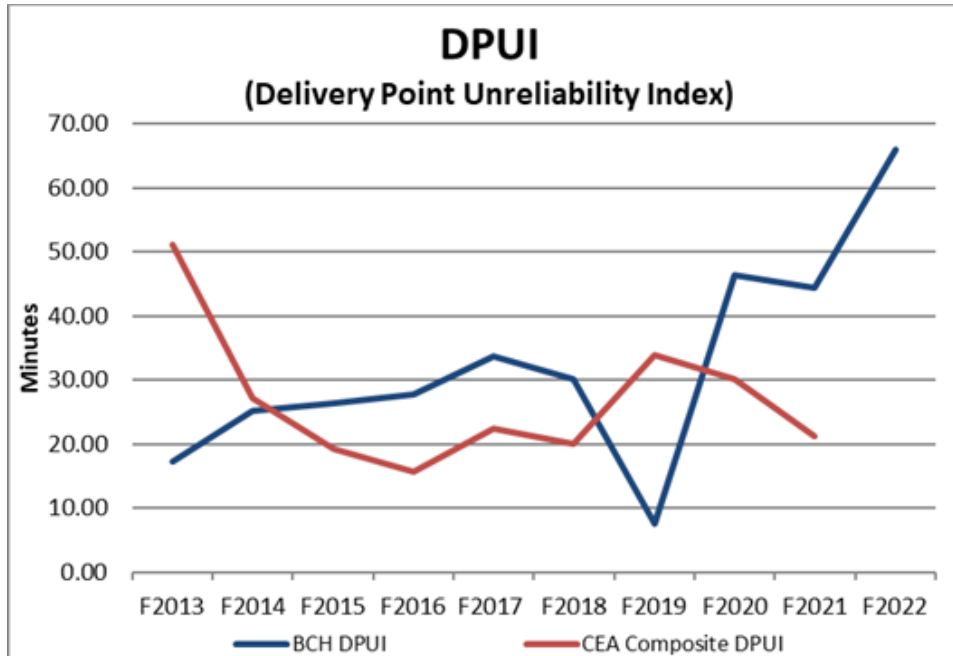




Note: The customer momentary interruptions and the resulting MAIFI may not apply to the utility's total customer population in the CEA comparison. Momentary outages are any interruptions on the feeders of less than one-minute duration, caused by disturbance on the distribution, substation or transmission system.

Transmission Graphs





**F05/F06 Revenue Requirements Application
Annual Response to Directive 26 of BCUC Decision**

F2022 Annual Reporting of Reliability Indices

Attachment 2

Generation Reliability Indices

F2022 Annual Reporting of Reliability Indices Attachment 2 - Generation Reliability Indices

Fiscal Year	BC Hydro Hydroelectric Units Non-Weighted Average					BC Hydro Hydroelectric Units - Weighted Average ^{Note 7}					Calendar Year	CEA Hydroelectric Units Non-Weighted Average				
	Non-Weighted Average Availability Factor (%)	Non-Weighted Average Operating Factor (%)	Non-Weighted Average Forced Outage Count (Including starting failures) (Internal) ^{Note 1}	Non-Weighted Average Forced Outage Factor (%) (Including starting failures) (Internal) ^{Note 1}	Non-Weighted Average Failure Rate	Weighted Average Availability Factor (%)	Weighted Average Operating Factor (%)	Weighted Average Forced Outage Count (Including starting failures) (Internal) ^{Note 1}	Weighted Average FOF (%) (Including starting failures) (Internal) ^{Note 1}	Weighted Average Failure Rate		Non-Weighted Average Availability Factor (%)	Non-Weighted Average Operating Factor (%)	Non-Weighted Average Forced Outage Count (Including starting failures) (Internal) ^{Note 1}	Non-Weighted Average Forced Outage Factor (%) (Including starting failures) (Internal) ^{Note 1}	Non-Weighted Average Failure Rate
F2012	82.2	69.8	2.4	5.0	2.7	85.40	69.9	2.3	1.8	2.6	C2011	88.4	72.5	2.5	3.9	2.2
F2013	82.7	72.6	2.0	3.4	2.3	82.57	72.1	1.7	0.5	2.2	C2012	89.2	72.0	2.5	3.8	2.3
F2014 ^{Note 2}	80.5	64.7	2.5	4.7	2.7	81.33	65.8	2.3	1.7	2.6	C2013	87.9	74.0	2.4	3.9	2.1
F2015 ^{Note 3}	81.1	65.1	2.4	3.7	2.9	83.52	62.4	2.6	1.3	3.7	C2014	87.5	73.5	2.4	5.0	2.1
F2016 ^{Note 3}	82.2	65.9	2.0	4.1	2.4	85.14	66.7	1.8	2.6	2.3	C2015	87.9	70.4	3.2	4.7	2.1
F2017 ^{Note 3}	81.7	67.6	1.8	4.4	1.9	83.39	65.2	2.3	3.5	3.2	C2016	86.7	71.7	3.1	4.8	1.9
F2018 ^{Note 3}	80.5	65.5	1.7	2.6	2.0	84.07	66.0	1.8	0.7	2.4	C2017	86.7	73.0	3.3	4.9	2.2
F2019 ^{Note 3}	79.6	61.9	2.0	2.8	2.3	85.98	63.4	1.9	0.6	2.0	C2018	85.6	67.8	3.7	5.0	2.1
F2020 ^{Note 4}	78.8	59.1	2.0	4.3	2.3	81.35	61.3	1.8	1.6	2.1	C2019	87.1	70.8	3.3	3.7	1.9
F2021 ^{Note 4}	81.4	63.8	1.9	2.8	2.2	86.36	68.7	1.8	1.3	1.9	C2020	89.2	73.0	3.9	3.6	1.9
F2022 ^{Note 5}	77.5	64.1	2.2	4.8	2.6	80.20	66.6	2.1	2.2	3.2	C2021	n/a	n/a	n/a	n/a	n/a

Definitions

- Availability Factor** = Operating Time + Available-But-Not-Operating Time / In Commercial Service Time ^{Note 6}
- Forced Outage Count** = Average Number of Forced Outages / Unit / Year (including Starting Failures)(Internal)
- Forced Outage Factor** = Forced Outage Time (including Starting Failures)(Internal) / In Commercial Service Time ^{Note 6}
- Failure Rate** = Forced Outage Count (excluding Starting Failures)(Internal) / Operating Time X In Commercial Service Time ^{Note 6}

Notes

1. Outages with causes that were external to Generation, such as Transmission System forced outages, are excluded from this measure.
2. Data excludes ALU Unit 1 and SHU Unit 1, which have been forced out of service for an extended period.
3. Data excludes ALU Unit 1, SHU Unit 1 and ELK Units 1 and 2 which have been forced out of service for an extended period.
4. Data excludes ALU Unit 1, SHU Unit 1, ELK Units 1 and 2 and SPN Unit 1,2 and 3 which have been forced out of service for an extended period.
5. Data excludes ALU Unit 1, SHU Units 1 and 2, ELK Units 1 and 2, SPN Unit 1,2,3 and FLS Unit 1 which have been forced out of service for an extended period.
6. In Commercial Service Time represents the number of hours in the measurement period that the unit(s) were considered part of the active fleet.
7. Average reliability indices are weighted by unit maximum capacity rating

