



CMS-TMCP commissioning plan

PRESENTED BY HIDEKI TATSUMOTO



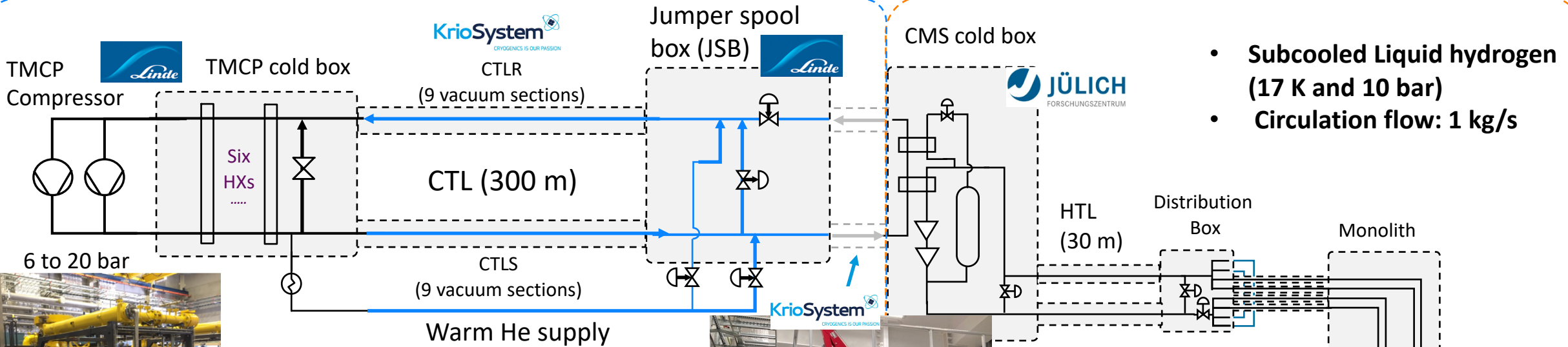
CMS-TMCP system overview

TMCP (Target Moderator CryoPlant)

Design pressure: 25 barg

CMS (Cryogenic Moderator System)

Design pressure: 16 barg



- **Subcooled Liquid hydrogen (17 K and 10 bar)**
- **Circulation flow: 1 kg/s**



G04 Compressor Hall

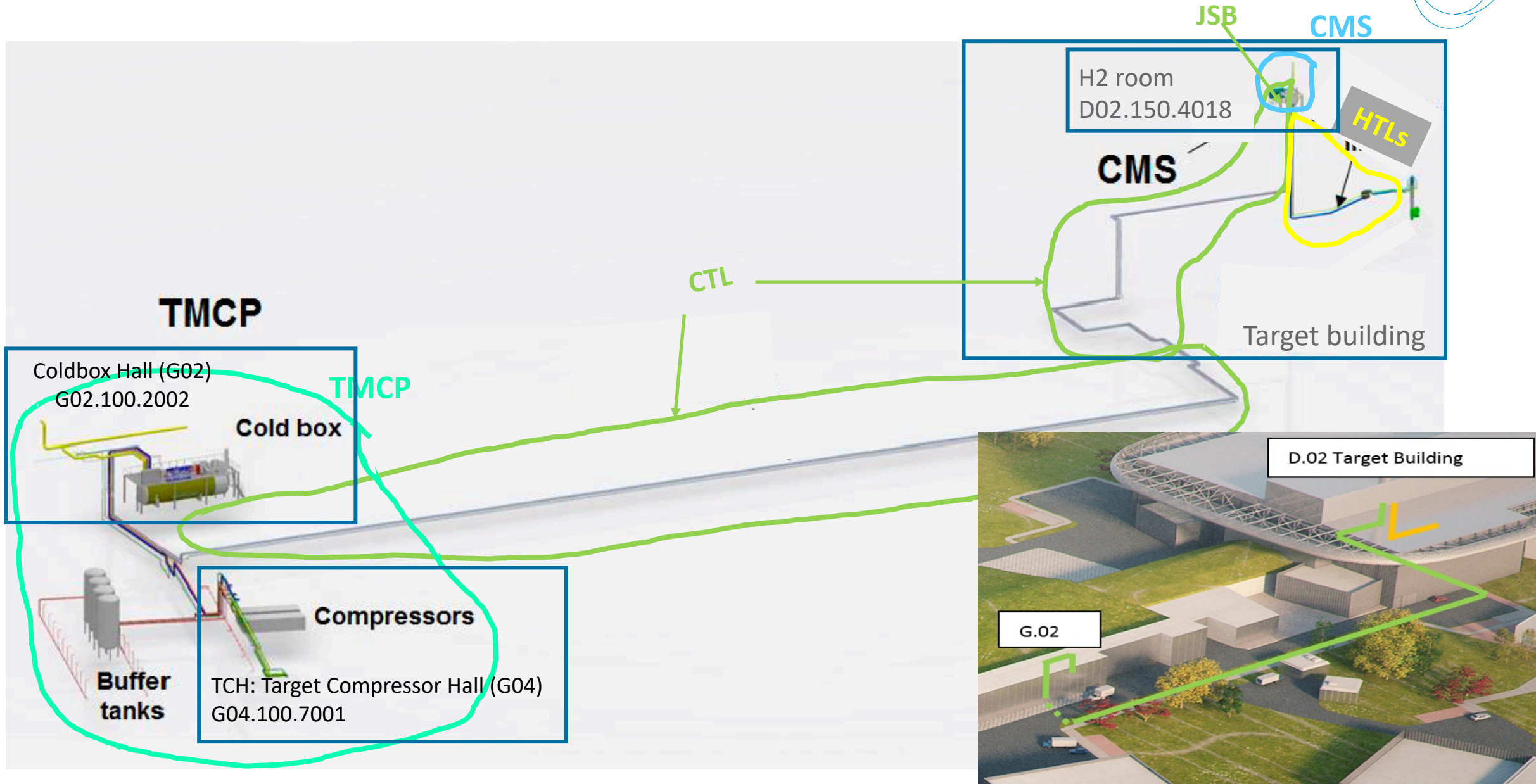
G02 Cold box Hall

CTL Trench

Hydrogen room

D02 Target building

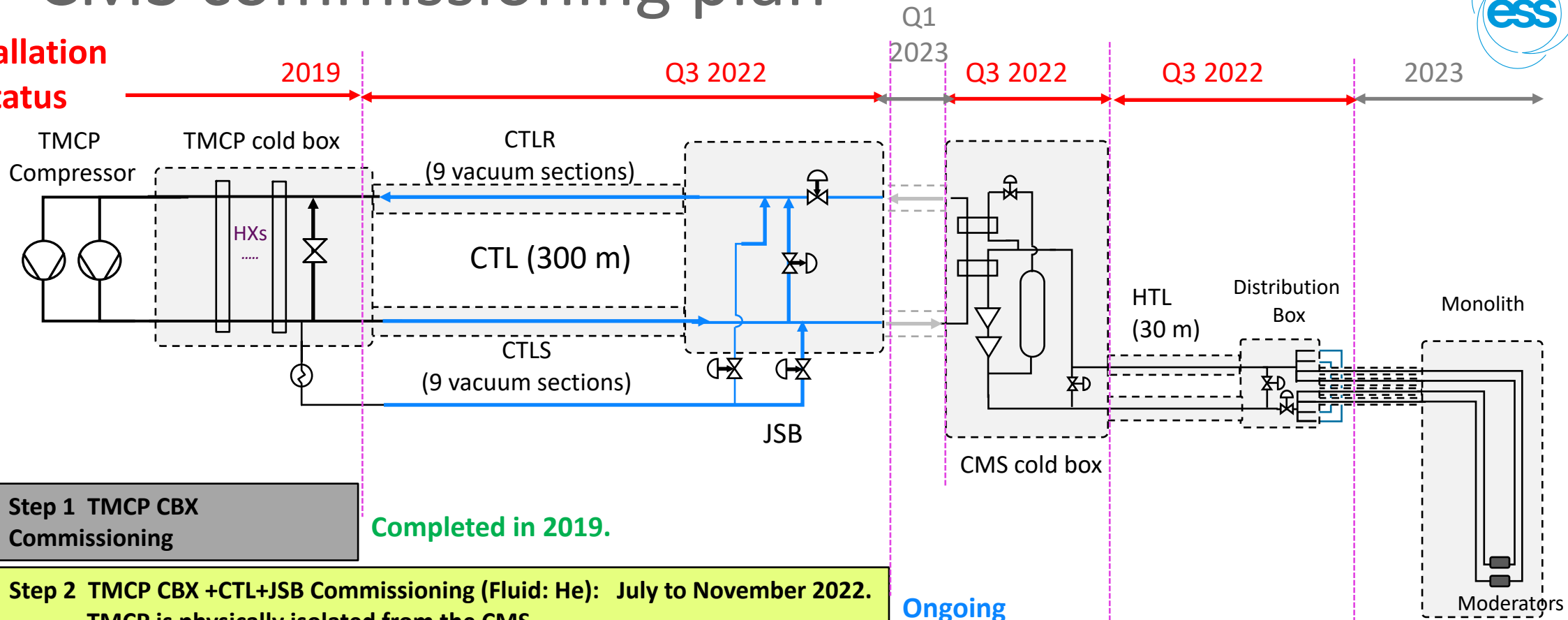
System Site Layout





CMS commissioning plan

Installation status



Step 1 TMCP CBX Commissioning

Completed in 2019.

Step 2 TMCP CBX + CTLR + JSB Commissioning (Fluid: He): July to November 2022.
 - TMCP is physically isolated from the CMS.

Ongoing

Step 3 TMCP + CMS CBX Commissioning (8 weeks by Helium and 4 weeks by Hydrogen)
 - CMS CBX will be cooled by TMCP.

**Q2-Q3 2023 (He)
 Q4 2023 (H2)**

Step 4 TMCP + CMS CBX + HTL + DB Commissioning (8 weeks by He and 4 weeks by H2)
 - CMS without the moderators will be cooled by TMCP.

**Q3-Q4 2023 (He)
 Q4 2023, Q1 2024 (H2)**

Step 5 TMCP + CMS CBX + HTL + DB + Moderators Commissioning (1 weeks by He and 5 weeks by H2)
 - Commissioning of the Whole CMS (off-beam)

**Q2 2024 (He)
 Q2-Q3 2024 (H2)**

CMS CBX FAT at FZJ

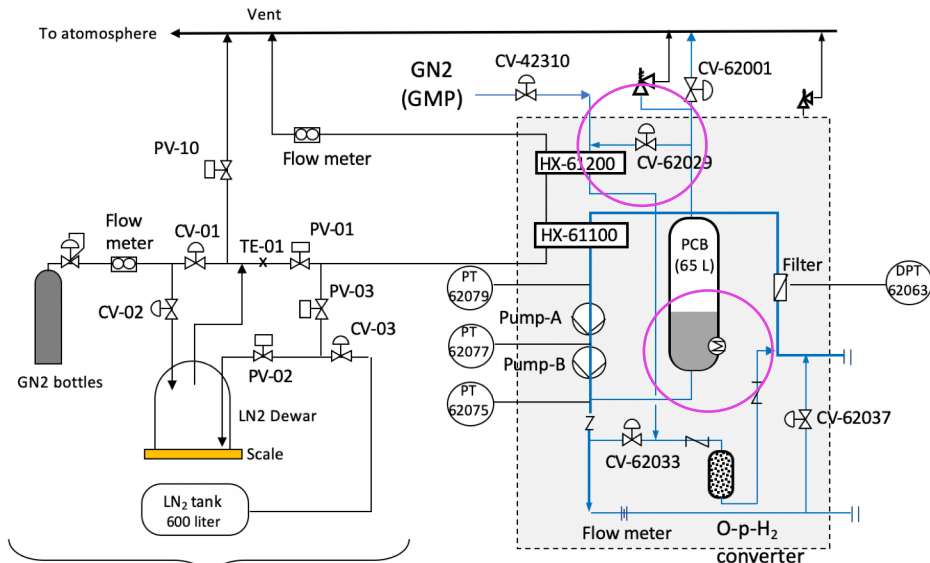


Mixing system

- Installation was done in Nov., 2020.
- FAT was carried out until Sep. 2021 using LN2.
 - Cooled by a temporary mixing system instead of the TMCP.
 - Pump performance test (80, 120 and 300 K)
 - Pressure drop measurement
 - PCB pressure control test (depressurized by a control valve and pressurized by a heater.)
- Delivered to the ESS in Nov. 2021.



Delivered to ESS

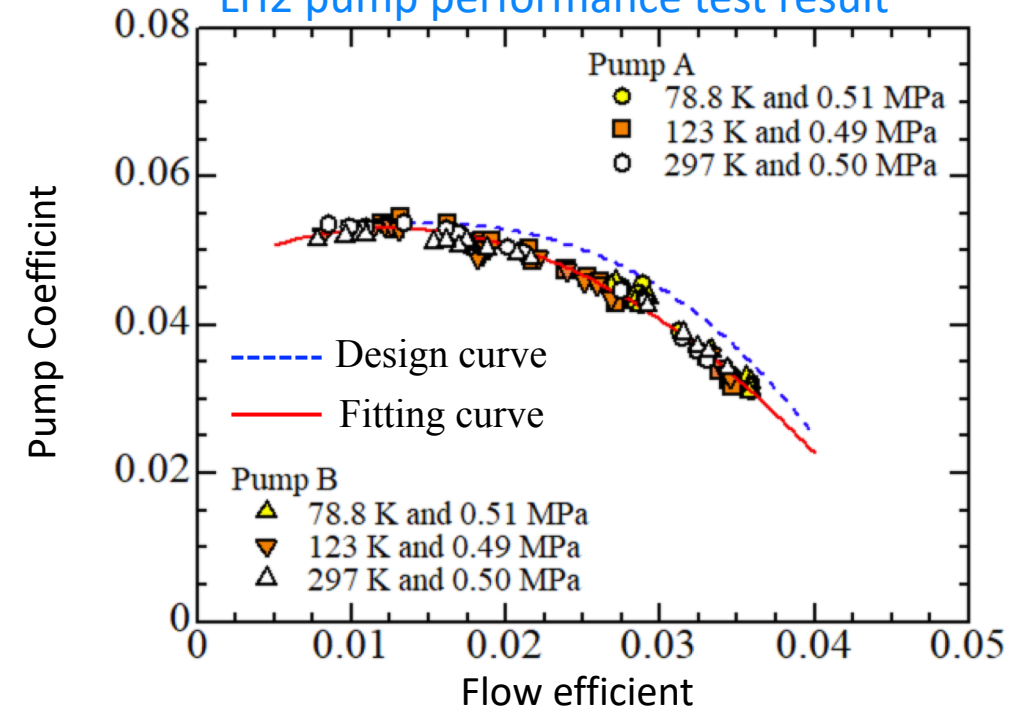


CMS CBX



LH2 pump

LH2 pump performance test result



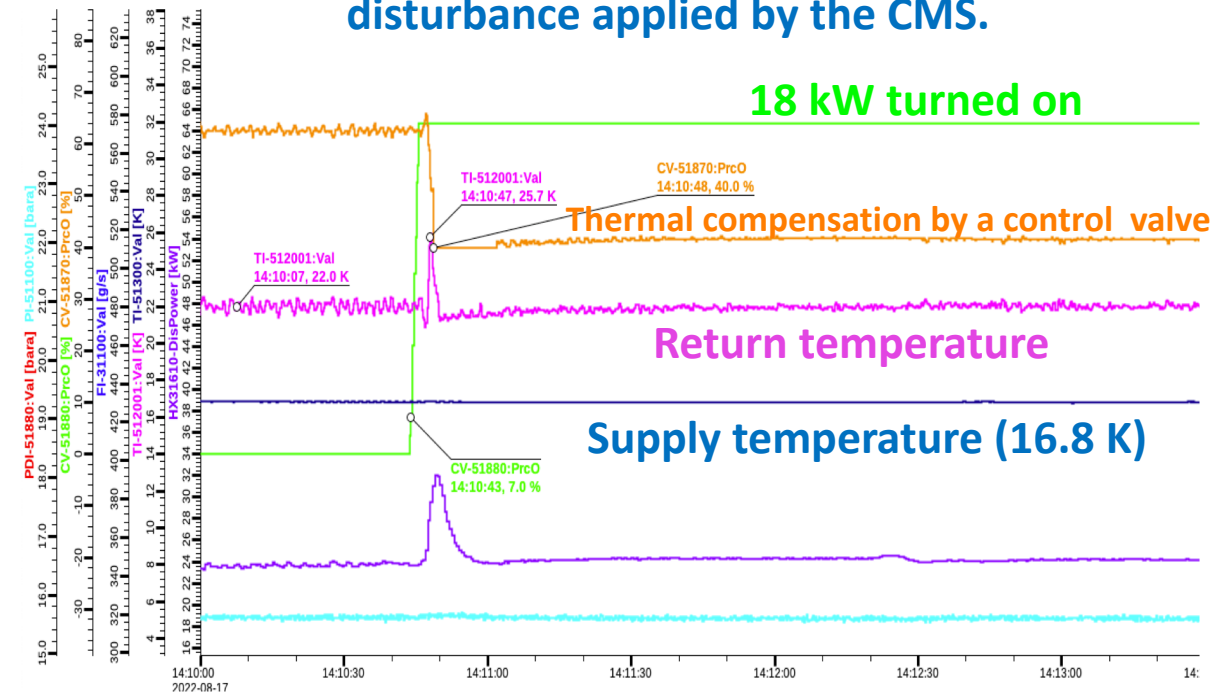
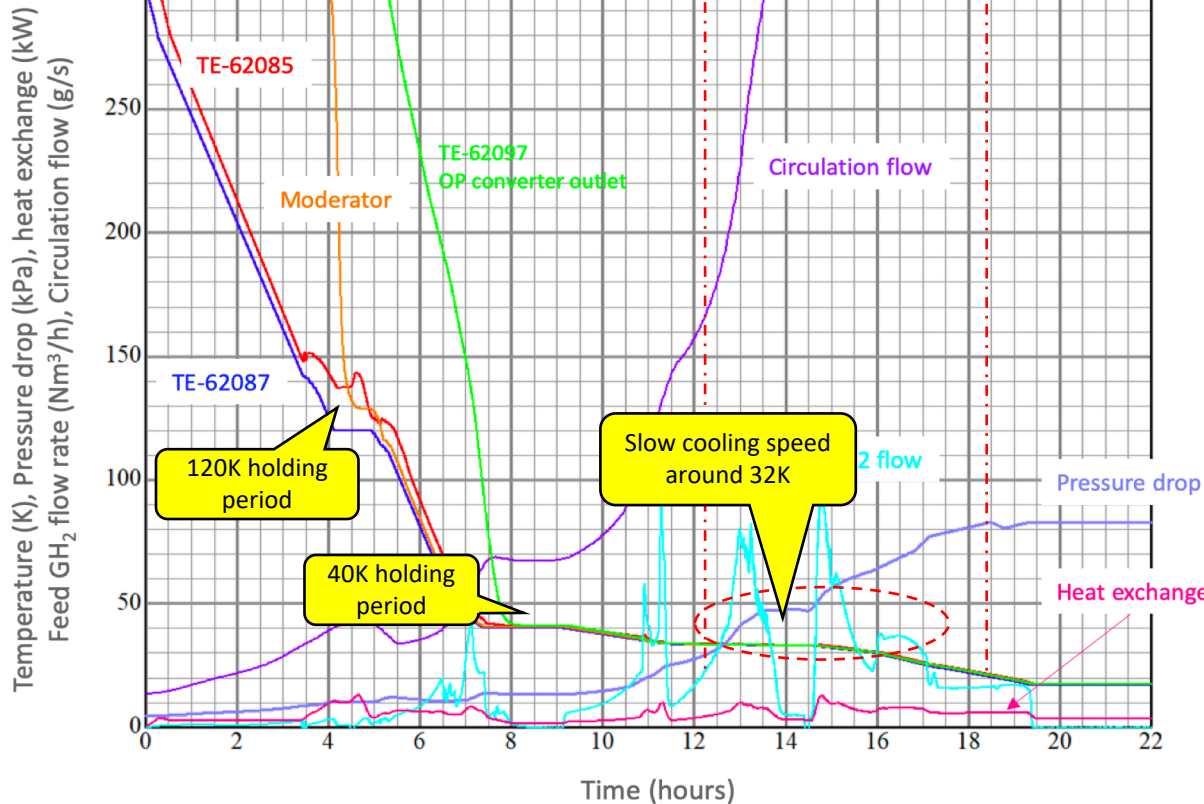


TMCP commissioning (STEP2) in 2022

- ESS has already developed a cool-down simulation code of the CMS. Cool down procedure has been established based on the result.
- > TMCP cool down operation is being studied.

- TEST#1 (TMCP commissioning)
 - First cooldown operation was completed.
 - CTL Heat load measurement (for 36 hours): 1.53 kW (design value=1.27 kW)
 - CTL pressure drop m
 - Vacuum degradation test and visual check.
 - Transient heat input simulated by the nuclear heating in the CMS.

-> It proved that the TMCP can be remove the thermal disturbance applied by the CMS.





Summary

- Most of the CMS-TMCP installation has been done.
 - GH2 filling station will be completed in Q1 2023.
 - U-shaped tubes between the CMS and JSB will be installed in Q1 2023.

- TMCP commissioning is ongoing. The Cooldown/warmup control logic is being studied via the STEP2 commissioning until the end of this November.

- CMS commissioning using He (cooled by the TMCP) will start Q2 2023.
- CMS commissioning will be completed in 2024.