BALANCE OF PLANT; IT’S A BIG DEAL

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What is “Balance of Plant” (BoP)

- BoP is all the supporting components and systems of a Hydropower plant needed to deliver the energy other than the generating unit itself.

- BoP may include transformers, cooling systems, water conveyance, SCADA, Cranes, Fish Bypasses, etc.

- BoP components and systems failure risk can depend on the condition, age and complexity of the plant. Testability and Maintainability also play large roles.
Typical Hydro Powerhouse Mechanical Systems

- Cooling water system
- Dewatering system
- Drainage System
- Service Air System
- Emergency Diesel
- Cranes
- Fire Protection
- HVAC
- Oil Treatment System
- Others (specific to each plant)

This is what can happen without enough Predictive Maintenance.
This is also what can happen without enough Predictive Maintenance.

Typical Hydro Powerhouse Electrical Systems

- High Voltage Switchyard
- Power Transformer
- Bus Duct
- Generator Circuit Breaker
- Medium Voltage Switchgear
- Station Supply AC/DC
- Cable/System
- Communications
- Emergency Diesel
- Light and Small Power
- Earthing and Lightning
- Others
These belong to Mechanical, Electrical, and Operational Groups who all take care of them.
What counts: Economics and Quality of Power

Without money, can you achieve Resilience, Reliability and Sustainability?
How to Identify Cycling Effects on Unit BoP Systems and Equipment
Let’s Talk Electrical BoP

- Is your plant’s equipment documentation thorough?
- Is one crew's equipment documentation better than another (electrical vs. mechanical equipment)?
- Is whole plant shutdown more susceptible from electrical equipment than from mechanical equipment?
- How are your One Line diagrams?
The Operator: Locating the Valve or Circuit on a Drawing?

- The Turbine-Generator Lockout-Tagout (LOTO) process is well known and documented now.
- The BoP LOTO processes are often not as well known than the units.
- Newer plants have accurate One Line diagrams and Piping & Instrumentation (P&ID) drawings.
- Do your older plants have complete P&IDs and One Line Diagrams? Are equipment tags installed everywhere?
- Do you find that plant drawings are more accurate than the engineering drawings?
Developing Need: New and Upgraded P&IDs

- LOTO is easier when equipment is tagged and P&IDs (and One Lines) are accurate.
- P&IDs provide a great training tool for new (and old) staff.
- Operator and maintenance errors are avoided.
- Did I mention LOTO?
Proper Care: BoP Equipment

- If equipment is redundant, or is not critical, having a spare may be enough (Reliability Centered Maintenance Approach).
- Know the consequences and likelihood of failure for every piece of equipment (Asset Management and Failure Modes and Effects).
- Track condition via thermal scans, oil analysis, equipment efficiency degradation and other tools (Predictive Maintenance).
- Analyze historical data (Computerized Maintenance Management System) and plan major maintenance well.
- Treat BoP as you would the unit. If no redundancy is built in, it could be likely to fail and cause a trip.
Which of these systems is more important?

Questions or Thoughts?

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