The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation.
USACE HYDROPOWER

- Largest owner/operator of hydro plants in the U.S.
- Over 20K MW capacity
- Generates nearly 100B kWh per year
- Enough power to serve 10M households
- Produces nearly 1/3 of the nation’s total hydropower
- 40% of the fleet is > 50 years old
• 9 plants with 914MW nameplate capacity
• FY17 generation – 2.8B kW hours; $60M
• Average age of equipment ~60 years (1948 - 1977)
NASHVILLE DISTRICT HYDROPOWER REHABILITATION PROGRAM

• $1.2B, 20+ Year, Master Planned Effort In Partnership with Southeastern Power Administration and Power Preference Customers
  • Customer funding under WRDA 2000 Section 212

• PROGRAM DRIVERS
  • Importance of hydropower to the grid
  • Equipment age and performance
  • Technology advances

• PROGRAM SCOPE
  • Water-to-wire equipment
WATER TO WIRE

Converting the potential energy stored in a reservoir into electric power.
Most system equipment is original installation.
NASHVILLE DISTRICT HYDRO REHAB

• CHALLENGES
  • Aging equipment
  • Replacing old technology with new – in the old footprint
  • Operating the plant during the rehabilitation

• OPPORTUNITIES
  • Section 212 funding
  • Improve plant performance and capacity, environmental enhancements
  • Once-in-a-career (lifetime) work
NASHVILLE DISTRICT HYDRO REHAB

- Preparatory projects at Barkley
- Repairing Old Hickory Unit #4
- Center Hill Hydropower Rehab is in progress
- Followed by rehab contracts:

- Barkley – FY19
- Old Hickory – FY22*
- Center Hill Complete 2019
- Wolf Creek – FY25*

These four plants represent 73% of system energy generation in FY17

* Optimized schedule, subject to funds availability and work authorization
BARKLEY PREPARATORY WORK
PRIOR TO TURBINE-GENERATOR REHABILITATION

Generator Cable Replacement
Awarded April 2018 $2.84M
Completion February 2019

Bridge Crane Replacement
Completed February 2017
Cost $3.78M

Exciter Replacement
Awarded February 2017 $3.36M
Completion February 2019

Transformer Replacement
Supply Contract Proposals
Received April 2018
Award Pending

Completed February 2017
Cost $3.78M
BARKLEY

- Smaller scope projects will be complete prior to Turbine-Generator (T-G) Rehab contractor mobilization
- Final T-G plans & specs reviews underway
- T-G Rehab contract to advertise Q1FY19
  - Turbine runners
  - Generators
  - Increase capacity
  - Substantial completion scheduled Q4FY24
OLD HICKORY UNIT #4 REPAIR

- Unit #4 alignment
- Age and condition of generator
- Contract awarded March 2017 to Alstom/GE ($19.2M)
  - Repair turbine
  - Rewind generator
  - Realign unit

Asbestos Abatement

Disassembly

Unit #4

Disassembly

Rotor & Coils

US Army Corps of Engineers.
OLD HICKORY

- Preparatory projects
- Turbine-Generator (T-G) engineering starts Q4FY18
- T-G Rehab contract FY22
  - New turbine runners
  - Generators (Units #1-3)
• First major hydropower rehab project in the Program
• Complete rehabilitation of 3 units placed in service 1950
• $47.2M contract awarded to Voith Hydro in June 2014
• Scheduled project completion in 2019
SCOPE OF THE CENTER HILL REHAB

Rehabilitate three 64+ year-old units
• New auto-venting Francis turbine runners
• New stator core
• Rewind generator
• Supporting components
CENTER HILL UNIT #2 Rotor Removal

One spot in the plant for something this heavy

Rotor Weight – 230 Tons
CENTER HILL UNIT #2 ROTOR
CENTER HILL UNIT #2 STATOR CORE

Disassembly

Restacked
CENTER HILL UNIT #2 STATOR WINDING

Coil insulation damage/degredation

New coil installation

Coil installation completed

Factory test fit
CENTER HILL UNIT #2 FRANCIS TURBINE

Out with the old

Design Differences

In with the new
CENTER HILL OFFSITE WORK

Shaft Thrust Runner Repair

Operating Ring/Head Cover

New SS Francis Turbine
CENTER HILL UNIT #2 TURBINE ASSEMBLY SHOWING SERVOS, OPERATING RING, NEW AERATION INTAKES
CENTER MAJOR HYDROPOWER REHAB

- 1,086 days without lost time injury as of July 3
- Unit #2 completed and returned to service
  - Notable increase in Unit #2 efficiency
- Units #1 and #3 scheduled completion in 2019
NASHVILLE DISTRICT HYDROPOWER REHABILITATION PROGRAM

- Maintaining capacity to generate clean energy
- Working with partners to rehab the system
- Building quality into the complex work
Questions?

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