Interior Region 7
Upper Colorado Basin
Glen Canyon Field Division
Glen Canyon Overview

• Placed into service in 1965.
• Eight Generating Units with an overall rating of 1,320 MW (depending on net head, currently around 470 feet).
• Roughly 110 employees work at Glen Canyon.
• 41 are dedicated to maintenance.
• Remainder is comprised of maintenance support / planning, admin, warehouse and security.
Generator Diagram
Generation Big Picture

- Generator
- Buswork
- Circuit Breaker & Disconnect Switch
- Step-Up Power Transformer
- Cable
- Transmission Line
- Surge Arrester
- To Switchyard
What Drives Maintenance / Outages?

- USBR Periodic Maintenance Requirements (FIST)
- Reliability Compliance (NERC / WECC)

• What are these?
FIST

Facilities Instructions, Standards & Techniques. (USBR)

• Specifies when periodic maintenance is to occur and how the maintenance is to be performed.

“Typical” Maintenance Season Begins September 1st through May 31st.
NERC (National Electrical Reliability Corporation)

• The North American Electric Reliability Corporation (NERC) is a not-for-profit international regulatory authority whose mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid.

• NERC develops and enforces Reliability Standards; annually assesses seasonal and long-term reliability; monitors the bulk power system.
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<tr>
<th>Generator</th>
<th>Unit Breaker</th>
<th>Transformer</th>
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- We typically do four units in the fall and four units in the spring.
- Past practice was to take two units down at a time for one month.
- Current practice is to take only one unit down at a time for two weeks.
Equipment Life Cycle Management

• USBR has developed guidelines on typical life cycle replacement schedule for generators, breakers, transformers, turbines, draft tubes etc.
• Typical life expectancy of a generator winding is 25 years.
• Typical life expectancy of a turbine is 45 years.
• Typical life expectancy of a transformer is 45 years.
• So, do we just replace the equipment when it hits that age?
  
  NO
Equipment Life Cycle Management

- USBR utilizes a program called HydroAmp

- Hydropower Asset Condition Assessments

- All of the power train equipment is assessed annually with each component on the equipment given a numerical value of its condition.

- These numbers are used to determine the overall condition of the equipment.
Determining When to Replace Equipment

• We’re looking five years out from the expected replacement schedule and the HydroAmp condition assessment to predict replacement.
• When the equipment is showing signs of failure, we will begin scheduling it’s replacement.
• Budget Planning with CREDA and WAPA.
• Engineering required?
• Developing overall acquisitions strategy.
• Planning for outages.
## High Level Schedule Overview

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Current Large Capital Replacements

• Transformers
  Four banks of transformers (2 units per bank)
  Project began in December of 2018
  Many delays with the first bank

• First bank scheduled for completion in March 2020

• Overall project scheduled for completion in September/October of 2021
Future Large Capital Replacements

• Station Service Transformers and Switchgear Replacement.

• Scheduled to coincide with the completion of the transformer replacement. There will be shorter duration outages with this job.

• Recoating Outlet Works and the Hollow Jet Tubes. (Still in the engineering and planning stages)
At the end of the day,

• We deliver water, generate power as directed by the USBR Water Management Group (monthly releases) and by WAPA (hourly/daily releases).

• Strive to have all available units available for HFE’s.

• Follow the LTEMP / ROD.

• Do our best to ensure generation equipment reliability.

• Operate as efficiently as possible for our stakeholders.

• Stuff happens, equipment sometimes just fails for a variety of reasons; there is no crystal ball.