Preliminary Ignition Investigation Report

Ignition Database Index:	450
Electric Incident Investigation (EII) Number:	N/A
HAWC Incident Name:	N/A
PG&E Facilities Ignition?	Y
CPUC Reportable Ignition?	Y
Date & Time of Incident:	April 18, 2022, at approximately 1809 hours
Street Address:	Near State Hwy 49, 1.80 miles east of Forest Route 93
City:	Sierra City
County:	Sierra
Latitude/Longitude:	39.566503, -120.709942
PG&E Division:	Sierra
High Fire Threat District (HFTD):	Tier 2
Fire Index Area:	350
Fire Potential Index (FPI) Rating:	R1
Was there a PSPS event at the time of ignition?	No
Failure Driver:	Utility work/Operation
Failure Sub-driver:	Improper Construction
Circuit:	Alleghany 1101
Circuit Protection Zone:	Alleghany 1101-LR804
Nominal Voltage:	12kV
PG&E Equipment associated with ignition:	Connector
EPSS enabled at time of ignition?	N
Fault Type:	None
Wire Down (Primary)?	N
MAVF Score	537.9695
Lead Agency/Agency Having Jurisdiction:	Sierra City Fire Department
Fire Size:	¼ to ½ of an acre
FAS Field Remarks:	Need crew to replace burnt jumper and connectors.
HAWC Summary:	N/A
Injuries / Fatalities / Property Damage / Media Attention:	No/No/No/No
Weather Conditions:	The high temperature was 44.0F at 1345 hours and the low temperature was 27.6F at 0230 hours. The relative humidity was as high as 97% at 2345 hours and as low as 38% at 0700 hours. The maximum wind speed was 13.0 mph from the east at 1515 hours.
Red Flag Warning (RFW) / High Wind Warning (HWW):	No/No
911 Standby Relief Time:	42 minutes
OIS #:	1676079

ILIS #:	22-0051167
FAS #:	T005600492
Assigned Attorney:	N/A
EII Ignition Investigator & Phone:	[redacted]

Executive Summary

On April 18, 2022, at approximately 1500 hours a PG&E troubleman was dispatched to the Alleghany 1101 12kV Distribution circuit off California State Highway 49 (Hwy 49), near the town of Downieville due to a 'Fire-Other' hazard near PG&E assets. As the troubleman neared the ("Incident Location") (See Figures 1, 3, & 4) he observed fire fighters on the side of the road blocking entry to the Incident Location. The ignition starting point was on the hill, north of Hwy 49, out of view from the road where they were standing (See Figure 1). One of the fire fighters asked the troubleman to enter the area on foot to observe the pole nearest to the suspected ignition starting point (SAP Pole ID 100111818) ("Pole #1"), stating he 'saw something that looked suspicious.' Upon arriving near Pole #1, the troubleman observed a burned connector laying at the base of Pole #1 (See Figure 6). Recognizing the connector had gone bad and concerned for the safety of the responding fire fighters, the troubleman de-energized the line via Line Recloser 804 (LR804) at 1817 hours, impacting 604 customers. The troubleman created EC Tag #123360159 to replace seven poles source side of C-535 of bad connectors, requiring a crew and additional logistical coordination due to the remote location of the area. The town of Downieville was already equipped with a PG&E owned generator that was initiated around 2120 hours the evening of April 18, back feeding the town while repairs (EC Tag #123360159) were made on the Alleghany 1101 12kV Distribution circuit. The repairs were completed the following day (April 19, 2022) by a PG&E crew. Downieville service was switched from the temporary generation back to the Alleghany 1101 12kV Distribution circuit around 1210 hours.

A post incident investigation was performed by vegetation management (VM) on April 18 near the Incident Location. The findings stated a slow-burning fire near powerlines on Forest Service property shows no direct evidence of being caused by vegetation. The fire burned a half-acre of pine needles and duff (organic matter in various stages of decomposition) but little to no damage to any trees.

A Wildfire Safety Inspection Program (WSIP) inspection took place on May 14, 2019, noting a reduced/deformed circumference due to animal activity (bear or mountain lion) of Pole #1. There was no tag created for the reduced circumference. However, it was noted that the guy/anchor assembly was loose. EC Tag #117235246 was created on May 14, 2019, with a due date of May 14, 2024, for the guy/anchor assembly. The tag was completed on March 7, 2020, for loose guy wires in which they were re-pulled down.

Applied Technology Services (ATS) was able to analyze the failed connector. Visual observations combined with optical microscopy shows little to no deformation on the fracture surface of the copper strands. The jumper failure within the compression connector appears to be at least partially attributed to a fatigue fracture combined with improper installation. The connector had one less crimp than required per Standard 041010-page 6 note 2 for the Homac OB-101 connectors. The permanent fault from the earlier vegetation contact in combination of the broken strands and workmanship, could have contributed to the localized arcing and thermal damage within the joint (See Figure 13).

A PG&E Standards & Work Methods specialist was able to analyze photos from the site and noted the compression connection that failed (commonly called an 'H' block) did not have the required number of crimps, which is four crimps. The failed compression connection only had three crimps (See Figure 8). Additionally, it was noted that a 'no-oxide' (corrosion inhibitor) was applied and may have corroded internally due to signs of heat damage observed, as indicated in TD-2907P-01 "Installing Overhead Conductor Splices".

Asset Failure Analysis (AFA) performed an analysis of the event, concluding the connector failed due to various voltage conditions on the Alleghany 1101 circuit by fatiguing it with higher-than-normal and more frequent-than-normal power fluctuations. Prior to this incident, there were four unplanned, emergency outages on this circuit in the year 2022 alone as well as one planned for system hardening work. Following the incident on April 18, 2022, two more outages, one planned and one emergency outage happened within ten days. Additional analysis placed this circuit in a Tier 2 and Tier

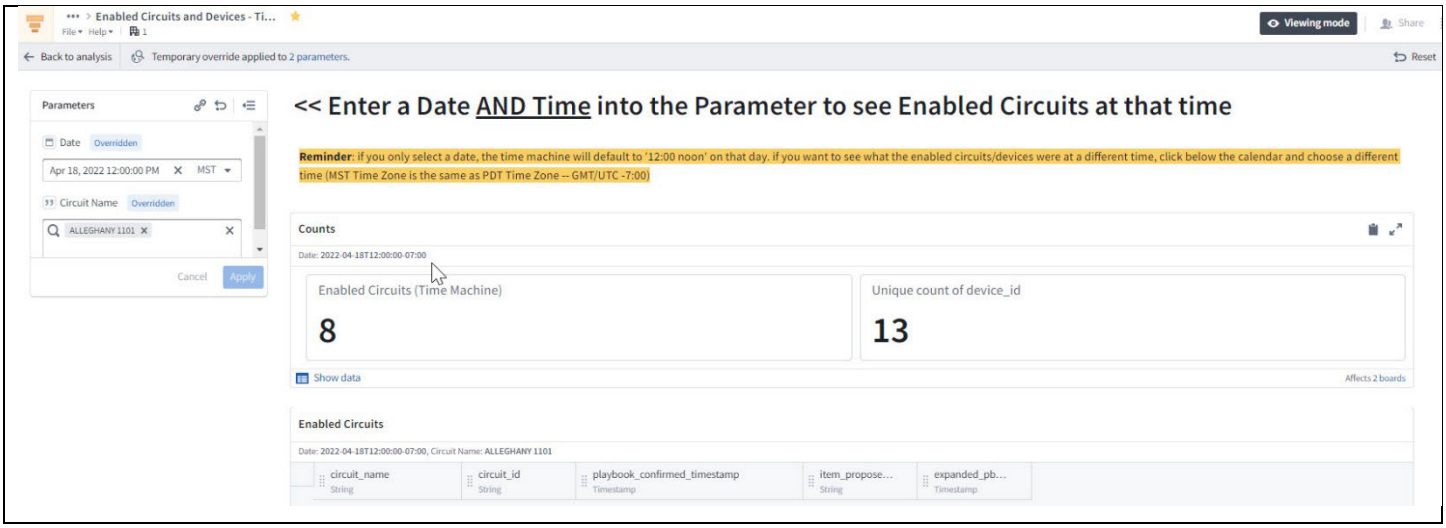
3 high fire threat district (HFTD), prompting AFA to recommend a Safety Condition Assessment Review (SCAR) of the area. AFA also created a timeline of relevant events (See Figure 14) as well as a historical information (See Figure 15) for the Alleghany circuit, demonstrating the voltage conditions prior to the incident as well as after. The SCAR analysis is still pending as of the publish date of this report.

An example of the voltage fluctuations impacting the Alleghany 1101 12kV circuit happened earlier in the day at approximately 1421 hours, approximately 4.75 miles east of the Incident Location causing a power outage (ILIS 22-0051067) impacting 604 customers due to vegetation contact (See Figure 2). This vegetation incident caused a permanent three phase fault, resulting in LR 804 to go through its reclosing sequence, with one reclose attempt, and finally a lock out impacting the same 604 customers that will be de-energized later that day by the troubleman to make the scene safe at the Incident Location. A post incident investigation was performed by VM on April 18 at this site as well. The findings state a large Jeffery Pine partially failed ten feet from the codominant crotch on to conductors, causing an outage. The subject tree showed signs of turpentine beetle attack but otherwise is a 'healthy, green tree.' There was no ignition at this location.

It was a cold day near the Incident Location with the high temperature at 44F at 1345 hours and the low temperature was 27.6F at 0230 hours. The relative humidity was as high as 97% at 2345 hours and as low as 38% at 0700 hours. The maximum wind speed was 13 mph from the east at 1515 hours. There were no red flag warnings or high wind warnings on this date.

EPSS Analysis

The Alleghany 1101 12kV distribution circuit was not enabled with Enhanced Powerline Safety Settings (EPSS) at the time of the ignition. The screenshot below from Foundry shows the Alleghany was not one of the circuits enabled on this day.



Ignition Impact

The ensuing fire burned approximately a quarter to half-acre of timberland. There were no reported structures damaged or reports of injuries, fatalities, or media coverage. The 68,782-minute outage impacted 604 customers.

Sequence of Events

April 18, 2022

- 1421 hours – Report of vegetation contact on Alleghany 1101 B & power outage 4.75 miles east of Incident Location (ILIS 22-0051067) (LR 804 Open – 604 Customers)

- 1809 hours – FNL (First No Light) (ILIS 22-0051167) (LR 804 Open – 604 Customers)
- 1817 hours – Troubleman dispatched to Incident Location
- 1839 hours – Switch 875BP open
- 1842 hours – Switch 341693 open
- 1853 hours – Switch 1493 close
- 1934 hours – Substation 52G close (351 customers re-energized)
- 1940 hours – Switch 341693 close (205 customers re-energized)
- 2020 hours – Switch 871 open
- 2031 hours – Switch 875BP close
- 2102 hours – Switch 2707 open
- 2118 hours – Line Recloser 804 close (27 customers re-energized)
- 2130 hours – Troubleman arrives onsite

April 19, 2022

- 1210 hours – Switch 2707 close (13 customer re-energized)

Corrective Notification Associated with Ignition

On April 18, 2022, the responding troubleman created EC Tag #123360159 for a bad connector on the highway side of SAP Pole ID 100111818, seven poles source side of C535. On April 19, 2022, a PG&E repair crew replaced six connectors, two jumpers and installed 'High' signs.

Pending Work

Type	Number	Description	Priority	Date Identified	Due Date
EC Notification	N/A				
COE Notification	N/A				
LC Notification	N/A				
Veg Work Order	N/A				

Please note this may not include pending major program or project work at the incident location.

Asset Info & Most Recent Inspections and Tests

Info / Inspection	Most Recent Date	Findings
Install Date:	01/01/1952	Wood – Douglas Fir, McCormick & Baxter Co., 40' tall, Class 4, Creosote treatment.
Inspection:		
	8/6/2020	No damage or compelling abnormal conditions to report.
Patrol:	N/A	
Corrective History:	3/7/2020	EC Tag #117235246, repulled down guys.

Aerial Inspection Records:	8/11/2019	Sharper Shape aerial inspection, photos in the shared file. No observations were noted down.
VM Inspection:	N/A	
EVM Inspection:	N/A	(Note: document if "not previously in EVM Scope")
Equipment Test:	N/A	
Pole Intrusive Test:	8/11/2016	Wood strength 100%, Pass. Bottom of pole showing animal damage.
WSIP Inspection:	05/14/2019	Pole showing signs of reduced circumference and is deformed. The guy/anchor is either broken, damaged, clearance, overgrown, soil-eroded, graded or buried, strain or abrasion. Pole showing signs of animal activity (bear or mountain lion). Compelling abnormal conditions were observed for this pole, equipment, and its associated spans.

*Incident Location: SAP ID: 100111818

Hazard Barrier Analysis:

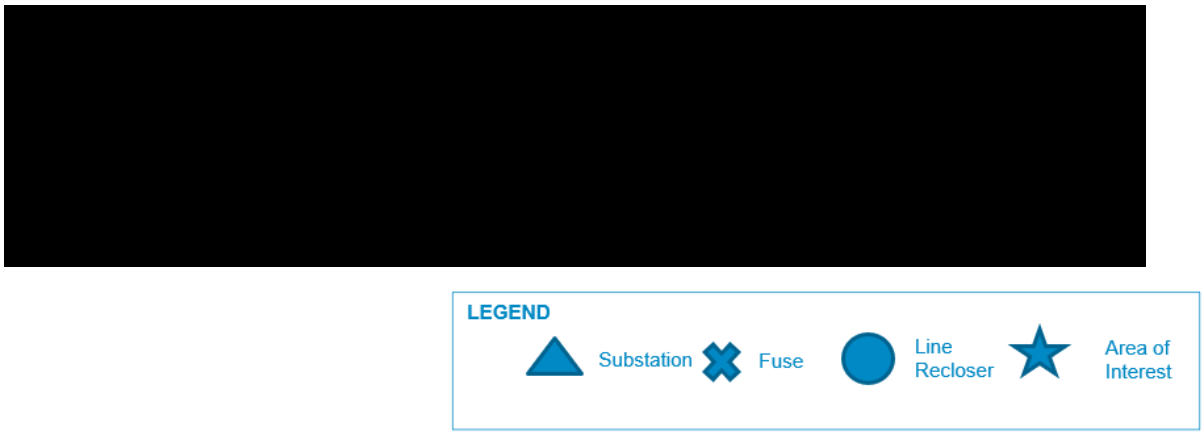
Hazard	Equipment failure				
Target	Connector				
Barrier	**Objective**	**Expected Performance**	**Did Barrier Perform as Expected**	**Did Barrier Contribute to Incident**	**Defect**
Patrol & Inspection (P&I) Records	Identify any nonconformances with poles or lines.	Inspection or patrol would identify any issues with PG&E equipment.	Yes	No	None
Wildfire Safety Inspection Program (WSIP) Inspections in high fire threat districts (HFTD)	Identify any nonconformances with structures in HFTD	Inspection would identify any issue with PG&E equipment.	Yes	No	The WSIP inspection noted guy wire issues as well as animal activity. A tag was created for the guy wire but not the compromised pole circumference however the pole did not play a factor in this ignition.
Catastrophic Event Memorandum (CEMA) Inspections	Identify dead or dying trees that could fall into primary or	Inspection would identify any dead or dying trees and mark them for removal.	N/A	N/A	N/A

	secondary PG&E facilities				
Vegetation Management (VM) Inspection (Routine)	Identify any trees that need work	Inspection would identify any vegetation that could cause a potential hazard.	N/A	N/A	N/A
Enhanced Powerline Safety Settings (EPSS)	De-energize sections of the distribution grid when a fault is experienced to make the line safe.	De-energize sections of the distribution grid until restored after visual inspection.	N/A	N/A	N/A
Enhanced Vegetation Management (EVM) Risk Inspection	Identify any trees that do not meet the state standards for minimum clearance around the power lines.	Trimming overhanging limbs & branches directly above & around the lines. Targeted removal of dead & dying trees as well as certain species that pose an increased potential risk of falling into power lines.	N/A	N/A	N/A

Potential Next Steps / Associated CAP Items:

- SCAR analysis/inspection of the Alleghany 1101 12kV circuit outcome pending as of the publish date of this report.

Single Line Diagram



Photos and Diagrams of Events

[redacted]

Figure 2 Schematics of the Incident Location as it correlates with the vegetation contact incident on the Alleghany 1101 12 kV Distribution circuit on April 18, 2022.

Figure 3 Burn scar near SAP Pole ID 1001118181. Photo taken by troubleman on April 18, 2022.

Figure 4 Burn scar near SAP Pole ID 100111818. Photo taken by troubleman on April 18, 2022.

Figure 5 SAP Pole # 100111818, photo taken by troubleman on April 18, 2022, the arrow pointing at the location where the bad connector was located before failing.

Figure 6 Photo of faulty/bad connector taken on April 18, 2022, by the responding troubleman.

Figure 7 SAP Pole ID 100111818 taken on May 14, 2019, by WSIP inspector.

Figure 8 SAP Pole ID 100111818 (showing animal damage) taken on May 14, 2019, by WSIP inspector.

Figure 9 Photo from Sharper Shape aerial inspection of Pole SAP ID 100111818 that took place on August 11, 2019.

Figure 10 Photo from Sharper Shape aerial inspection of Pole SAP ID 100111818 that took place on August 11, 2019.

Figure 11 Visuals from analysis performed by ATS on the failed compression connector.

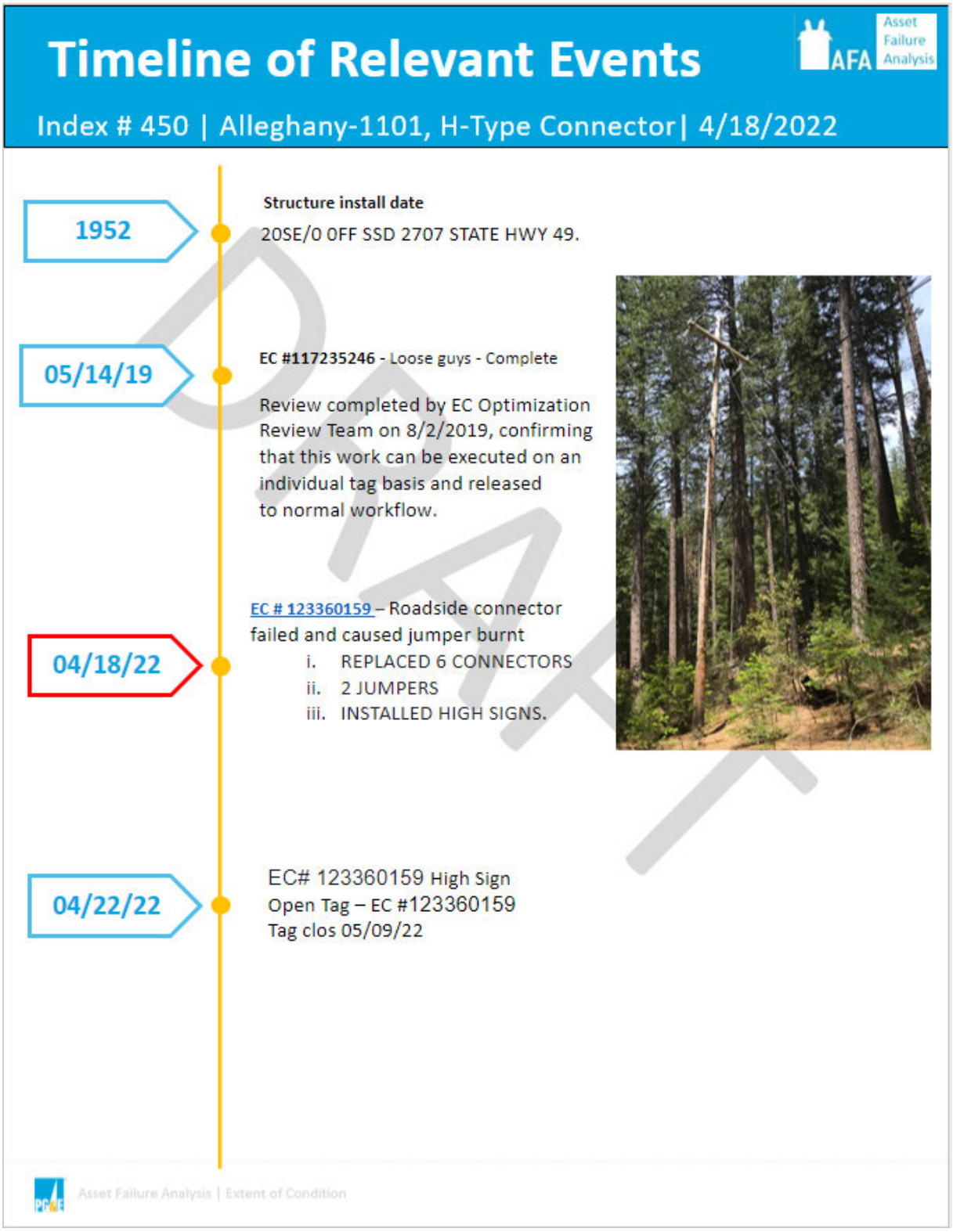
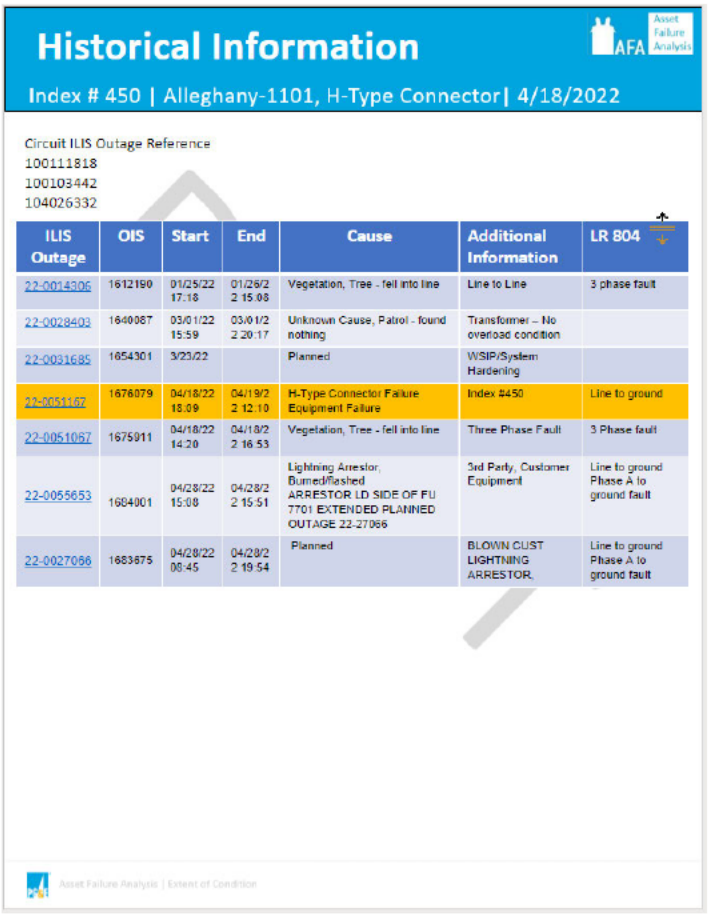


Figure 12 AFA Timeline of Relevant Events pertaining to the incident.

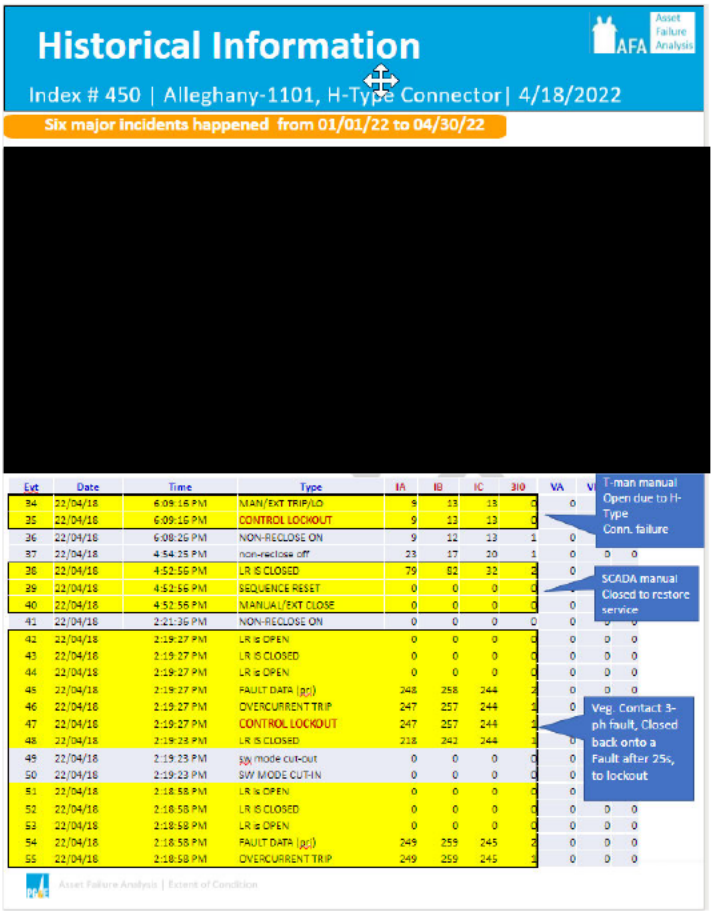


Historical Information

Index # 450 | Alleghany-1101, H-Type Connector| 4/18/2022

Circuit ILIS Outage Reference
100111818
100103442
104026332

ILIS Outage	OIS	Start	End	Cause	Additional Information	LR 804
22-0014306	1612190	01/25/22 17:18	01/26/22 15:08	Vegetation, Tree - fell into line	Line to Line	3 phase fault
22-0028403	1640087	03/01/22 15:59	03/01/22 20:17	Unknown Cause, Patrol - found nothing	Transformer – No overload condition	
22-0031685	1654301	3/23/22		Planned	WSIP/System Hardening	
22-0051167	1676079	04/18/22 18:09	04/19/22 12:10	H-Type Connector Failure Equipment Failure	Index #450	Line to ground
22-0051067	1675911	04/18/22 14:20	04/18/22 16:53	Vegetation, Tree - fell into line	Three Phase Fault	3 Phase fault
22-0055653	1684001	04/28/22 15:08	04/28/22 15:51	Lightning Arrestor, Burned/flashed ARRESTOR LD SIDE OF FU 7701 EXTENDED PLANNED OUTAGE 22-27066	3rd Party, Customer Equipment	Line to ground Phase A to ground fault
22-0027066	1683675	04/28/22 08:45	04/28/22 15:54	Planned	BLOWN CUST LIGHTNING ARRESTOR.	Line to ground Phase A to ground fault



Historical Information

Index # 450 | Alleghany-1101, H-Type Connector| 4/18/2022

Six major incidents happened from 01/01/22 to 04/30/22

[redacted]

Evt	Date	Time	Type	IA	IB	IC	3I0	VA	
34	22/04/18	6:09:16 PM	MAN/EXT TRIP/LO	9	13	13	0	0	
35	22/04/18	6:09:16 PM	CONTROL LOCKOUT	9	13	13	0		
36	22/04/18	6:08:26 PM	NON-RECLOSE ON	9	12	13	1	0	
37	22/04/18	4:54:25 PM	non-reclose off	23	17	20	1	0	0 0
38	22/04/18	4:52:56 PM	LR IS CLOSED	79	82	32	2	0	
39	22/04/18	4:52:56 PM	SEQUENCE RESET	0	0	0	0		
40	22/04/18	4:52:56 PM	MANUAL/EXT CLOSE	0	0	0	0	0	
41	22/04/18	2:21:36 PM	NON-RECLOSE ON	0	0	0	0	0	
42	22/04/18	2:19:27 PM	LR is OPEN	0	0	0	0	0	0 0
43	22/04/18	2:19:27 PM	LR IS CLOSED	0	0	0	0	0	0 0
44	22/04/18	2:19:27 PM	LR is OPEN	0	0	0	0	0	0 0
45	22/04/18	2:19:27 PM	FAULT DATA (pg)	248	258	244	2	0	0 0
46	22/04/18	2:19:27 PM	OVERCURRENT TRIP	247	257	244	1	0	
47	22/04/18	2:19:27 PM	CONTROL LOCKOUT	247	257	244	1		
48	22/04/18	2:19:28 PM	LR IS CLOSED	218	243	244	1	0	
49	22/04/18	2:19:23 PM	sw mode cut-out	0	0	0	0	0	
50	22/04/18	2:19:23 PM	SW MODE CUT-IN	0	0	0	0	0	
51	22/04/18	2:18:58 PM	LR is OPEN	0	0	0	0	0	
52	22/04/18	2:18:58 PM	LR IS CLOSED	0	0	0	0	0	0 0
53	22/04/18	2:18:58 PM	LR is OPEN	0	0	0	0	0	0 0
54	22/04/18	2:18:58 PM	FAULT DATA (pg)	249	259	245	2	0	0 0
55	22/04/18	2:18:58 PM	OVERCURRENT TRIP	249	259	245	1	0	0 0

T-man manual Open due to H-Type Conn. failure

SCADA manual Closed to restore service

Veg. Contact 3-ph fault, Closed back onto a Fault after 25s, to lockout

Figure 13 AFA Historical Information pertaining to the incident.

Revision Notes

Section:	What Changed?
Table:	
Failure driver:	Added to table: 'Utility Work/Operation' – Removed from table: 'All types of equipment/facility failure'
Failure Sub-driver:	Added to table: 'Improper Construction' – Removed from table: 'Utility work'

Attachments

Attachments and references can be in the ESA folder, located below:

[redacted]

----------END of REPORT----------