INL/MIS-24-80962-Revision-0

TEDS-SOEC Non-Fired Boiler Repurpose

September 2024

T.J. Morton

Changing the World's Energy Future

INL is a U.S. Department of Energy National Laboratory operated by Battelle Energy Alliance, LLC

INL/MIS-24-80962-Revision-0

TEDS-SOEC Non-Fired Boiler Repurpose

T.J. Morton

September 2024

Idaho National Laboratory
Idaho Falls, Idaho 83415

http://www.inl.gov

Prepared for the
U.S. Department of Energy
Under DOE Idaho Operations Office
Contract DE-AC07-05ID14517

IES
Integrated Energy Systems

Re-Purpose of TEDS-SOEC Non-Fired Boiler (DETAIL)

Prepared for: DOE-NE

LRS number: INL/xxx-24-xxxxx

Funding: Contract DE-AC07-05ID14517

Milestone Update

September 2024

Zach Sellers, T.J. Morton

Idaho National Laboratory

Purpose of the Project

Context

- Xcel Energy and Bloom Energy will install a 240-kW electrolyzer at Xcel's Prairie Island Nuclear Generating Plant to demonstrate clean hydrogen production.
- Long lead times for boilers and other hardware led to a discussion about hardware that might be currently available.
- The non-fired boiler procured for DETAIL (TEDS-SOEC boiler) was found to be of a sufficient size to meet the requirements for the demonstration at Prairie Island.

Objectives and Impact

- Identify interface boundaries and requirements.
- Alter boiler pressure ratings to meet applicable requirements.
- Build boiler skid to provide steam for electrolysis.
- Collaboration with Xcel and Bloom benefits INL and is in line with DOE's mission of addressing national energy challenges.

IES
Integrated Energy Systems

Methodology

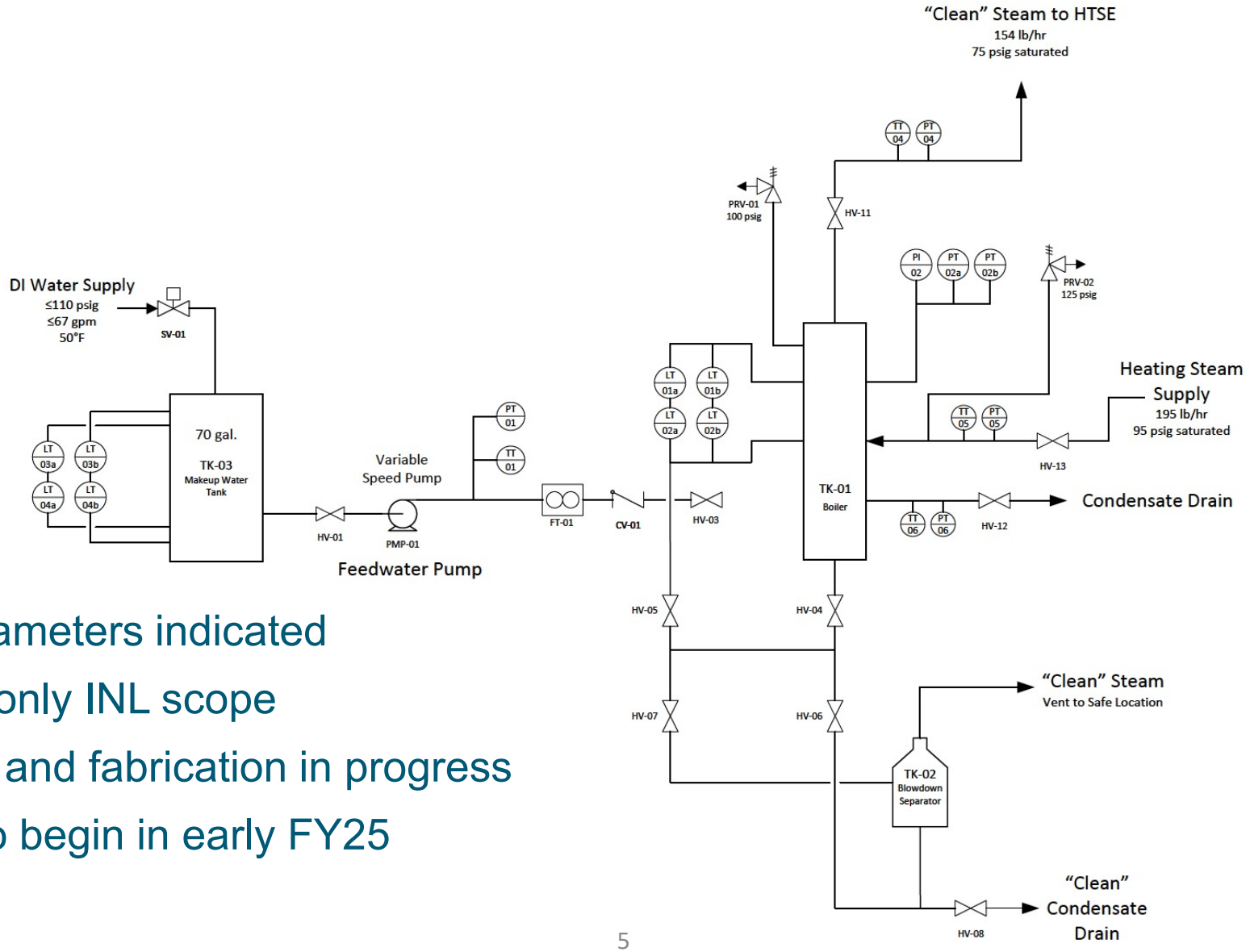
- Interface Requirements:
  - Provide “Clean” Steam
    - 154 lbm/hr at 75 psig saturated
    - Assume 100% steam quality
  - Receive Plant Heating Steam
    - ≥ 195 lbm/hr at 95 psig saturated
    - Assume 100% steam quality
- Alter Boiler Maximum Allowable Working Pressures (MAWP)
  - The non-fired boiler procured for TEDS-SOEC originally rated for:
    - Tube side = 75 psig
    - Shell side = 100 psig
  - To meet interfact requirements, the MAWP needed to be higher
    - Tube side = 125 psig
    - Shell side = 100 psig
  - Boiler altered to new MAWP by vendor with ASME “R” stamp (“R” = repair)

Methodology

Remaining Items

- Initiate “Engineering Change” process
- Create interface requirements document and review with Xcel and Sargent & Lundy
- Create drawing and review with Xcel and Sargent & Lundy
- Procure parts
- Fabricate skid
- Prepare skid for shipment

Boiler Skid P&ID



- Interface parameters indicated
- P&ID shows only INL scope
- Procurement and fabrication in progress
- Fabrication to begin in early FY25

IES Integrated Energy Systems