

Rancor Hybrid Energy System Microworld

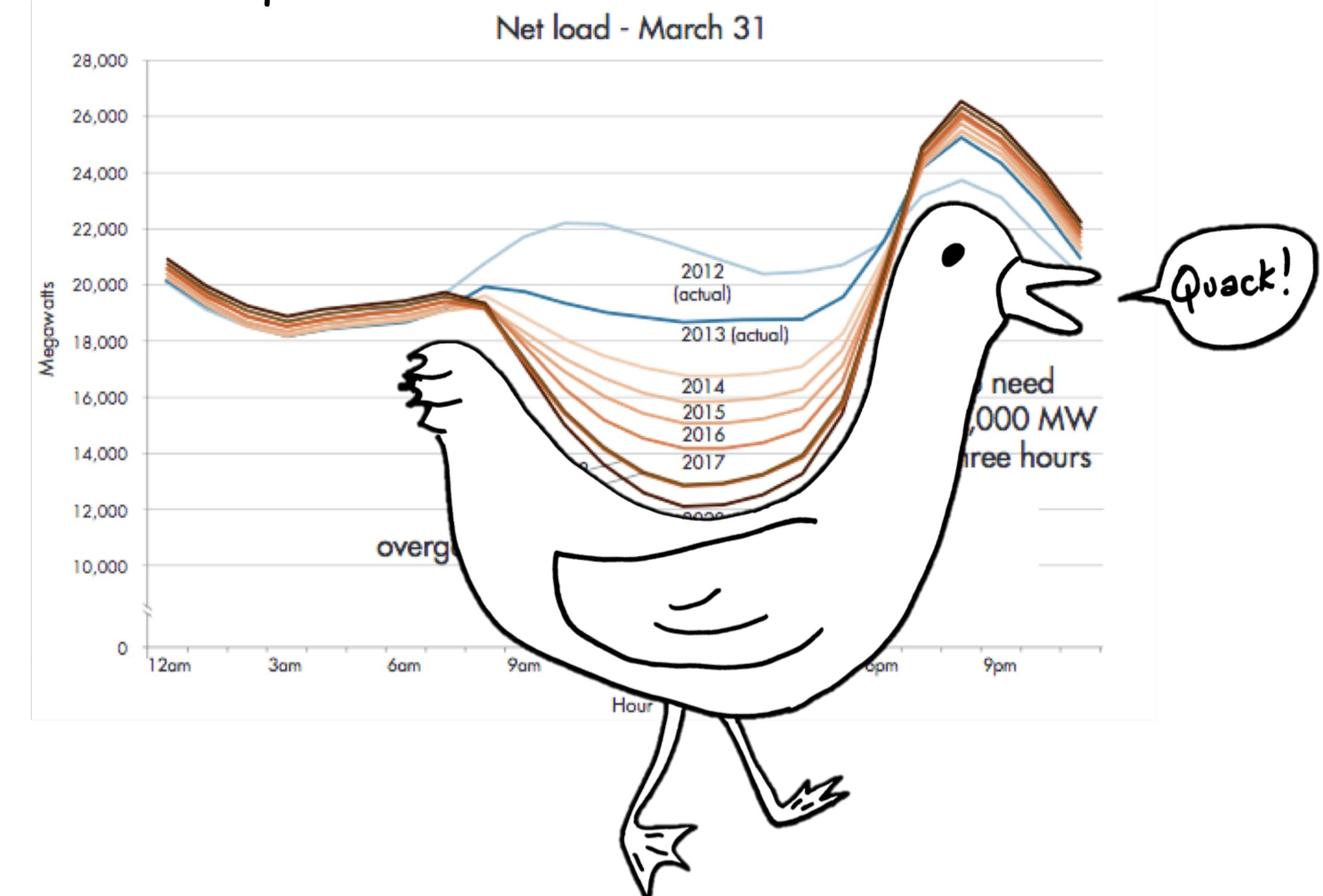
(How to design and evaluate HMIs for Nuclear Power)

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Acronyms (In order of appearance)
NPP Nuclear Power Plant
ConOps Concept of Operations
HMI Human Machine Interface
UofI University of Idaho
INL Idaho National Laboratory
HSSL Human Systems Simulation Laboratory
HFE Human Factors Engineer

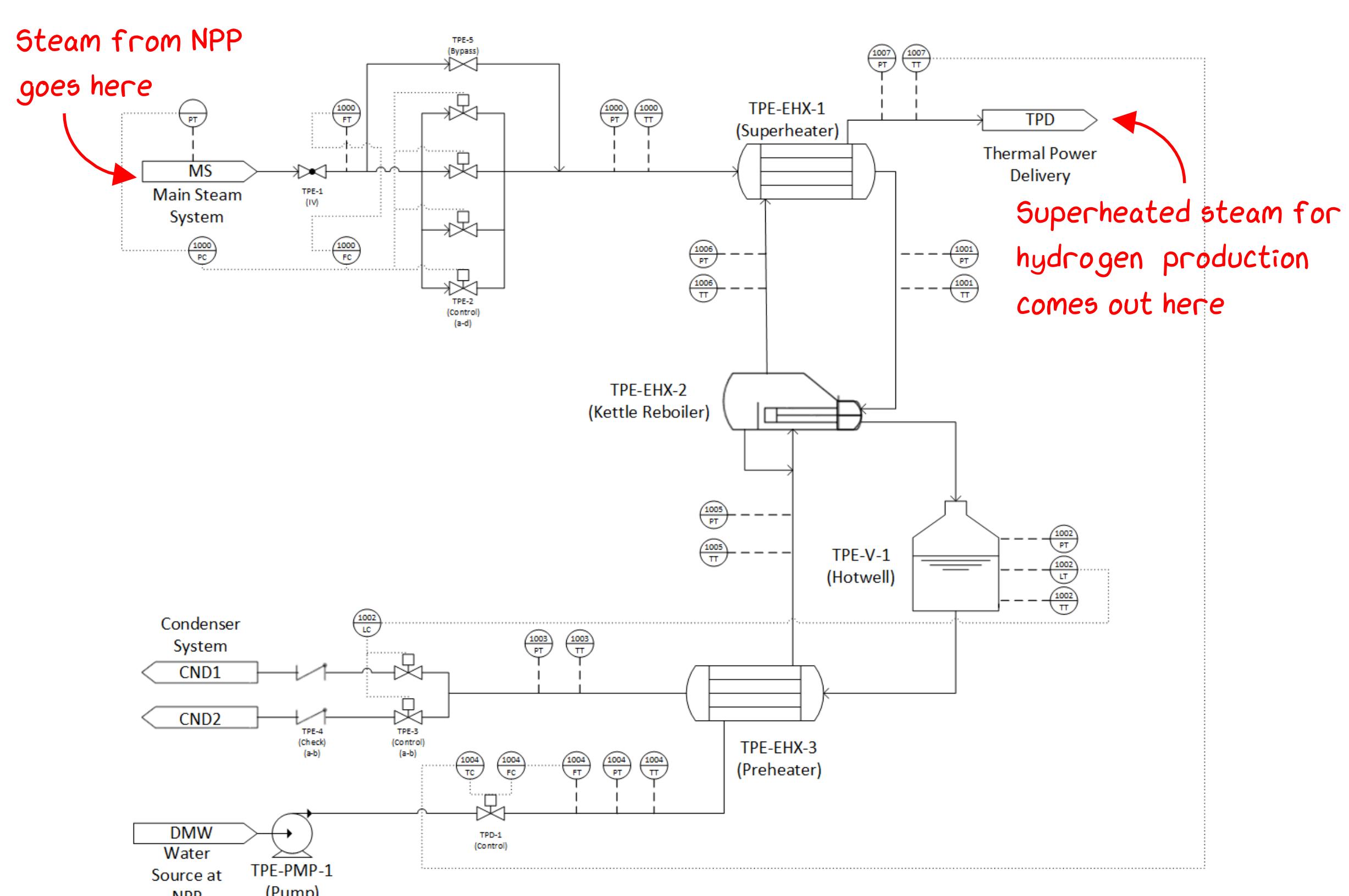
I. Understand the Problem

Proliferation of renewables results in too much electricity being generated during the day. Nuclear Power Plants (NPPs) can't load follow and need alternative revenue streams to remain competitive.



2. Design Hybrid Energy System for NPP.

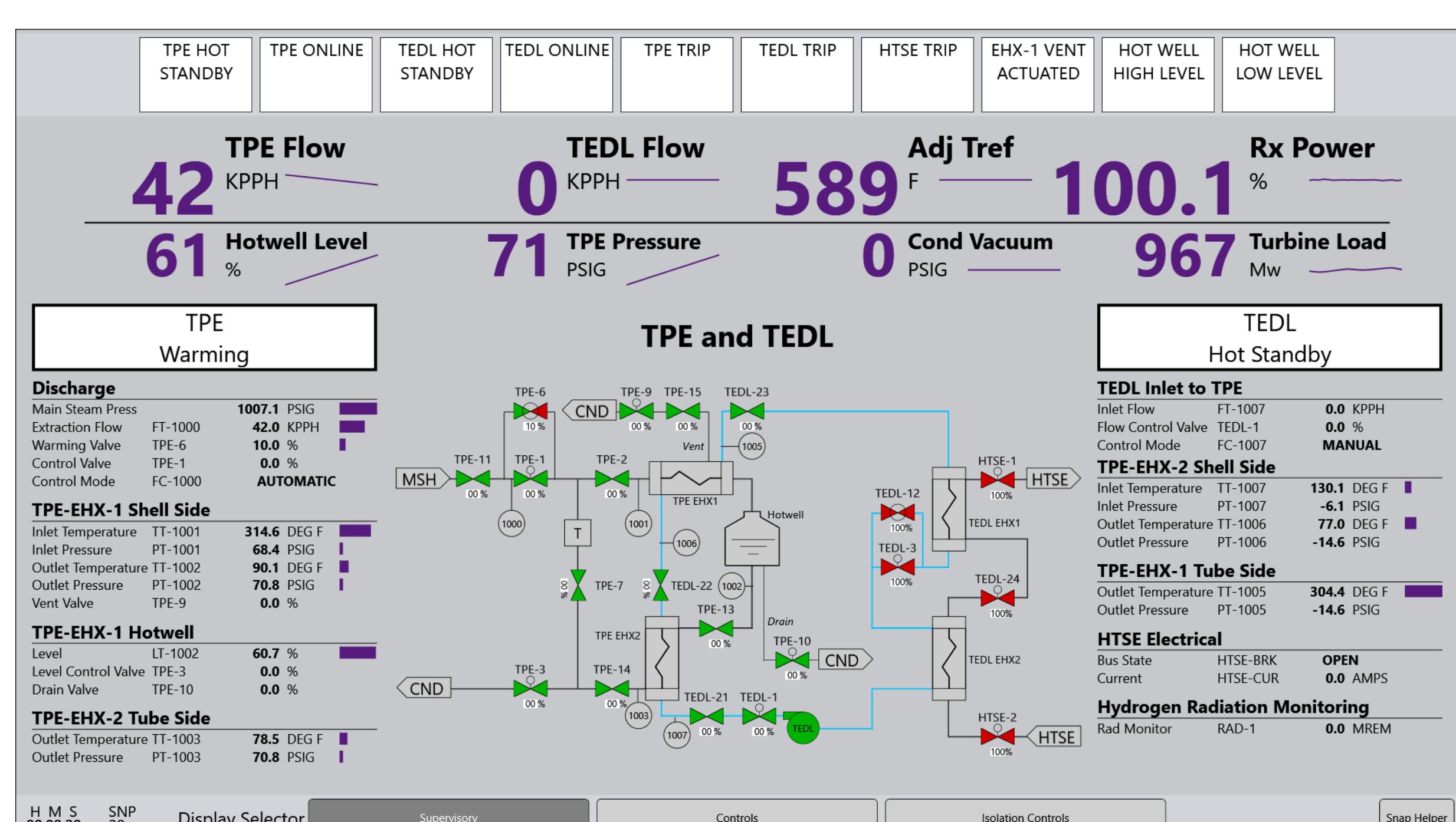
Easy, just hire some nuclear engineers.



3. Specify ConOps and HMI requirements.

4. Survive Pandemic.

5. Design Quasi-Dynamic Prototype HMI and Procedures



2020 Supervisory HMI

6. Remote User Evaluation w/ Operators

Operators walked through scenarios with a quasi-dynamic HMI over teleconferencing. We validated the basic ConOps and received lots of feedback regarding the interface and engineering design.

7. Utilize Rancor Microworld for Iterative Interface Design and Evaluation with Student Operators

The Rancor Microworld is a dynamic simplified nuclear reactor simulator developed by the UofI and INL. We implemented a simplified model of the hybrid energy system allowing us to iterate the design with students.



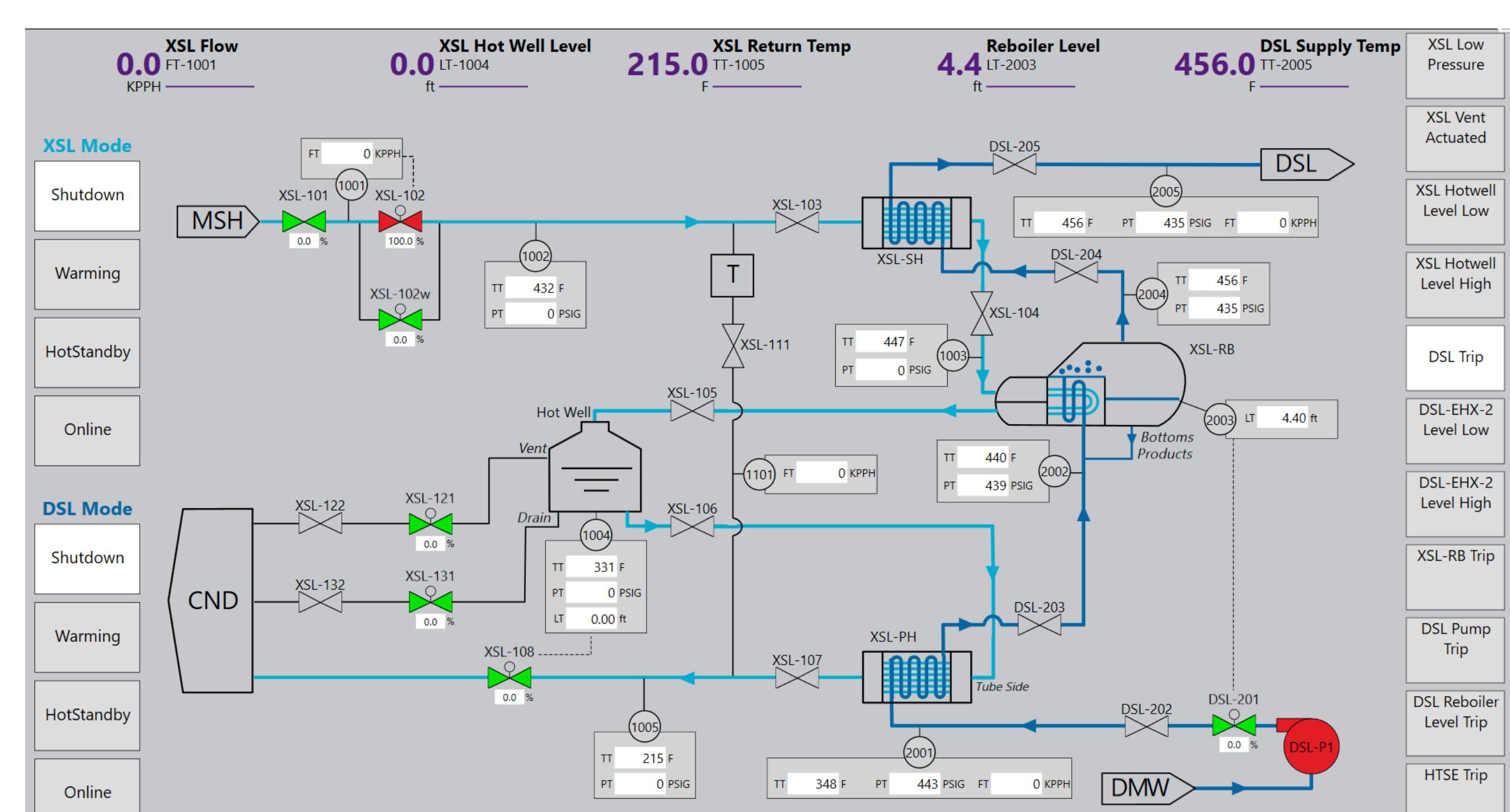
8. Implement Refined HMI in INL's HSSL's Full-scope, Full-scale, Reconfigurable Simulator.



HFEs (yours truly) pretending to discuss something important during a photoshoot in the HSSL circa 2013.

9. Conduct Dynamic Scenario Testing w/ Operators

Operators were able to complete normal and abnormal operating procedures but desired increased automation for starting up and shutting down the hybrid energy system.



2021 Supervisory HMI