



# Hydrogen Delivery System Schedule

MICE Schedule Review

23<sup>rd</sup>-25<sup>th</sup> May 2011

M Hills

STFC



Science & Technology  
Facilities Council



# Outline

- i. Work package overview
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- v. Schedule by task
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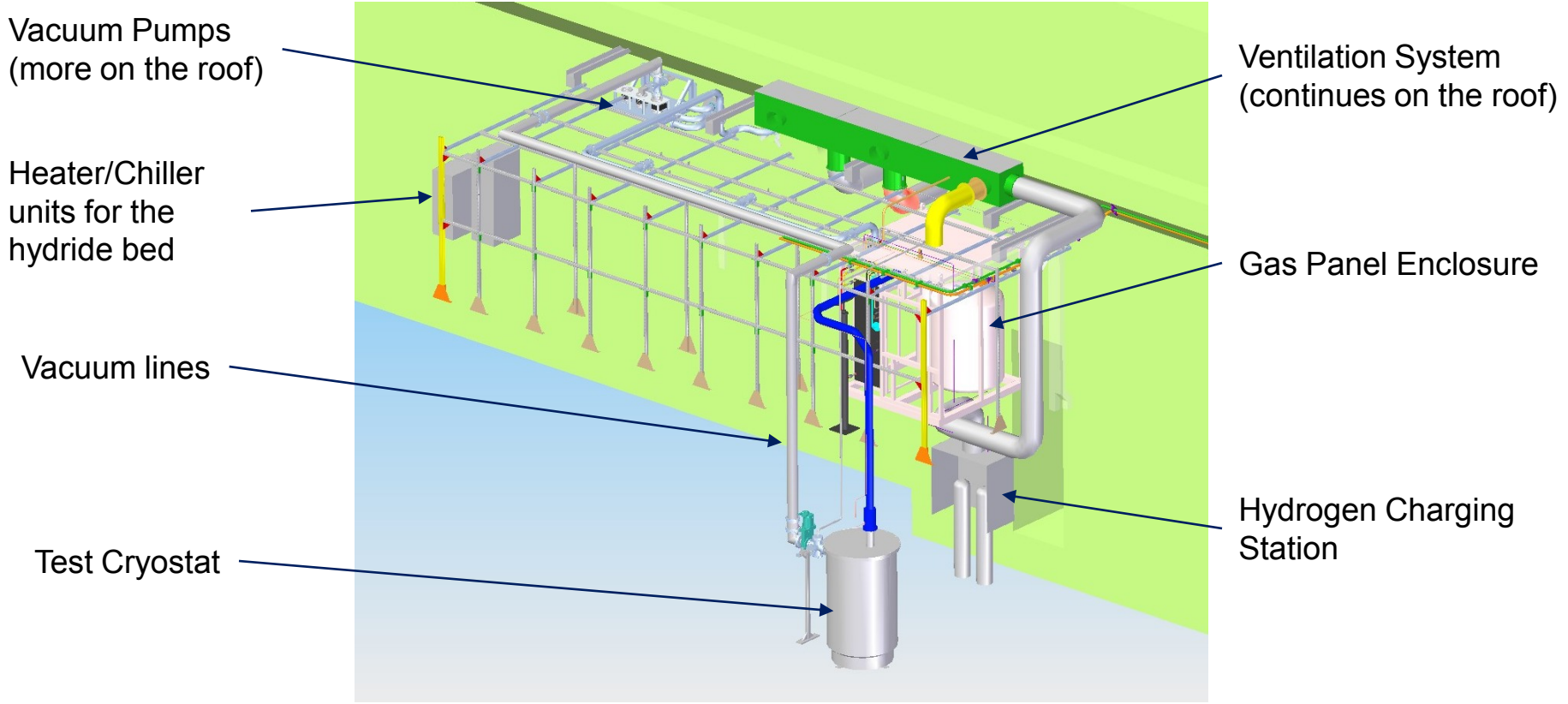
# Work package overview

- The Hydrogen Delivery Systems will provide liquid hydrogen to the Absorbers in MICE
- Each Absorber will have a dedicated delivery system (A, B & C)
- The systems use metal-hydride storage and an R&D phase is planned to de-bug this novel part of the system
- The R&D phase uses a dedicated test cryostat in place of the final MICE Absorber
- Upon completion of the R&D, the system will be integrated with the AFC containing a KEK absorber for final commissioning





# What we have to do...to test the system



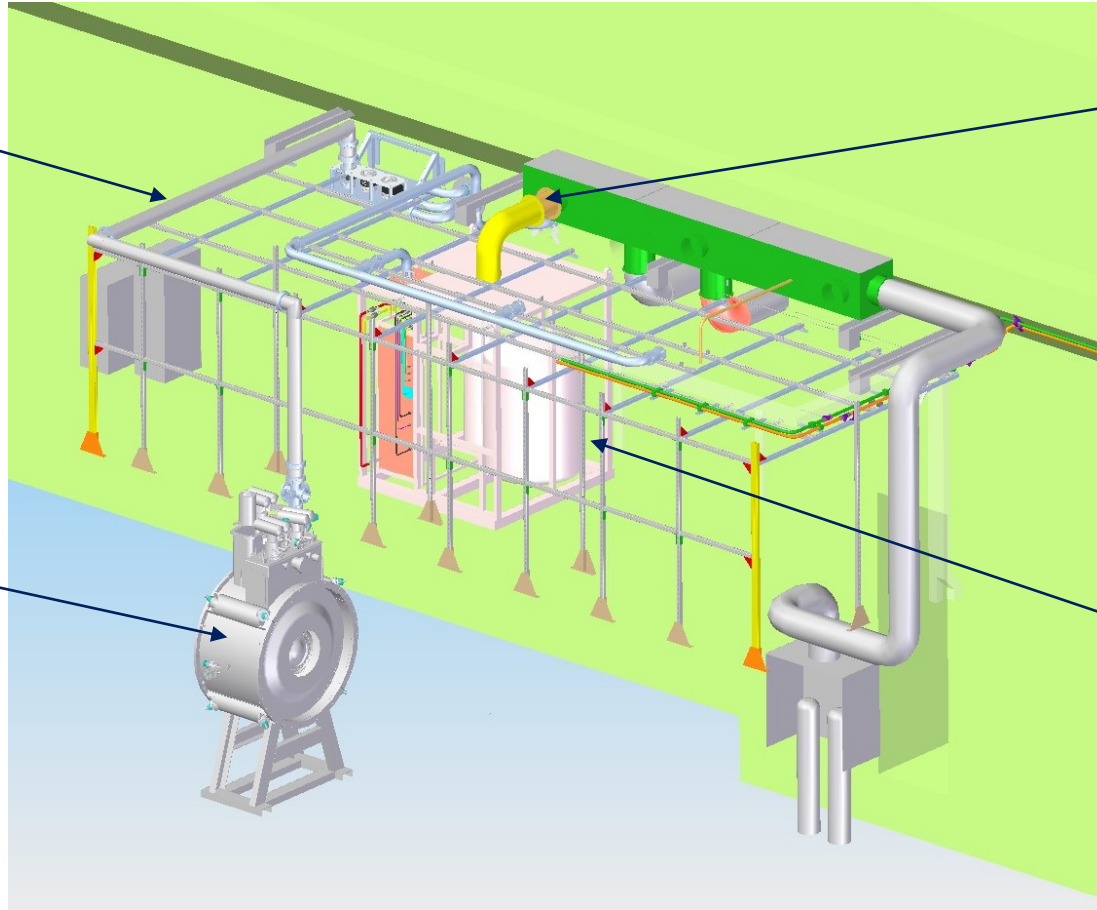
View of MICE Hall South Side (mezzanine not shown)

**AND**  
Pass a pre-operation safety review

# ...to be ready for STEP IV

New vacuum line

AFC  
module in  
STEP IV  
position



Ventilation extract  
duct moved

Gas Panel  
Enclosure moved up  
the mezzanine







# What we have done so far



Gas Panel Enclosure

Control System

Vacuum Pump Enclosure



Vent stacks

Test Cryostat

Ventilation System





# Tasks

- Controls
- Mechanical Design
- Safety
- Hall Infrastructure and Installation
- R&D Testing
- STEP IV Preparation (AFC Commissioning)





# People

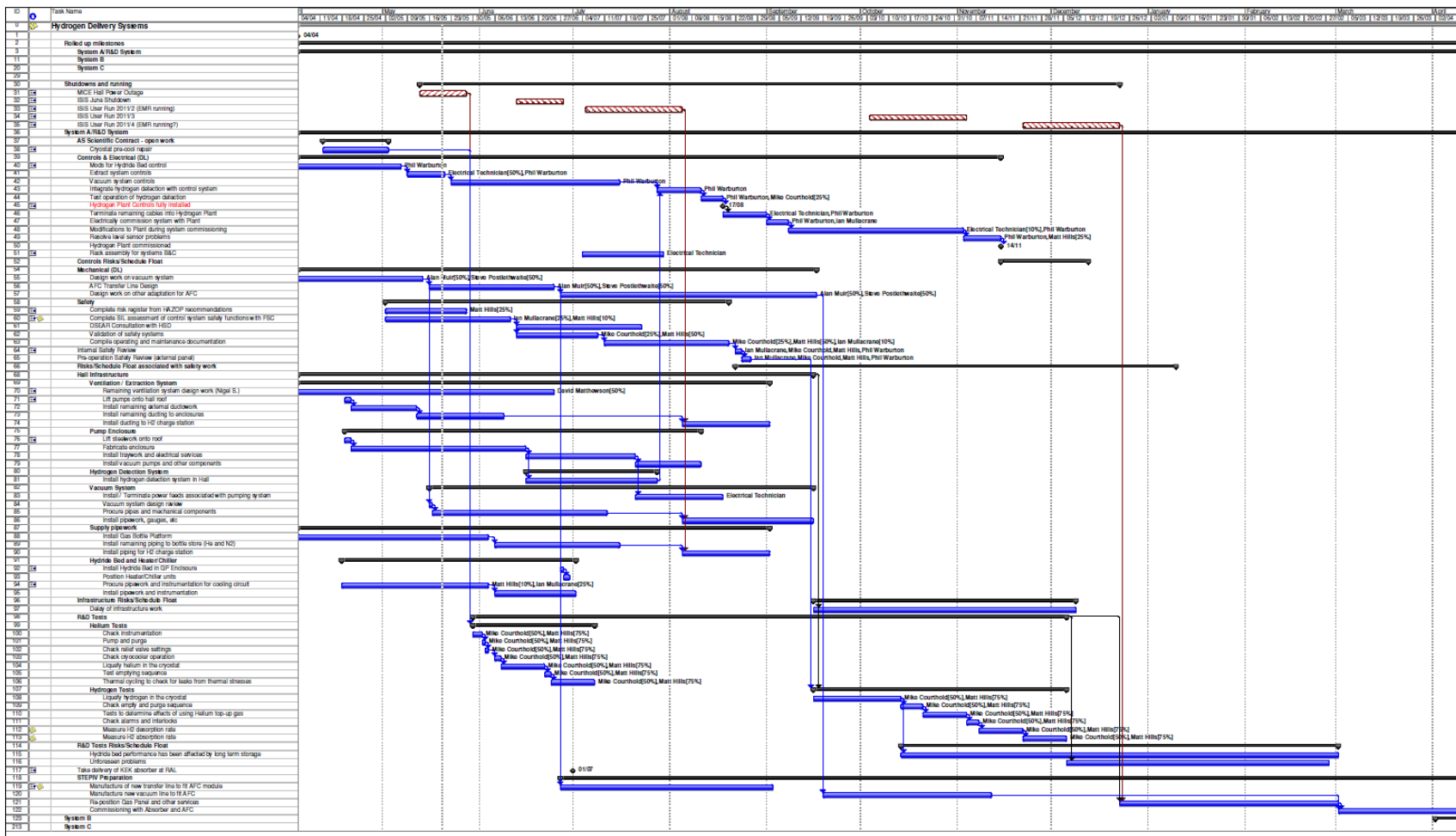
- M Hills - project management, cryogenic and mechanical design
- M Courthold - cryogenic design, controls and testing
- T Bradshaw – advice and consultation on cryogenic issues
- I Mullacrane, P Warburton - control system design and implementation
- A Muir, S Postlethwaite (with supervision from A Grant) – mechanical design
- Hall technicians – installation and assembly



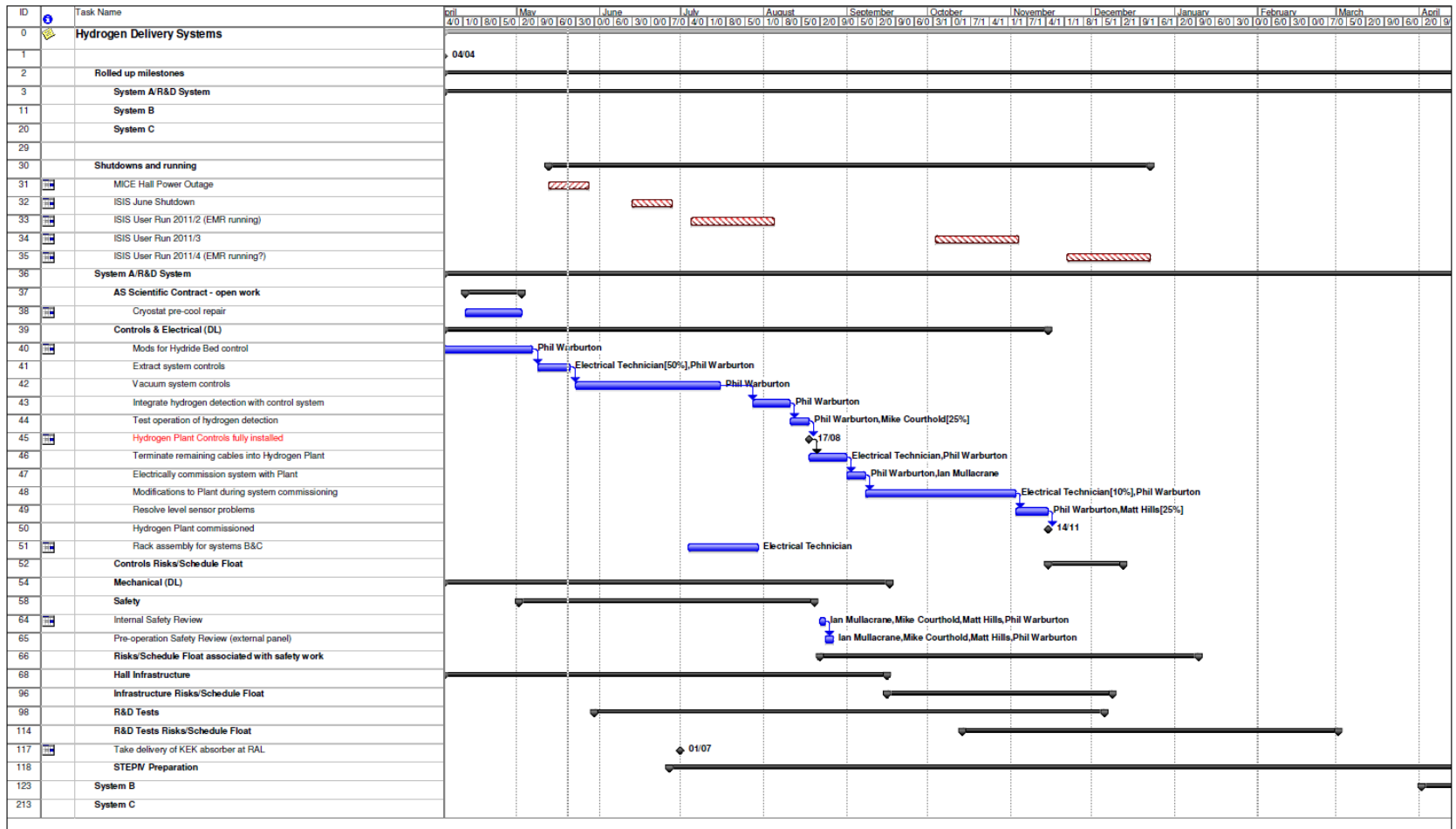




# 2011/12 Schedule Overview



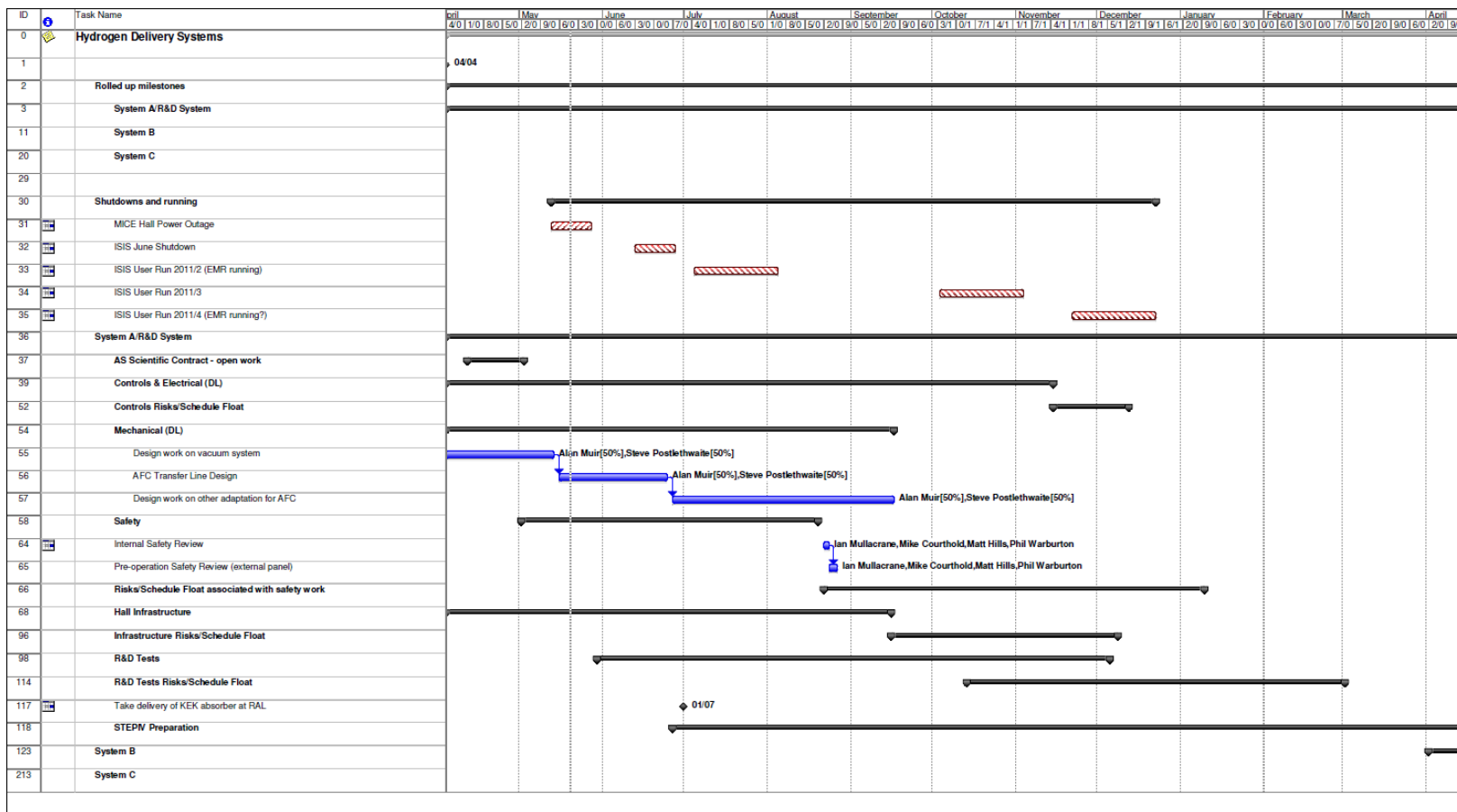
# Controls



- Controls for helium testing already in place
- This work covers the additional tasks for hydrogen testing



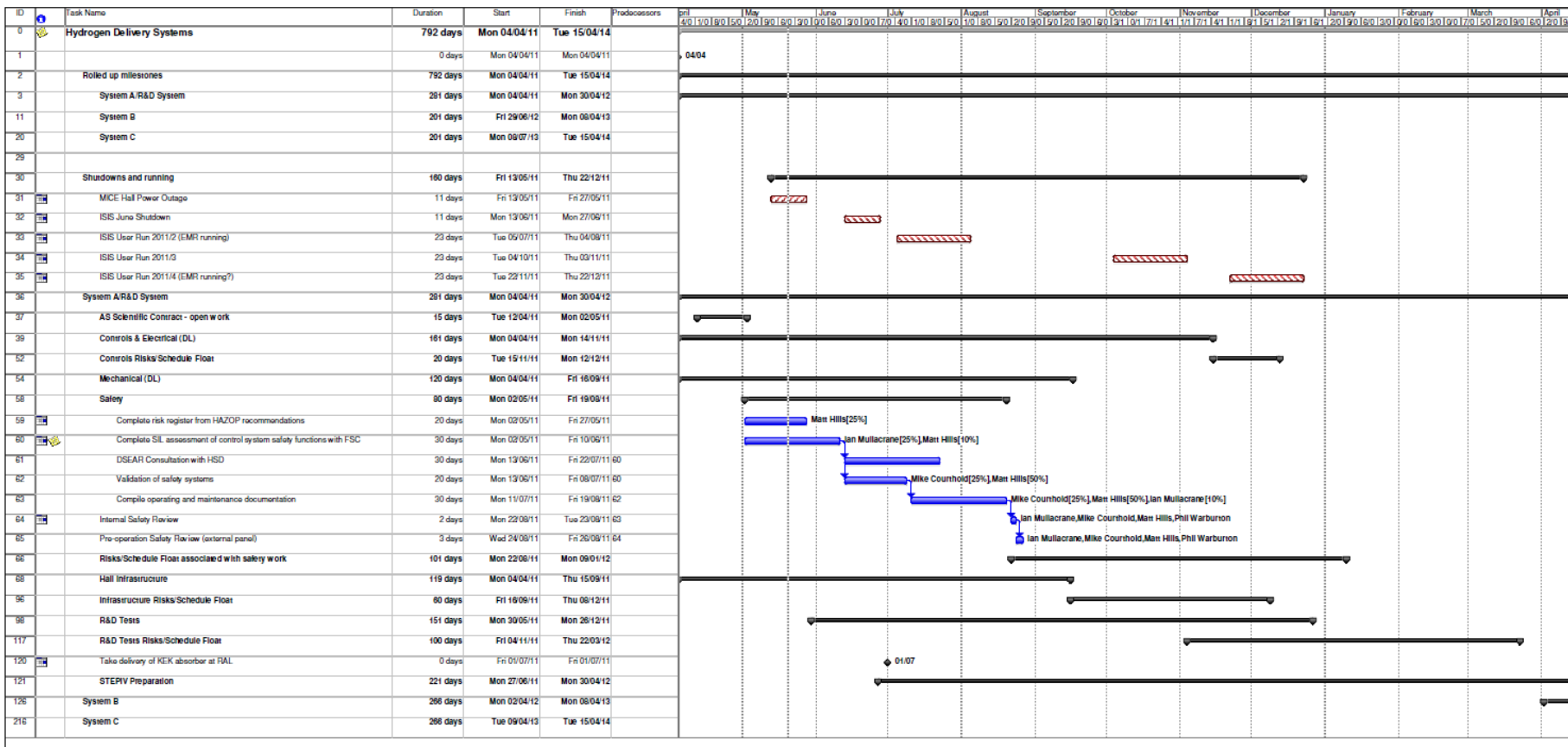
# Mechanical Design



Mostly laying the foundations for integration with the AFC



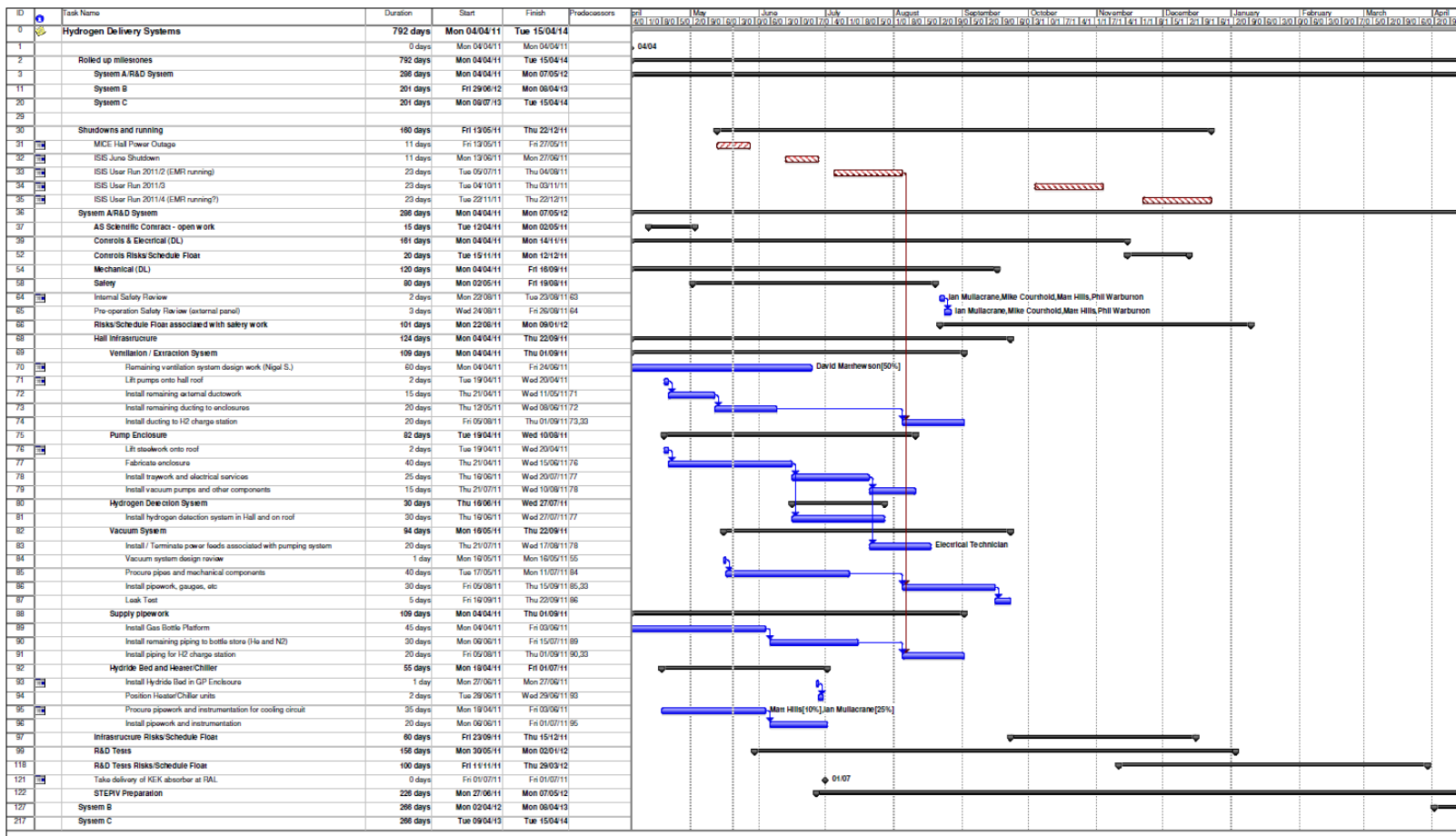
# Safety



- Working closely with consultants to ensure DSEAR and IEC61508 compliance
- Plenty of documentation to prepare



# Infrastructure and Installation



EMR run will push back several tasks, but work can continue on external infrastructure during this period











# Milestones

Milestone	Date
Helium R&D testing complete	July 2011
Safety Review passed	August 2011
Hall infrastructure and installation complete	September 2011
Hydrogen R&D complete	December 2011
Manufacture of items for AFC adaption complete	November 2011
AFC Commissioning complete	April/May 2012





# Risk Summary

- Funding availability
- Manpower restrictions/key staff availability
  - Would impact all aspects of the project
- Hydride bed has been affected by long term storage
  - A concern given that a direct replacement is no longer available
- Safety review recommends major design changes before R&D testing can commence
  - Significant knock-on effect for STEP IV
- R&D system manufacturers are unwilling or unable to take on contract for systems B & C
  - Would result in delays to transfer knowledge and require closer oversight of the new contract from STFC





# STEPS V & VI

- This means Systems B & C in the context of the Hydrogen Delivery System
- Most of the hall infrastructure (e.g. vacuum enclosure, ventilation system, gas supplies) will serve all three systems, so it is 'only' the hydride bed, gas panel, transfer lines and control system that are required
- If R&D system is successful design can be carried over with very few changes
- Type of hydride bed is currently the major unknown as the current manufacturer, Treibacher, no longer supply an equivalent model
- Each system will take approximately 1 year to design, manufacture and test with an AFC module (full Gantt chart available)
- Current assumption is that work in System B will start in April 2012 with System C following in April 2013, but this is highly dependent on the overall project schedule





# Summary

- Detailed schedule is known for System A installation and the R&D testing
- This is due to be completed by the end of 2011
- MICE running to commission the EMR will impact the current plan and may delay this date
- Significant work following R&D testing to prepare for AFC commissioning and STEP IV
- Delivery of Systems B & C should be in line with their need-by dates, but hydride bed supply issues need resolving

