



U.S. MAGNET
DEVELOPMENT
PROGRAM

LBNL Hybrid Test Facility

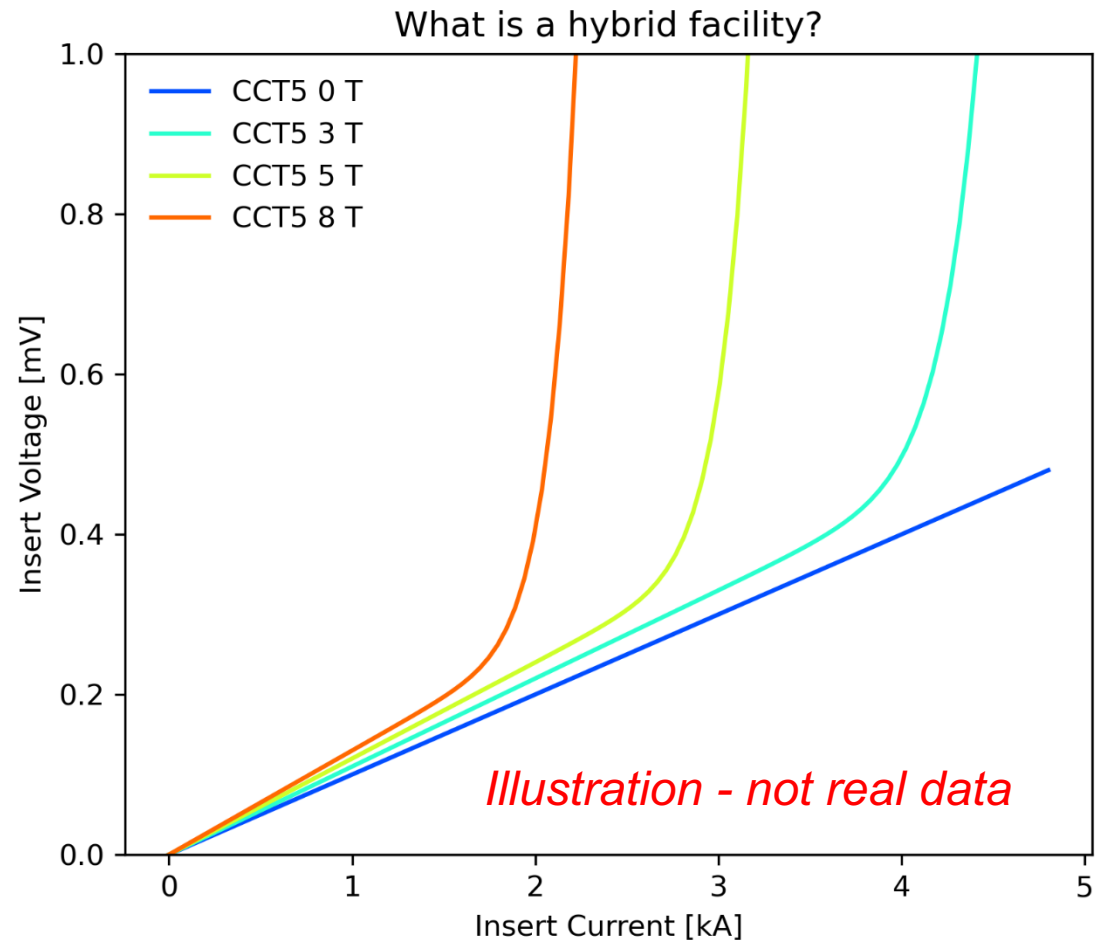
Reed Teyber and the MTF-U team

Outline

- Motivation
- Recently completed projects
- Challenges with test facility
- Concluding Statements

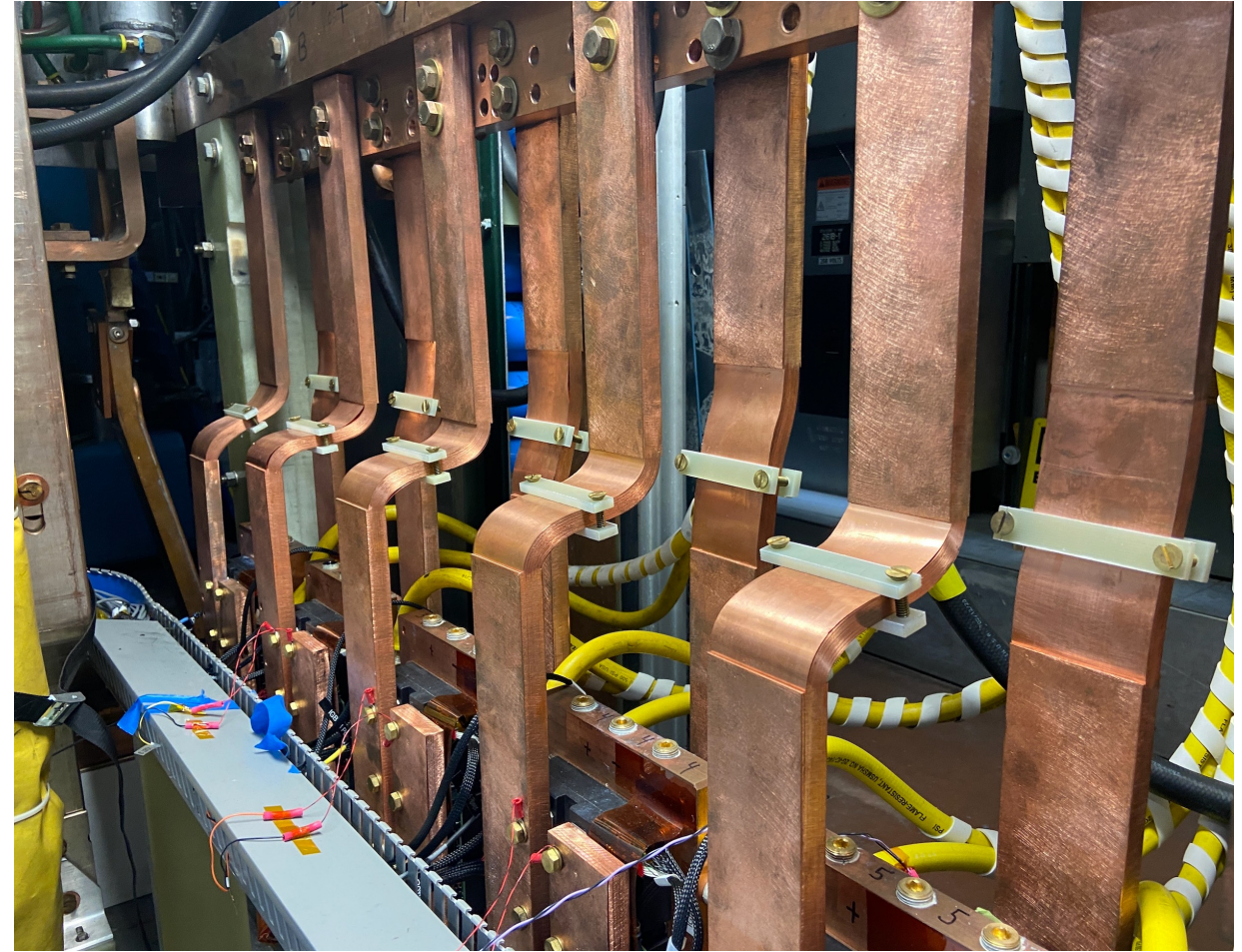
What is a Hybrid magnet test facility?

- We are focused on having the capabilities to produce this plot for HTS inserts
 - We are not “upgrading for the sake of upgrading”
 - We are not “making things shiny that are not currently shiny”



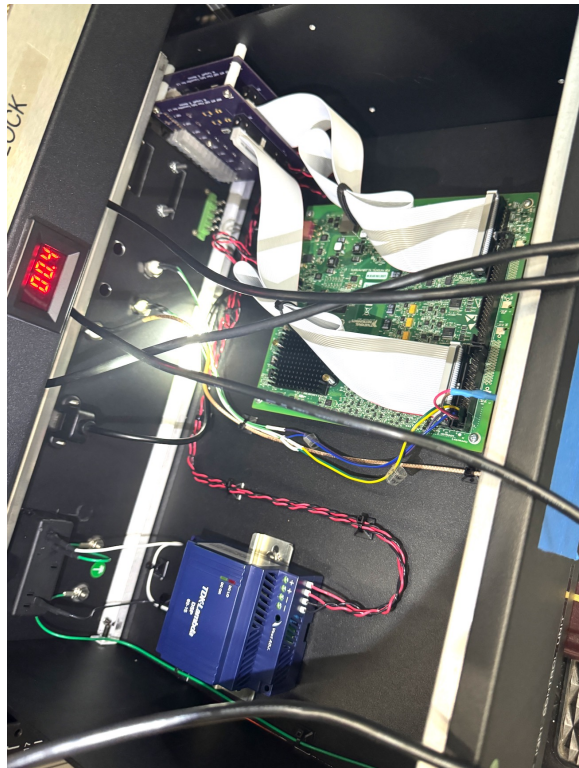
IGBT Upgrades (X2!)

- IGBT upgrade for our main power supply (~ 17.5 kA)
- IGBT installation for Sorensen circuit (4.8 kA)



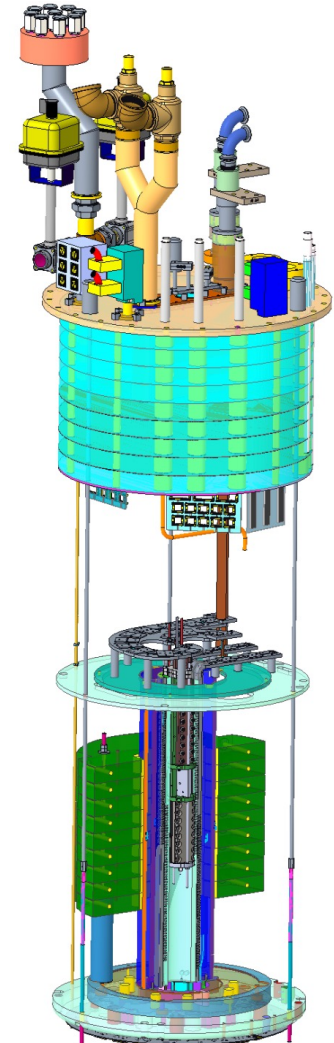
IGBT Timing, Protection

- IGBT and power diodes water cooled, with flow meters and unit temperatures logged. FPGA IGBT timing controller



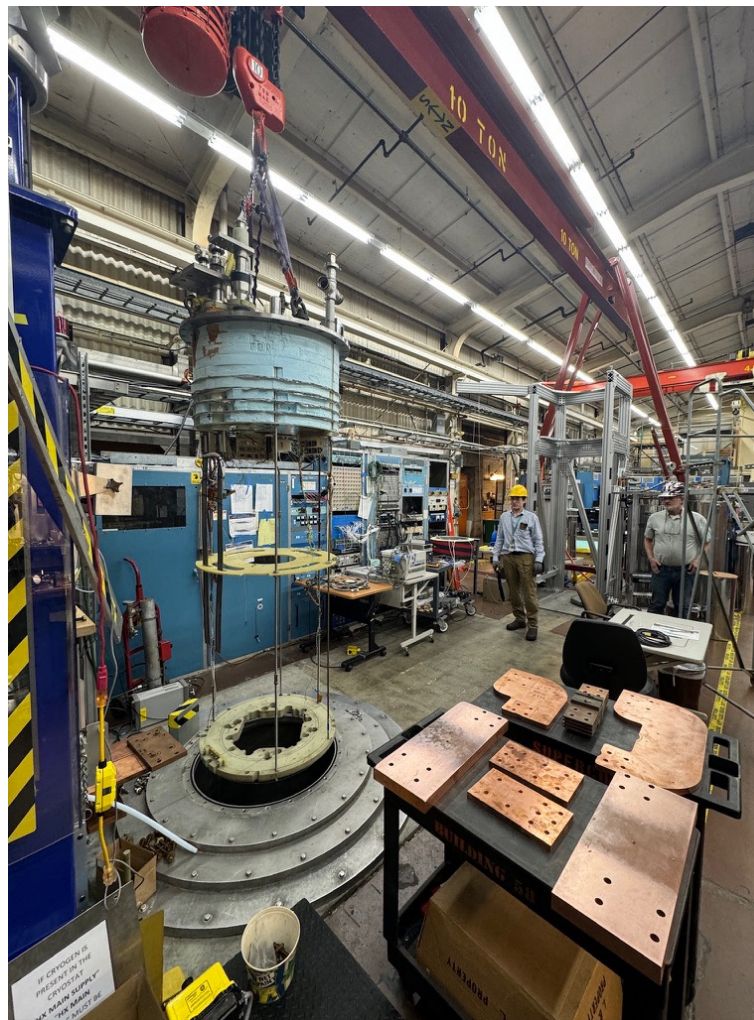
Hybrid Header

- Converted existing 32" header into a hybrid header
- Ordered new 20 kA leads, will require new header (exciting)



Hybrid Header

- New header stand (civil eng. + permits)
- High current bus bar extensions
- New PCB feedthrough and wiring harnesses



Integration of new VCL's to Cryoplant

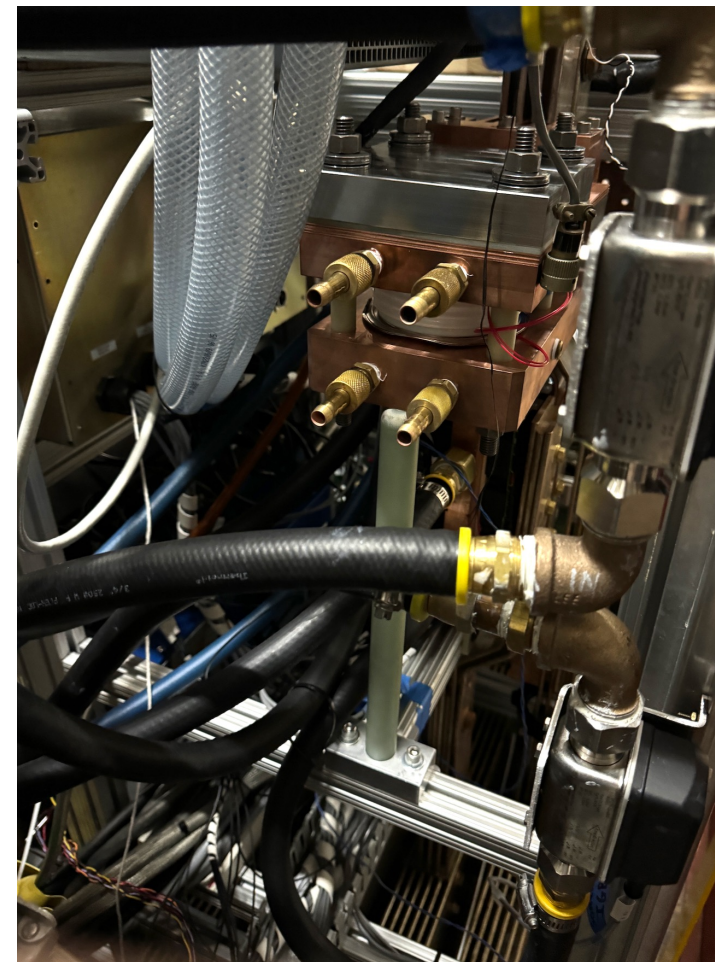
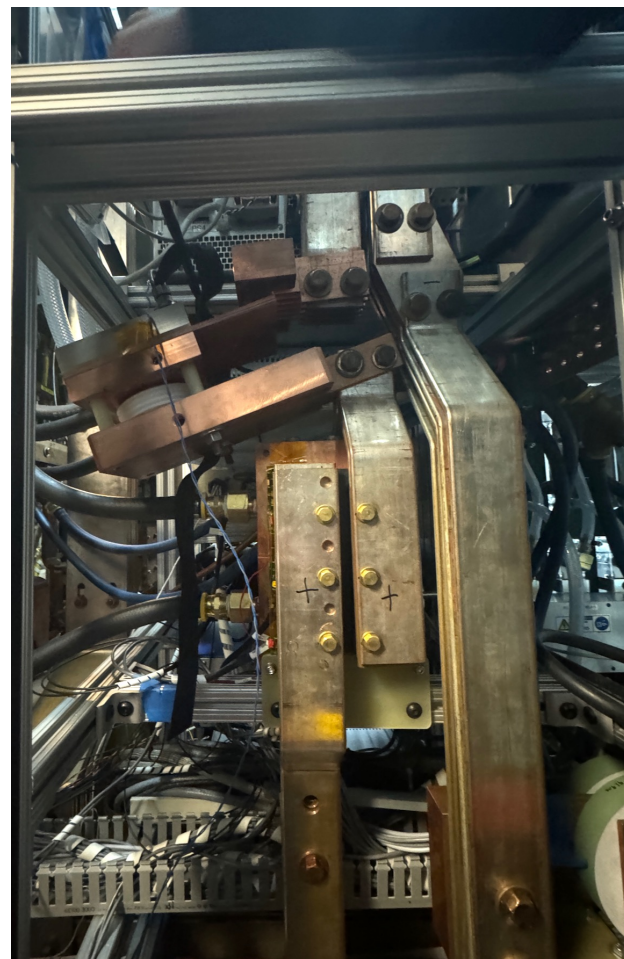


Sorensen AC power cables

- Battle over cable + cable tray approval + power cables

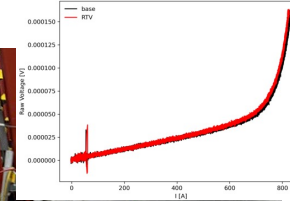
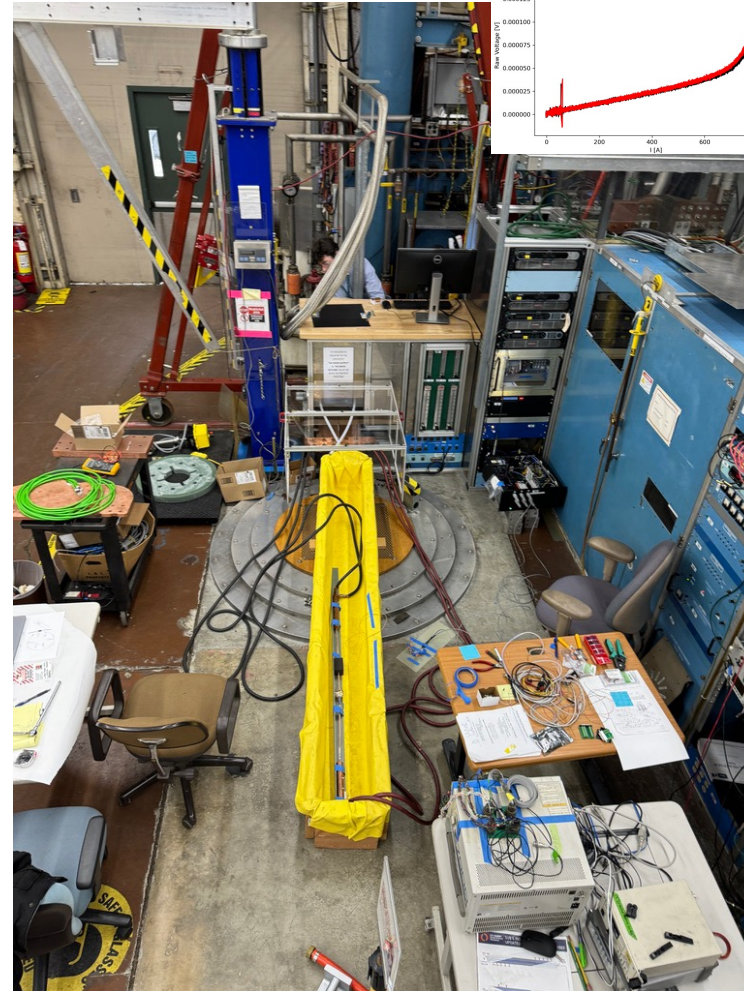


Sorensen Series Diode



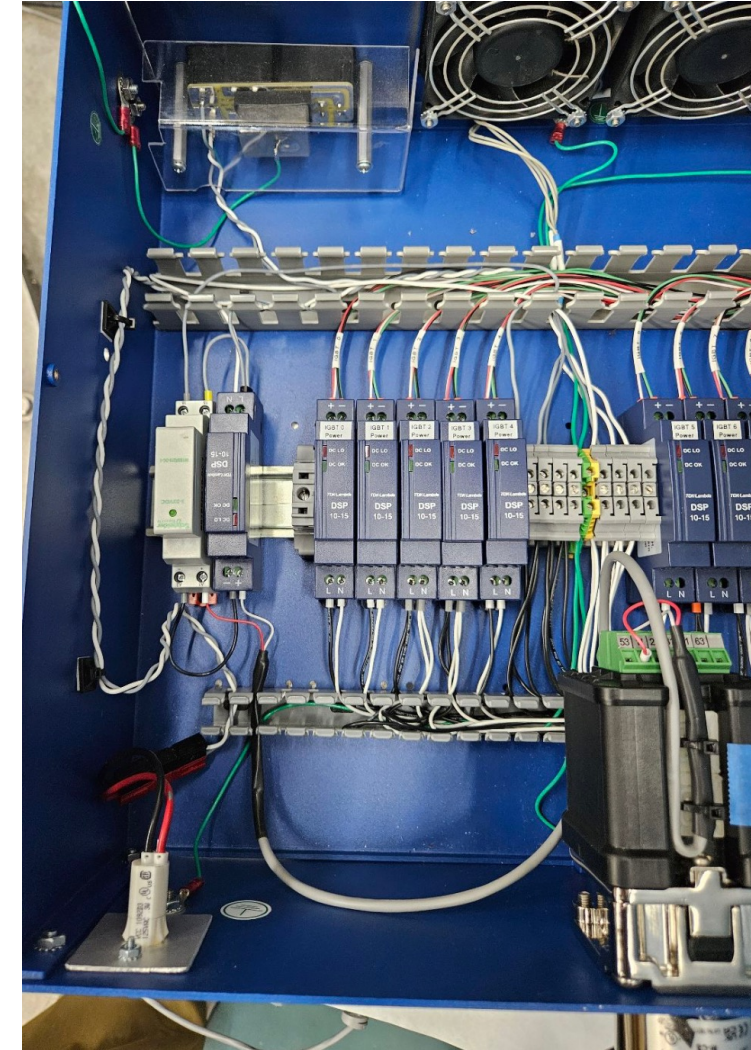
Sorensen Control and Quench Detection

- Commissioned to 4.8 kA
- Significant programming effort



Safety System Upgrade

- New safety system to LOTO both power circuits at single lockout point



Cleanup



Sorensen Expansion

- First work towards expanding insert power supply to 7.2 or 8.4 kA
- Three additional 1.2 kA power supplies purchased and here



Challenges with a facility upgrade

- 1) Project work on a research budget
 - Test facility work at a scale that enters the “belly of the beast” of the National Laboratory system

Challenges with a facility upgrade

- 2) Diversity of required skillset varies on a weekly basis
 - The perfect contributor to the test facility upgrade in one month may have nothing to do the next period of time
 - In other words, need people who are comfortable working in environments completely outside of their comfort zone
 - Have not found a good match looking for new engineer
 - Lesson learned - cannot simply “hire” what we need when we need it
 - Should have a continuously open position hoping for the right candidate

The Facility Status Today

- We have two working power supplies and IGBT protection circuits
 - Have been using Sorensen circuit for CORC I-V curves
- We have a hybrid header and hybrid header stand
- First dual-powering / hybrid test imminent
 - General Atomics CORC fusion sample inside of CCT 5 (FES)



New facility enables hybrid testing for MDP goals

- Greater than 12 T background field after CCT6 complete
- 4.8 kA independent insert powering (7.2/8.4 kA soon)
- New infrastructure optimized for HTS characterization



Special Thanks

- Special thanks to Chet Spencer and Anjana Saravanan

