

**San Diego Gas & Electric  
Annual Transmission Availability  
Report - 2023**

**To**

**California Independent System  
Operator**

**April 19, 2024**

**Prepared by SDG&E Grid Operation Services**

# San Diego Gas & Electric Annual Transmission Availability Report - 2023

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## **I. EXECUTIVE SUMMARY**

This Availability Performance report, submitted to the CAISO, summarizes the 2023 San Diego Gas & Electric's transmission Availability Measure performance and fulfills the annual reporting requirement under the CAISO Transmission Maintenance Standards (Appendix C of the CAISO Transmission Control Agreement (TCA), Section 4.3 Availability Report).

The annual Transmission Availability Report (TAR) is based on SDG&E's Forced Outage records and only considers the Availability Measure performance of SDG&E's transmission circuits that are under the operational control of CAISO.

SDG&E's transmission system performance is monitored using control charts for each voltage class (69 kV, 138 kV, 230 kV, and 500 kV). As the CAISO Transmission Maintenance Standards do not have a 138 kV voltage class, all performance measurements for SDG&E's 138 kV voltage level are placed in the CAISO's 115 kV voltage class. Control charts are statistically based graphs which illustrate both an expected range of performance on historical data, and discrete measures of recent performance. Three performance indices are plotted in the charts to measure SDG&E's transmission Availability. These indices are (1) the annual average forced outage frequency for all transmission circuits, (2) the annual average accumulated forced outage duration only for those circuits with forced outages, and (3) the annual proportion of circuits with no forced outages.

Four predetermined statistical tests are used to assess shifts in annual performance and trends in longer-term performance. SDG&E provided CAISO its forced outage data that were used to establish the baseline for the control chart limits in this report.

In 2023, there was no performance test that triggered for degradation for SDG&E. Twenty-two tests were triggered on improvement.

## **II. AVAILABILITY PERFORMANCE ANALYSIS**

Having a reliable transmission system requires that the availability of individual transmission facilities is maintained. Each transmission facility has inherent levels of achievable availability and reliability. Short of making capital improvements or additions, an individual facility cannot operate above these inherent levels. It is possible, however, for performance to degrade to a lower level. This can occur from improper operation and/or improper or ineffective maintenance. From this background, the CAISO in collaboration with stakeholders developed transmission maintenance standards.

This report considers the performance of SDG&E's transmission circuits that are under the operational control of CAISO. SDG&E's forced outage data from its outage database was submitted to CAISO. These forced outage data was compared with SDG&E's forced outage information at CAISO (from CAISO's WebOMS system). The data validation was done in accordance with CAISO's Transmission Maintenance Procedure No 5. Transmission outages classified as "Not a Forced Outage" in the procedure are excluded. Moreover, SDG&E's forced outages that were de-energized for fire and other public safety reasons were also excluded. Transmission outages that lasted more than three days are capped at 72 hours so that excessively long forced outages do not skew the data. Forced outages in the database were rounded up to the nearest full minute.

The Availability performance of SDG&E is monitored using control charts. Annual performance indices reflecting annual Availability performance are then plotted on these control charts. The indices below are calculated using basic statistical methodology as outlined in section 4 of the TCA, Appendix C.

- Index 1: Annual Average Forced Outage (IMS) Frequency for All Transmission Line Circuits.
- Index 2: Annual Average Accumulated Forced Outage (IMS) Duration for those Transmission Line Circuits with Forced Outages (IMS).
- Index 3: Annual Proportion of Transmission Line Circuits with No Forced Outages (IMS).

Section 2.3.6 of CAISO Transmission Maintenance Procedure 2, dated 4/13/18, provides guidance on the outage data that should be included in calculating the control chart limits. In addition, the TMCC approved a change in 2014 to the valid Summary outage data used to initially establish the control chart limits. As a result, the 2023 control charts were generated using forced outage data from 2003 to 2012

(10 years) regardless if any points triggered a test. This established the initial control chart limits. In addition, valid summary outage data from 2013 to present were included in the outage data for calculating the control chart limits provided the point didn't trigger a test. The control charts show 21 years of data, 2003 to 2023.

The statistical chart limits, which are upper and lower control limits (UCL and LCL, respectively) and upper and lower warning limits (UWL and LWL, respectively), are calculated either using so-called "bootstrap" resampling procedures (Indices 1 and 2) or using exact determinations of limits for the proportion chart (Index 3). The Center Control Line (CL) represents the average annual historical performance for a period prior to the current calendar year. The UCL and LCL define a range of expected performance extending above and below the CL. Collectively, the CL, UCL, LCL, UWL and LWL provide reference values for use in evaluating performance.

The four tests have been selected to enable identification of exceptional performance in an individual calendar year, shifts in longer-term performance, and trends in longer-term performance.

**Test 1 Control Limit Test:** The index value for the current calendar year falls outside the UCL (Upper Control Limit) or LCL (Lower Control Limit).

**Test 2 Center Line Test:** At least  $v_1$  consecutive annual index values fall above the CL (Center Line) or  $v_2$  consecutive annual index values fall below the CL. The actual values of  $v_1$  and  $v_2$  will be outputted from the bootstrap resampling procedures. The choices for  $v_1$  and  $v_2$  are designed to keep the probability of these events less than one percent. (Refer to Table 1 of Appendix C of the TCA for values of  $v_1$  and  $v_2$ ).

**Test 3 Warning Limit Test:** At least two out of three consecutive annual index values fall outside the UWL or LWL on the same side of the CL.

**Test 4 Trend Test:** Six or more values are consecutively increasing or consecutively decreasing.

Therefore, Test 1 is designed to detect a short-term change or jump in the average level. Tests 2 and 4 are looking for long-term changes. Test 2 will detect a shift up in averages or a shift to a lower level. Test 4 is designed to detect either a trend of continuous increase in the average values or continuous decrease. Test 3 is designed to assess changes in performance during an intermediate period of three calendar

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years. If Test 3 is satisfied, the evidence is of a decline (or increase) in Availability over a three-calendar year period.

The four tests will assist the CAISO and SDG&E in assessing the Availability performance of the transmission system for each voltage class.

### III. SDG&E TRANSMISSION SYSTEM PERFORMANCE

The 2023 average forced outage frequency, average accumulated forced outage duration for lines experiencing forced outages, and the annual proportion of transmission lines that experienced outages are calculated as shown in Table 1 below. The values are calculated using forced outage data of SDG&E’s transmission lines that are under the control of CAISO.

<b>Table 1: 2023 Performance Indices</b>						<b>FREQUENCY METRIC</b>	<b>DURATION METRIC</b>	<b>PROPORTION METRIC</b>
VOLT CLASS (kV)	No. of Ckts	No. of outages	No. of outaged lines	No. of non-outaged lines	Total duration (min)	Frequency per Ckt	Duration per Ckt	Ratio of Non-outaged lines to Total lines
						Total no. of Outages / Total no. of Ckts	Total Duration / No. of Ckts Outaged	No. non-outaged ckts / Total no. of Ckts
69	142	36	29	113	18409	0.25352113	634.79310345	0.79577465
115	32	2	2	30	382	0.06250000	191.00000000	0.93750000
230	36	27	13	23	3848	0.75000000	296.00000000	0.63888889
500	5	4	3	2	1197	0.80000000	399.00000000	0.40000000

\* Note: *Duration/circuit are based only on those circuits experiencing forced outages each year.*

To determine the availability performance of SDG&E’s transmission system, the four tests (i.e. the Control Limit Test, the Center Line Test, the Warning Limit Test, and the Trend Test) were performed to each control chart type in all voltage classes.

If none of these tests indicate a change has occurred, test is not triggered (NT), performance shall be considered stable and consistent with past performance. If one or more of these tests indicates a change, test is triggered (T), Availability performance shall be considered as improved (green **T**) or degraded (red **T**).

Table 4.2.1 of CAISO Transmission Control Agreement (TCA), Appendix C provides performance status indications (improvement or degradation) for the result of the control chart tests.

The following table was used in determining if any of the triggered four tests previously mention was triggered as an improvement or degradation.

**Table 4.2.1 Performance Indications Provided by Control Chart Tests**

Control Chart Type	Test		Performance Status Indicated by Test Results	
	Number	Results	Improvement	Degradation
Annual Average Forced Outage <sup>(IMS)</sup> Frequency	1	value is above the UCL		X
		value is below the LCL when LCL>0	X	
	2	v1 or more consecutive values above the CL		X
		v2 or more consecutive values below the CL	X	
	3	2 out of 3 values above the UWL		X
		2 out of 3 values below the LWL	X	
	4	6 consecutive values increasing		X
		6 consecutive values decreasing	X	
Annual Average Accumulated Forced Outage <sup>(IMS)</sup> Duration	1	value is above the UCL		X
		value is below the LCL when LCL>0	X	
	2	v1 or more consecutive values above the CL		X
		v2 or more consecutive values below the CL	X	
	3	2 out of 3 values above the UWL		X
		2 out of 3 values below the LWL	X	
	4	6 consecutive values increasing		X
		6 consecutive values decreasing	X	
Annual Proportion of Transmission Line Circuits with No Forced Outages <sup>(IMS)</sup>	1	value is above the UCL	X	
		value is below the LCL when LCL>0		X
	2	v1 or more consecutive values above the CL	X	
		v2 or more consecutive values below the CL		X
	3	2 out of 3 values above the UWL	X	
		2 out of 3 values below the LWL		X
	4	6 consecutively increasing values	X	
		6 consecutively decreasing values		X

Results of applying the four tests are summarized in the Table 2 below.



<b>Table 2: 2023 Performance Tests Results</b>					
<b>Voltage Class</b>	<b>Monitored Index</b>	<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>	<b>Test 4</b>
		<b>Control Limit</b>	<b>Center Line</b>	<b>Warning Limit</b>	<b>Trend</b>
		<b>Not Triggered /Triggered (NT/T)</b>	<b>Not Triggered /Triggered (NT/T)</b>	<b>Not Triggered /Triggered (NT/T)</b>	<b>Not Triggered /Triggered (NT/T)</b>
<b>69 kV</b>	<b>Forced Outage Frequency</b>	<b>T</b>	<b>T</b>	<b>T</b>	<b>NT</b>
	<b>Duration</b>	<b>T</b>	<b>NT</b>	<b>T</b>	<b>NT</b>
	<b>Proportion</b>	<b>T</b>	<b>T</b>	<b>T</b>	<b>NT</b>
<b>115 kV</b>	<b>Forced Outage Frequency</b>	<b>T</b>	<b>T</b>	<b>T</b>	<b>NT</b>
	<b>Duration</b>	<b>T</b>	<b>T</b>	<b>T</b>	<b>NT</b>
	<b>Proportion</b>	<b>T</b>	<b>NT</b>	<b>T</b>	<b>NT</b>
<b>230 kV</b>	<b>Forced Outage Frequency</b>	<b>NT</b>	<b>T</b>	<b>T</b>	<b>NT</b>
	<b>Duration</b>	<b>T</b>	<b>T</b>	<b>T</b>	<b>NT</b>
	<b>Proportion</b>	<b>NT</b>	<b>NT</b>	<b>NT</b>	<b>NT</b>
<b>500 kV</b>	<b>Forced Outage Frequency</b>	<b>NT</b>	<b>T</b>	<b>NT</b>	<b>NT</b>
	<b>Duration</b>	<b>NT</b>	<b>NT</b>	<b>NT</b>	<b>NT</b>
	<b>Proportion</b>	<b>NT</b>	<b>NT</b>	<b>NT</b>	<b>NT</b>

In 2023, 22 out of the 48 control chart tests were triggered. From Table 4.2.1 of the Transmission Control Agreement, Appendix C, all 22 tests were triggered on improvement; therefore, are marked in green (**T**) in the summary table above.

The Control Limit Test (Test 1) was triggered for 7 tests. The outage frequency test was triggered at 69 kV and 115kV; the mean outage duration test was triggered at 69kV, 115kV, and 230kV; and the proportion of circuits with no forced outages test was triggered at 69kV and 115kV.

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The Center Line Test (Test 2) was triggered for 7 tests. The outage frequency test was triggered at 69kV, 115kV, 230kV, and 500kV; the mean outage duration test was triggered at 115kV and 230kV; and the proportion of circuits with no forced outages test was triggered at 69kV.

The Warning Limit Test (Test 3) was triggered for 8 tests. The outage frequency test was triggered at 69kV, 115kV, and 230kV; the mean outage duration test was triggered at 69kV, 115kV and 230kV; and the proportion of circuits with no forced outages test was triggered at 69kV and 115kV.

Overall, the control chart results indicate an improved Availability performance of SDG&E's transmission system.

#### **IV. DISCUSSION OF RESULTS**

- At the 69 kV Level, the Control Limit, the Center Line, and the Warning Limit tests triggered on improvement for mean outage frequency. The Control Limit and Warning Limit tests triggered on improvement for duration. The Control Limit, Center Line, and Warning Limit tests triggered on improvements for annual proportion of circuits with no forced outages.
- At the 115 kV Level, the Control Limit, the Center Line, and the Warning Limit tests triggered on improvement for mean outage frequency. The Control Limit, the Center Line, and the Warning Limit tests triggered on improvement for duration. The Control Limit and the Warning Limit tests triggered on improvement for proportion of circuits with no forced outages.
- At the 230 kV Level, the Center Line and Warning Limit tests triggered on improvement for mean outage frequency. The Control Limit, Center Line, and Warning Limit tests triggered on improvement for the mean outage duration.
- At the 500 kV level, the Center Line test triggered on improvement for mean outage frequency.

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Table 3 below summarizes the limits and results of the control chart tests.

<b>Table 3: Limit Test</b>									
Voltage Level		Control Limit		Center Limit	Warning Limit		2023 Metric	Not Triggered/ Triggered	Comments
		Upper	Lower		Upper	Lower			
69 kV	Frequency	2.542	1.118	1.739	2.282	1.278	0.25352	Triggered	Tests 1, 2, and 3 triggered on improvement
	Duration	2558.98	764.73	1464.15	2174.15	930.84	634.79	Triggered	Tests 1 and 3 triggered on improvement
	Proportion	0.595	0.348	0.471	0.558	0.385	0.795775	Triggered	Tests 1, 2, and 3 triggered on improvement
115 kV	Frequency	2.783	0.457	1.383	2.313	0.670	0.06250	Triggered	Tests 1, 2, and 3 triggered on improvement
	Duration	5159.09	309.61	1649.81	4112.26	504.31	191.00	Triggered	Tests 1, 2, and 3 triggered on improvement
	Proportion	0.792	0.295	0.563	0.721	0.369	0.937500	Triggered	Tests 1 and 3 triggered on improvement
230 kV	Frequency	2.644	0.604	1.452	2.248	0.800	0.75000	Triggered	Tests 2 and 3 triggered on improvement
	Duration	2731.93	322.01	1200.99	2213.07	487.98	296.00	Triggered	Tests 1, 2, and 3 triggered on improvement
	Proportion	0.731	0.203	0.483	0.651	0.281	0.638889	Not Triggered	No test was triggered
500 kV	Frequency	4.100	0	1.225	3.125	0	0.80	Triggered	Test 2 triggered on improvement
	Duration	6763.50	10.60	1600.97	5095.00	32.75	399.00	Not Triggered	No test was triggered
	Proportion	0.987	0	0.470	0.872	0	0.4	Not Triggered	No test was triggered

### **69 kV Voltage Class:**

In 2023, out of the 142 SDG&E lines at 69 kV that are under the control of CAISO, 29 lines experienced 36 outages.

- The calculated mean forced outage frequency was 0.25352. This value is below the LWL of 1.278 and the LCL of 1.118.
  - The Control Limit test, Test 1, triggered on improvement since the mean forced outage frequency value fell below the LCL.
  - The Center Line test, Test 2, triggered on improvement since more than eight consecutive annual index values fell below the CL.
  - The Warning Limit test, Test 3, triggered on improvement since at least two out of three consecutive index values fell below the LWL.
- The 2023 mean forced outage duration was 634.79 min. Mean forced outage duration was below the LWL of 930.84 min and the LCL of 764.73 min.
  - The Control Limit test, Test 1, triggered on improvement since mean forced outage duration value fell below the LCL.
  - The Warning Limit test, Test 3, triggered on improvement since at least two out of three consecutive index values fell below the LWL.
- In 2023, 113 out of the 142 lines did not experience outages. The proportion index of the lines with no forced outages was 0.795775, which is above the UWL of 0.558 and the UCL of 0.595.
  - The Control Limit test, Test 1, triggered on improvement since the proportional index value was above the UCL.
  - The Center Line test, Test 2, triggered on improvement since more than seven consecutive annual index values fell above the CL.
  - The Warning Limit test, Test 3, triggered on improvement since at least two out of three consecutive index values fell above the UWL.

### **115 kV Voltage Class:**

In 2023, of the 32 SDG&E lines at 138 kV that are under the control of CAISO, 2 lines experienced a total of 2 outages.

- The calculated mean forced outage frequency was 0.06250. This value is below the LWL of 0.670 and the LCL of 0.457.
  - The Control Limit test, Test 1, triggered on improvement since the mean forced outage frequency value fell below the LCL.
  - The Center Line test, Test 2, triggered on improvement since more than eight consecutive annual index values fell below the CL.

- The Warning Limit test, Test 3, triggered on improvement since at least two out of three consecutive index values fell below the LWL.
- The 2023 mean outage duration was 191.00 min. This value is below the LWL of 504.31 min and the LCL of 309.61 min.
  - The Control Limit test, Test 1, triggered on improvement since the mean forced outage duration value fell below the LCL.
  - The Center Line test, Test 2, triggered on improvement since more than nine consecutive annual index values fell below the CL.
  - The Warning Limit test, Test 3, triggered on improvement since at least two out of three consecutive index values fell below the LWL.
- In 2023, 30 out of the 32 lines did not experience outages. The proportion index of the lines with no forced outages was 0.937500, which is above the UWL of 0.721 and the UCL of 0.792.
  - The Control Limit test, Test 1, triggered on improvement since the proportional index value was above the UCL.
  - The Warning Limit test, Test 3, triggered on improvement since at least two out of three consecutive index values fell above the UWL.

### **230 kV Voltage Class:**

In 2023, of the 36 SDG&E lines at 230 kV that are under the control of CAISO, 13 lines experienced a total of 27 outages.

- The calculated mean forced outage frequency was 0.75000. This value is below the LWL of 0.800 and above the LCL of 0.604.
  - The Center Line test, Test 2, triggered on improvement since more than eight consecutive annual index values fell below the CL.
  - The Warning Limit test, Test 3, triggered on improvement since at least two out of three consecutive index values fell below the LWL.
- The mean outage duration was 296.00 min. This value is below the LWL of 487.98 min and the LCL of 322.01 min.
  - The Control Limit test, Test 1, triggered on improvement since the mean forced outage duration value fell below the LCL.
  - The Center Line test, Test 2, triggered on improvement since more than eight consecutive annual index values fell below the CL.
  - The Warning Limit test, Test 3, triggered on improvement since at least two out of three consecutive index values fell below the LWL.
- In 2023, 23 out of the 36 lines did not experience outages. The proportion index of the lines with no forced outages was 0.638889, which is below the UCL of 0.731 and the UWL of 0.651.

**500 kV Voltage Class:**

In 2023, of the 5 SDG&E lines at 500 kV that are under the control of CAISO, 3 lines experienced a total of 4 outages.

- The calculated mean forced outage frequency index was 0.80. This value is above the LCL of 0 and LWL of 0 but below the CL of 1.225.
- The mean outage was 399.00 min. This value is above the LCL of 10.60 min and LWL of 32.75 min but below the CL of 1600.97 min.
- In 2023, 2 out of the 5 lines did not experience outages. The proportion index of the lines with no forced outages was 0.4, which is below the CL of 0.470 but above the LCL of 0 and LWL of 0.

SDG&E continues to take proactive measures to improve the performance of its transmission system by having a robust maintenance practices and decreasing outage restoration times. The result of the 2023 availability performance shows that the approach is working.

**V. Appendix 1: Summary Outage Data**

**69kV Annual Outages Summary**

<b>Company</b>	<b>Line ID</b>	<b>Frequency</b>	<b>Duration</b>	<b>Mileage</b>
SDG&E	TL 600	0	0	7.80
SDG&E	TL 601	0	0	1.68
SDG&E	TL 602	0	0	2.96
SDG&E	TL 603	0	0	2.81
SDG&E	TL 604	0	0	2.90
SDG&E	TL 605	0	0	1.35
SDG&E	TL 606	0	0	0.95
SDG&E	TL 607	1	30	2.68
SDG&E	TL 608	0	0	2.16
SDG&E	TL 609	1	359	1.30
SDG&E	TL 610	0	0	6.13
SDG&E	TL 611	0	0	3.80
SDG&E	TL 612	0	0	3.49
SDG&E	TL 613	0	0	5.24
SDG&E	TL 614	1	74	7.95
SDG&E	TL 615	1	4320	3.35
SDG&E	TL 616	0	0	8.75
SDG&E	TL 617	0	0	6.62
SDG&E	TL 618	0	0	6.86
SDG&E	TL 619	1	1	6.87
SDG&E	TL 620	0	0	1.70
SDG&E	TL 621	0	0	6.18
SDG&E	TL 622	0	0	3.14
SDG&E	TL 623	0	0	7.60
SDG&E	TL 624	0	0	4.85
SDG&E	TL 625	0	0	15.56
SDG&E	TL 627	0	0	7.97
SDG&E	TL 628	0	0	10.90
SDG&E	TL 629	3	159	25.10
SDG&E	TL 630	0	0	4.72
SDG&E	TL 631	2	4540	8.69
SDG&E	TL 632	1	719	18.50
SDG&E	TL 633	0	0	3.04
SDG&E	TL 634	2	36	14.80
SDG&E	TL 635	0	0	12.07
SDG&E	TL 636	0	0	14.88



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SDG&E	TL 637	0	0	13.43
SDG&E	TL 638	0	0	3.43
SDG&E	TL 639	0	0	7.96
SDG&E	TL 640	0	0	3.15
SDG&E	TL 641	0	0	1.82
SDG&E	TL 642	0	0	4.32
SDG&E	TL 643	0	0	8.73
SDG&E	TL 644	1	76	4.62
SDG&E	TL 645	0	0	3.36
SDG&E	TL 646	0	0	2.81
SDG&E	TL 647	0	0	2.13
SDG&E	TL 648	0	0	3.70
SDG&E	TL 649	1	15	13.30
SDG&E	TL 650	0	0	1.40
SDG&E	TL 651	0	0	4.03
SDG&E	TL 652	2	989	7.05
SDG&E	TL 653	0	0	2.81
SDG&E	TL 654	0	0	2.21
SDG&E	TL 655	0	0	3.57
SDG&E	TL 656	0	0	0.20
SDG&E	TL 657	0	0	0.13
SDG&E	TL 658	0	0	1.90
SDG&E	TL 659	1	818	3.04
SDG&E	TL 660	0	0	6.76
SDG&E	TL 661	0	0	2.90
SDG&E	TL 662	0	0	2.63
SDG&E	TL 663	0	0	5.78
SDG&E	TL 664	1	111	12.00
SDG&E	TL 665	0	0	2.40
SDG&E	TL 666	0	0	2.70
SDG&E	TL 667	0	0	6.67
SDG&E	TL 668	0	0	3.70
SDG&E	TL 669	0	0	2.43
SDG&E	TL 670	0	0	7.61
SDG&E	TL 671	0	0	7.04
SDG&E	TL 672	0	0	2.70
SDG&E	TL 673	0	0	4.92
SDG&E	TL 674	0	0	10.70
SDG&E	TL 675	1	13	5.98
SDG&E	TL 676	0	0	4.27
SDG&E	TL 677	0	0	3.49
SDG&E	TL 678	0	0	8.20
SDG&E	TL 679	0	0	5.07

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SDG&E	TL 680	1	1	14.50
SDG&E	TL 681	2	923	16.13
SDG&E	TL 682	0	0	20.22
SDG&E	TL 683	0	0	10.34
SDG&E	TL 684	1	360	6.02
SDG&E	TL 685	0	0	11.20
SDG&E	TL 686	0	0	25.10
SDG&E	TL 687	0	0	11.70
SDG&E	TL 688	0	0	10.72
SDG&E	TL 689	0	0	11.00
SDG&E	TL 690	0	0	15.60
SDG&E	TL 691	0	0	11.80
SDG&E	TL 692	1	425	6.80
SDG&E	TL 693	0	0	5.30
SDG&E	TL 694	0	0	14.46
SDG&E	TL 695	0	0	5.69
SDG&E	TL 696	0	0	3.50
SDG&E	TL 697	0	0	6.42
SDG&E	TL 698	1	18	12.69
SDG&E	TL 699	1	359	2.68
SDG&E	TL 6902	1	1483	0.69
SDG&E	TL 6904	0	0	2.38
SDG&E	TL 6905	0	0	3.83
SDG&E	TL 6906	0	0	6.07
SDG&E	TL 6907	0	0	0.74
SDG&E	TL 6908	0	0	2.03
SDG&E	TL 6910	0	0	6.11
SDG&E	TL 6911	0	0	3.30
SDG&E	TL 6912	1	1096	7.70
SDG&E	TL 6913	0	0	2.54
SDG&E	TL 6914	0	0	11.62
SDG&E	TL 6915	0	0	1.93
SDG&E	TL 6916	0	0	6.66
SDG&E	TL 6917	1	66	15.59
SDG&E	TL 6920	0	0	10.90
SDG&E	TL 6923	0	0	13.46
SDG&E	TL 6924	0	0	1.90
SDG&E	TL 6925	0	0	1.60
SDG&E	TL 6926	0	0	8.15
SDG&E	TL 6927	0	0	4.92
SDG&E	TL 6930	0	0	5.41
SDG&E	TL 6931	1	39	6.04
SDG&E	TL 6932	0	0	9.21

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SDG&E	TL 6939	1	84	2.44
SDG&E	TL 6943	0	0	1.98
SDG&E	TL 6945	0	0	3.75
SDG&E	TL 6949	2	614	4.60
SDG&E	TL 6950	0	0	0.95
SDG&E	TL 6952	0	0	2.97
SDG&E	TL 6954	0	0	0.70
SDG&E	TL 6956	0	0	3.18
SDG&E	TL 6957	0	0	13.53
SDG&E	TL 6958	1	214	12.44
SDG&E	TL 6959	0	0	2.01
SDG&E	TL 6964	0	0	4.59
SDG&E	TL 6966	0	0	5.42
SDG&E	TL 6970	0	0	4.41
SDG&E	TL 6971	1	467	2.54
SDG&E	TL 6973	0	0	3.01
SDG&E	TL 6974	0	0	2.48
SDG&E	TL 6975	0	0	11.83
SDG&E	TL 6976	0	0	0.54
SDG&E	TL 6978	0	0	3.57
SDG&E	TL 6979	0	0	2.82
<b>Total</b>		<b>36 outages</b>	<b>18409 min</b>	<b>896.81 mi</b>

### 138kV Annual Outages Summary

<b>Company</b>	<b>Line ID</b>	<b>Frequency</b>	<b>Duration</b>	<b>Mileage</b>
SDG&E	TL 13801	0	0	0.20
SDG&E	TL 13804	0	0	23.00
SDG&E	TL 13805	0	0	2.75
SDG&E	TL 13806	0	0	3.08
SDG&E	TL 13809	0	0	2.61
SDG&E	TL 13810	0	0	14.50
SDG&E	TL 13811	0	0	16.18
SDG&E	TL 13812	0	0	3.81
SDG&E	TL 13815	1	146	14.93
SDG&E	TL 13816	0	0	6.73
SDG&E	TL 13819	0	0	6.67
SDG&E	TL 13820	0	0	5.77

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SDG&E	TL 13821	0	0	8.19
SDG&E	TL 13822	0	0	9.90
SDG&E	TL 13824	0	0	24.04
SDG&E	TL 13825	0	0	6.34
SDG&E	TL 13826	0	0	1.34
SDG&E	TL 13827	0	0	1.39
SDG&E	TL 13828	0	0	6.89
SDG&E	TL 13830	0	0	5.32
SDG&E	TL 13831	1	236	6.67
SDG&E	TL 13833	0	0	3.77
SDG&E	TL 13834	0	0	3.82
SDG&E	TL 13835	0	0	4.14
SDG&E	TL 13836	0	0	1.15
SDG&E	TL 13837	0	0	3.20
SDG&E	TL 13838	0	0	3.23
SDG&E	TL 13840	0	0	6.20
SDG&E	TL 13843	0	0	7.98
SDG&E	TL 13844	0	0	13.80
SDG&E	TL 13847	0	0	3.22
SDG&E	TL 13848	0	0	6.88
SDG&E	TL 13849	0	0	0.16
<b>Total</b>		<b>2 outages</b>	<b>382 min</b>	<b>227.86 mi</b>

### 230kV Annual Outages Summary

<b>Company</b>	<b>Line ID</b>	<b>Frequency</b>	<b>Duration</b>	<b>Mileage</b>
SDG&E	TL 23001	6	54	35.26
SDG&E	TL 23002	3	358	17.59
SDG&E	TL 23003	0	0	7.22
SDG&E	TL 23004	1	5	35.25
SDG&E	TL 23006	2	22	18.16
SDG&E	TL 23007	0	0	14.05
SDG&E	TL 23010	3	466	17.60
SDG&E	TL 23011	0	0	21.82
SDG&E	TL 23012	0	0	18.00
SDG&E	TL 23013	0	0	10.77
SDG&E	TL 23014	0	0	0.37
SDG&E	TL 23015	0	0	0.37

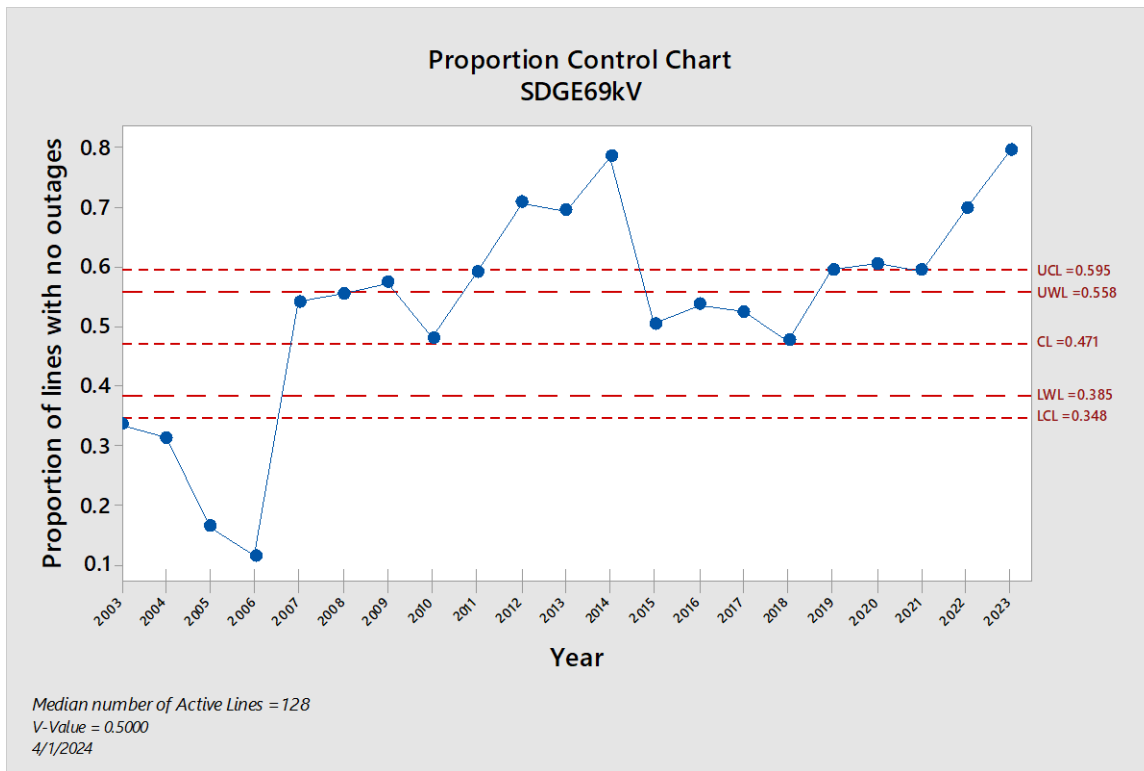
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SDG&E	TL 23020	0	0	9.65
SDG&E	TL 23021	2	1126	28.90
SDG&E	TL 23022	0	0	34.05
SDG&E	TL 23023	0	0	35.79
SDG&E	TL 23026	0	0	7.23
7SDG&E	TL 23027	1	352	3.85
SDG&E	TL 23028	1	632	11.29
SDG&E	TL 23029	1	632	7.14
SDG&E	TL 23030	2	18	58.53
SDG&E	TL 23040	1	17	4.59
SDG&E	TL 23041	2	137	37.80
SDG&E	TL 23042	2	29	18.94
SDG&E	TL 23050	0	0	9.50
SDG&E	TL 23051	0	0	10.59
SDG&E	TL 23052	0	0	6.91
SDG&E	TL 23053	0	0	18.00
SDG&E	TL 23054	0	0	28.31
SDG&E	TL 23055	0	0	28.31
SDG&E	TL 23056	0	0	1.02
SDG&E	TL 23061	0	0	5.60
SDG&E	TL 23066	0	0	5.72
SDG&E	TL 23071	0	0	14.58
SDG&E	TL 23072	0	0	13.86
SDG&E	TL 23080	0	0	0.18
SDG&E	TL 23081	0	0	0.18
SDG&E	TL 23082	0	0	0.00
Total		27 outages	3848 min	596.98 mi

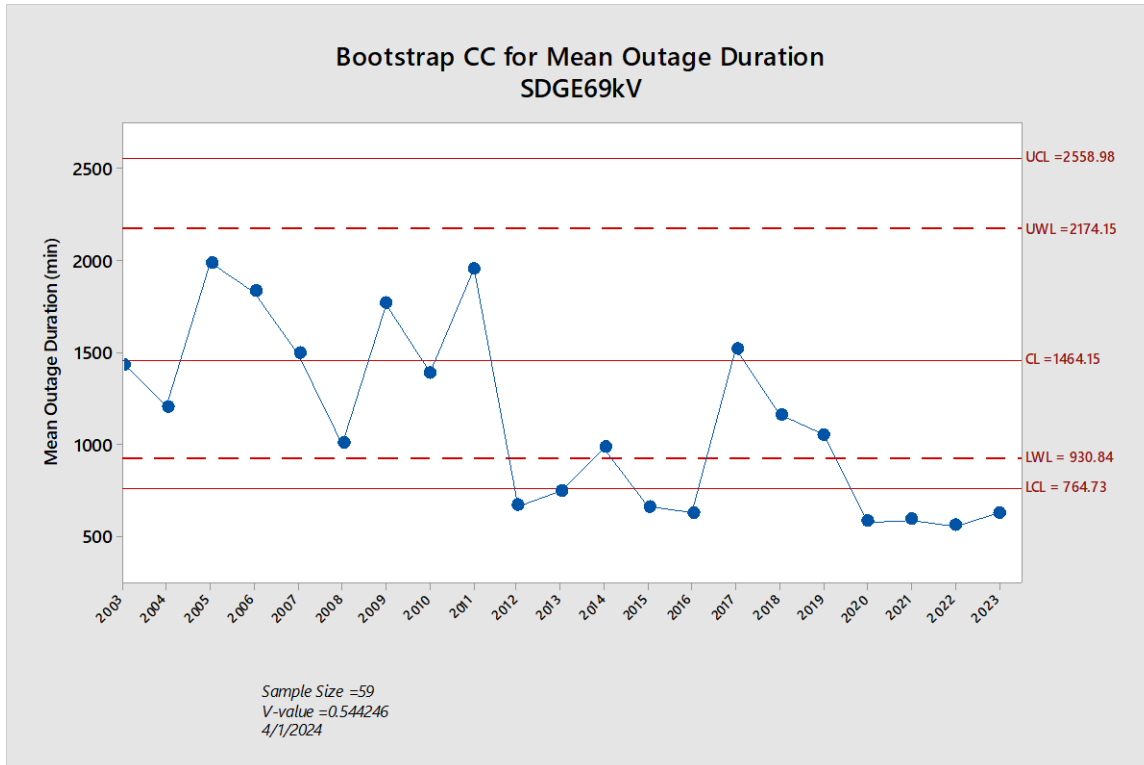
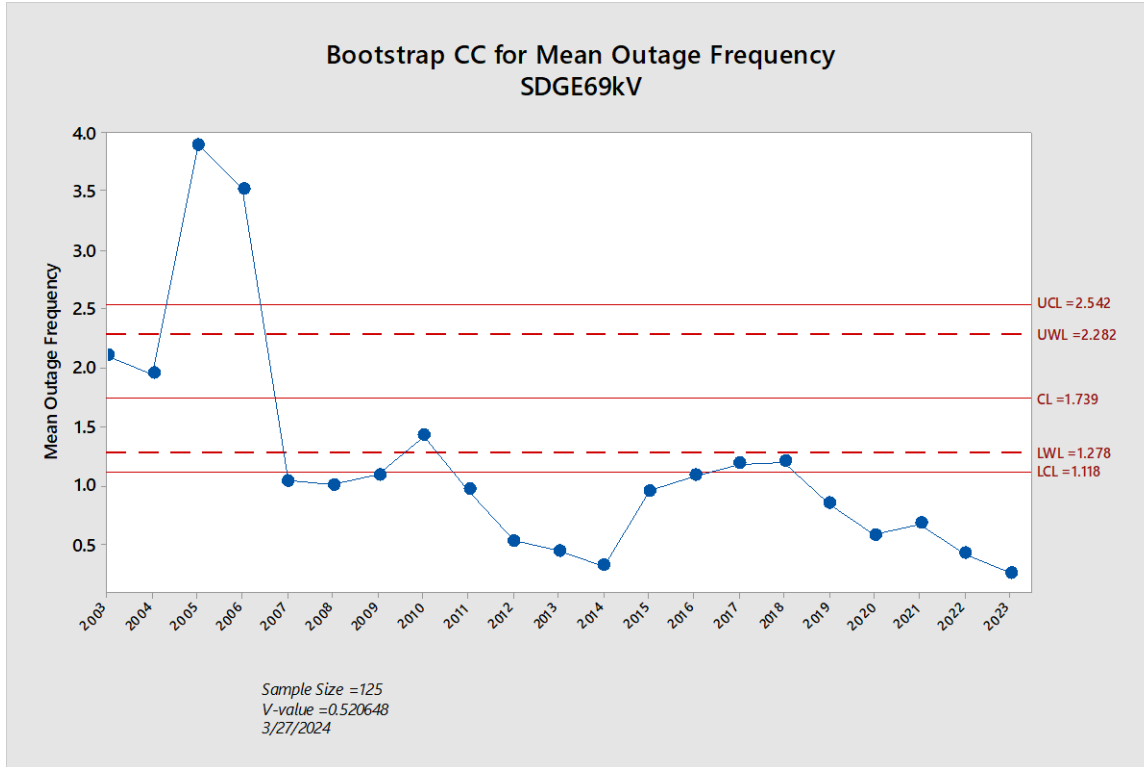
### 500kV Annual Outages Summary

Company	Line ID	Frequency	Duration	Mileage
SDG&E	TL 50001	1	14	52.96
SDG&E	TL 50002	0	0	80.60
SDG&E	TL 50003	2	685	67.46
SDG&E	TL 50004	1	498	30.94
SDG&E	TL 50005	0	0	21.60
Total		4 outages	1197 min	253.56 mi

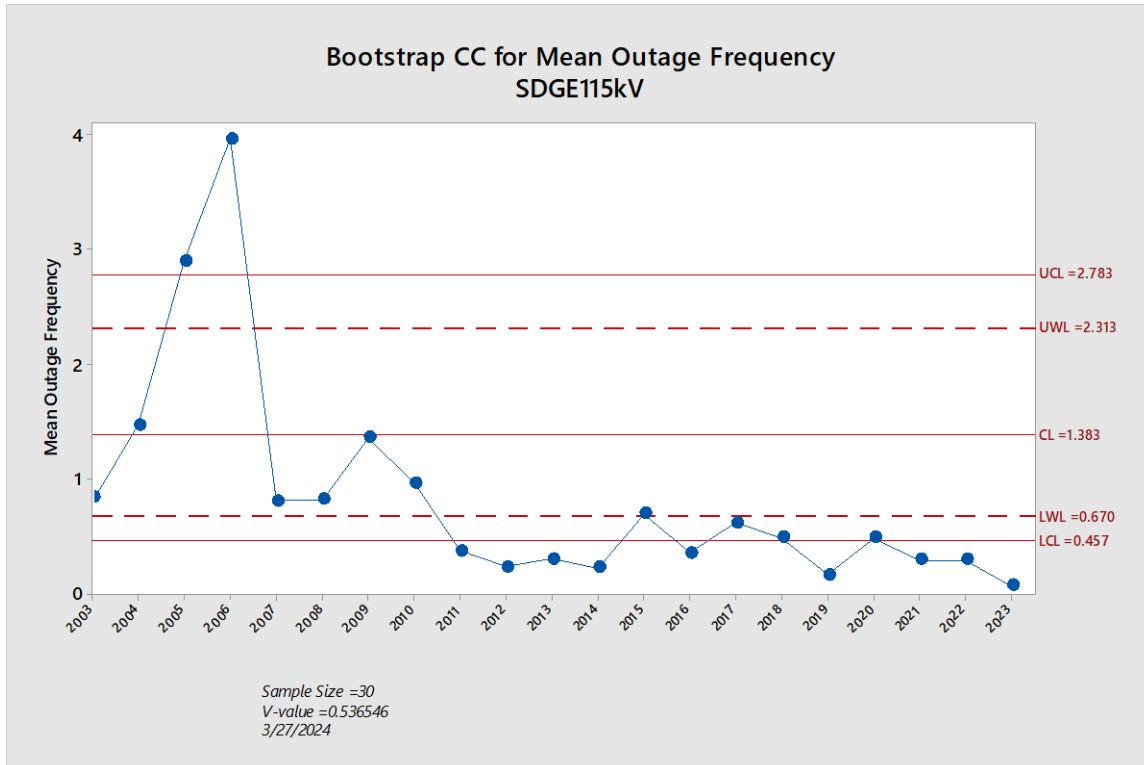
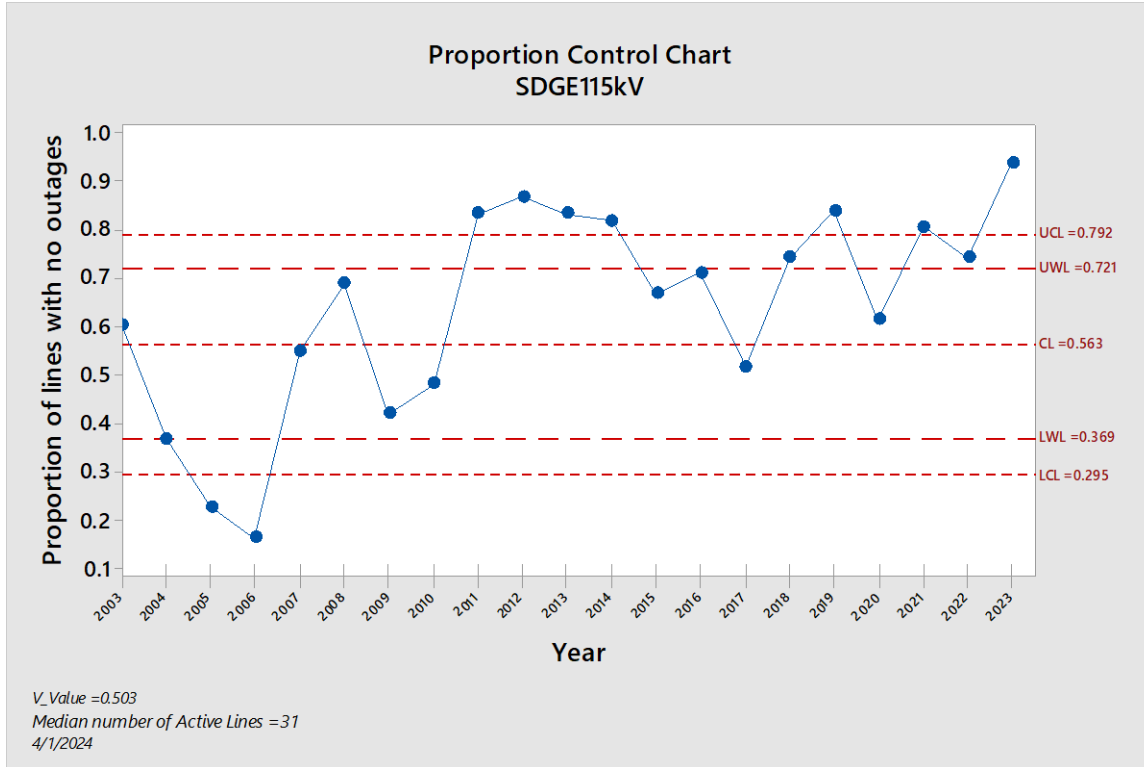
## VI. Appendix 2: CONTROL CHARTS



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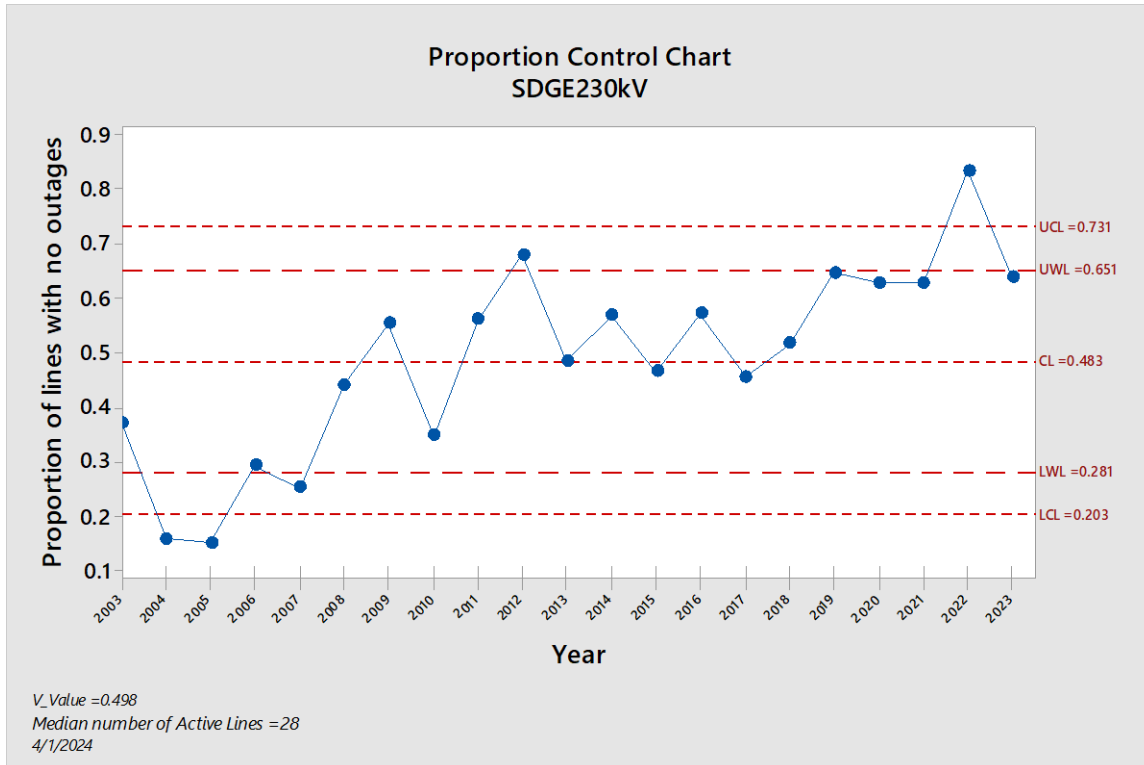
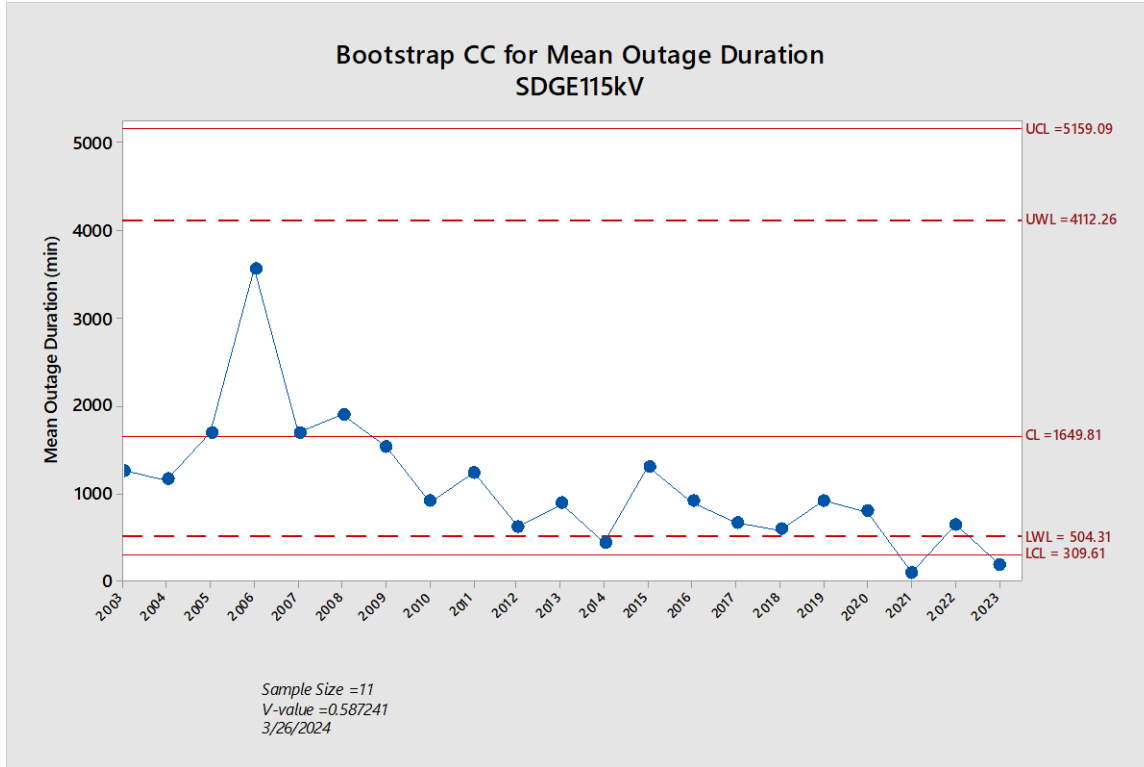


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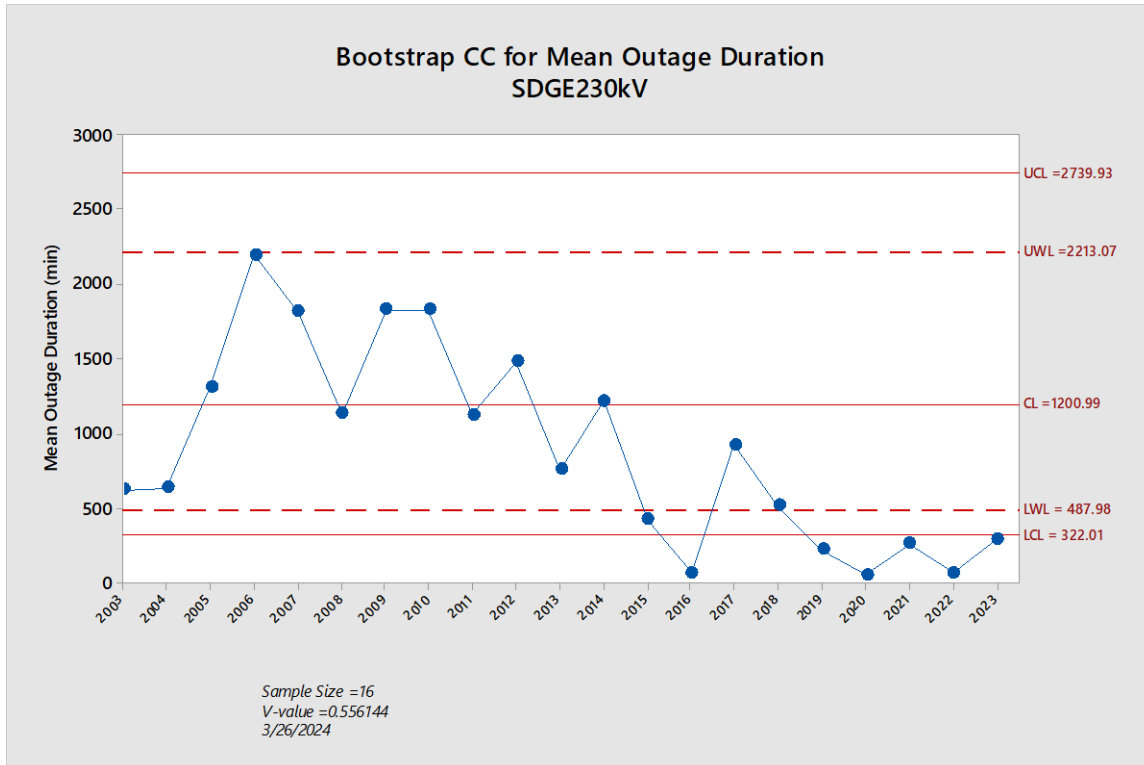
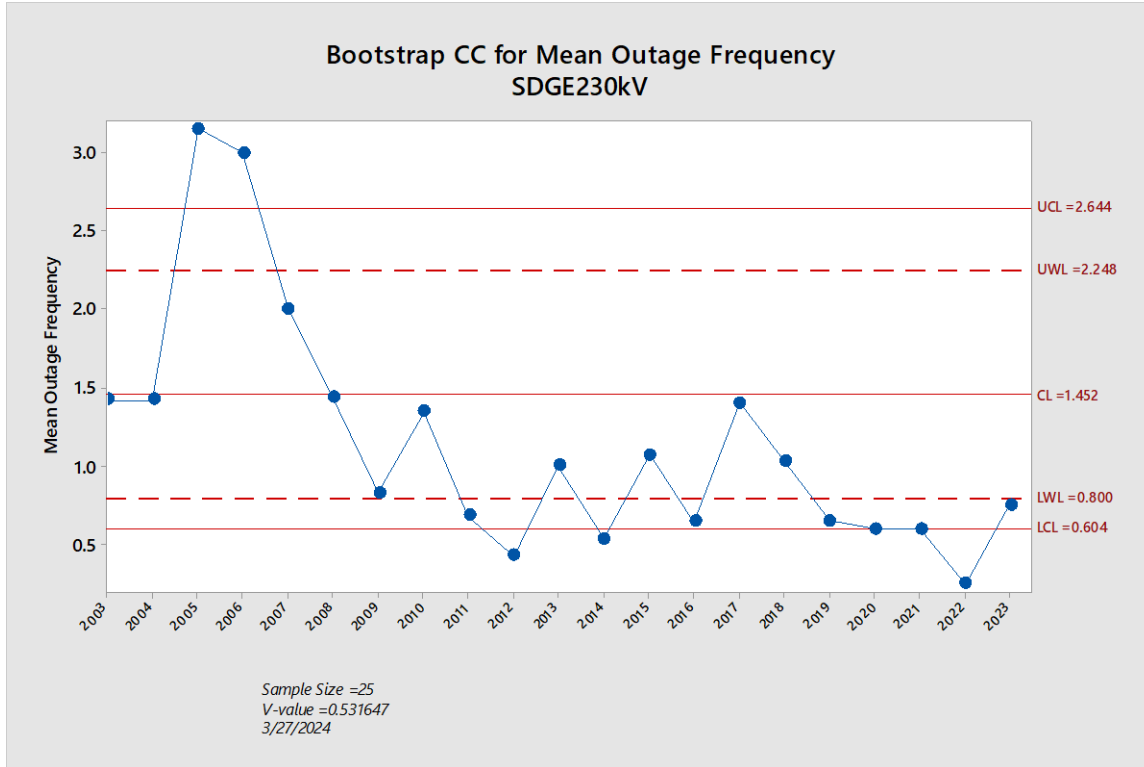




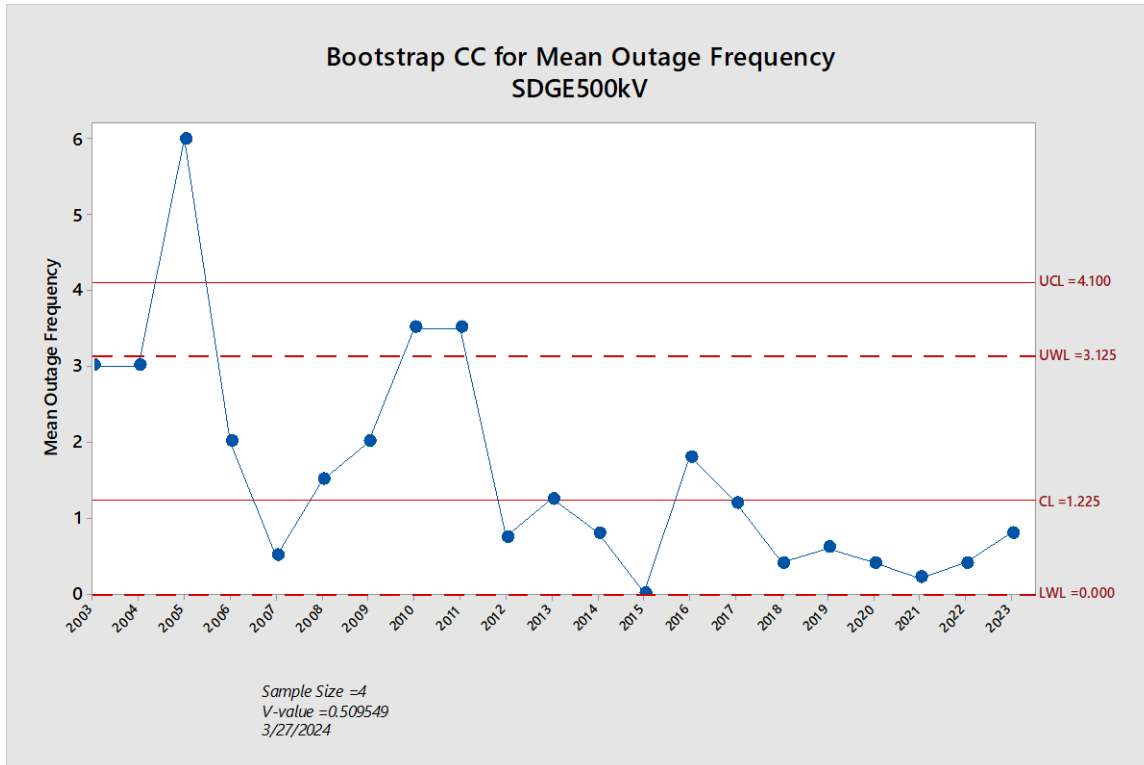
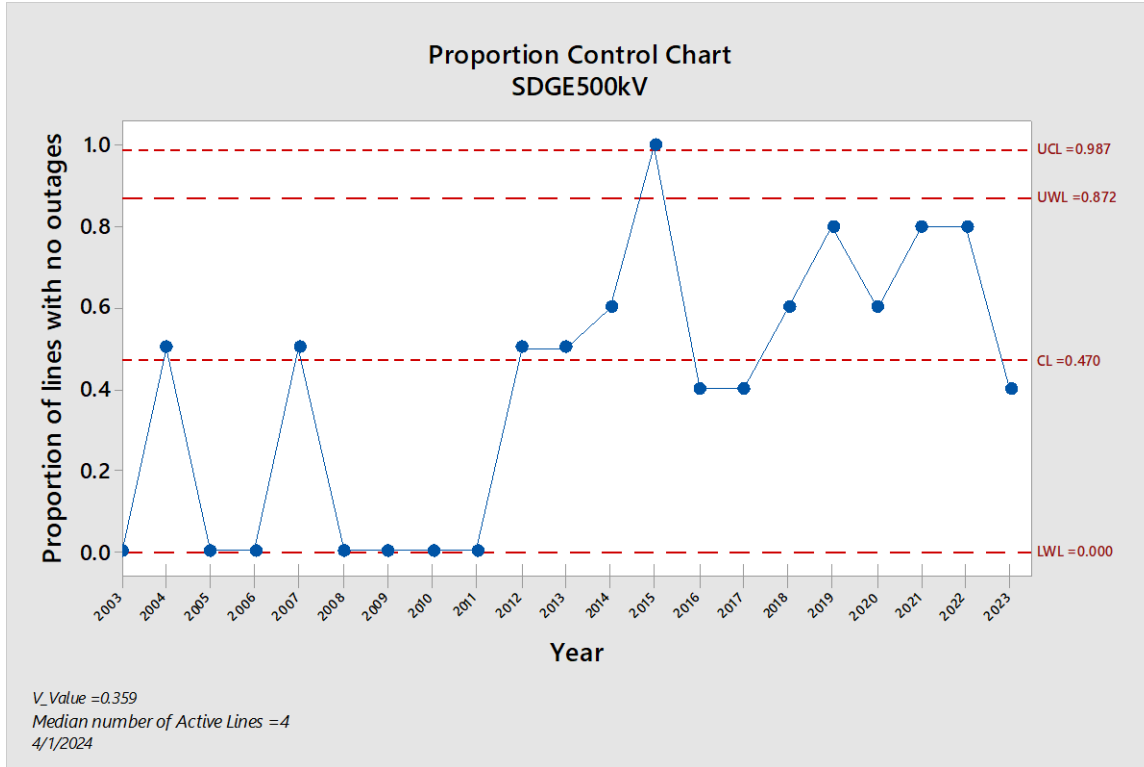
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