

TCS Electrification Services and Products



Brochure
January 2023

About us



TCS Electrification, division of TCS, is specialized in the Electrical Systems from Early Studies and Detailed Design to Construction, Commissioning, Operations and Final Decommissioning.

Our technical team is composed by high profile engineers and experts with extensive experience in the Oil&Gas, Heavy Industry and Energy Sectors.

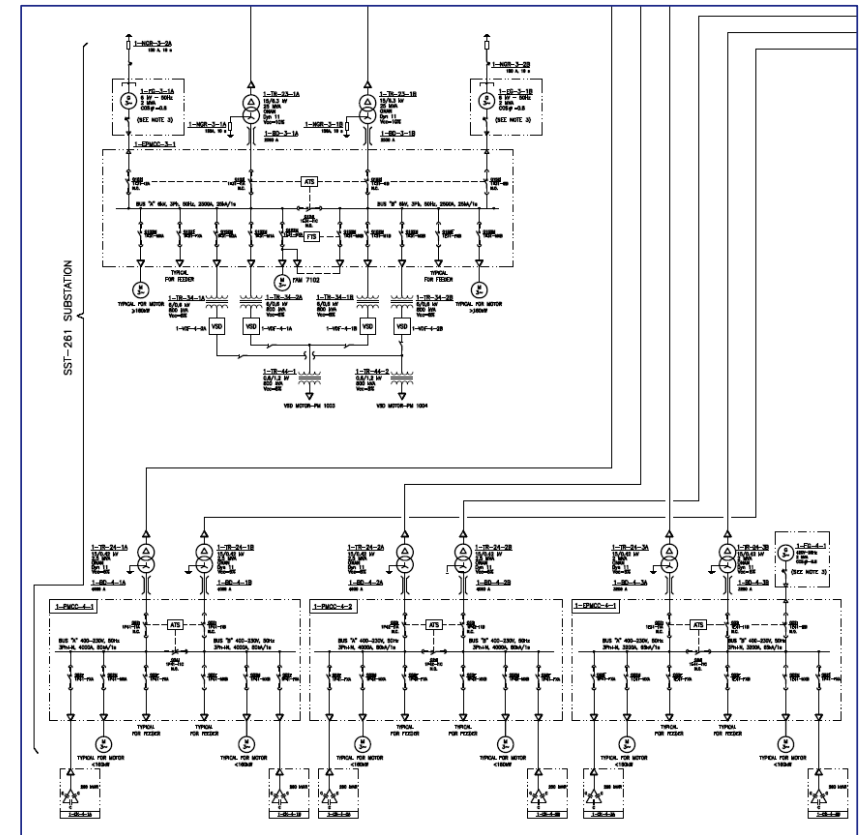
Our activity is focused in particular on:

- Design, Procurement, Construction and Start-up*
 - Feasibility and Network Studies*
 - Incident investigations and Troubleshooting*
 - Asset Integrity Management*
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Design, Procurement, Construction and Start-up – General



- Design as per IEC, NEC/NFPA, GOST international codes. Inclusion of local codes and standards where required.
- Electrical substations and E-house
- New systems/plants, retrofit, upgrades
- *Sub-systems:*
 - HV and MV switchgears (air and gas insulated)
 - LV switchgears
 - SCADA and PMS
 - Electrical Generation and Motors
 - UPS and batteries
 - Transformers
 - VFDs, soft-starters and power electronics
 - Ex equipment selection
 - Electrical Heat Tracing (*coordination only)

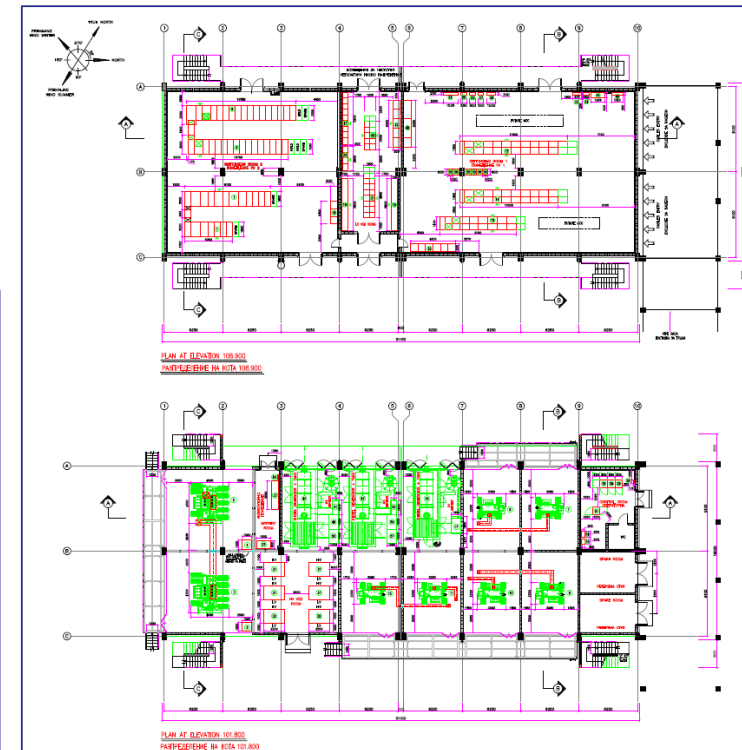
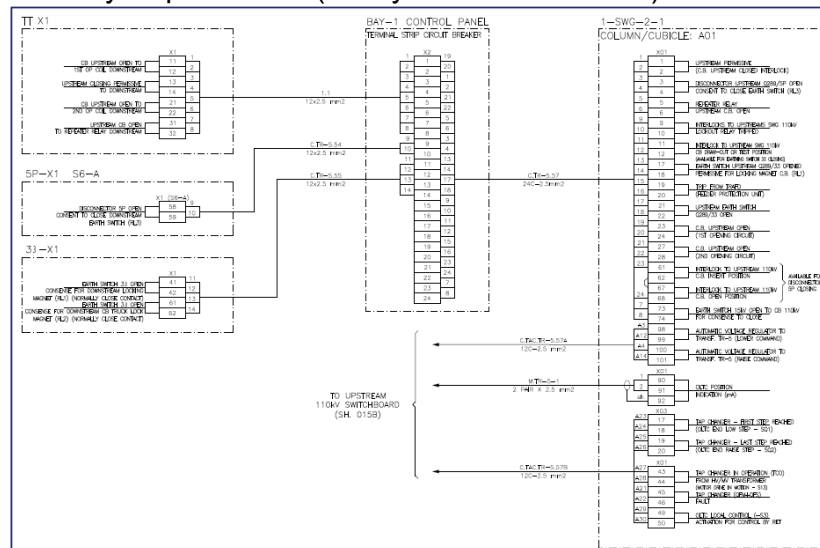


Design, Procurement, Construction and Start-up – Substations and E-house



Activities

- Electrical Design
- Layout definition and space management
- Components/systems sizing and design
- Material selection
- Interconnections between systems
- Application of safety requirements (safety tools and barriers)

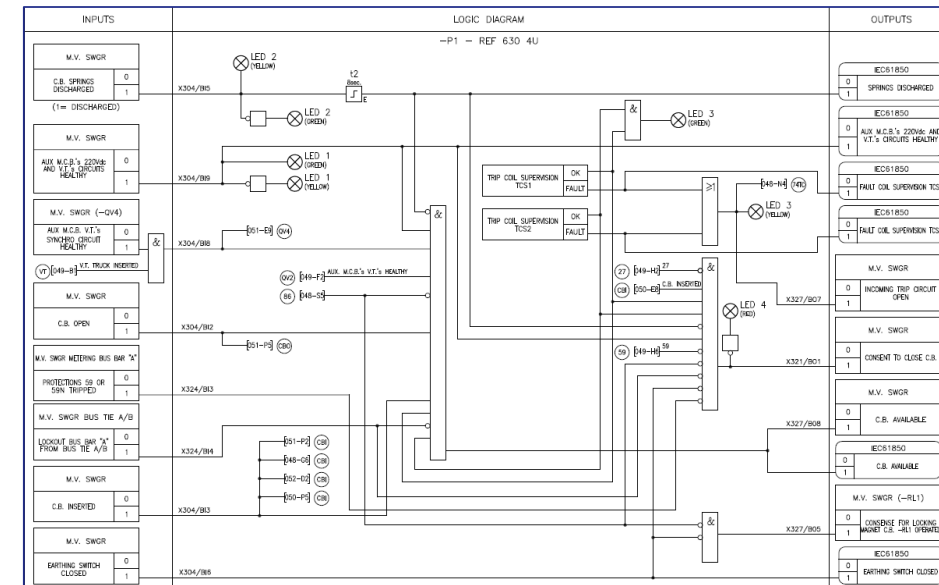
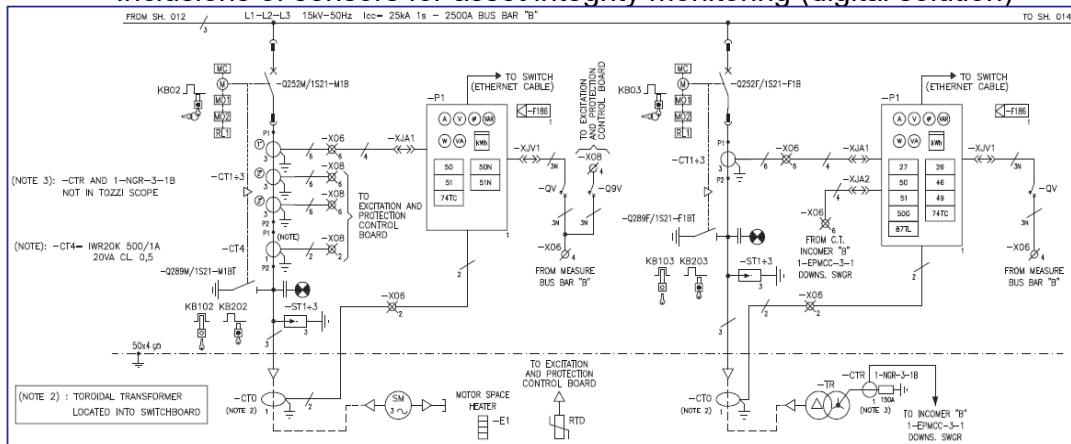


Design, Procurement, Construction and Start-up – Sub-Systems and Components



HV and LV switchgears and switchboards

- From <1kV (LV) up to 40.5kV (HV - GIS)
- Air Insulated and Gas Insulated
- New built, refurbishment and retrofit of old switchgears and switchboards
- Vendor and material selection based on applicable specifications
- Schematics and logic diagrams
- Interface with remote monitoring and control systems (PMS, SCADA, DCS, ESD, PCS, etc.) through hardwired and/or serial link (IEC 61850, IEC 60870-5-103, Profibus, Modbus, etc.)
- Serial network architecture definition and selection (Star, HSR, PRP)
- Inclusions of sensors for asset integrity monitoring (digital solution)

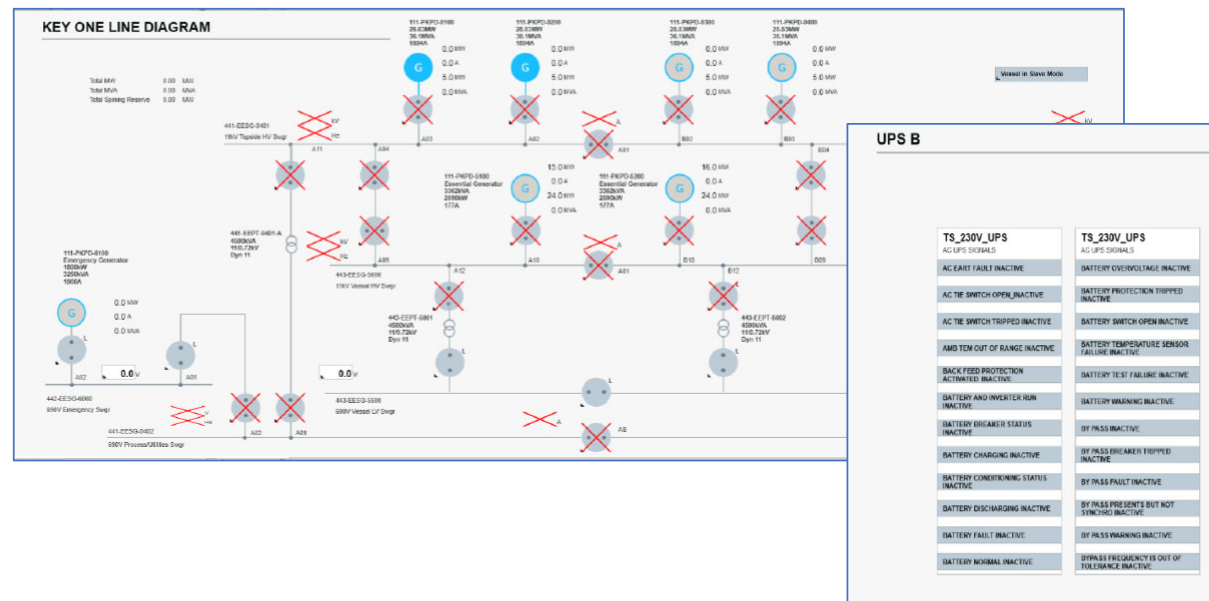


Design, Procurement, Construction and Start-up – Sub-Systems and Components



SCADA

- Electrical Monitoring and Control System with unlimited number of I/O
- Interface with electrical system through hardwired and/or serial links (IEC 61850, IEC 60870-5-103, profibus, modbus, etc.)
- Design for Maintenance
- Definition of Interface (Serial and/or Hardwired) with protection relays and electrical packages (e.g., UPS, VFDs, etc.).
- Configuration using communication protocol IEC 61850, IEC 60870-5-103, profibus, modbus RTU, etc.
- Definition of Interface (Serial and Hardwired) with process monitoring and control systems (DCS, PCS, ESD, etc.)
- Definition of Interlocking Logic between different substations/switchboards
- Remote control of Circuit Breakers
- Optimization of HMI and management from Field Operators
- Digital solution for remote monitoring and preventive maintenance

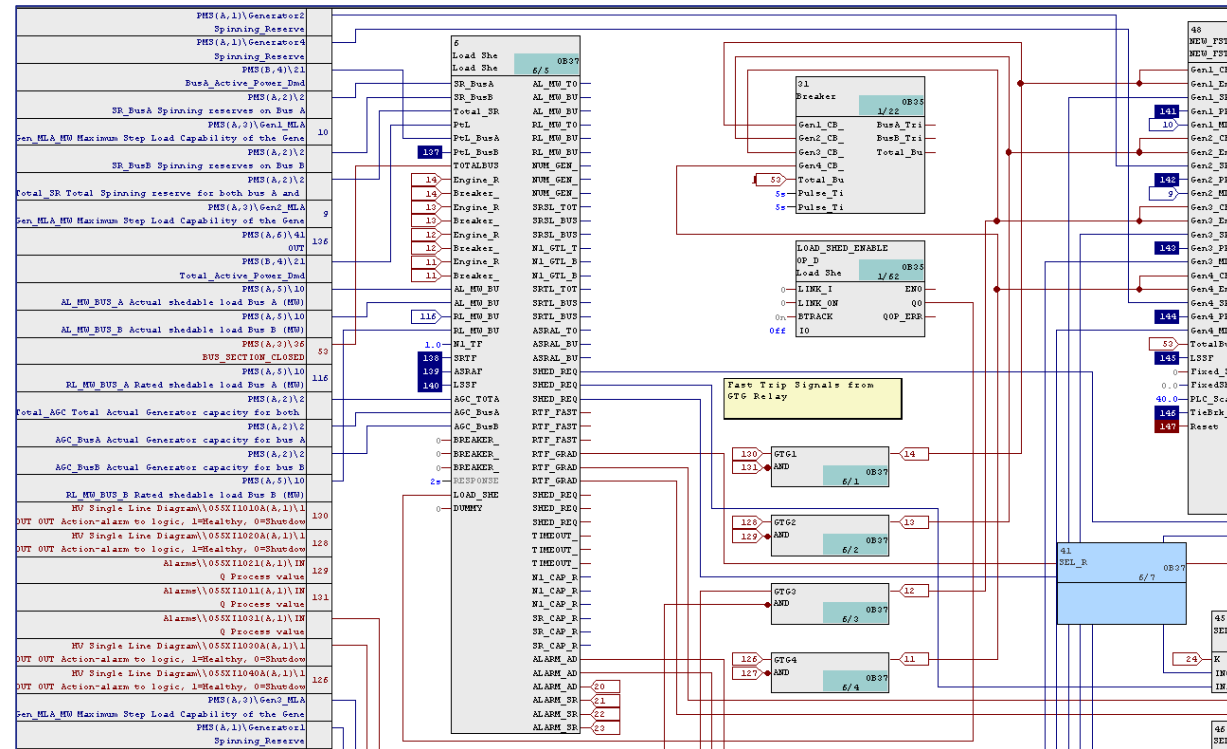


Design, Procurement, Construction and Start-up – Sub-Systems and Components



PMS

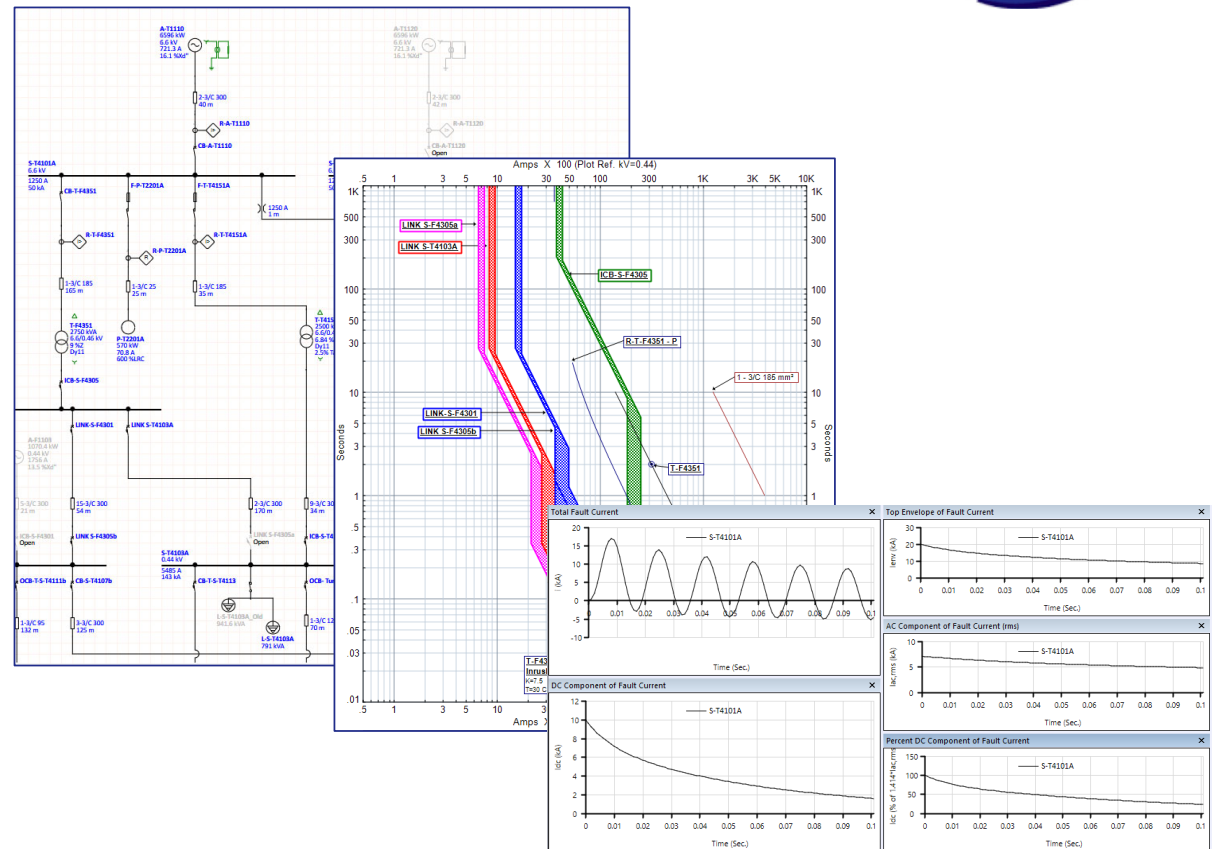
- Power Management System with unlimited number of power generators
- Design for Maintenance
- Definition of Interface (Serial and Hardwired) with protection relays
- Definition of Interface (Serial and Hardwired) with power generators and remote monitoring and control system (SCADA and DCS)
- Load sharing (Isoch, Droop and back-up to Turbine Control Panel)
- Spinning reserve calculation and optimized load start inhibition logic
- Load shedding (gradual, fast, frequency)
- Possibility of integration of SCADA in the same system (PMS + SCADA)
- Optimization of HMI and management from Field Operators
- Digital solution for remote monitoring and preventive maintenance



Feasibility and Network Studies



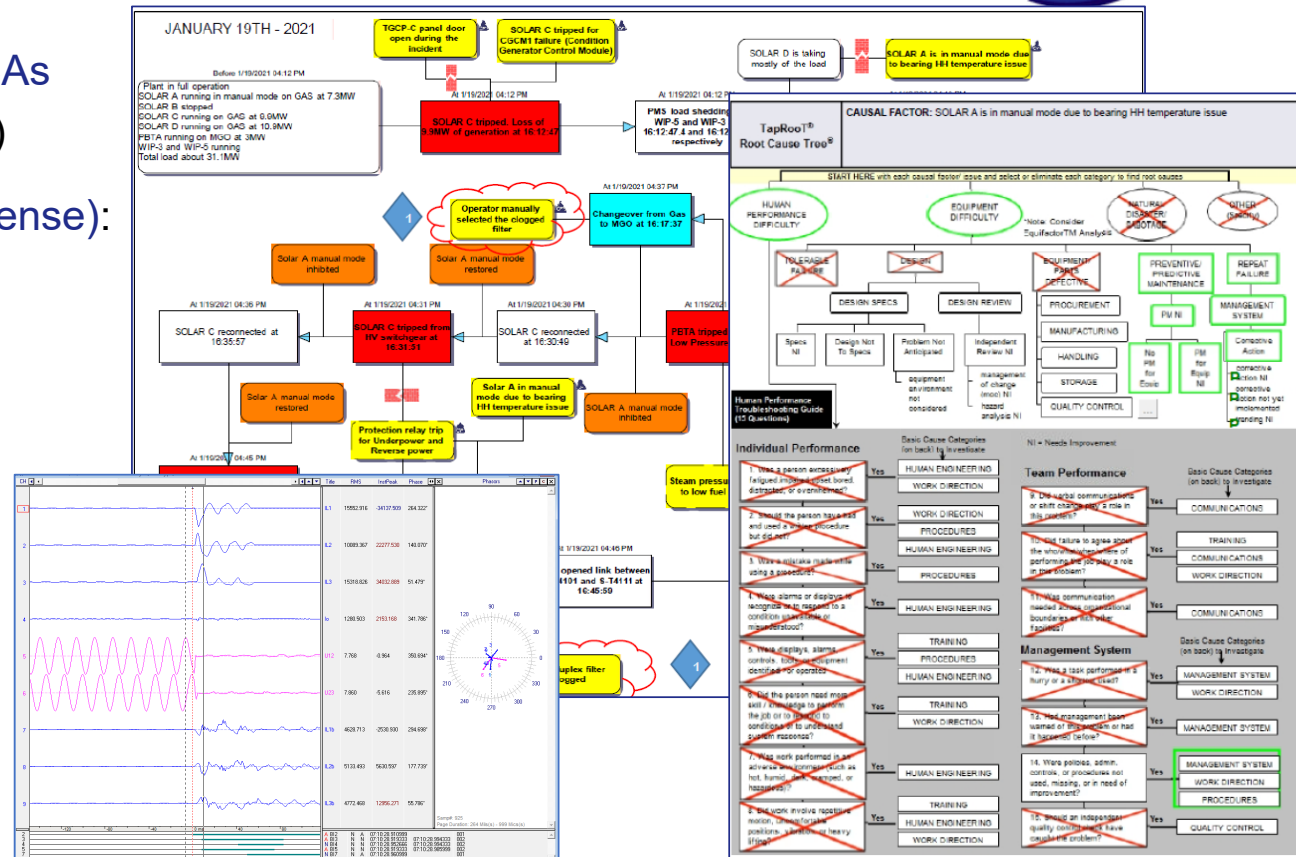
- **Feasibility Studies:**
 - Integration of new systems and connections to external energy providers (TSO)
 - Plants upgrades
- **Network Studies (using ETAP software):**
 - Grounding and Lightning Analysis
 - Load Flow
 - Short-Circuit
 - Motor Starting
 - Transient Stability
 - Harmonic Analysis
 - Coordination and selectivity of electrical protections
 - Arc-Flash assessment and mitigations (IEEE 1584-2018 and NFPA 70E-2021)
 - Electrical Reliability Studies



Incident Investigation and Troubleshooting



- Event reconstruction and Incident RCAs (methods used: Taproot® and 5WHY)
- Provide mitigation plan (4 lines of defense):
 - Operational procedure changes
 - Maintenance upgrade
 - Barriers to restore/put in place
 - Design changes (retrofit, system upgrades, etc.)



Asset Integrity Management



- Definition of Maintenance Procedures and Strategies (preventive maintenance strategies based on industrial practices and international codes)
- Obsolescence assessment and sparing strategies
- Asset Field Assessment:
 - Dielectric and resistance/continuity test
 - TanD and PD (Online and Offline)
 - MCSA/ESA (Motor Current Signature Analysis / Electrical Signature Analysis)
 - Etc.

Work Instruction							
PM to be done by Third Party							
1)	PREREQUISITE						
1.a.	Maintenance to be performed only by personal with High Voltage Qualification						
1.b.	Carry out all task as per						
1.c.	If maintenance will be highlighted.						
1.d.	Review a Thermograp						
1.e.	Ensure clusters and t						
1.f.	Ensure the "Black Sta						
1.g.	Executed Busbar by b						
1.h.	"Special attention to						
2)	VISUAL INSPECTION BEFORE EQU						
2.a.	Visual inspection of in						
2.b.	Visual inspection of la						
2.c.	Visual inspection of in						
2.d.	Inspection of the HV S						
3)	PARAMETER RECORD						
3.a.	Record the value of th						
4)	ISOLATION						
4.a.	Perform Isolation foll Authority.						
4.b.	Place Isolation Labels						
5)	DETAILED INSPECTION						
5.a.	Open cubicle/section doors, remove panel/enclosure covers.						
5.b.	External cleaning of steel doors/covers and components.						
5.c.	Tight connections and torque following Vendor recommendations on busbars and report						
5.d.	Tighten connections and torque following Vendor recommendations on fuses and report.						
5.e.	Tighten connections and torque following Vendor recommendations on joints in general and report.						
5.f.	General internal cleaning of busbars, insulators, cubicles and components using vacuum cleaner and dielectric solvent.						
5.g.	Ensure correct alignment of removable Switchboard circuit breaker/fuse switch connections following Vendor recommendations. Replace clusters/tulips on condition.						
5.h.	Inspect Busbar compartments, ensure all dust, debris is removed.						
5.i.	Visual inspection of enclosure housing checking seals						
5.j.	Visual inspection of enclosure housing checking alignment & screws all in place.						
5.k.	Inspect all busbar support insulators.						
5.l.	Inspect all circuit breaker connections between busbars and circuit breaker.						
5.m.	Torque accordingly as per Vendor specifications and record.						
5.n.	Inspection of High & Low voltage terminations; check integrity & tightness						
5.o.	Ensure satisfactory operation of switchboard shutters						
5.p.	Inspect main Switchboard earthing arrangement. Readings above 1 Ohm to be treated as fault.						
5.q.	Ensure all earth bonding is clean, undamaged and free from corrosion						
5.r.	Check fuse size and protection settings.						
5.s.	Confirm interlocking arrangements between feeders and bus section breakers.						
6)	FUNCTION TEST						
6.a.	Test Insulation; Resistance of C.T. (windings, overloads, circuit breakers. Ensure trip setting is as per design) and report value in WO history.						
6.b.	Test resistance of Busbar joints/connections using a Ductor Test Meter, record reading giving details of where the measurement was taken.						
6.c.	Carry out H.V. Insulation Resistance (IR) test on bus bar and record.						
6.d.	Polarisation Index (PI) tests and record. Minimum PI value = 1.7: All IR values between 1 and 2 M Ohms should be trended to monitor degradation. Values below 1 M Ohm should be investigated						
6.e.	Megger test on auxilliary circuits						
	<table border="1"> <thead> <tr> <th>Circuit Voltage</th> <th>Test Voltage</th> <th>Minimum IR</th> </tr> </thead> <tbody> <tr> <td>>6.6 KV - 11 KV & Above</td> <td>5000V</td> <td>200 M Ohms</td> </tr> </tbody> </table>	Circuit Voltage	Test Voltage	Minimum IR	>6.6 KV - 11 KV & Above	5000V	200 M Ohms
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TCS Electrification



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