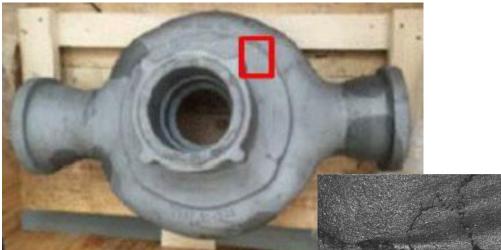


# sCO2 Power Cycle Development **Near Net Shape Hot Isostatic Press** (NNS HIP) Manufacturing Modality for **Cost Reductions**

GE Research in partnership with Synertech PM, Special Metals, EPRI have validated significant cost savings when applying NNS HIP to components utilized in sCO2 power cycles. Specifically, the high temperature alloys, IN740H<sup>™</sup> and Haynes 282<sup>™</sup> used in high temperature sCO2 cycles. **Components for validation: elbow (plant pipe component), nozzle ring and turbine case (sCO2** turbine)

#### **Motivation:**





#### **Current solutions:**

- Forging + machining: expensive, high material waste
- Sand casting: defects, extensive weld repair

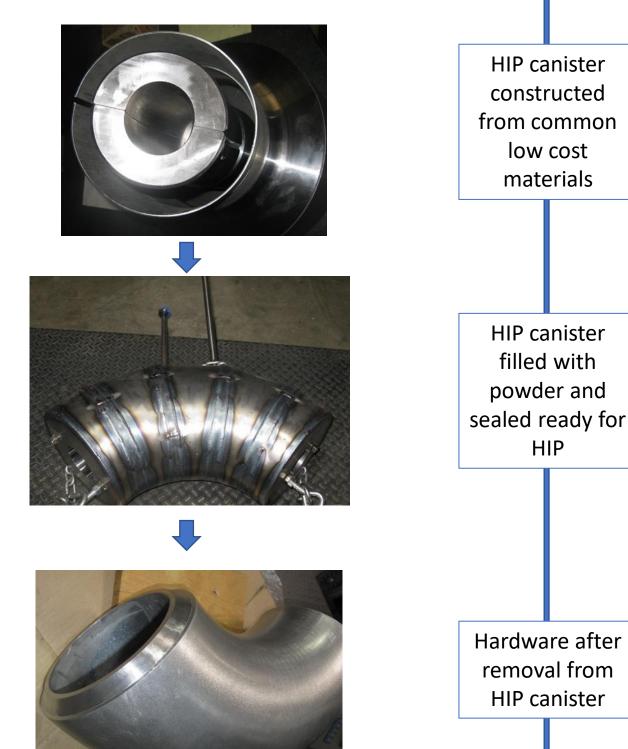
#### **Alternative manufacturing modality (NSS HIP):**

- Reduced 2~3X volume of material vs wrought
- Reduced machining costs
- Reduce welds & weld repair
- Chemical & structural homogeneity

(SUNSHOT project: HA282 sand casting trial for turbine case) DE-EE0005804

# **Piping Components**

- Alloy: IN740H, Special Metals \_
- Powder atomization: Wyman-Gordon
- Weld development: SMC
- 8" Sch 160 elbow, 120 lbs



HIP

Turbine valve body from DE-FE0028979 (sand casting for turbine stop and control valve)

• Ultrasound inspectability

# sCO2 Turbine Nozzle Ring

- Alloy: HA282, Haynes
- International
- Powder plasma atomization: AP&C (GE Additive)
- 9" OD, 3" width, 20 lbs

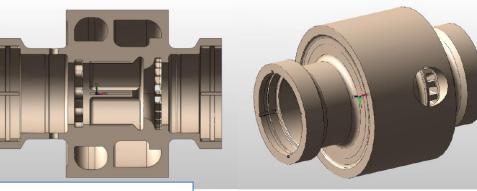






# sCO2 Turbine Case

- Alloy: HA282, Haynes International
- Powder plasma atomization: AP&C (GE Additive)
- 33" long, 37" height, 1600 lbs



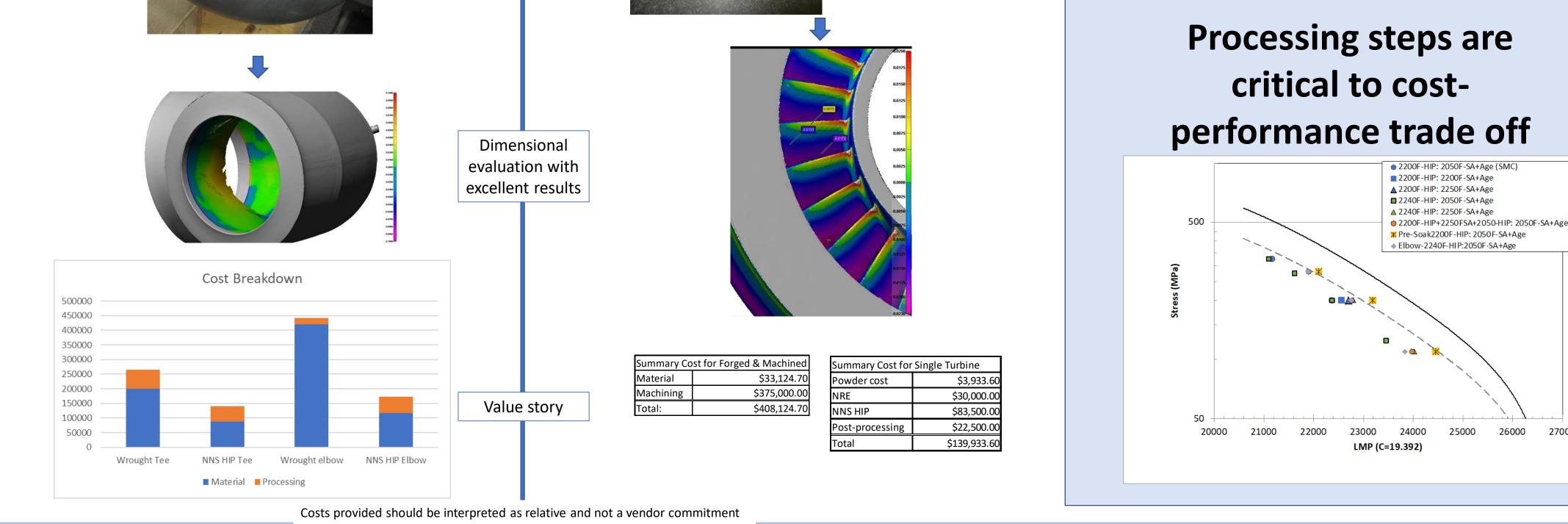
sCO2 turbine case

**HIP** canister filled with powder and sealed ready for HIP



Case is being post-processed 1Q2022

27000



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