



# UK Crab Cavity Project Structure

Niklas Templeton – STFC Daresbury Laboratory  
On behalf of the UK Crab Cavity collaboration

13th HL-LHC Collaboration Meeting – Vancouver (CA) – 26 Sep '23

# UK Crab Cavity Project Structure

- Meetings & Organisation
- Management Changes from RFD to DQW
- Staffing Changes
- Team Structure
- Sub-team management
- Parts Management

# Phase I vs Phase II Management Changes

## RFD SPS

- PM: Andy B-M (was Shrikant)
  - *Schedule, finance, status reports*
- Sponsor: Alan W
- Technical Manager: Nik T

## DQW LHC

- PM (HL-LHC-UK): Graeme B
- WPL: Nik T
  - *Schedule, finance, status reports*
- Sponsor: Ian L

# Meetings & Organisation

## *Meeting / Freq. / Chair / Traceability*

- Toolbox Meeting (1/wk) NT
  - Tech Task Board
- UK Project (1/2wks) NT + mins
  - 1 slide (2 min) updates
- UK-CERN Technical (1/wk) NT
- UK-CERN Project (1/2wks) NT + mins
- Design sub-group (1/2wks) EJ + mins
- Quality sub-group (1/2wks) CG
- FAT sub-group (ad-hoc) AM
- Marco 1-1 (1/2wks)
- Sponsor 1-1 (1/mo.) + min
- PM Board (4/yr)
- UK Oversight Committee (2/yr)
- CERN Steering Committee (1/yr)
- MS To-do Task Planner

Dec '22

## Staffing

Mar '23

		FTE (yrs)		
Role		23/24	24/25	25/26
IL	0-Sponsor	5%	5%	5%
NT	1-WPL	50%	50%	50%
NT	2-Lead Mech Eng	40%	40%	10%
EJ	2-Mech Eng	70%	50%	10%
CG	2-QA/Mech Eng	70%	70%	50%
PC	2-Design Eng	40%	30%	10%
TS	3-RF Eng	7%	7%	7%
SP	4-Cryo Eng	20%	20%	10%
AM	4-Cryo Tech	0%	20%	10%
KM	5-Snr Vac Eng	20%	20%	10%
SW	5-Vac Eng	15%	30%	10%
PA	6-Tech Man.	10%	30%	20%
PH	6-Tech Man.	0%	0%	0%
LB/TH	6-Senior Techs	160%	400%	180%
-	6-Techs	80%	100%	90%
RC	7-Survey	25%	50%	25%
	8-Other	25%	70%	45%
	Total	<b>6.4</b>	<b>9.9</b>	<b>5.4</b>
RL	Lanc Mech Eng	100%	100%	
		<b>7.4</b>	<b>10.9</b>	<b>5.4</b>

		FTE (yrs)		
Role		23/24	24/25	25/26
IL	0-Sponsor	5%	5%	5%
NT	1-WPL	70%	70%	30%
EJ	2-Lead Mech Eng	100%	90%	50%
JB	2-Mech Eng	50%	50%	10%
CG	2-QA/Mech Eng	90%	90%	50%
KC/LC	2-Design Eng	40%	50%	50%
TS	3-RF Eng	0%	0%	0%
AM	4-Cryo Eng	60%	60%	50%
IS	4-Cryo Tech	10%	20%	10%
KM	5-Snr Vac Eng	20%	20%	10%
SW	5-Vac Eng	20%	30%	20%
PA	6-Tech Man.	10%	10%	10%
PH	6-Tech Man.	10%	10%	10%
LB/TH	6-Senior Techs	160%	400%	180%
TBD	6-Techs	80%	100%	90%
RC	7-Survey	20%	30%	20%
	8-Other	30%	70%	50%
	Total	<b>7.8</b>	<b>11.1</b>	<b>6.5</b>
RL	Lanc Mech Eng	100%	100%	
		<b>8.8</b>	<b>12.1</b>	<b>6.5</b>

# Change Request After RI Cavity Delays

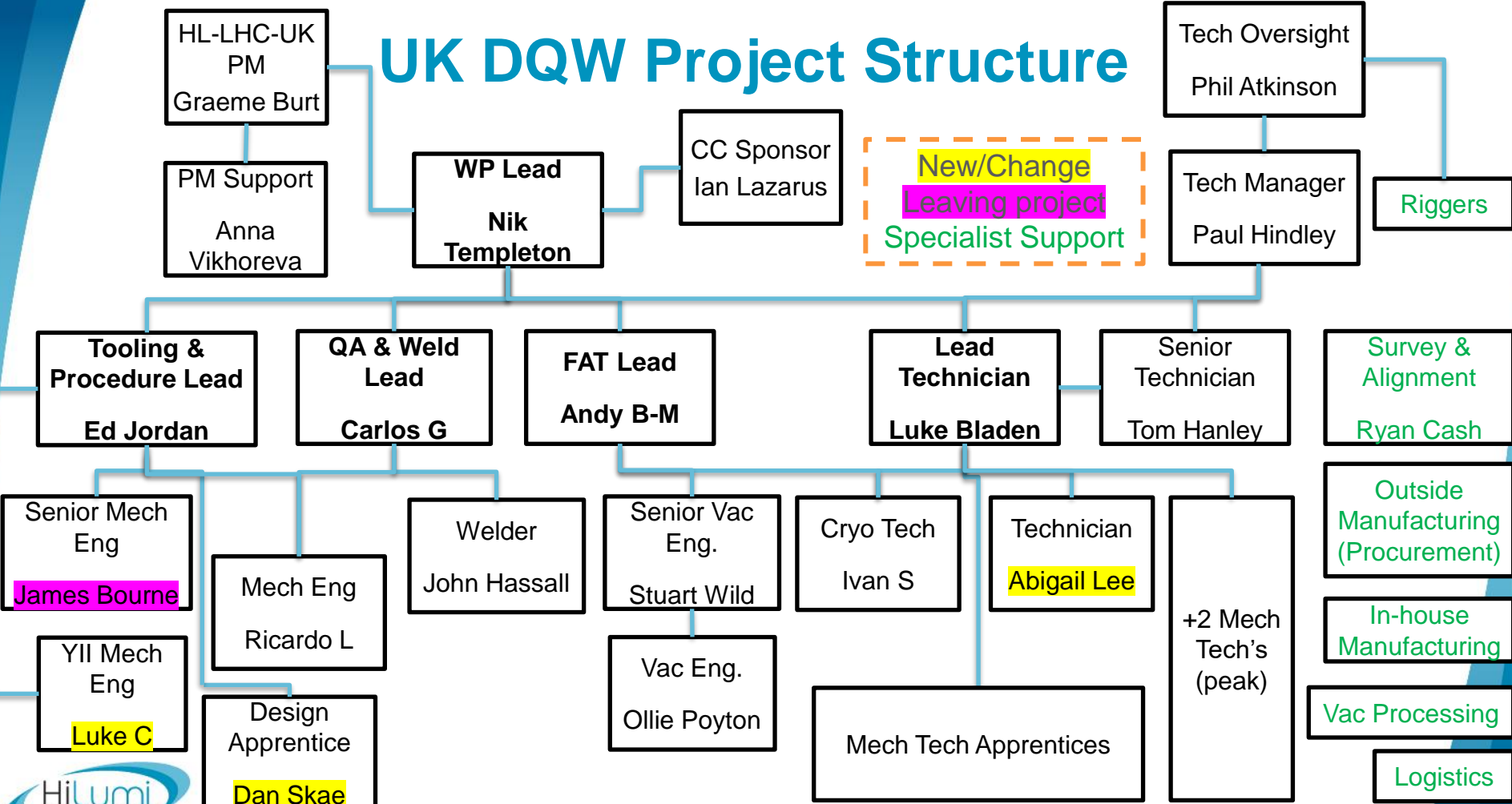
Mar '23

		FTE (yrs)		
	Role	23/24	24/25	25/26
IL	0-Sponsor	5%	5%	5%
NT	1-WPL	70%	70%	30%
EJ	2-Lead Mech Eng	100%	90%	50%
JB	2-Mech Eng	50%	50%	10%
CG	2-QA/Mech Eng	90%	90%	50%
KC/LC	2-Design Eng	40%	50%	50%
TS	3-RF Eng	0%	0%	0%
AM	4-Cryo Eng	60%	60%	50%
IS	4-Cryo Tech	10%	20%	10%
KM	5-Snr Vac Eng	20%	20%	10%
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PA	6-Tech Man.	10%	10%	10%
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LB/TH	6-Senior Techs	160%	400%	180%
TBD	6-Techs	80%	100%	90%
RC	7-Survey	20%	30%	20%
	8-Other	30%	70%	50%
	<b>Total</b>	<b>7.8</b>	<b>11.1</b>	<b>6.5</b>
RL	Lanc Mech Eng	100%	100%	
		<b>8.8</b>	<b>12.1</b>	<b>6.5</b>

Sep '23

		FTE (yrs)			
	Role	23/24	24/25	25/26	26/27
IL	0-Sponsor	5%	5%	5%	0%
NT	1-WPL	70%	70%	70%	40%
EJ	2-Lead Mech Eng	100%	90%	90%	50%
JB	2-Mech Eng	50%	50%	10%	0%
CG	2-QA/Mech Eng	90%	80%	40%	20%
KC/LC	2-Design Eng	40%	50%	50%	0%
TS	3-RF Eng	0%	0%	0%	0%
AM	4-Cryo Eng	60%	50%	40%	20%
IS	4-Cryo Tech	10%	10%	20%	10%
KM	5-Snr Vac Eng	20%	10%	20%	10%
SW	5-Vac Eng	20%	20%	30%	20%
PA	6-Tech Man.	10%	10%	10%	0%
PH	6-Tech Man.	10%	10%	10%	10%
LB/TH	6-Senior Techs	160%	200%	400%	120%
AL	6-Techs	80%	80%	100%	50%
RC	7-Survey	20%	20%	20%	10%
	8-Other	30%	30%	50%	20%
	<b>Total</b>	<b>7.8</b>	<b>7.9</b>	<b>9.7</b>	<b>3.8</b>
RL	Lanc Mech Eng	100%	100%		
		<b>8.8</b>	<b>8.9</b>	<b>9.7</b>	<b>3.8</b>

# UK DQW Project Structure



# Project Management

HL-LHC-UK  
PM  
Graeme Burt

PM Support  
Anna  
Vikhoreva

WP Lead  
Nik  
Templeton

CC Sponsor  
Ian Lazarus

Tech Oversight  
Phil Atkinson

Tech Manager  
Paul Hindley

Riggers

Tooling & Procedure Lead  
Ed Jordan

QA & Weld Lead  
Carlos G

FAT Lead  
Andy B-M

Lead Technician  
Luke Bladen

Senior Technician  
Tom Hanley

Survey & Alignment  
Ryan Cash

Senior Mech Eng  
James Bourne

Mech Eng  
Ricardo L

Welder  
John Hassall

Senior Vac Eng.  
Stuart Wild

Cryo Tech  
Ivan S

Technician  
Abigail Lee

+2 Mech Tech's (peak)

Outside Manufacturing (Procurement)

In-house Manufacturing

Vac Processing

Logistics

YII Mech Eng  
Luke C

Design Apprentice  
Dan Skae

Vac Eng.  
Ollie Poyton

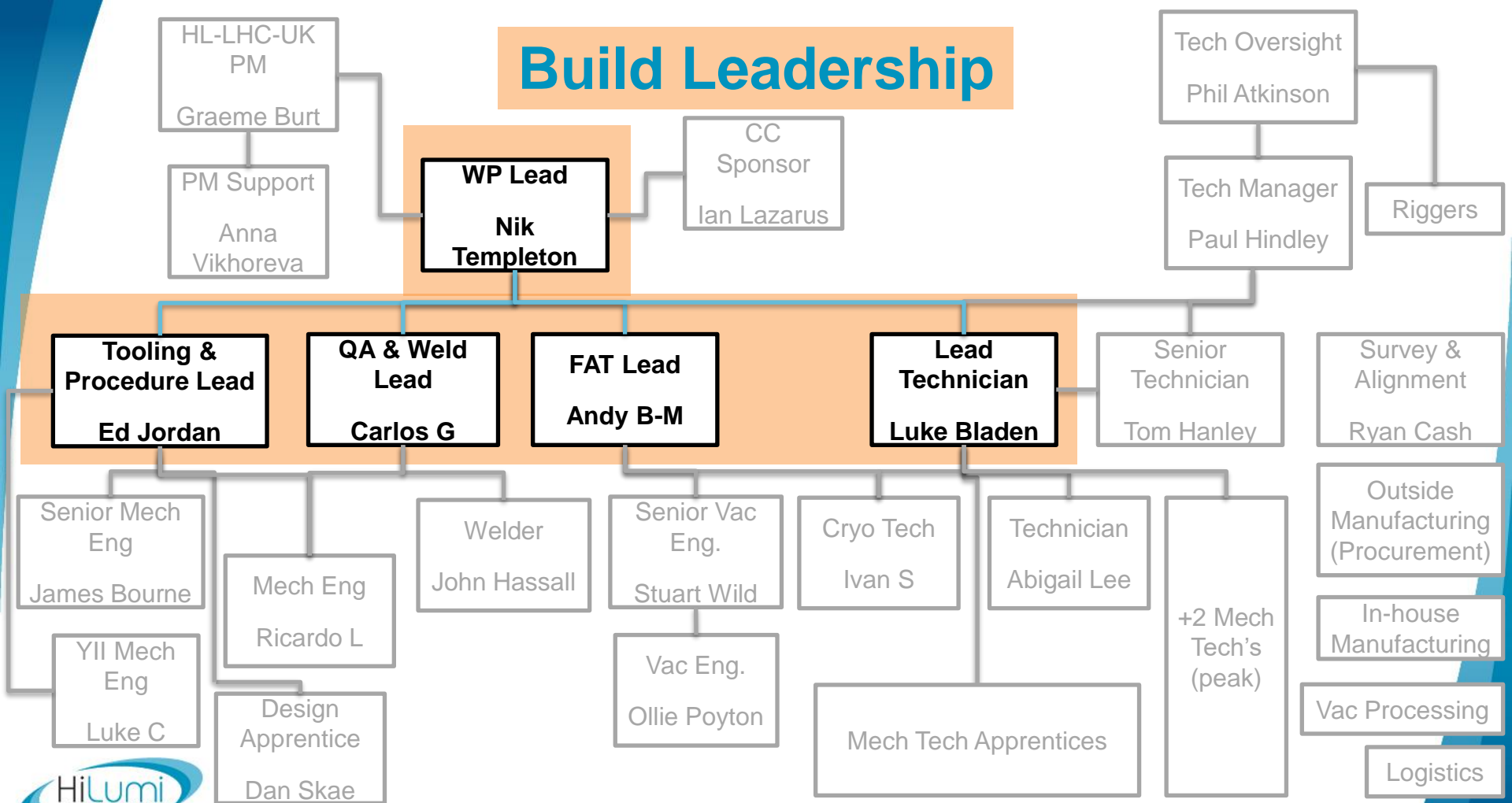
Mech Tech Apprentices



\*Does not reflect STFC pay bands. Some staff are shared between multiple projects.

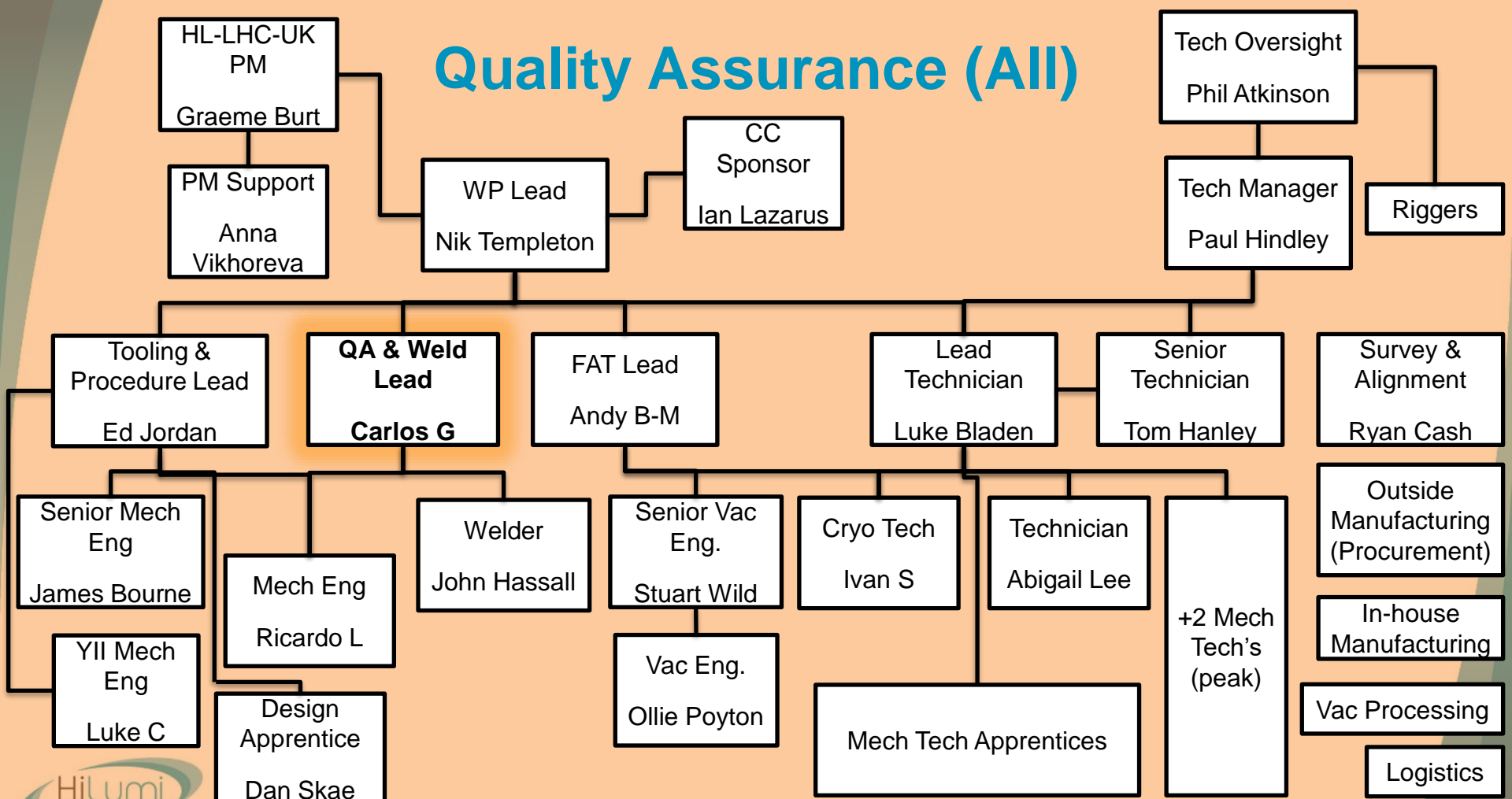


# Build Leadership



*\*Does not reflect STFC pay bands. Some staff are shared between multiple projects.*

# Quality Assurance (All)



*\*Does not reflect STFC pay bands. Some staff are shared between multiple projects.*

# Quality Management

- Ensuring EDMS & MTF requirements are met
- Ensuring local ISO 9001 requirements are met:
  - Awareness
  - Processes & Procedures
  - Competence
  - Continuous Improvement
  - Etc.
- Driving Culture
- EDMS & MTF Local Instructions 'knowledge base'

**WP Lead**

**Nik T**

**QA Lead**

**Carlos G**

Anna  
Vikhoreva

Howard  
Cheng

Peter Bates

Non-Technical Support

# Cryomodule Procurement

Large Proc. Items	Responsible
OVCs	Ricardo (+ Carlos & Nik)
Warm Mag Shields	James Bourne (+ Nik)
Cryolines	Andy & Carlos (+ Ricardo)
Thermal Screens	Nik (+ Ed)
Cavity Support Systems	Ed (+Nik)

Nik T      Ed J      Carlos      Andy B-M

Stu W      James B      Ricardo

Technical Management / QA

Peter B      Howard      Diane (OM)      UKRI Proc.

Jac (OM)

Nick (OM)      Lanc Proc.

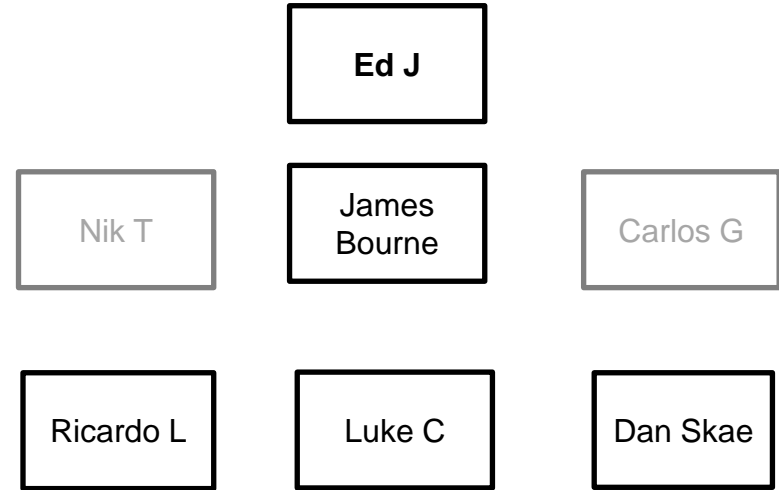
Non-Tech. Management (Low → High Value)

## Procurement Thresholds

<£2.5k Credit Card	<£10k Single Quote OK	<£115k Managed by OM	>£115k UKRI Proc.
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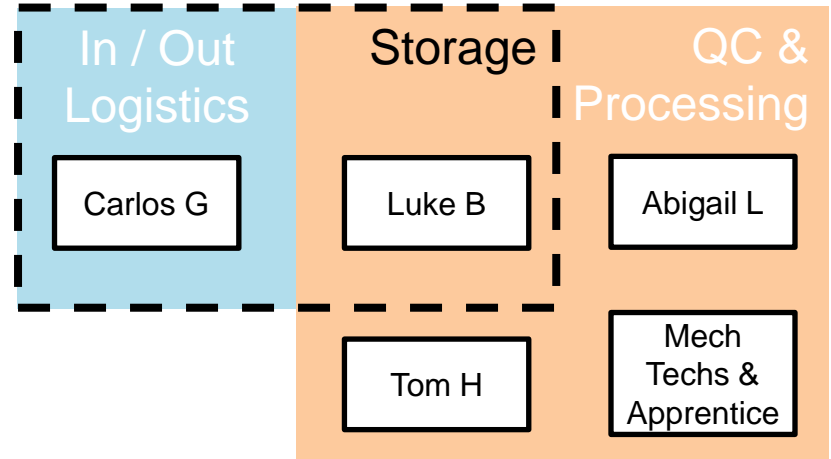
# Design Management

- Assembly tooling & infrastructure
- Design development & review
- Check & approval of drawings
- Nik & Carlos available supervision, support (& design if necessary)
- Discussions on-going for JB replacement

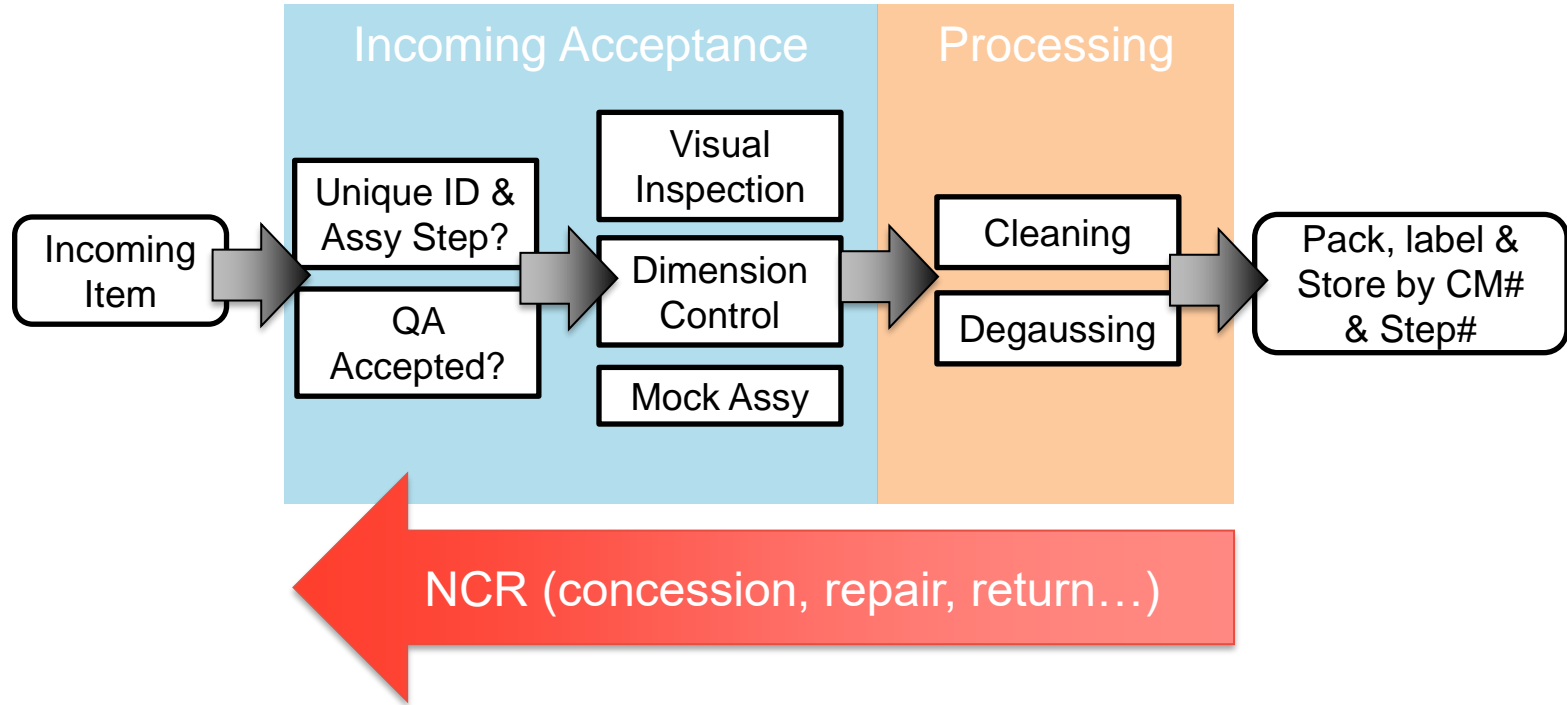


# Parts Management

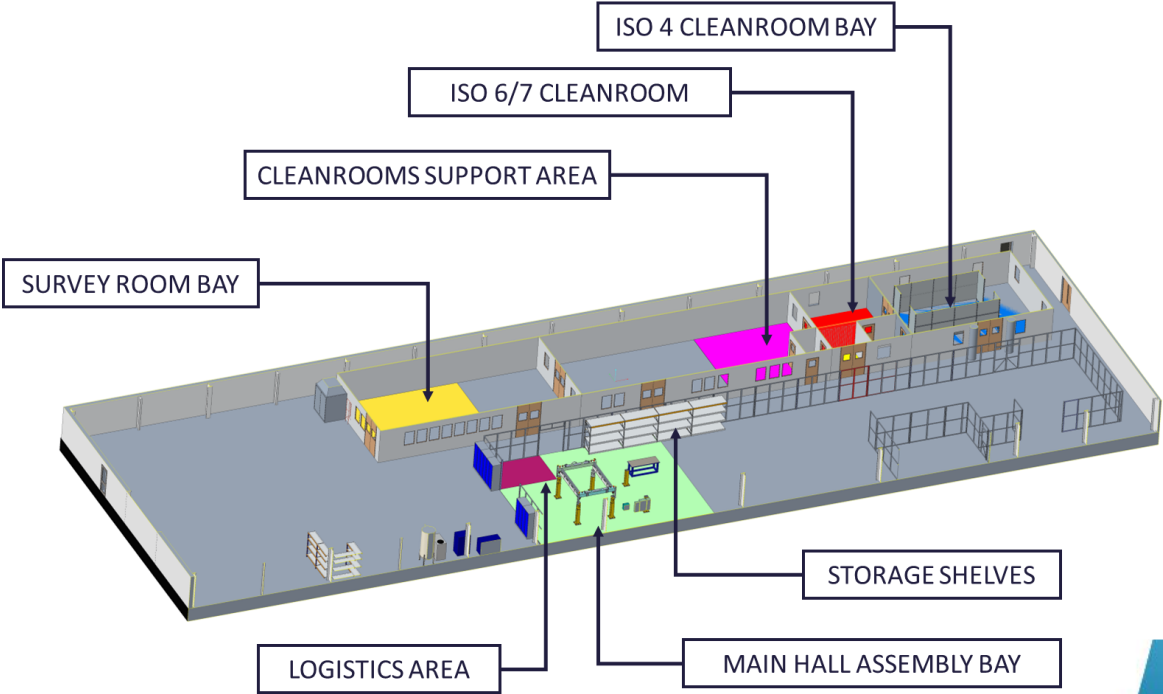
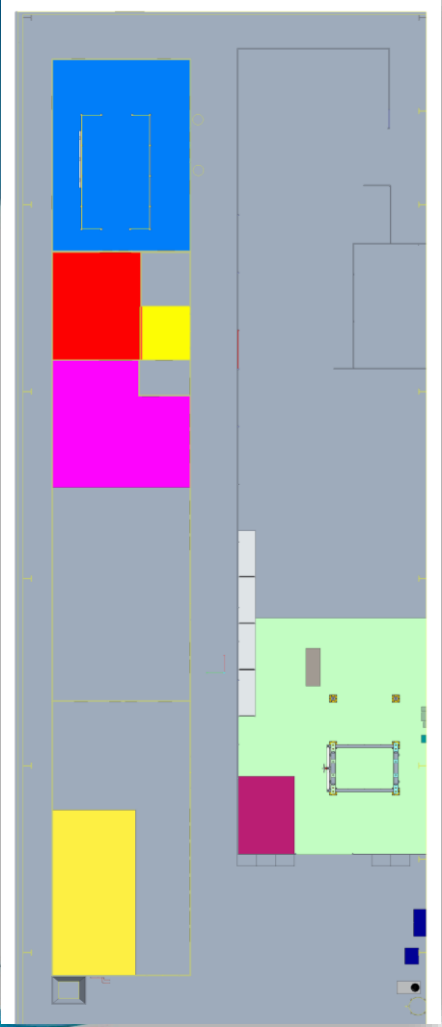
- All incoming & Outgoing items managed by Carlos
- All inventory & storage managed by Carlos & Luke
- Abi, Luke & Tom to manage QC & processing
  - Dimensions control
  - Mock assembly
  - Cleaning
  - Degaussing
  - BOM Kits



# Parts Management Process



# Infrastructure Layout

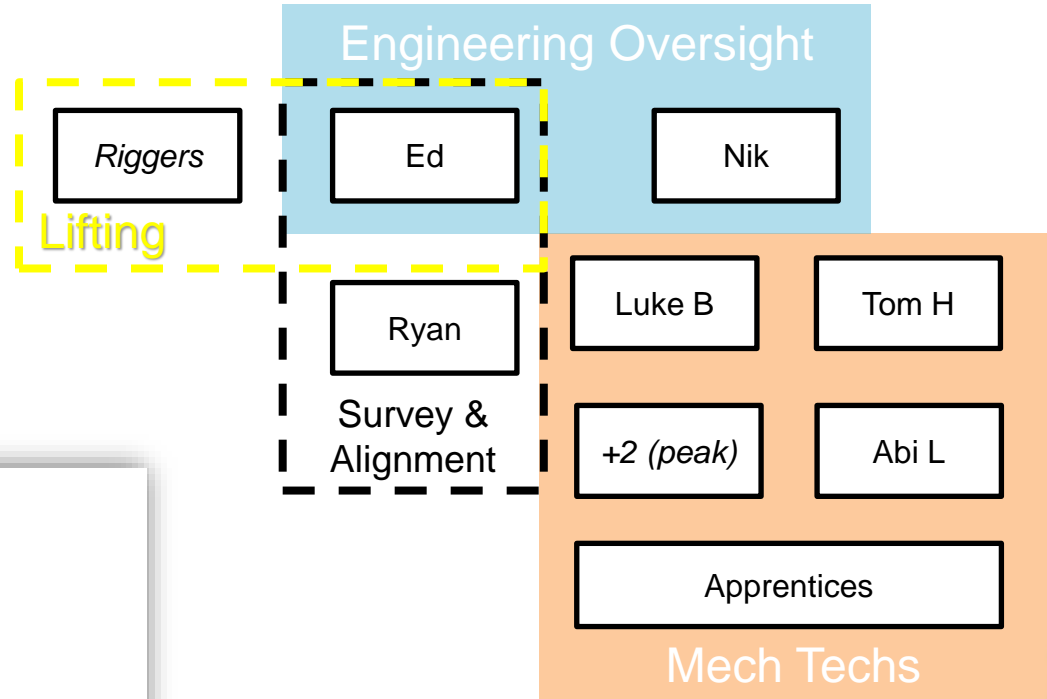




# Assembly Management

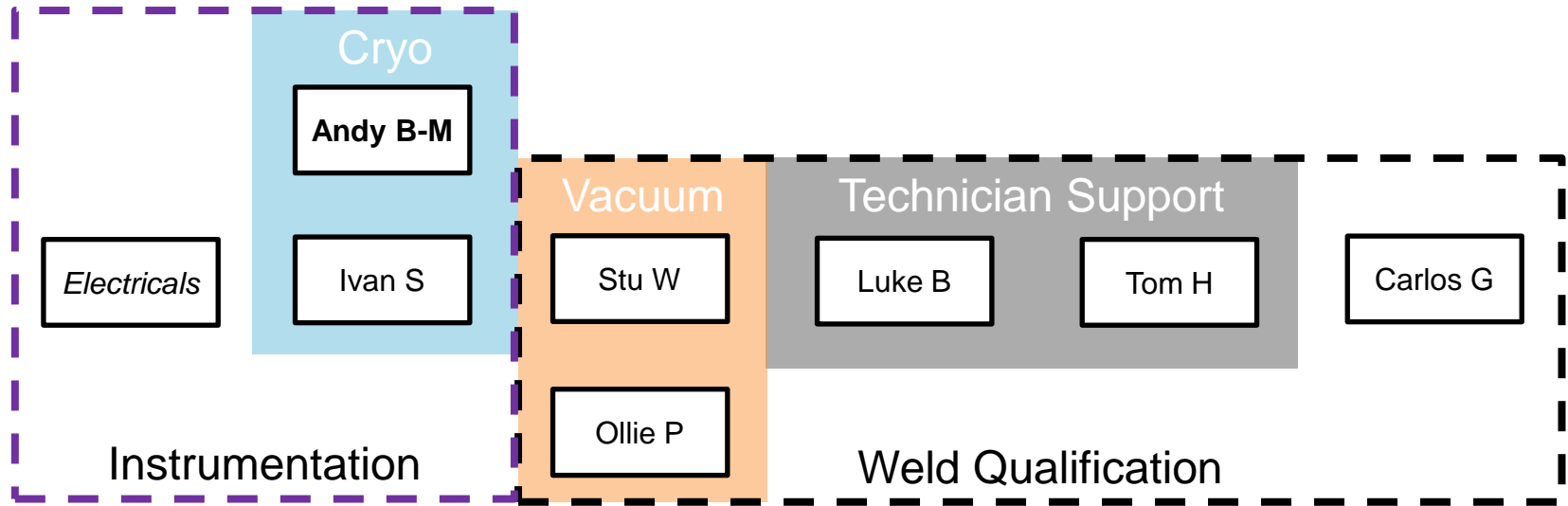
## Provisional Assembly Plan

- CM2: Luke, Tom, Abi
- CM3: (Luke) Tom, Abi, +1
- CM4: Luke, +2
- CM5: Tom, Abi, (Luke)



# Instrumentation, Qualification & Testing

- All on-site vacuum, pressure and cold tests as part of qualification and outgoing acceptance



# Closing Remarks

- Lots of improvements done & planned for series
  - Parts Management is greatest opportunity
- Clearer roles & responsibilities with sub-team management
- QA is everyone's responsibility, & ALL needed for EDMS MTF requirements to be met
- More effort = more staff budget
  - More than £100k is a major change request
- Even if accepted, additional staffing is not guaranteed

*Thank You!*

*Questions?*





# Assembly Procedures

- Based on poster logic + tooling & infrastructure
- To troubleshoot & de-risk technical tasks
- 'BOM kits' can be prepped by sub-step
- Extremely valuable for LHC CC Cryomodules
- Includes requirements, torques & sign-off checklists for travellers

**Step 11**

- 1 Installation of insulation vacuum instrumentation
- 2 Installation of secondary beam line vacuum assemblies
- 3 Installation of blow-off valve for insulation vacuum
- 4 Inspection and leak check of UHV secondary line

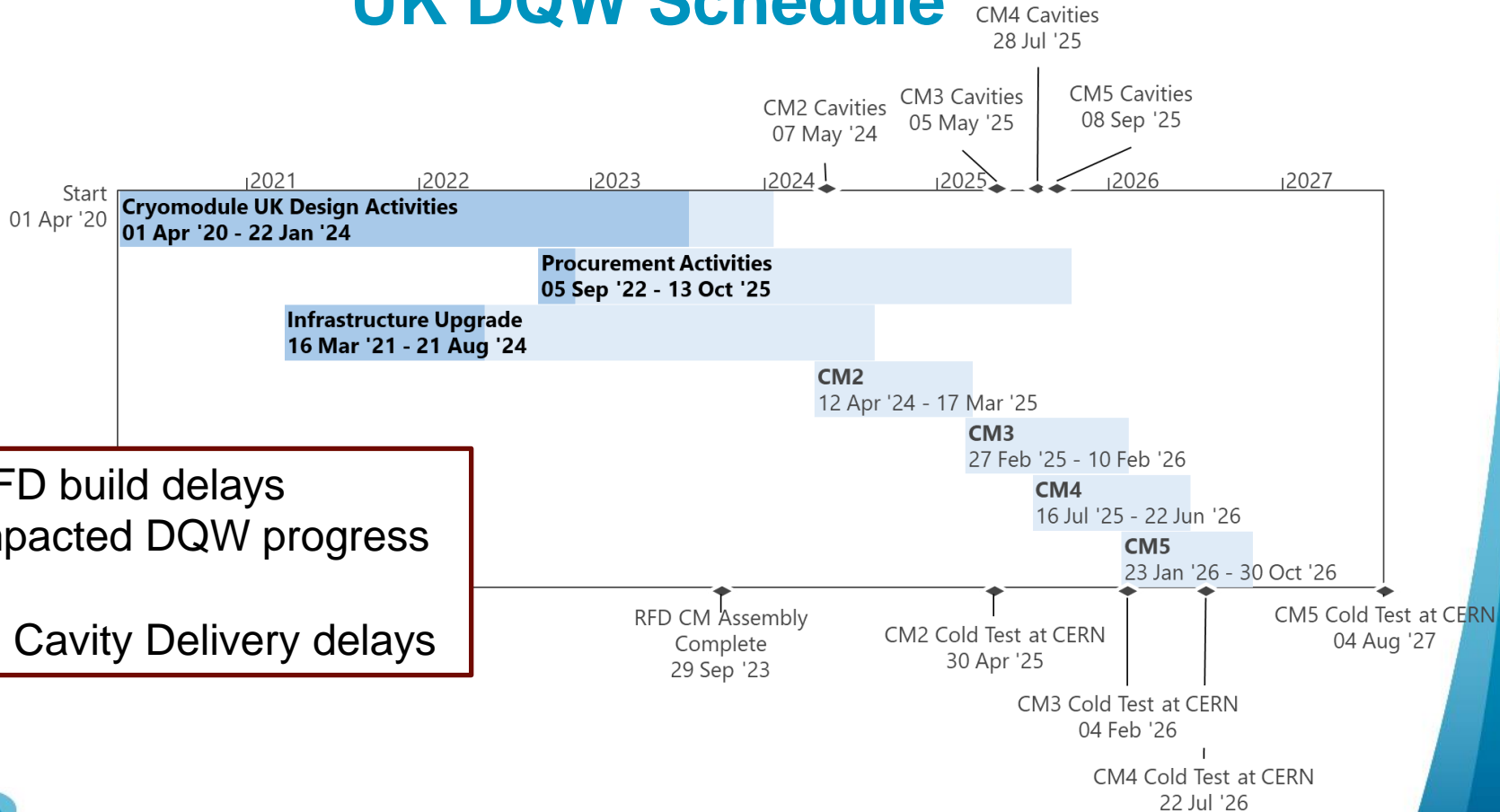
11-3 Install Blow-Off Valve

32	VALVE FLANGE - BRASS	UNIONFITTELLA	IN 7/8" x 1/2"
33	ADJUSTABLE BLEED VALVE - 1/2"	ADJUST. VALV. 1/2" BRASS	IN 7/8" x 1/2"
34	BRASS WIRE	BRASS WIRE	1/2" x 1/2"
35	BRASS RELIEF SPRING	BRASS RELIEF SPRING	1/2" x 1/2"
36	WIRE O-RING - BRASS	WIRE O-RING - BRASS	1/2" x 1/2"
37	WIRE O-RING - BRASS	WIRE O-RING - BRASS	1/2" x 1/2"
38	WIRE O-RING - BRASS	WIRE O-RING - BRASS	1/2" x 1/2"

- Install Valve Flange with O-ring, relief spring and ancillaries as shown
- Wire rope to be double looped through crimped collars (see image) but should be as tight as possible without excessive bending



# UK DQW Schedule



- RFD build delays impacted DQW progress
- RI Cavity Delivery delays