|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| EVENT REPORT: Power outage from FOT | | | | | | | | | | | | | | |
| 1. WHAT IS THE PROBLEM? | | | | | | | | | | | | | | |
| Title: POWER OUTAGE FROM RCA | | | | | | | | | | | | | | |
| Date Occurred: 25/10/2021, 23/10/2021, 21/10/2021, 17/10/2021,16/10/2021 | | | Time: | | | | | Location/System: FORCADOS TERMINAL | | | | | | |
| Date Reported: 25/10/2021, 23/10/2021, 21/10/2021, 17/10/2021,16/10/2021 | | | Time: | | | | | Reported by: SYSTEM | | | | | | |
| **Event Type:** | | Potential Threat (not yet occurred)  Reliability/integrity – Trip  Reliability/integrity – Equipment failure  Reliability/integrity – Others | | | | | | | |  | | | | |
| Equipment Tag Number: FOT | | | | | | | | | | | | | | |
| Threat Description:  Forcados Terminal power generation system provides power to the upstream facilities (South bank, North Bank and Yokri facilities, and some host communities).  These facilities use power for operations of the export pumps to supply Oil to the terminal.  There have been several events of power outages from FOT leading to deferment in North bank FS and CPF.  Sequence of Events:  **16/10/21**: About 12:40hrs and 13:08 hrs: 33 kV Transmission Transformer (TR-8111 ) Trip. No indication on  33kV switch gear but master trip relay tripped on the 11kV switch gear ( SG101).  **17/10/21:** About 8:15 hrs: 33 kV Transmission Transformer (TR-8111 ) Trip. No indication on  33kV switch gear but master trip relay tripped on the 11kV switch gear (SG101).  **21/10/21:** About 4:20 am and 12:01 Pm: 33 kV Transmission Transformer (TR-8111 ) Trip. No indication on  33kV Switch gear. Master trip relay tripped on the 11kV switch gear ( SG101)  **22/10/21:** About 12:20 pm: 33 kV Transmission Transformer (TR-8111 ) Trip. No indication on the 33kV switch gear but master trip relay tripped on the 11kV switch gear ( SG101).  **25/10/21:** About 9:25 am: 33 kV Transmission line trip. Inter-trip received alarm indicated and power system fault indicated on the HMI of the 33kV Switch gear. No alarm indication of TR-8121 @ 11kV Switch gear ( SG101) Note: TR-8121 (Primary) did not trip but TR-8121 (Secondary) tripped. | | | | | | | | | | | | | | |
| Consequences: | | | |  | Risk Assessment: (People, Asset, Environment, Reputation) | | | | | | | | | |
| No deferment / outage  Oil: BBLS  Gas: MMSCF  Water: BBLS  Flare: MMSCF  Other:  Downtime | | | |  | A | B | | C | | D | E | | Consequence Scenario  The several Power outages from FOT caused a total deferment of 32,000bbls and 15mmscf of gas for Northbank and Southbank.  Actual: A3C |
| 0 |  |  | |  | |  |  | |
| 1 |  |  | |  | |  |  | |
| 2 |  |  | |  | |  |  | |
| 3 |  |  | | X | |  |  | |
| 4 |  |  | |  | |  |  | |
| 5 |  |  | |  | |  |  | |
| Immediate Corrective Actions Taken: | | | | | | | | | | | | | | |
| # | Immediate action | | | | | | | | | | | | By | |
| 1. | 16/10/2021 - A line walk across the overhead line (OHL) ROW was conducted immediately on different occasions and no damage was found. - Power restored | | | | | | | | | | | | FOT Electrical Team | |
| 2. | 17/10/2021 - A line walk across the overhead line (OHL) ROW was conducted immediately on different occasions and no damage was found – Power restored | | | | | | | | | | | | FOT Electrical Team | |
| 3 | 21/10/2021 – Line walks across the overhead line and observed a climbing plant entangled on the line. The climbing plant was cut off from the base to dry off and drop. – Power restored | | | | | | | | | | | | FOT Electrical Team | |
| 4 | 23/10/2021 - No indication on the 33kV switch gear but master trip relay tripped on the 11kV switch gear. Swapped tripped TR-8111 with TR-8121. Power restored. | | | | | | | | | | | | FOT Electrical Team | |
| 5 | 25/10/2021 - 33 kV Transmission line trip. Inter-trip received alarm indicated and power system fault indicated on the HMI of the 33kV Switch gear. Alarm reset and Power restored | | | | | | | | | | | | FOT Electrical Team | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2. WHAT DO WE THINK CAUSED THE PROBLEM? | | | | | | | |
| **Investigation Team** | | | Obioha Obinna, Azibapu Franklin, Onukem Bright, Ohore Stanley, Victor Ndukwe, Ajayi Olakunle, Iroboudu Otoakhia, Nathan Patrick, Gbalaka Ovie, Nemibofori Gabriel, Akporie Samson, Edache Simon, David Emmanuel, Ejiformah John, Ononogbu Harry. | | | | |
|  | | Why? / Immediate cause | | Answer/Root Cause | EVIDENCE? | | |
| **Why 1** | | Why was power outage from FOT? | | 1. Transformer de-energized (TR-8111) 2. Transformer de-energized (TR-8121) 3. Solar turbine(s) shutdown 4. Outgoing feeder (Secondary) of TR-8111 trip. 5. Outgoing feeder (Secondary) of TR-8121 trip. | Physical observation | | |
| **Why 2** | | 1. Why did transformer TR-8111 de-energize? 2. Why was there a trip on the Outgoing feeder TR8121? | | * 1. Trip on the incoming feeder circuit breaker.   2. Solar turbine(s) shutdown   3. Master relay (MVAJ) trip | Physical observation (breaker in open condition) | | |
| **Why 3** | | Why was there a trip on the incoming feeder circuit breaker? | | 3.1 Master relay (MVAJ) trip  3.2 Manual action | Master Relay MVAJ flagged | | |
| **Why 4** | | Why did Master Relay MVAJ trip? | | 4.1 Undervoltage  4.2 Earth fault  4.3 Transformer fault (ANY)  4.4 Current differential  4.5 Under frequency  4.6 Overload  4.7 Design | Line walk was done, and it was observed that a climbing plant entangled one of the lines via the pole re-enforcement.  An FYIP fault investigation study has been completed and there are corrective actions yet to be implemented. STOP | | |
| **Why 5** | | 1. Why was there an earth fault? | | 5.1.1 Vegetation growth . STOP  5.1.2 Dangling power cable |  | | |
| **Why 6** | | Why dangling power cable? | | 6.1.1 Dropped porcelain insulator hangers STOP | Physical observation – Porcelain defect | | |
| **Comments:** | | | | | | | |
| **3. WHAT SOLUTIONS DO WE HAVE IN MIND?** | | | | | | | |
| **#** | **Proposed Action** | | | | | **Action Party** | **Target Date** |
| **1** | Develop a plan to carry out periodic plant cutting around the lines. | | | | | Abule James |  |
| **2** | Consider concretizing the pole areas | | | | | Ogun Patrick |  |
| **3** | Check the wiring and the masking of the automatic transfer scheme, as well as the wiring of the measuring points of voltage and current. ref: Siemens report in appendix | | | | | Madume Emmanuel |  |
| **4** | Adjust the settings for 06-52-103 and 06-52-101 relays as seen [3] in the Siemens report. ref: Siemens report in appendix | | | | | Madume Emmanuel |  |
| **5** | Adjust the settings of 11kV SPAJ 140C like described in [3] or in Table 5. Especially the I>> stage should be adjusted. ref: Siemens report in appendix | | | | | Madume Emmanuel |  |
| **6** | Maintain minimum critical stock level of Porcelains. | | | | | Madume Emmanuel |  |
| **4. HOW WILL THE PROPOSED SOLUTIONS ELIMINATE THE CAUSES OF THE PROBLEM?** | | | | | | | |
| 1. Putting a contract/system in place to carry out routine surveillance of the poles would help to identify any imminent threat to the power transmission line e.g. Climbing plants and nature of the Porcelain and address the threat immediately before impact. 2. The study of the faults by the Siemens team contains some implementation actions to be done and a vendor mobilized to carry out similar study and has proposed some other recommendation on the protection study. There must be an alignment of the reports and implementation done on the relays. If this is done, then most of these trips would be averted. | | | | | | | |
| **LESSONS LEARNT**  Master trip relays are the final command of the breaker tripping circuits. Master trip relays is nothing but a collection of all tripping circuits. If one of the unit breaker trips, this should not transcend to the Master relay trip. | | | | | | | |
| **Incident Owner: Ogun Patrick** | | | | | | | |

**APPENDIX**

