The Project

- TVA (Tennessee Valley Authority) is the owner and operator of the Blue Ridge Dam which is nearly 90 years old.
- A 168” riveted steel penstock under this dam leads to a 25 MW hydroelectric power plant at dam base.
- Shortly after construction a section of the penstock began to deform from external loading and required structural reinforcement.
- Original remedy was to install a steel reinforced, concrete filled girder through the center of the penstock 160’ long by 18” thick and weighing 300 tons.
- TVA/Paul Rizzo Assoc. Engineers remedy was to remove the girder and install a 147” x 1” thick steel liner within the penstock then grout the annular void.
- National Welding Corp. was hired by Garney Companies to remove the girder, develop the installation means and install the new penstock.
- Northwest Pipe laid out and provided the new penstock and reducers.
Dam and Penstock Section View

PENSTOCK GIRDER

PENSTOCK BULGE
Original Penstock Construction

- Penstock 1050 ft long x 14 ft diameter riveted steel, encased in 4 ft reinforced concrete
- Penstock/Dam constructed between 1923 - 1931
Penstock Buckling 60’ Long x 36” Tall

Penstock buckling occurred due to external loading. Bulge was a water-filled cavity.
300 Ton Steel/Concrete Girder

GIRDER MEASURED 160 FEET LONG X 18” THICK AND 14’ TALL (FLOOR TO CEILING). CONTAINED STEEL AND CONCRETE MIX WITH LIMITED ACCESS.
Reduce Pressure & Remove Bulge

PENSTOCK STABILIZED BY REDUCING EXTERNAL PRESSURE WHICH ALLOWED REMOVAL OF BULGE
Removed 300 Ton Girder

THERMIC (OXYGEN) LANCE CUTTING TO REMOVE STEEL AND CONCRETE GIRDER
Reducer Assembly

168” TO 147” REDUCER INSTALLED IN QUARTER SECTIONS WEIGHING 4000 LBS EACH
Install Rail Sections & Carrier
Penstock Installation

8” ANNULAR SPACE WITH 50,000 LB PIPE REQUIRED VERY ACCURATE TOLERANCES & GOOD CONTROLS
Supports, Weld and Grout Dams

UNIQUE SUPPORTS, DAMS AND WELDING WERE REQUIRED
Final Section (tight fit!)
BLUE RIDGE PENSTOCK REHABILITATION

QUESTIONS ?