March 29th, 2024

Mr. Steve Rutty
Director, Grid Assets
California ISO
250 Outcropping Way
Folsom, CA 95630

Dear Mr. Rutty,

In accordance with the Transmission Control Agreement (TCA) section 14.3, TCA Appendix C Section 4.0 and CAISO Tariff 4.8.3, Trans Bay Cable LLC (TBC) submits the following **Public Access** Availability Report for CAISO review.

Performance:

TBC's summary performance for 2023 is:

Total Annual NET Availability (excluding scheduled)	99.95%

TBC completed all preventative maintenance for 2023, in accordance with CAISO approve Converter Station and Cable Maintenance Practices. Details are provided separately in the CAISO Standard Maintenance Reporting System TBC 2023 Review.

TBC operates a single DC transmission line (HVDC Facility) and has accrued 14 years of operational data. TBC monitors the performance of the HVDC Facility based on this data since the start of commercial operations. The Total Forced Outage duration in 2023 was 4.67 hours. TBC conducted 2 scheduled outages for planned maintenance activities to ensure reliable operation of the HVDC Facility.

The following section provides details in TBC's derivation of UCL, as well as other values used to create the Control Charts.

Control Charts:

TBC used the CAISO's TCA, Appendix C, as a reference in creating TBC's control charts. Forced Outage data of the TBC HVDC Facility was used to create the charts. The following outage data were not included in the control charts:

- Scheduled Outages
- Outages classified as "Not a Forced Outage" in the Maintenance Procedures
- Forced Outages which:
    - Were caused by events outside of TBC's HVDC Facility including outages which originate in other transmission operator (TO) systems, other electric utility systems or customer equipment
    - Or outages which can be demonstrated to have been caused by earthquakes

The following variable and equations were extracted from the TCA and used to create TBC's control charts:

Annual Average Forced Outage Frequency for the TBC HVDC Facility

$$F_{vc,k} = \frac{1}{N_k} \sum_{i=1}^{N_k} f_{ik}$$

N_k = number of Transmission Line Circuits in Voltage Class in calendar year "k". See Appendix C, Note 2, Section 4.1.1 of the TCA.

Because the TBC HVDC Facility is considered a single transmission line, N_k will equal one (1) for each calendar year "k".

f_{ik} = frequency of Forced Outages(IMS) for the "ith" Transmission Line Circuit as calculated in accordance with Appendix C, Section 4.1.1 of the TCA for calendar year "k".

Because the TBC HVDC Facility is considered a single transmission line, "i" will equal one (1), and f_{ik} will simply be f_k. f_k will equal the number of Forced Outages that occurred on the TBC HVDC transmission line each for calendar year "k".

$F_{vc,k}$ = frequency index for the Voltage Class, *vc*, (units = Forced Outages(IMS) /Transmission Line Circuit). The frequency index equals the average (mean) number of Forced Outages(IMS) for all Transmission Line Circuits within a Voltage Class for the calendar year "k".

Because the TBC HVDC facility is considered its own voltage class and a single transmission line "vc" will equal one (1), and $F_{vc,k}$ will simply be F_k. F_k will subsequently equal the number of Forced Outages that occurred on the TBC HVDC transmission line for each calendar year "k".
$F_k = f_k$

Annual Average Accumulated Forced Outage Duration for the TBC HVDC Facility

$$D_{vc,k} = \frac{1}{N_{o,k}} \sum_{i=1}^{N_{o,k}} d_{ik}$$

$N_{o,k}$ = number of Transmission Line Circuits in the Voltage Class for which the

Forced Outage(IMS) frequency Availability Measure (f_{ik}) as calculated in accordance with Section 4.1.1 of this Appendix C is greater than zero for the calendar year "k". See Appendix C, Note 2, Section 4.1.1 of the TCA.

Because the TBC HVDC Facility is considered a single transmission line, $N_{o,k}$ will equal one (1) for each calendar year "k".

d_{ik} = accumulated duration of Forced Outages(IMS) for the "ith " Transmission Line Circuit having a Forced Outage(IMS) frequency Availability Measure (f_{ik}) greater than zero for calendar year "k" as calculated in accordance with Section 4.1.1 of this Appendix C.

Because the TBC HVDC Facility is considered a single transmission line, "i" will equal one (1), and d_{ik} will simply be d_k. d_k will equal the total accumulated duration of Forced Outages the TBC Facility experienced each calendar year "k".

$D_{vc,k}$ = duration index for the Voltage Class (units = minutes/Transmission Line Circuit). The duration index equals the average accumulated duration of Forced Outages(IMS) for all Transmission Line Circuits within a Voltage Class which experienced Forced Outages(IMS) during the calendar year "k".

Because the TBC HVDC facility is considered its own voltage class and a single transmission line "vc" will equal one (1), $D_{vc,k}$ will simply be D_k. D_k will subsequently equal the number of Forced Outages that occurred on the TBC HVDC Facility for each calendar year "k".
$D_k = d_k$

CL for Annual Average Forced Outage Frequency for the TBC HVDC Facility

$$CL_f = \sum_{k=1}^{Y} \sum_{i=1}^{N_k} f_{ik} \Big/ \sum_{k=1}^{Y} N_k$$

Y = number of calendar years prior to the date a TO becomes a PTO for which the PTO has reliable, continuously recorded Forced Outage(IMS) data.

TBC became a PTO from the beginning of commercial operation in November of 2010. Due to this the first calendar year used for the CL calculation will begin from the date of January 1st, 2011.

CL_f = center control line value for the Forced Outage(IMS) frequencies for each of the Transmission Line Circuits in the Voltage Class for "*Y*" calendar years prior to the date a TO becomes a PTO.

Because the TBC Facility is considered a single voltage class and a single transmission line, this calculation essentially becomes the average number of Forced Outages since January 1st, 2011.

CL for Annual Average Accumulated Forced Outage Duration for the TBC HVDC Facility

$$CL_d = \sum_{k=1}^{Y} \sum_{i=1}^{N_{o,k}} d_{ik} \Big/ \sum_{k=1}^{Y} N_{o,k}$$

CLd = center control line value for accumulated Forced Outage(IMS) duration for each of the Transmission Line Circuits in the Voltage Class for "*Y*" calendar years prior to the date a TO becomes a PTO in which the Forced Outage(IMS) frequency *(fik*) was greater than zero.

Because of the assumptions made above, this calculation essentially becomes the average duration (in minutes) of Forced Outages since January 1st, 2011.

Upper Control Limit (UCL) and Lower Control Limit (LCL) for Annual Average Forced Outage Frequency for the TBC HVDC Facility

UCL_f and LCL_f define a range of expected performance extending above and below the CL. The UCL_d and LCL_d were generated by multiplying the total number of Forced Outages of since January 1st, 2011 by 99.75% (0.9975) and .25% (0.0025), respectively.

UCL and LCL for Annual Average Accumulated Forced Outage Duration for the TBC HVDC Facility

UCL_d and LCL_d define a range of expected performance extending above and below the CL. The UCL_d and LCL_d were generated by multiplying the total number of the duration (in minutes) of Forced Outages since January 1st, 2011 by 99.75% (0.9975) and .25% (0.0025), respectively.

Upper Warning Limit (UWL) and Lower Warning Limit (LWL) for Annual Average Forced Outage Frequency for the TBC HVDC Facility

UWL_f *and* LWL_f define a range showing if the number of annual TBC Forced Outages is approaching the UCL_f and LCL_f. The UWL_f *and* LWL_f were generated from multiplying the total number of Forced Outages since January 1st, 2011 by 97.5% (0.975) and 2.5% (0.025), respectively.

UWL and LWL for Annual Average Accumulated Forced Outage Duration for the TBC HVDC Facility

UWL_d *and* LWL_f define a range showing if the annual accumulated duration of Forced Outages is approaching the UCL_d and LCL_d. This number was generated from multiplying the total duration of Forced Outages since January 1st, 2011 by 97.5% (0.975) and 2.5% (0.025), respectively.

Performance Monitoring:

Based on the analysis of the control charts, TBC has identified that performance is accurately represented and in line with the calculated Center Control line values and should continue its preventative and predictive maintenance efforts in this manner.

Performance Outside Limits:

Performance was inside the upper and lower limits, with the LCL specified at 2.5% of the sum of accumulated forced outage duration since 2011. Performance outside of this limit was 0 minutes force outage duration, which was less than 2.5% of the sum of all previous forced outages. This was reviewed and found to be accurate.

Improving Performance:

TBC continues to explore new preventative techniques and use of industry best practices. These practices have provided a solid operational foundation for TBC over the past 14 years. TBC remains committed to the safe and reliable delivery of power to the city of San Francisco.

2023 Summary Outage Data:

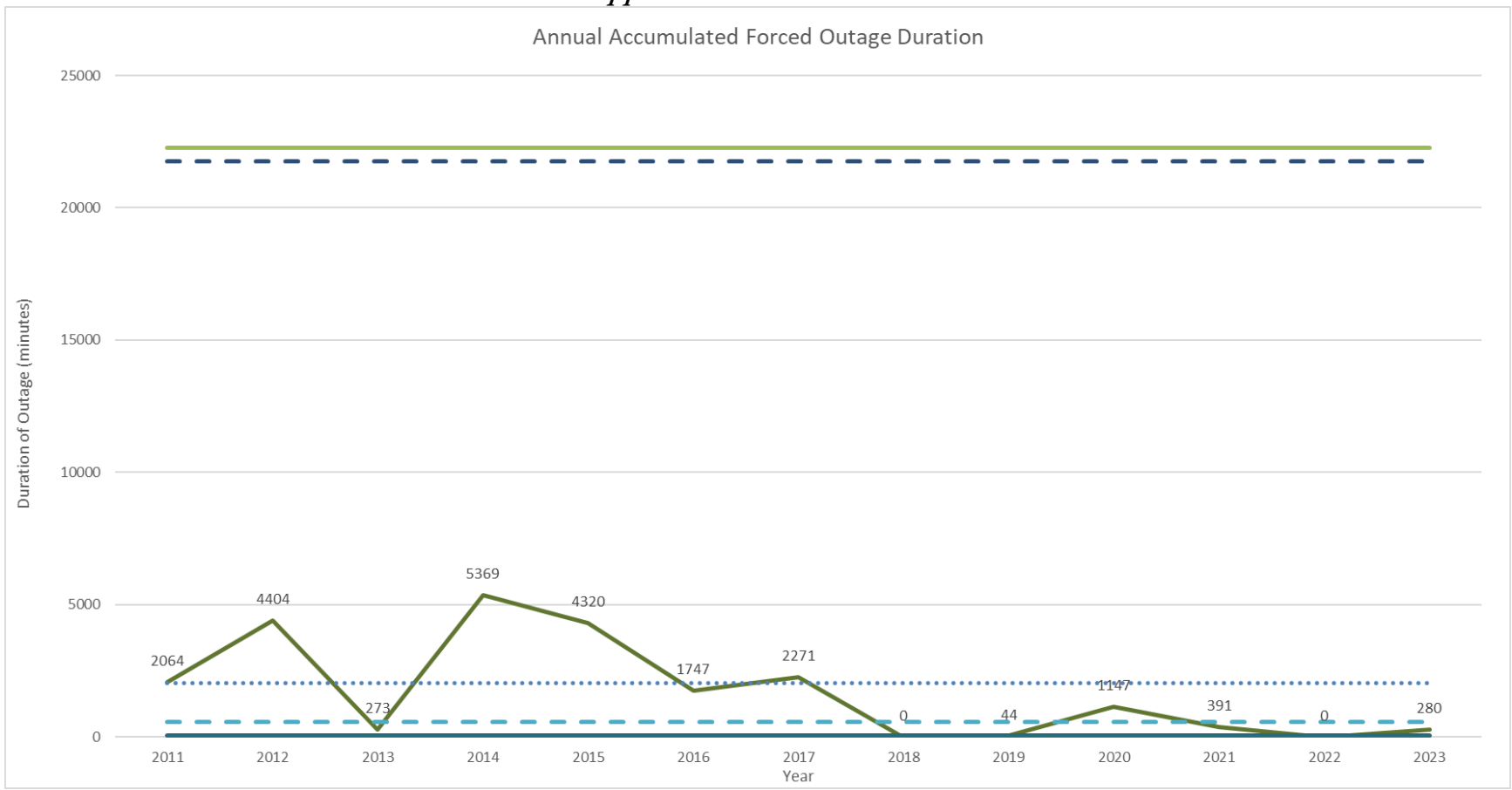
Period	Scheduled Energy Unavailability	Forced Energy Unavailability	Availability (Combined)	MW Utilization
Q1	0.00%	0.22%	99.78%	79.25%
Q2	0.23%	0.00%	99.77%	58.48%
Q3	4.95%	0.00%	95.05%	50.37%
Q4	0.00%	0.00%	100.00%	58.04%
YEAR	1.29%	0.05%	98.65%	61.54%

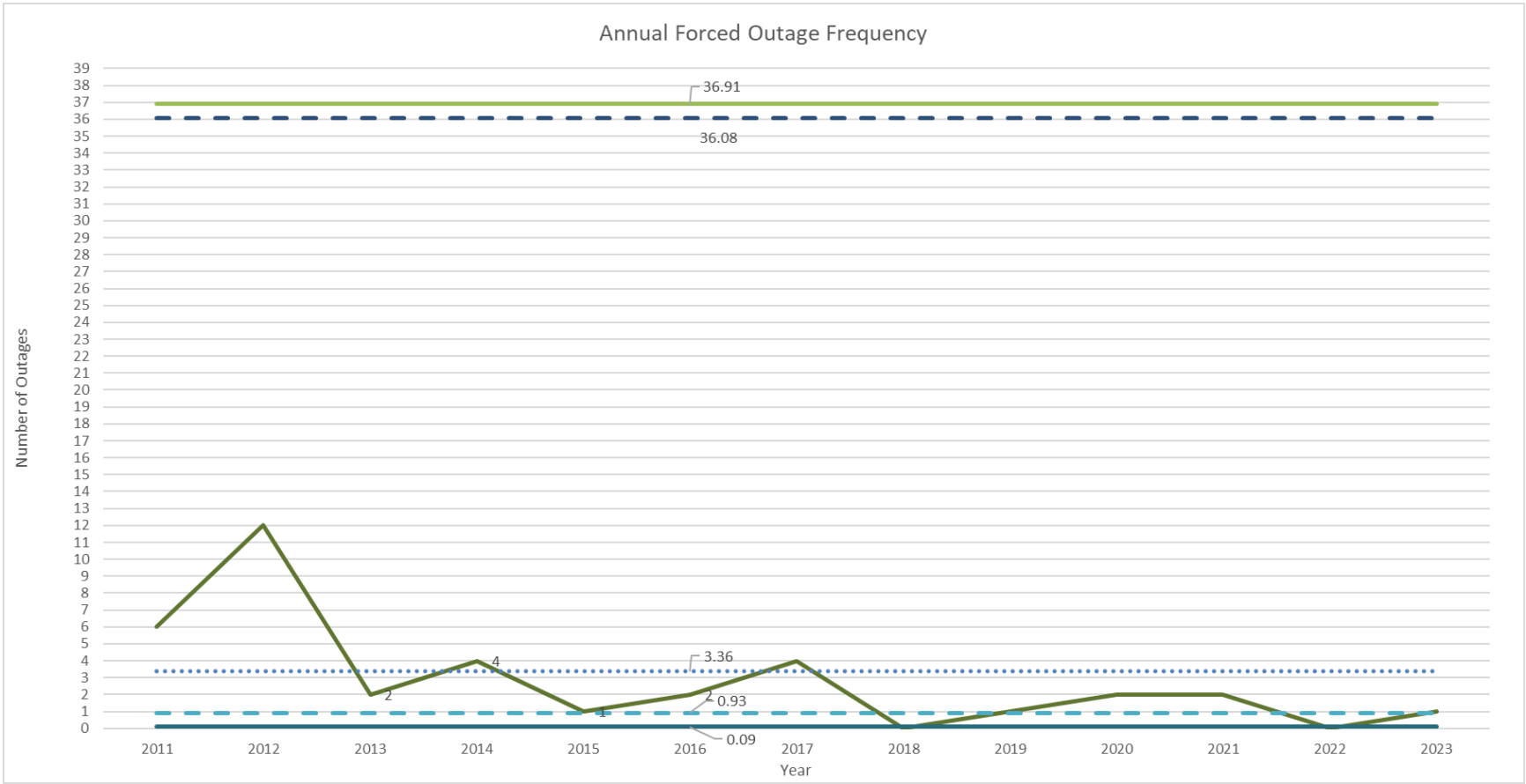
Total Annual NET Availability (excluding scheduled)	99.95%

Respectfully,

Michael Blunt
Operations Manager
Trans Bay Cable LLC

Appendix 1. Control Charts




Annual Forced Outage Frequency
Number of Outages
Year
36.91
36.08
3.36
0.93
0.09
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023