Q. **Reference: Program 1 Overhaul Turbine and Valves Unit 3, page 12.**

It is stated that in 2024, GE was engaged to study repair and replacements options for the Unit 3 steam chest crack. Please provide a copy of this study.

A. In 2024, General Electric ("GE") was engaged to study repair and replacement options for the Unit 3 steam chest crack, the results of which were provided to Newfoundland and Labrador Hydro ("Hydro") via two presentations. The first presentation, provided as PUB-NLH-032, Attachment 1, references four repair and replacement options that were evaluated by GE in this study. These options are as follows:

- Option 1: Replace steam valve chest;
- Option 2: Replace lower half of the outer casing of the turbine (including the steam valve chest);
- Option 3: Remove heat affected zone and weld a forged ring between the steam valve chest and lower half of the outer casing of the turbine; and
- Option 4: Perform temporary weld reinforcement repair of steam valve chest crack.

The second presentation, provided as PUB-NLH-032, Attachment 2, discusses an additional option that was considered and recommended by GE. This option is the replacement of the entire upper and lower half of the outer casing of the turbine, including the steam valve chest.

Hydro notes that consultation was sought with both GE and the Unit 3 turbine original equipment manufacturer ("OEM") to determine the best path forward for remediation of the steam chest crack. After consultation with the Unit 3 OEM, it was determined that a welding repair could be completed onsite during the 2025 Unit 3 planned outage for the turbine overhaul. As the 2025 turbine overhaul is the most cost-effective opportunity to complete the welding repair and support the continued safe and reliable operation of the Unit 3 turbine at the least cost, Hydro has proposed to complete the welding repair as proposed by the Unit 3 turbine OEM instead of replacement.

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HOLYROOD UNIT 3 INFORMATION

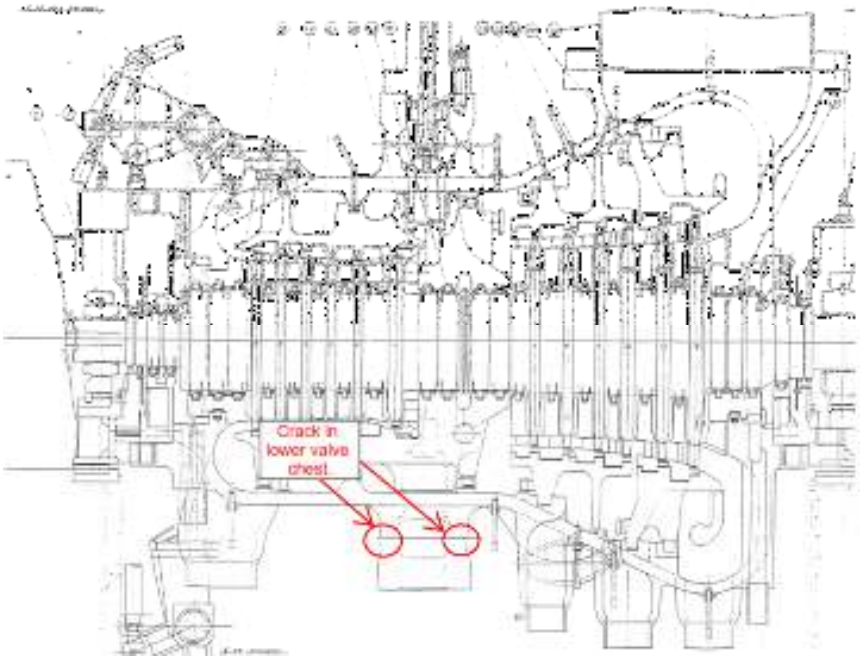
Holyrood Unit 3

March 2024

Safety Moment

- Use the two second rule on heavily traveled roads to maintain adequate spacing with the car in front of you
- Pull Up to Red Lights Slowly
- Leave Plenty of Room ahead of You
- Keep a minimum of 1 Hand on the Wheel
- Stay Off Your Phone – Even at a Red Light
- Perform Engine Maintenance Regularly
- Be mindful of driving conditions

Cross Section & Steam Temperatures



Inlet Steam: 1000 F

Reheat Steam: 1000 F

Inlet Pressure: 1800 PSI

Mass Flow: 135 kg/s

Rated Speed: 3600 RPM

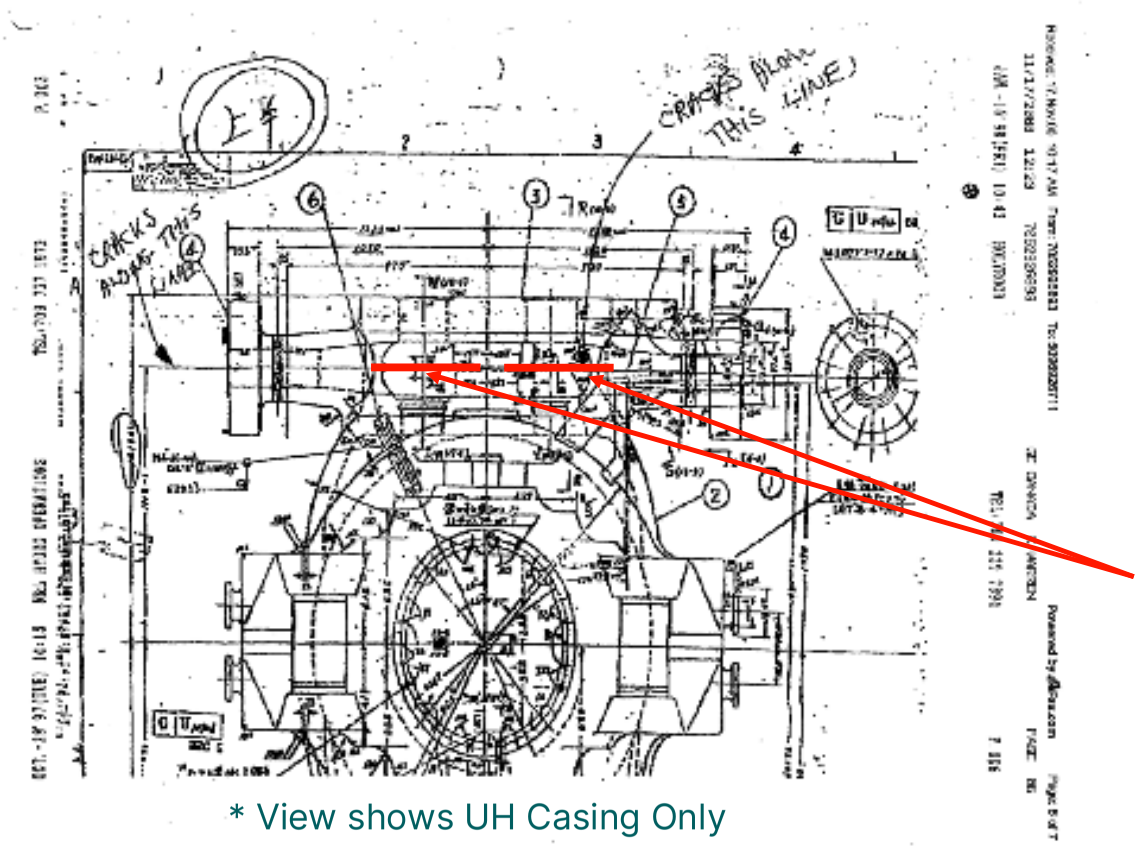
COD: 1979

OH: > 250,000

History

- ~1998: Customer discovered cracks in the adjoining welds between the outer lower half HP/IP Casing and the Valve Chest
- ~1999: GE provides several repair options and life expectancy of each repair, recommending a reinforcement repair option with tempering solution
- ~2001: Customer performs reinforcement repair option via GE Schenectady
- Ultrasonic inspections have been completed in 2013, 2016, 2019, and 2021 with the crack growing to ~12mm in depth
- 2022: GE completed a fracture mechanics assessment on the unit to identify critical crack size, ultimately recommending a short remaining life and a valve chest replacement/repair
- 2024: Customer requested repair/replacement options going forward based on the continued operation of the unit

Assumed UH Valve Chest Configuration



* View shows UH Casing Only

- Control Valves: 4 (2 Upper & 2 Lower)
- Valve Chest Material: Cr-Mo-V (Sim. to STG50T)
- Ass. Casing Depth at Indication: 100 mm
- Indication Approx. Locations

Repair/Replacement Options

- Option #1: Replace Main Steam Valve Chest
- Option #2: Replace Lower Half Outer Casing (Including Vlv. Chest)
- Option #3: Remove Heat Affected Zone & Weld Forged Ring Between Valve Chest & Casing
- Option #4: Perform Temporary Weld Reinforcement Repair

Option #1: Replace Main Steam Valve Chest (GE Preferred)

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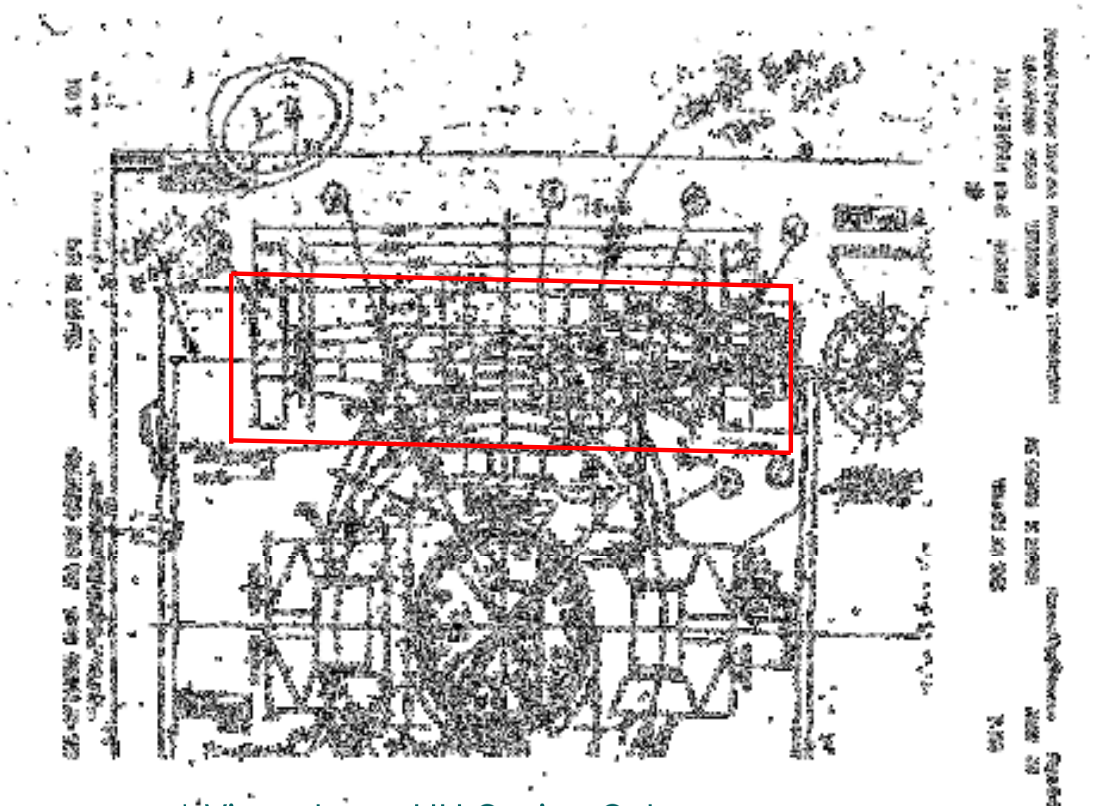
Benefits:

- Improved Reliability Based on Significant Operating time & cycles
- Improved Design Practices to meet estimated station end of life
- No accessibility issues to perform work

Risks:

- Current outer casing conditions unknown, last replica samples completed in 2001
- Stress relieving weld based on distance between aged outer casing and valve chest
- Third party machine
- Casing Split Line May Need Rework



* View shows UH Casing Only

Option #2: Replace LH Outer Casing Incl. Valve Chest

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Benefits:

- Improved Reliability Based on Significant Operating time & cycles

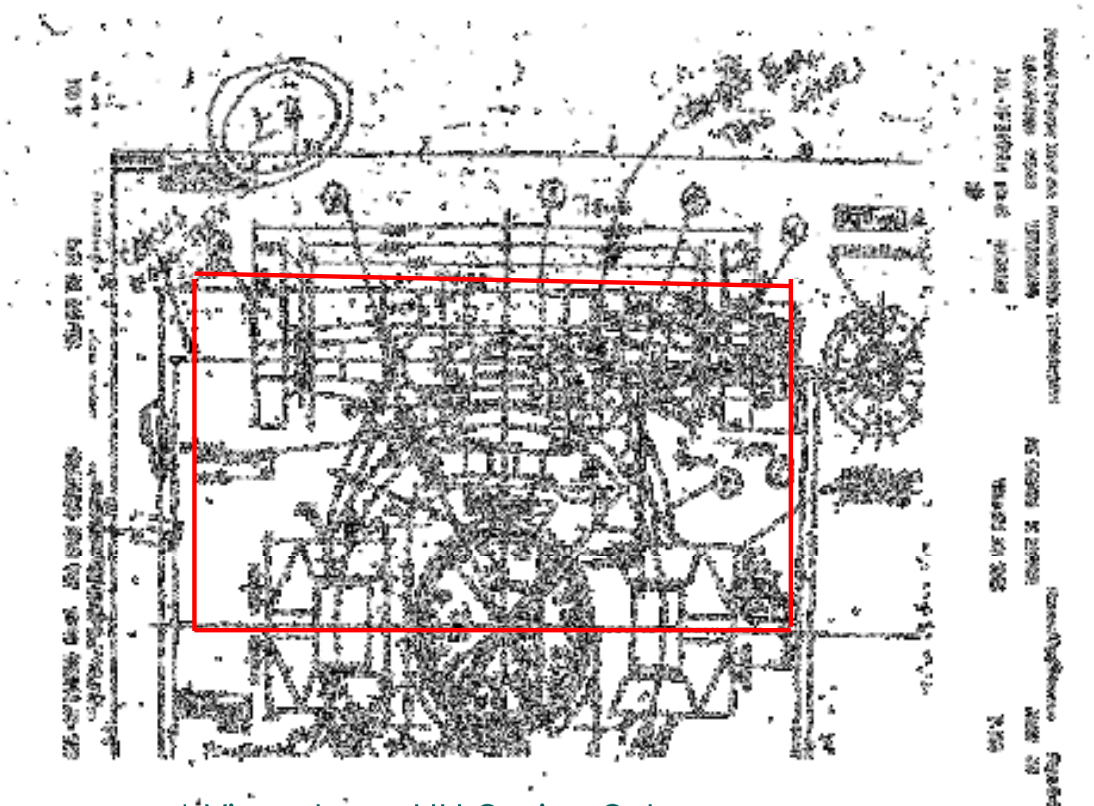
- Optimized Design Practices to meet estimated station end of life

- No accessibility issues to perform work

Risks:

- Third party machine, scanning would likely be required

- Potential welding restrictions, given current piping configuration and ability to install/remove LH casing with valve chest



* View shows UH Casing Only

Option #3: Remove Heat Affected Zone & Weld Forged Ring Between Valve Chest & Casing

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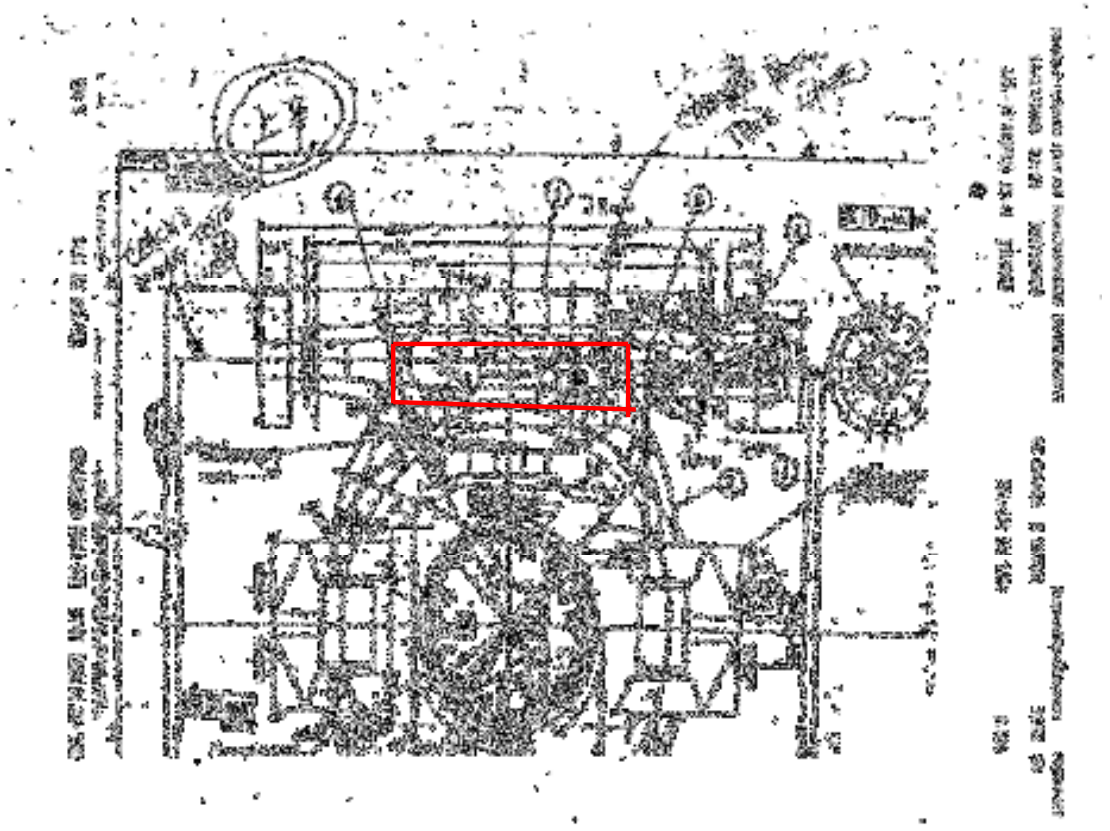
Benefits:

- Limited work scope and repair lead time could be reduced

Risks:

- Third party machine, scanning would likely be required to support
- Aged material condition unknown at this time for welding/continued operation
- Accessibility based on diameter of inlet piping
- Welding orientation for LH casing in place and spacing available
- Casing Split Line May Need Rework



Option #4: Perform Temporary Weld Reinforcement Repair

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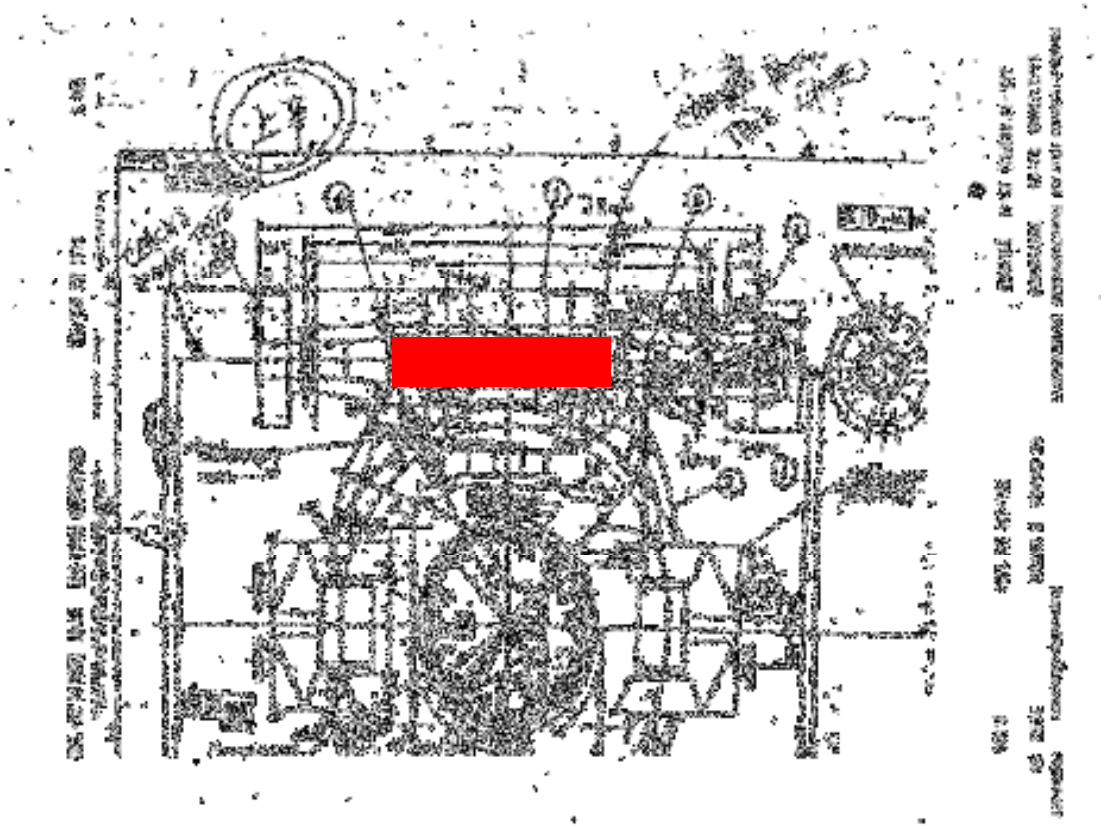
Benefits:

- Does not require removal of outer casing
- Scanning would not be required

Risks:

- Aged material condition unknown at this time for welding/continued operation
- Accessibility based orientation of the piping
- Valve Chest and Casing have seen significant operating hours and are approaching the end of life
- May not be most cost-effective option
- Repair is only a temporary solution
- Casing Split Line May Need Rework

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HOLYROOD UNIT 3 INFORMATION

Holyrood Unit 3

April 2024

Safety Moment

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- Use the two second rule on heavily traveled roads to maintain adequate spacing with the car in front of you
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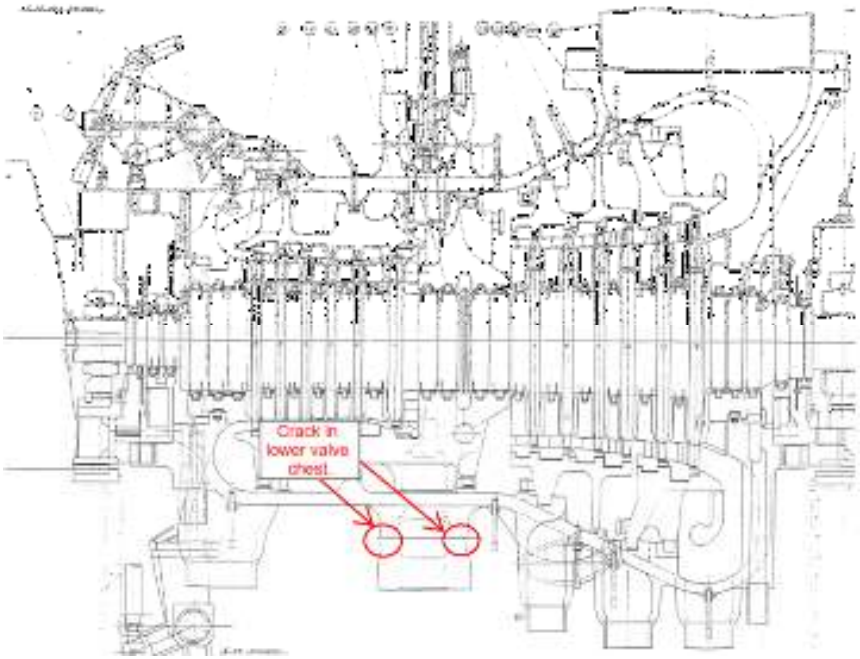
Cross Section & Steam Temperatures



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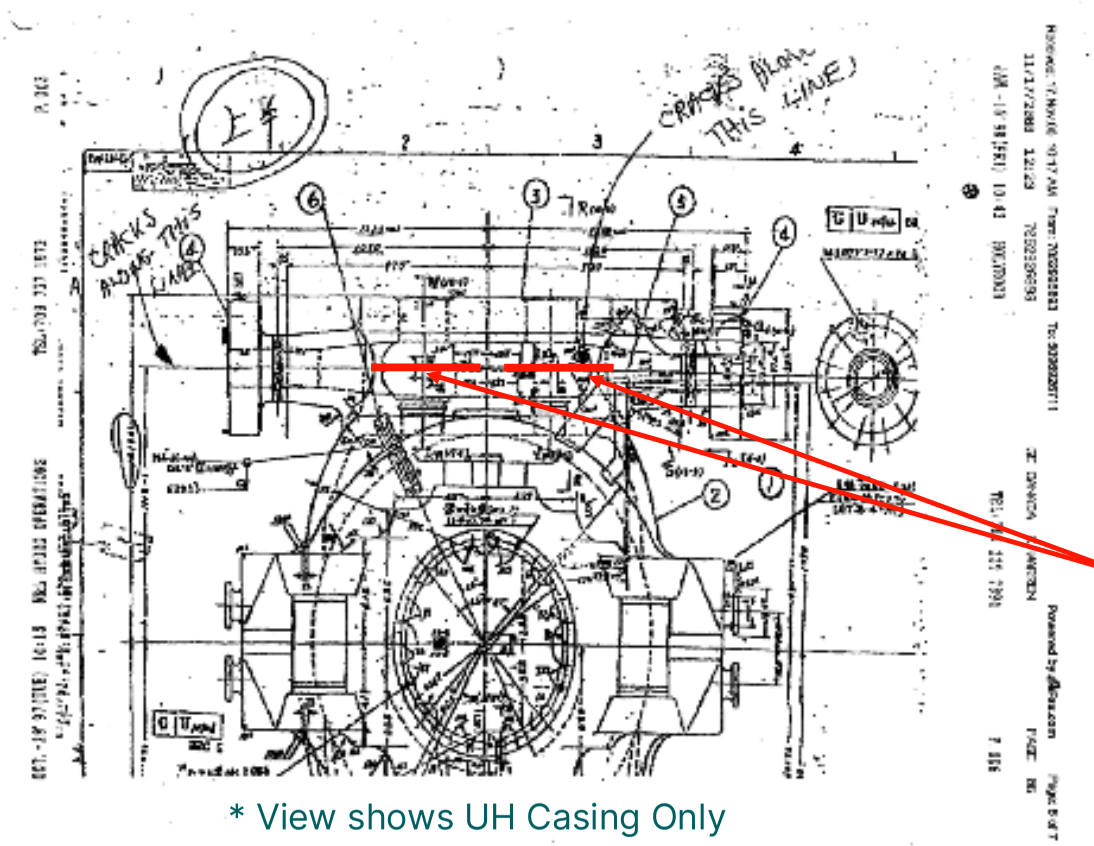

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- Valve Chest Material: Cr-Mo-V (Sim. to STG50T)
- Ass. Casing Depth at Indication: 100 mm
- Indication Approx. Locations

Repair/Replacement Options

- Option 1: Replace Upper & Lower Half Outer Casing (Including valve chest) (GE Preferred)

Option 1: Replace UH & LH Outer Casing Incl. Valve Chest (GE preferred)

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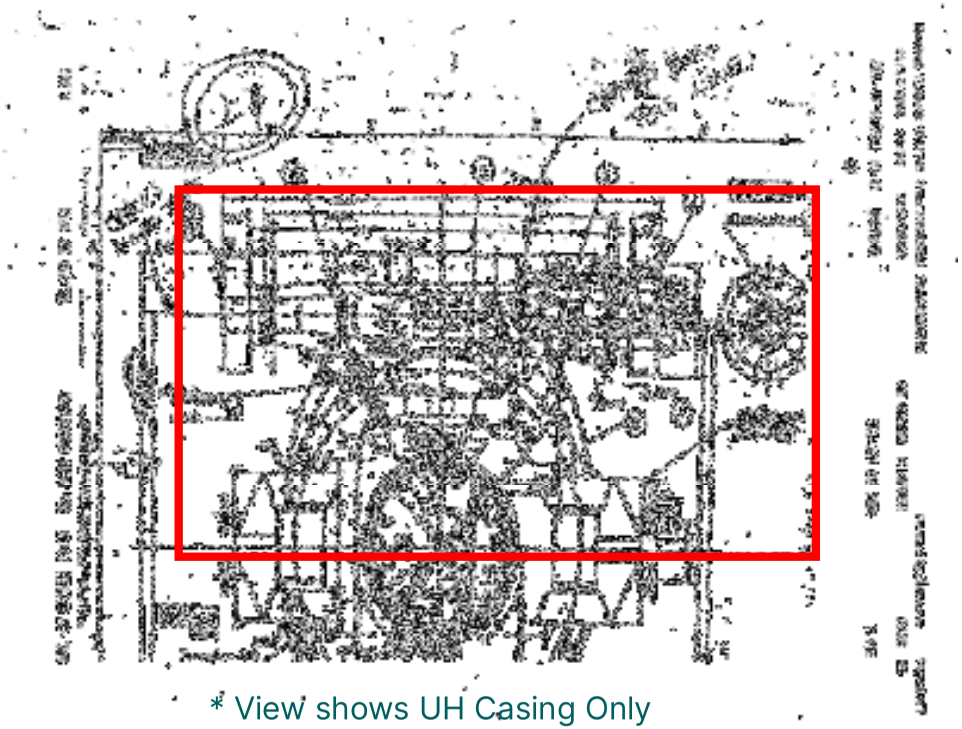
Benefits:

- Improved reliability and availability of unit for cyclic operation.
- It meets customer end of life unit operation requirements.
- GE design principles and manufacturing practices to meet estimated end of unit life.

Risks:

- High design, manufacturing and installation cost.
- Site data collections requires major outage.
- New casing installation could take 3-4 months outage and high execution cost.
- Additional outages may be required to support re-engineering data collection.



* View shows UH Casing Only

Budgetary Costing/Lead Time

- Option 1: Replace UH & LH Outer Casing Incl. Valve Chest **(GE Recommended Based on Known Risks)**
  - Budgetary Manufacturing/Engineering/Installation: ~18.3M CAD
    - No Valve Internals Included
  - Budgetary Lead Time: ~24 Months Following Data Collection for Engineering/Manufacturing Only
    - Pending SRC Approval

Outage Requirements to Support Scanning

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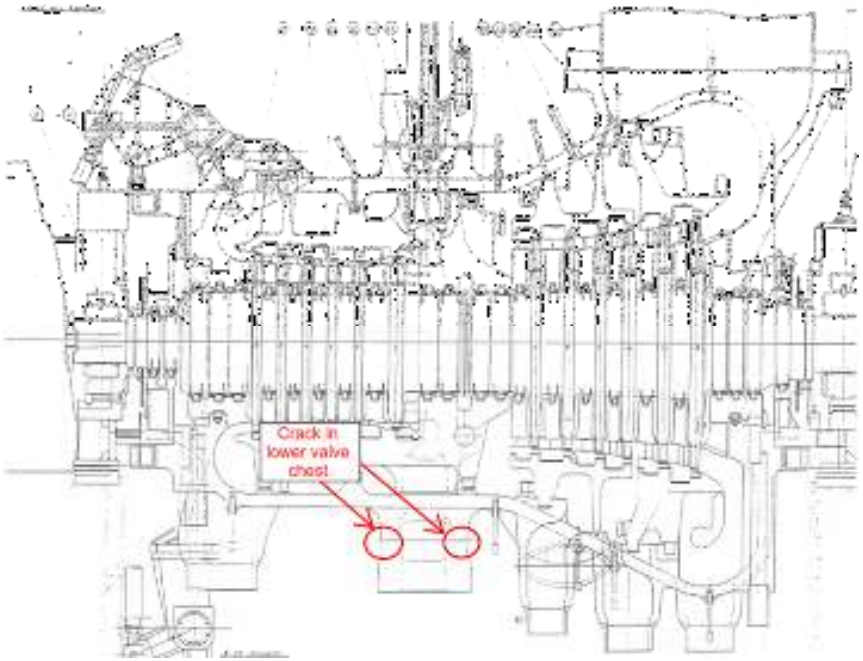
Site measurements for Options 1:

- 3D Scanning
- Hand measurements
- Material
- Replica Analysis

Required Components for Removal During Outage

- Rotor
- Inner casing and diaphragms
- Packing Heads
- Control valve internals
- Inside & Outside of the Outer Casing Dimensions Required

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