



LH2 Infrastructure

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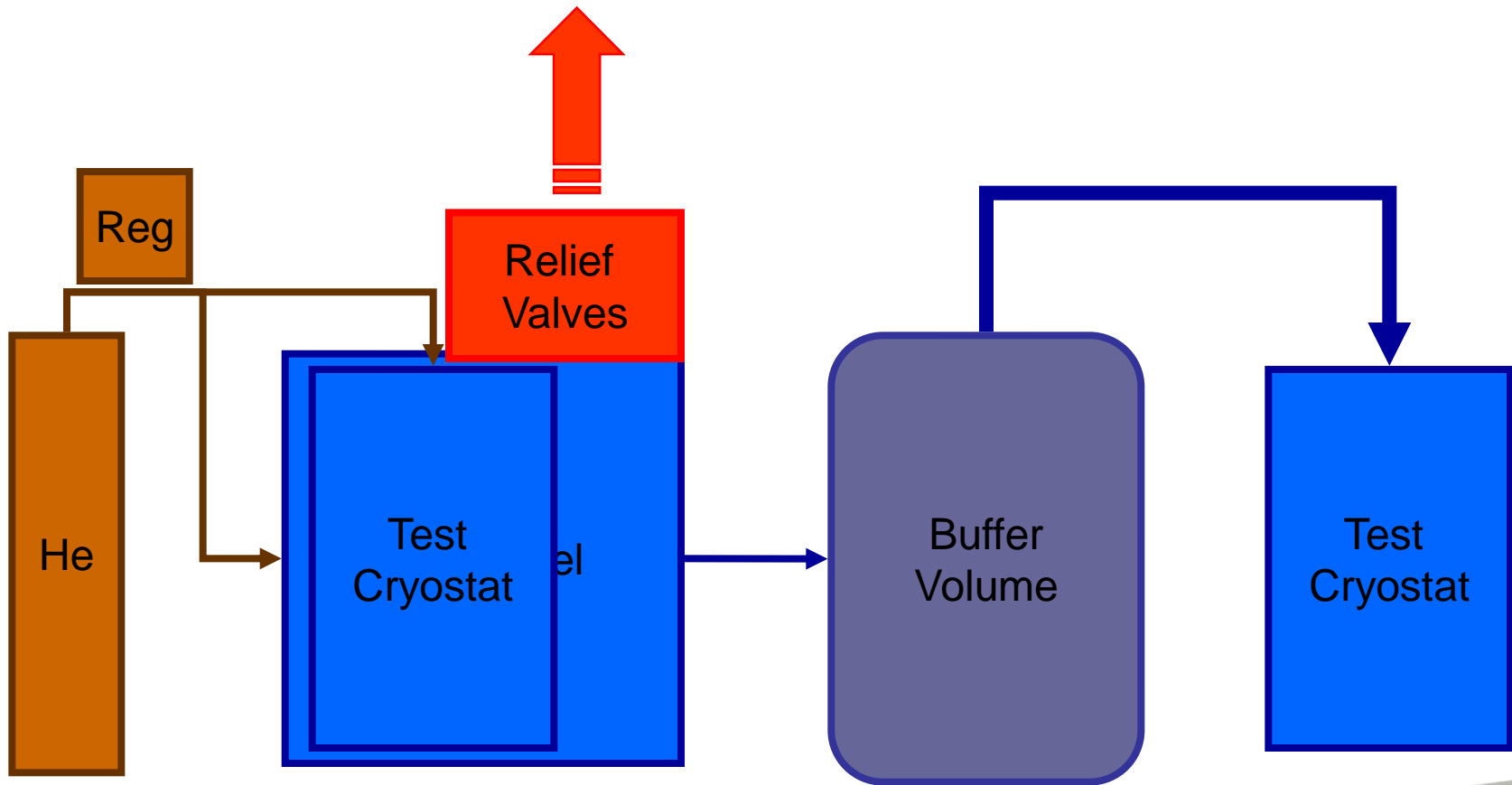
Outline

1. Progress Update
 - i. R&D System Acceptance Testing
 - ii. Gas Panel Enclosure Manufacture
 - iii. Vacuum System
 - iv. Ventilation System
 - v. Bottle Store
2. Dealing with a power cut
3. H2 considerations for the overall schedule
4. The next 6 months



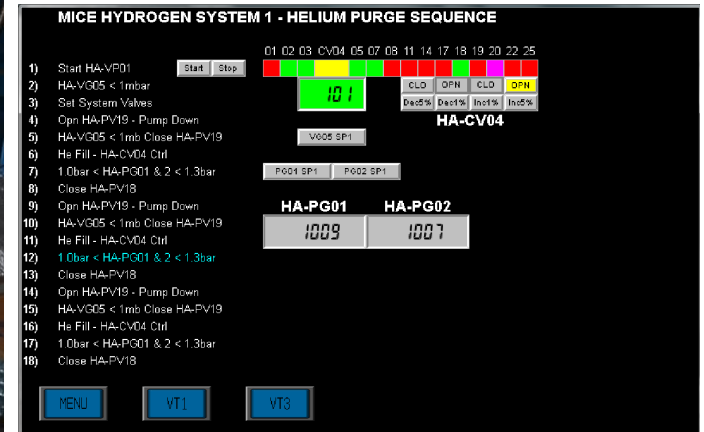


Acceptance Test Set-up





Acceptance Testing



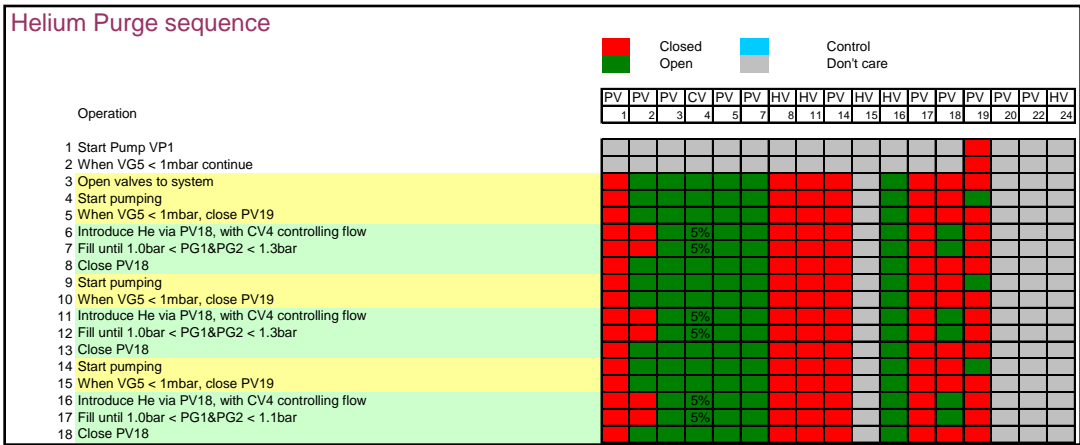
Several Purposes:

- Leak testing
- Pressure testing (and certification)
- Full system cool-down with buffer tank and gas panel
- Testing of instrumentation and logging on PLC
- Some testing of control sequences for helium





Purge Sequence Test



- Helium Purge sequence was programmed in PLC
- Display shows sequence operation, valve states and relevant parameters

MICE HYDROGEN SYSTEM 1 - HELIUM PURGE SEQUENCE

01 02 03 CV04 05 07 08 11 14 17 18 19 20 22 25

1) Start HA-VP01

2) HA-VG05 < 1mbar 101

3) Set System Valves

4) Opn HA-PV19 - Pump Down

5) HA-VG05 < 1mb Close HA-PV19 **HA-CV04**

6) He Fill - HA-CV04 Ctrl

7) 1.0bar < HA-PG01 & 2 < 1.3bar

8) Close HA-PV18 **HA-PG01** **HA-PG02**

9) Opn HA-PV19 - Pump Down

10) HA-VG05 < 1mb Close HA-PV19

11) He Fill - HA-CV04 Ctrl

12) 1.0bar < HA-PG01 & 2 < 1.3bar

13) Close HA-PV18

14) Opn HA-PV19 - Pump Down

15) HA-VG05 < 1mb Close HA-PV19

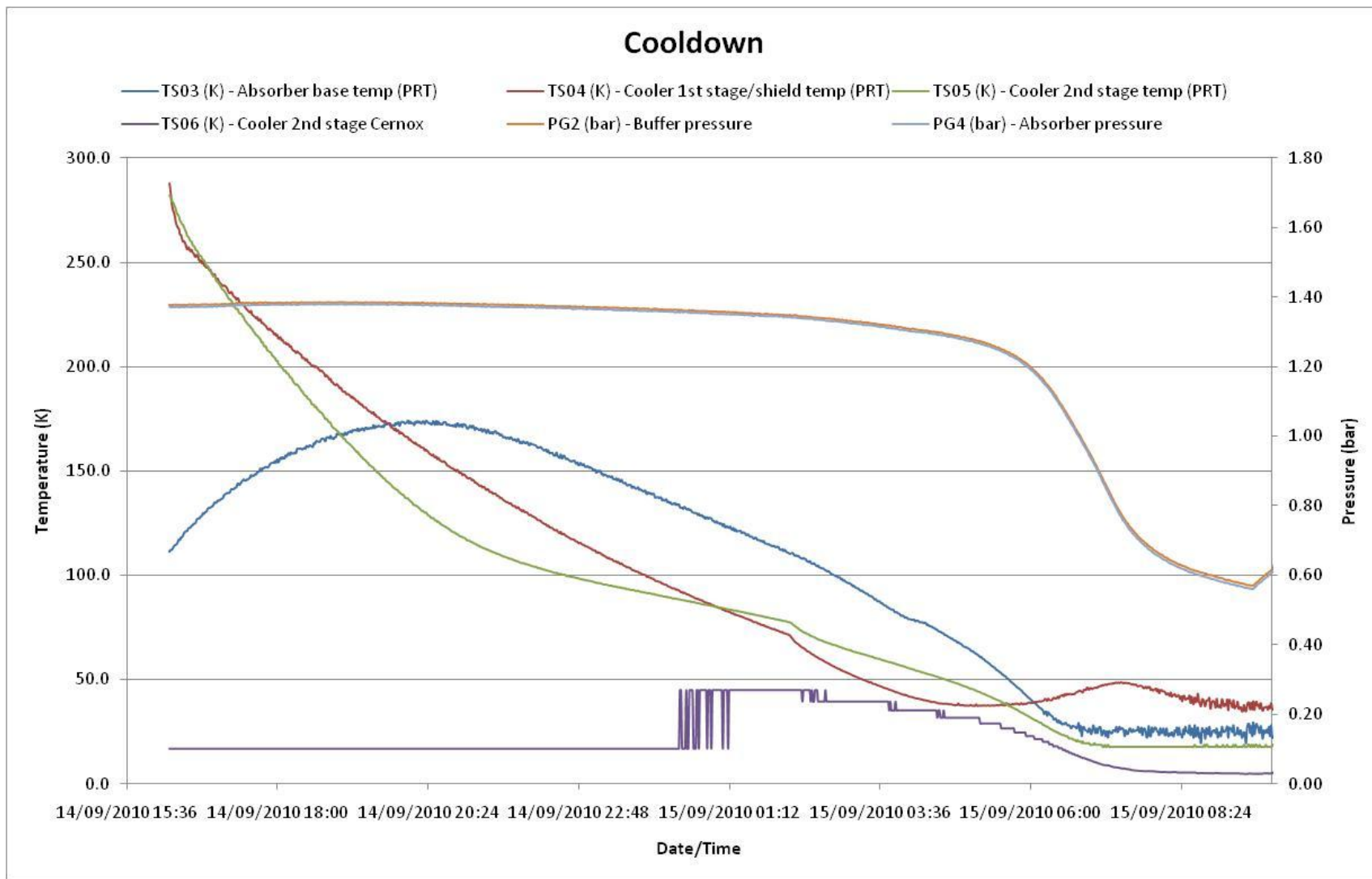
16) He Fill - HA-CV04 Ctrl

17) 1.0bar < HA-PG01 & 2 < 1.3bar

18) Close HA-PV18

- Switches used to simulate signals that were not available at this stage
- Successfully run

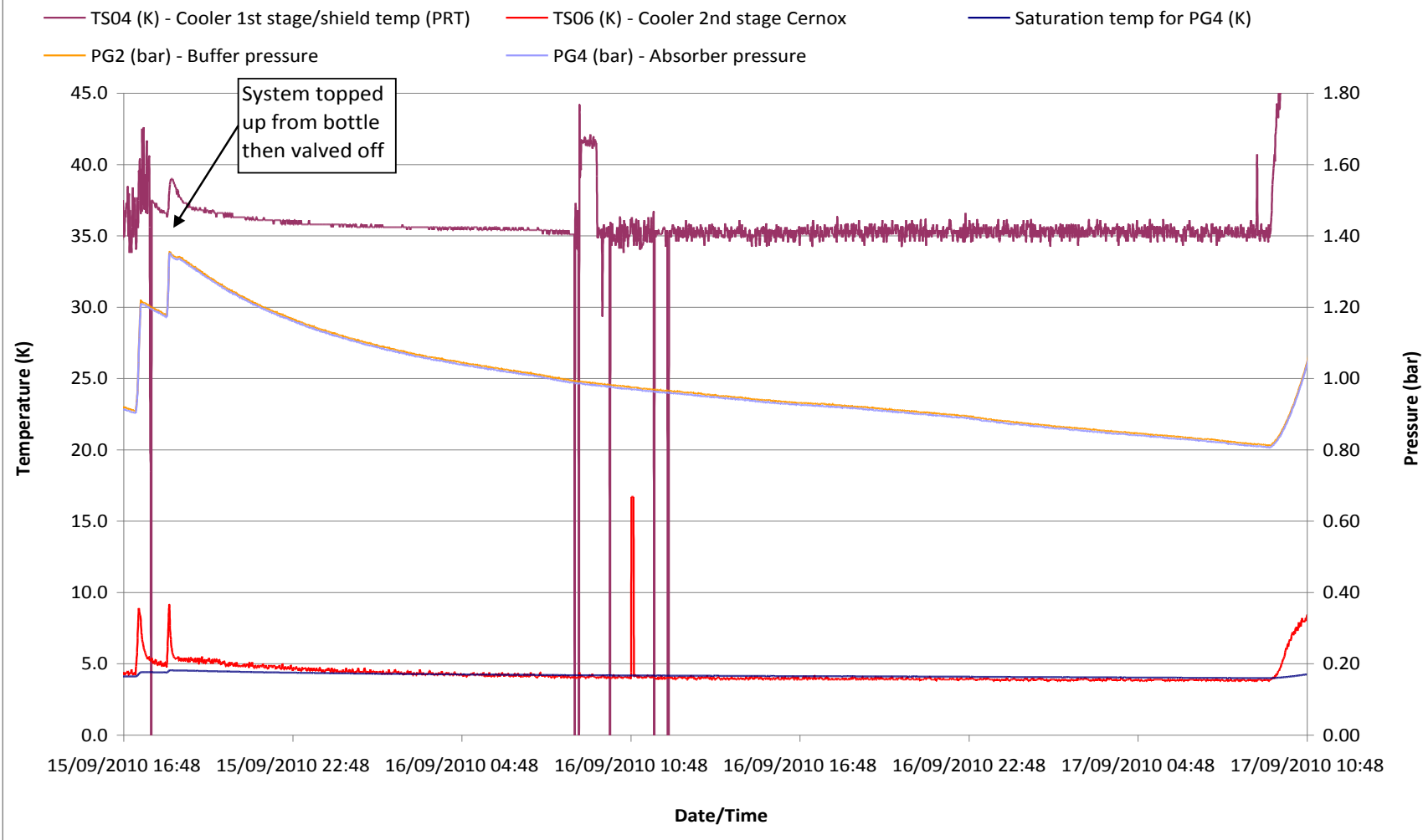
Test Results (1)





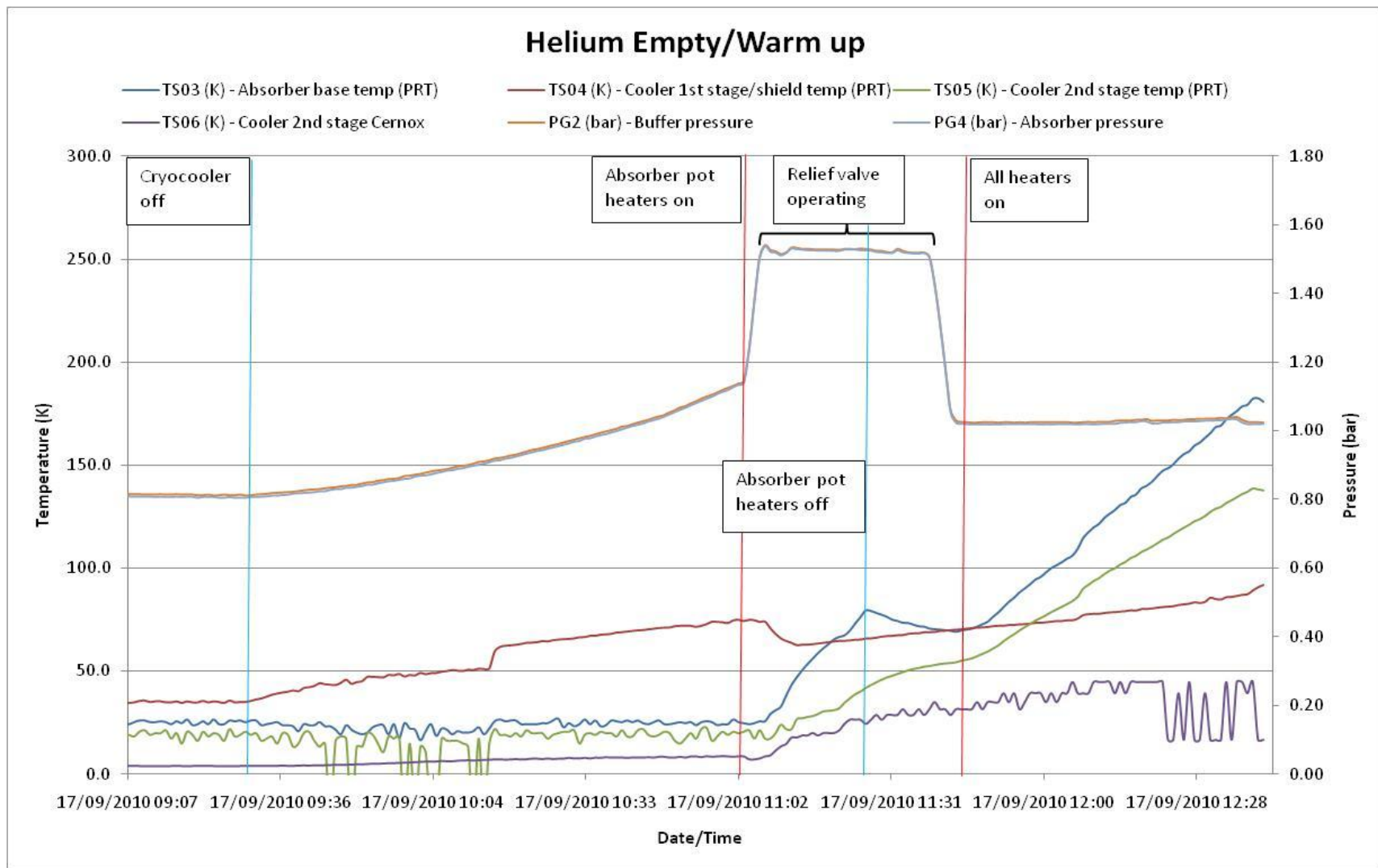
Test Results (2)

Cryocooler at base temperature and system valved off





Test Results (3)



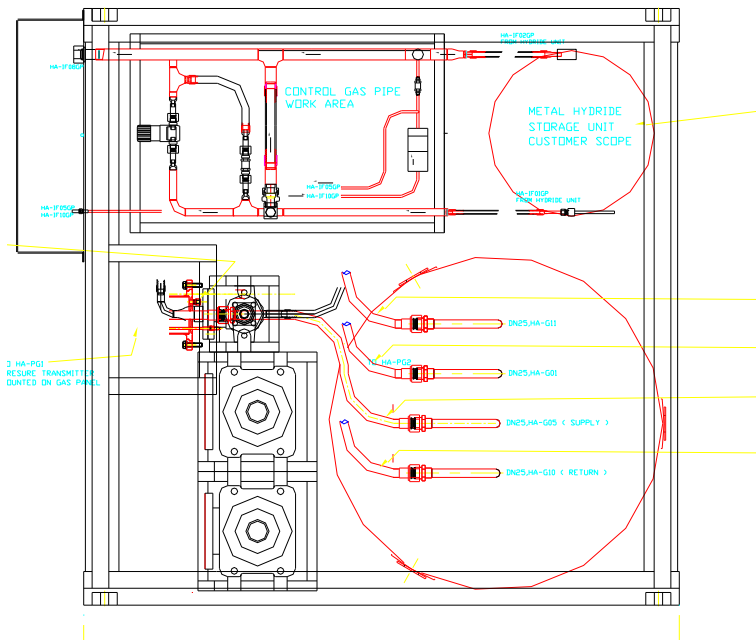


GP Enclosure

Framework welding complete

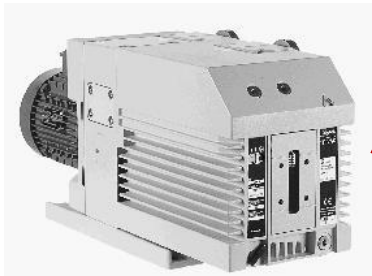
Next steps:

- Proof loading
- Fit floor plate and arrange details of gas panel, buffer tank and relief valve fixing
- Install gas panel, buffer tank, etc.
- Fit removable outer panels
- Deliver to MICE Hall

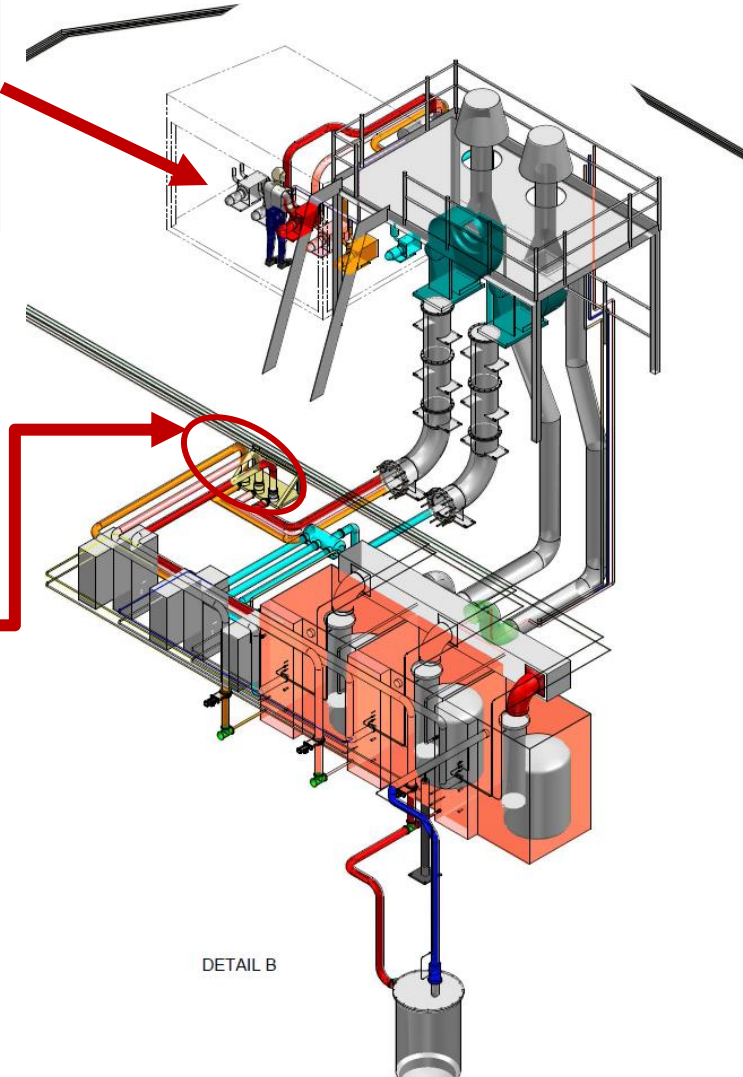




Vacuum System



Backing pump



Turbo pumps

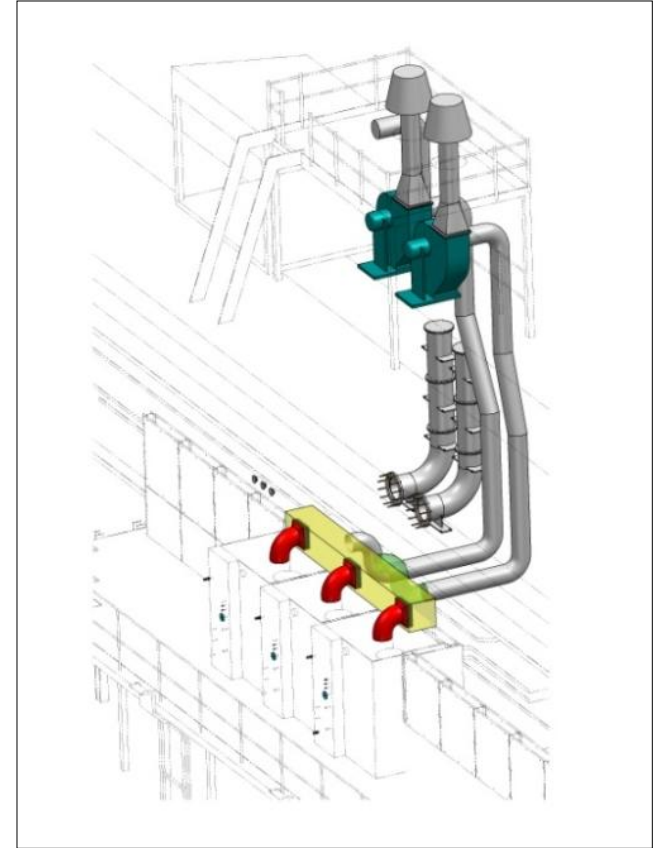
- Dedicated pump enclosure to be sited on MICE Hall roof
 - Will house backing pumps required for all 3 hydrogen systems
 - Designated Hydrogen Zone 2 (same as Gas Panel Enclosures) for DSEAR purposes
- Turbo pumps for AFC modules' safety vacuum to be sited on South Wall in present plan
- Pipe diameters will need to be large (approx. 150mm) to achieve required vacuum
- Pumps have now been delivered to RAL
- Still work to do on details of the control system



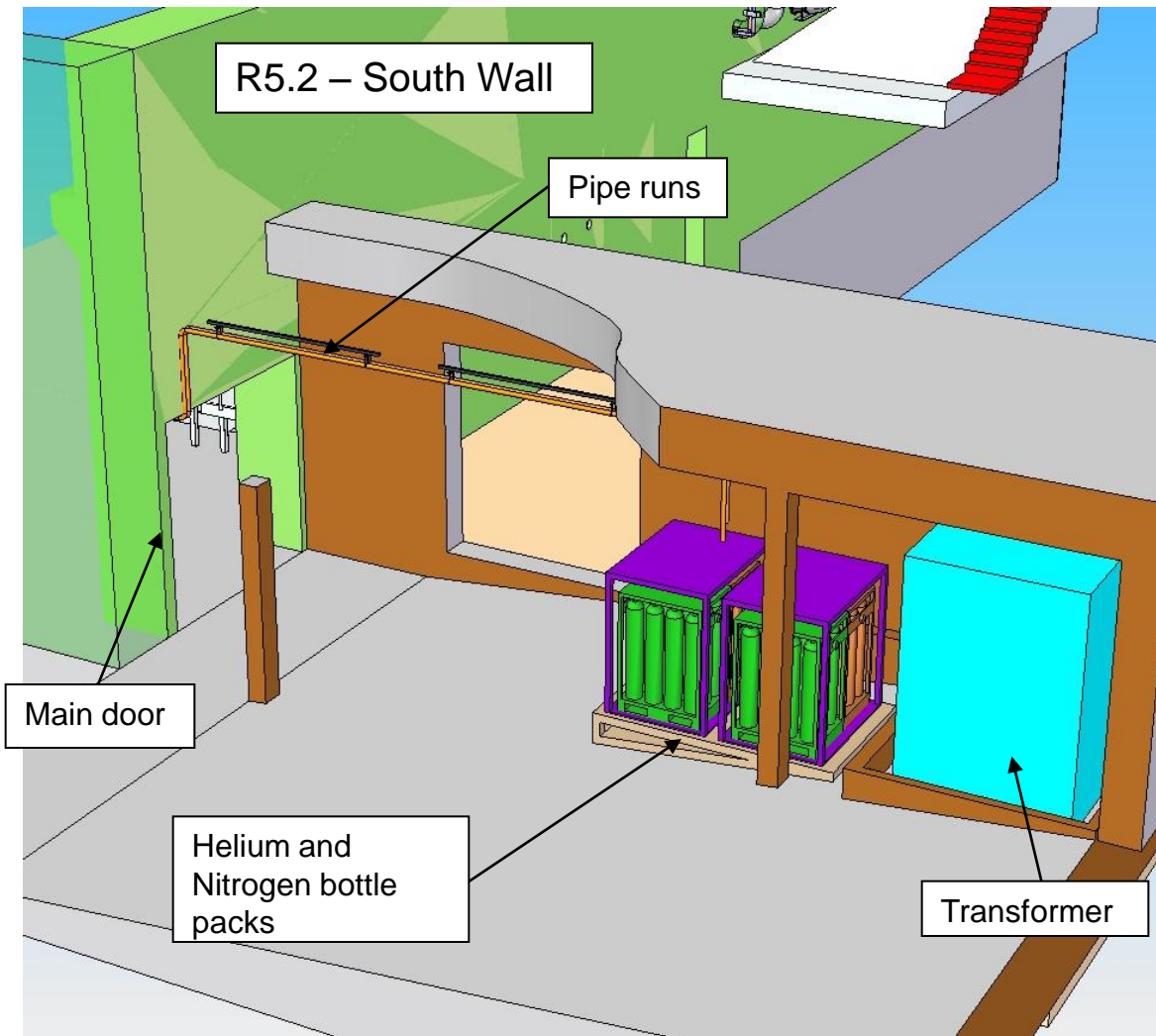


Ventilation System Update

- Fans delivered
- Ductwork out for tender at present
- Final approval of risk assessment by third party consultants in hand
- Vacuum pump enclosure will have a dedicated ventilation duct due to dual purpose requirements
 - Maintain temperature of enclosure within acceptable limits for pump operation
 - Provide level of ventilation consistent with an ATEX Zone 2



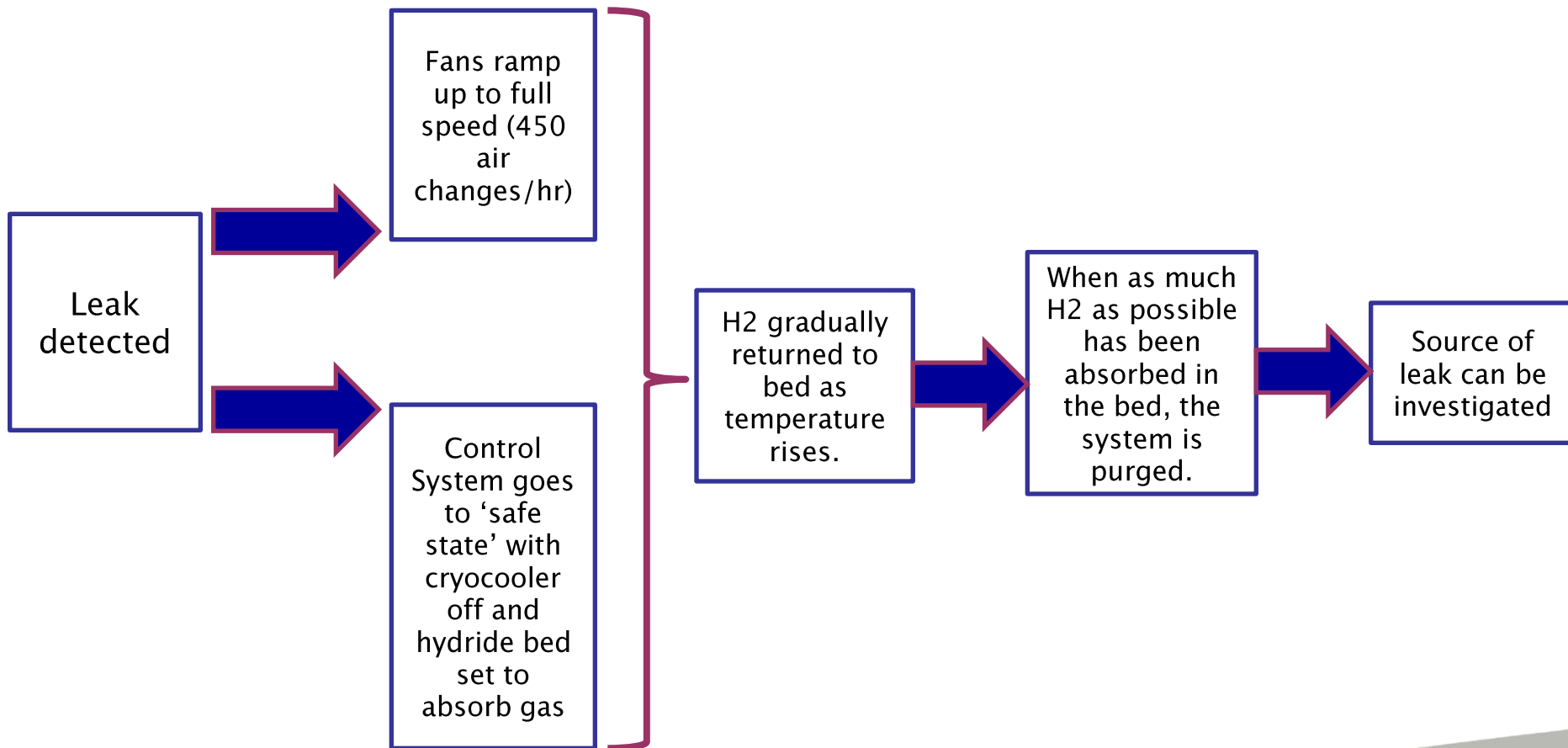
Bottle Store



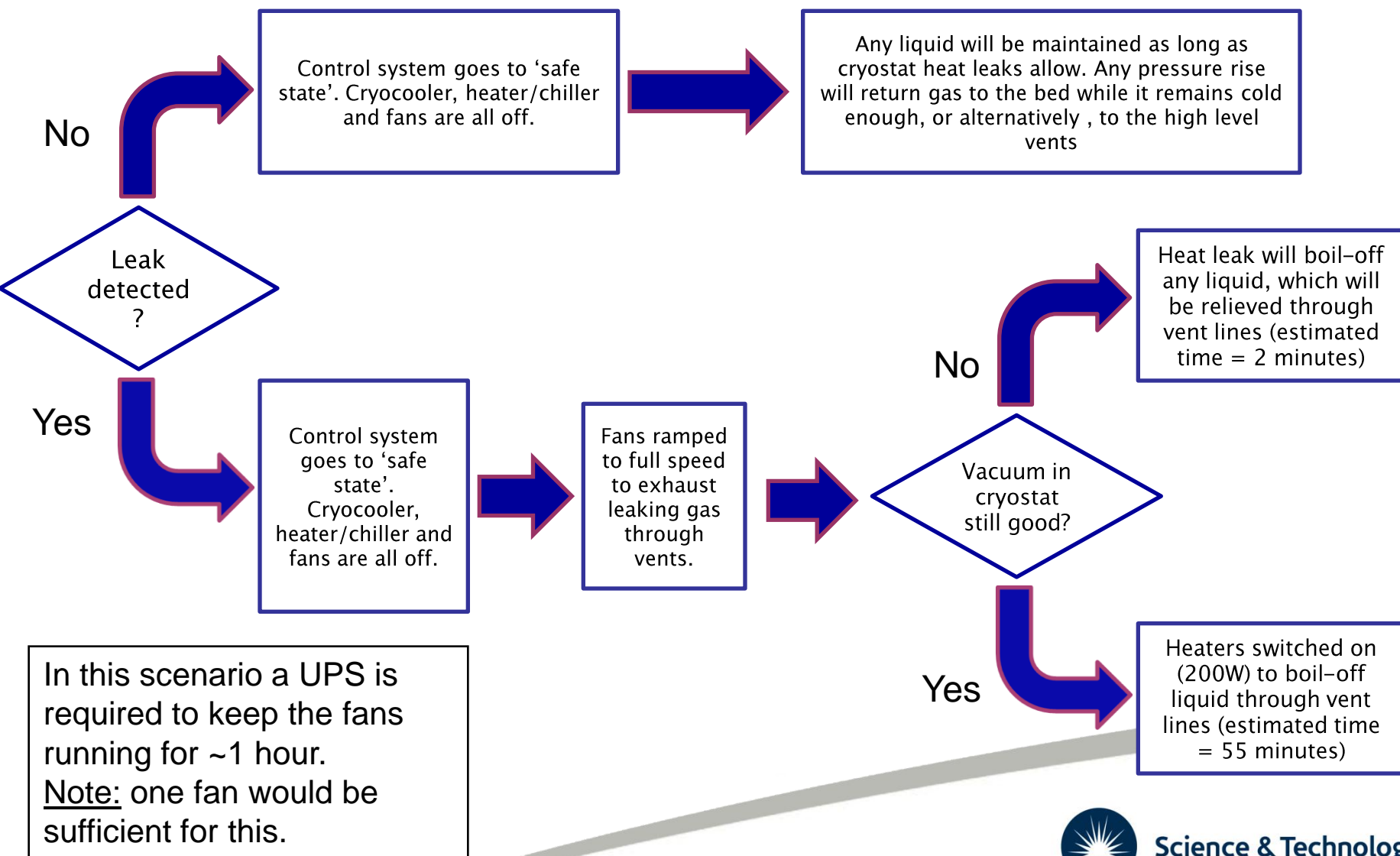
- Area agreed with ISIS
- Bottle packs to be mounted on a removable framework in case the transformer ever has to be removed
- Pipe will be routed along South Wall once inside Hall



With Power On...



When power goes off...





Power Outage Summary

- Would like to follow a controlled venting procedure in a power outage
- Preference is to use heaters to boil off LH2, which will take approx. 55mins
 - Heaters interlocked to cryostat vacuum pressure to prevent switching on in presence of explosive mixture
- Still requires a significant UPS (keep fan(s) running for ~1hr)
- To be documented and discussed with MICE/ISIS Safety Committee





Overall schedule considerations

- Is installing STEP III (or STEP II) compatible with H2 R&D?
 - Probably not.
- Is running STEP III compatible with continuation of H2 R&D?
 - The R&D system was designed to be compatible with STEP III...
 - ...but this might not be practical in reality
- The H2 R&D must be complete before we can consider installing STEP IV
- STEP IV installation tasks specific to the LH2 infrastructure
 - Re-design and install AFC specific transfer line
 - Modify transfer line support structure
 - Move GP Enclosure along South Mezzanine (this may need additional electrical infrastructure)
- Liquid-Solid Absorber changes in STEP IV
 - Disconnect H2 transfer line
 - Move AFC module into maintenance position
 -
 - Therefore, we need to know requirements for disconnection





Next steps/outline schedule

- Hall preparation underway now:
 - Compressed air supply
 - Scaffolding for electrical installation
- Gas Panel Enclosure, Test Cryostat and Transfer Line delivered to RAL in next month
 - Installed during the remainder of 2010
- In parallel:
 - Cabling for controls (Nov 2010 – Dec 2010)
 - Assembly of control cabinets and installation in Hydrogen Local Control Room (HLCR) (Dec 2010 – Feb 2011)
 - Ventilation system installation (Nov 2010 – Mar 2011)
 - Bottle store fabrication and running pipelines (Nov 2010 – Feb 2011)
 - Vacuum Enclosure installation (Nov 2010 – Jan 2011), followed by vacuum system installation (Feb 2011 – Apr 2011)





Summary

- Acceptance Testing completed and went well
- Control system has been given a good shakedown
- Assembly of racks and inclusion of control functions for vacuum/ventilation/hydride bed will be next focus
- Gas Panel Enclosure manufacture is well underway
- Ventilation system out to tender – hope to place contract in next month
- Key vacuum system components are delivered, but lots of design work to do on the complete installation
- Safety work is still going on behind the scenes and interaction with ISIS will be crucial.

