



— BUREAU OF —  
RECLAMATION

# Interior Region 7

Upper Colorado Basin

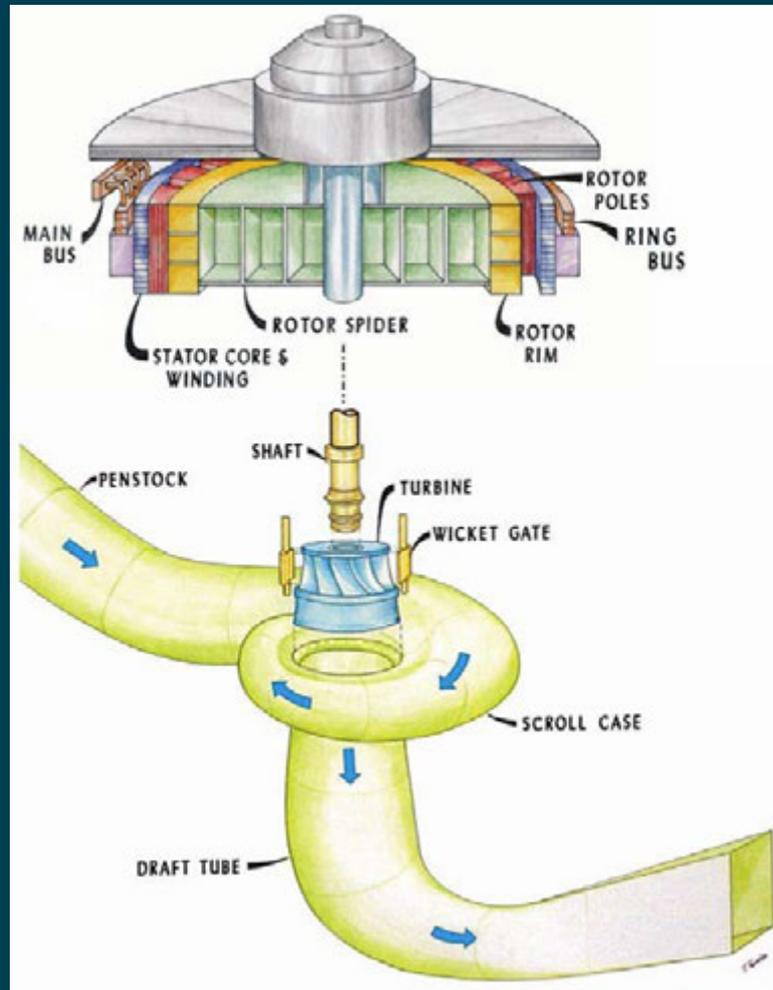
Glen Canyon Field Division

# Glen Canyon Overview

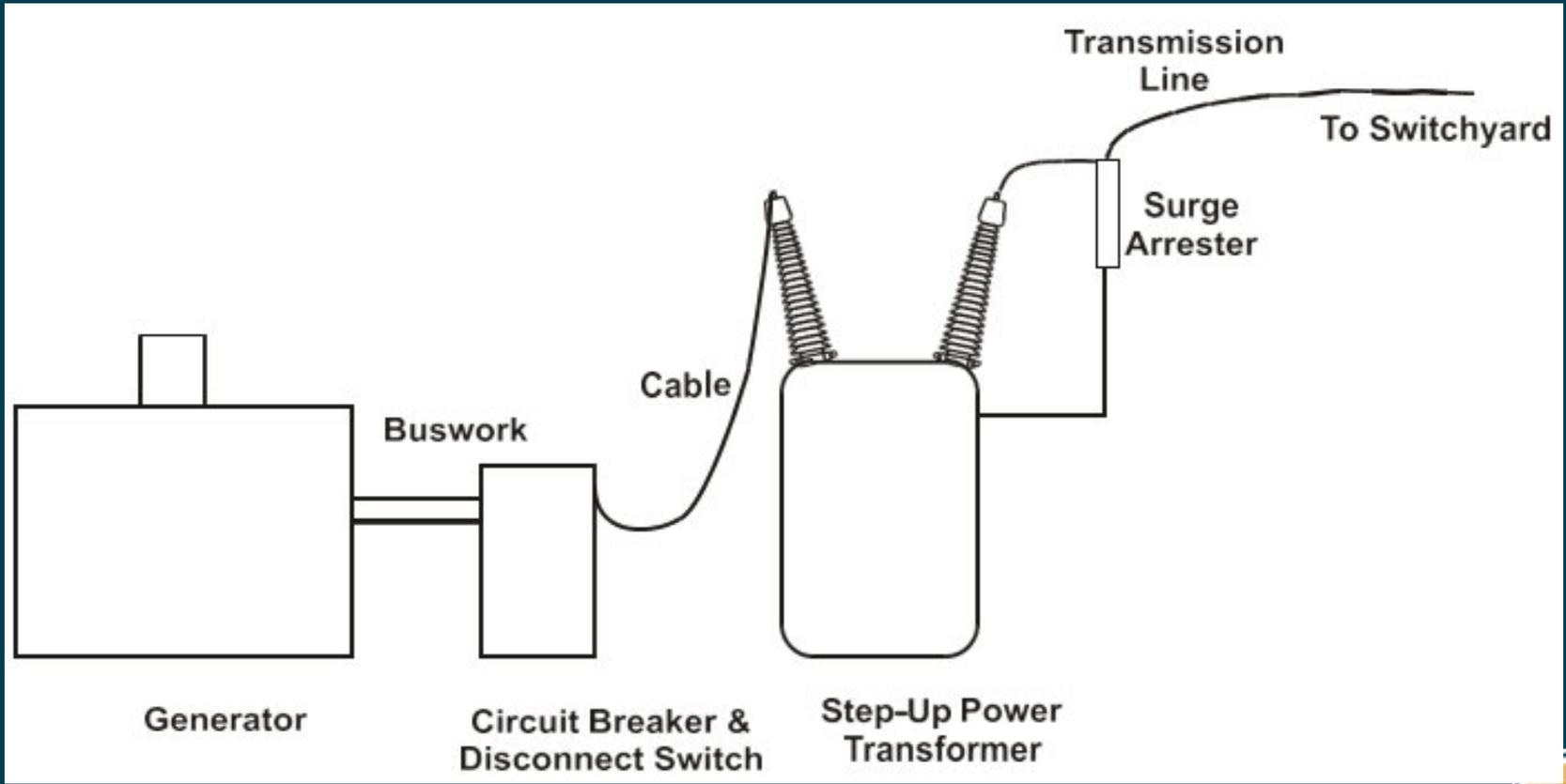
- Placed into service in 1965.
- Eight Generating Units with an overall rating of 1,320 MW (depending on net head, currently around 470 feet).
- Roughly 110 employees work at Glen Canyon.
- 41 are dedicated to maintenance.
- Remainder is comprised of maintenance support / planning, admin, warehouse and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



# Generator Diagram



# Generation Big Picture



# 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 1<sup>st</sup>  
through May 31<sup>st</sup>.



# 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.



# GLEN CANYON NERC / FIST Compliance

## Annual Maintenance

Generator

Unit Breaker

Transformer

- 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 it's condition.
- These numbers are used to determine the overall condition of the equipment.

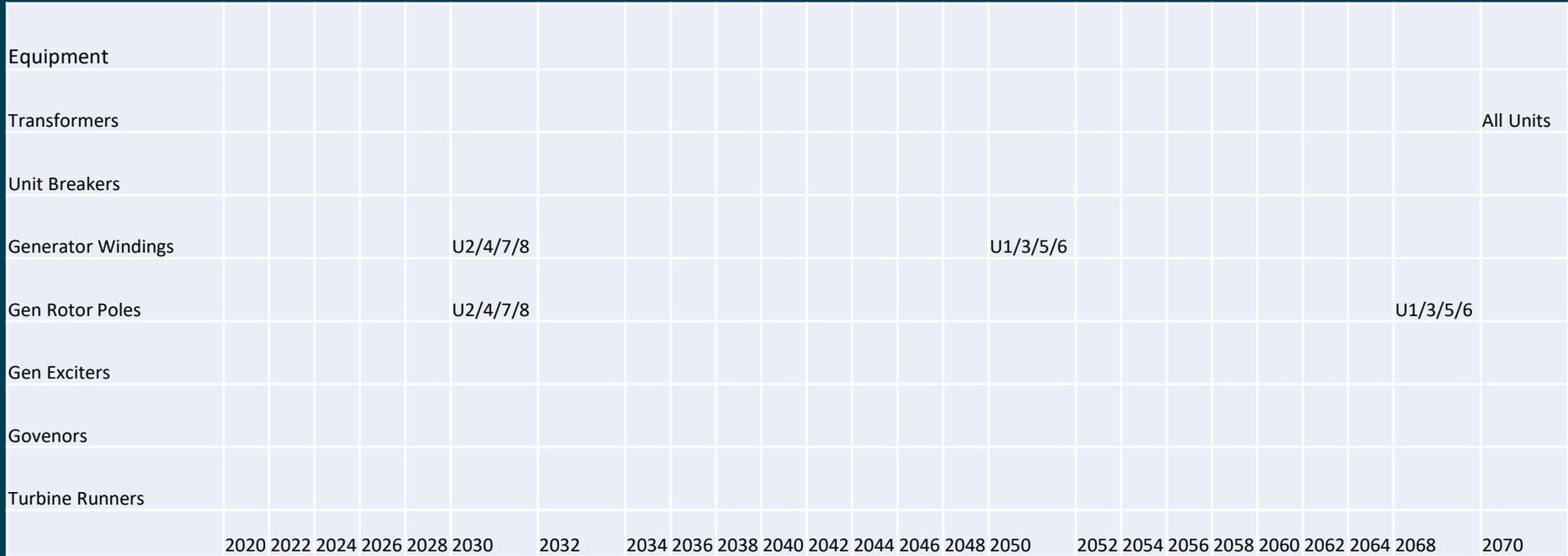


# Determining When to Replace Equipment

- 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 its replacement.
- Budget Planning with CREDA and WAPA.
- Engineering required?
- Developing overall acquisitions strategy.
- Planning for outages.



# High Level Schedule Overview



# 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.

