Science & Technology Facilities Council

Status of the MICE Construction Project

Resource Loaded Schedule Review

13th November 2013

Roy Preece

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Status of the MICE Construction Project

The Construction Project

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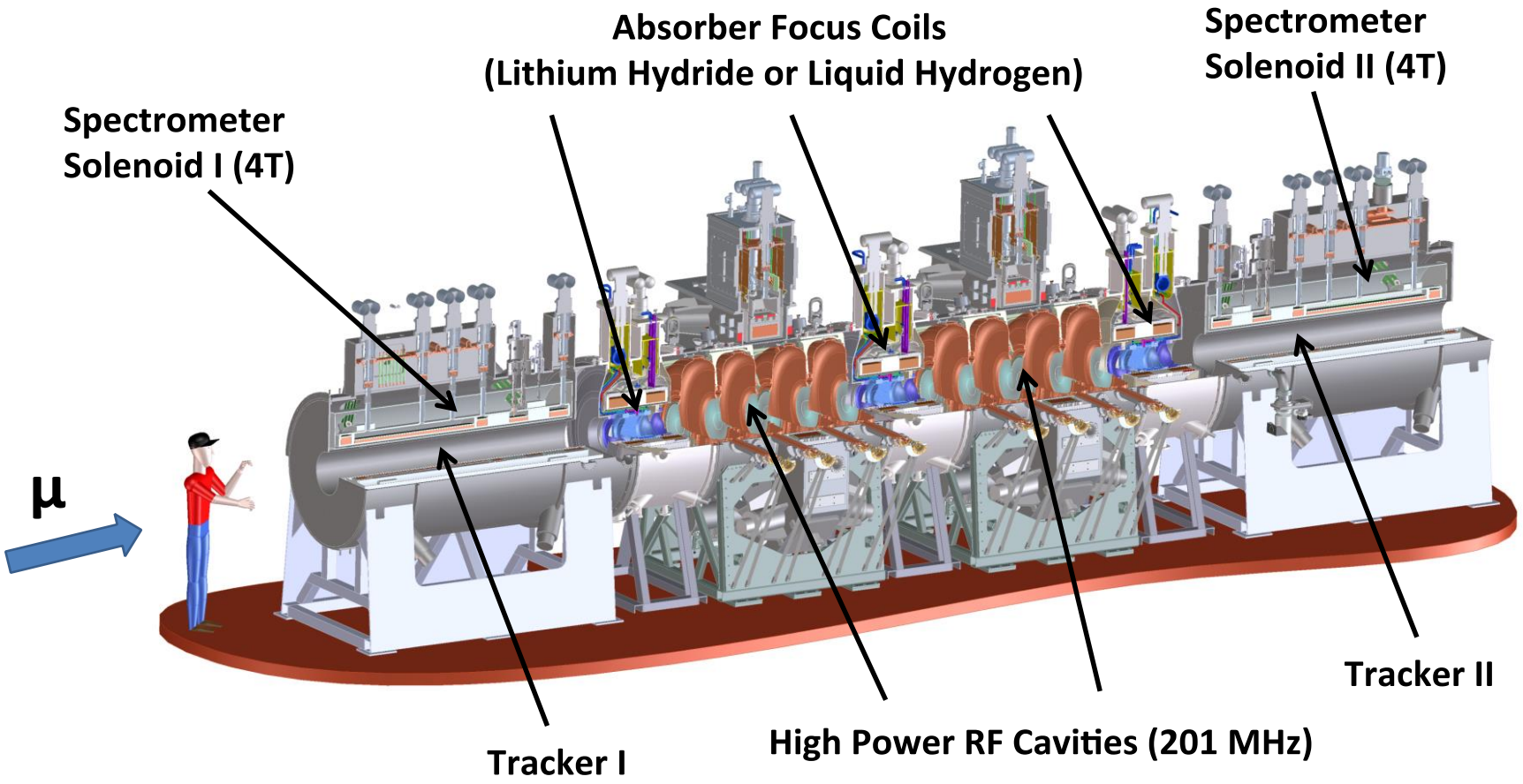

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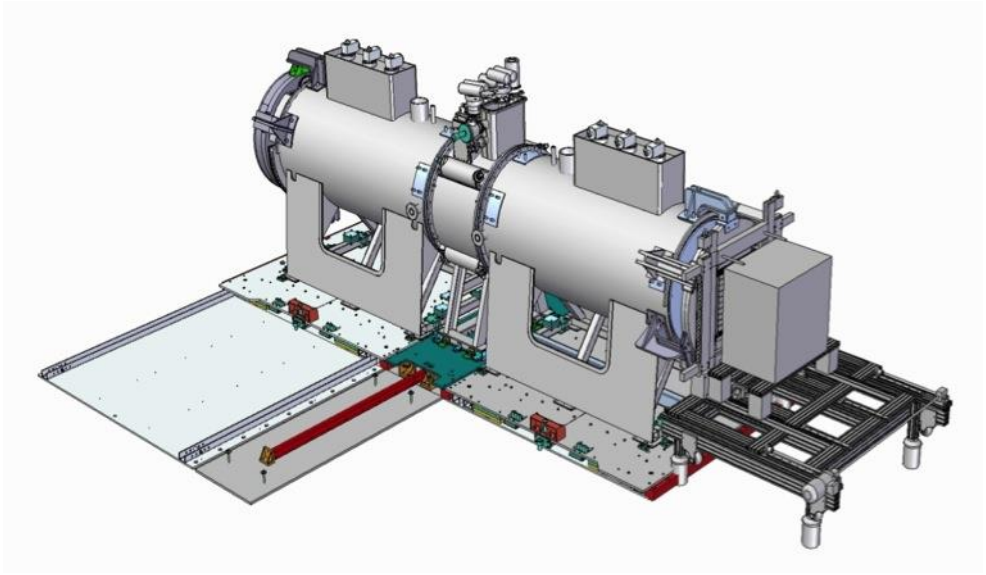
Responsibilities for Step IV equipment



Sub-system	Responsibility
Spectrometer solenoid #1	US
Spectrometer solenoid #2	US
Fibre tracker #1 + #2	Japan, UK, US
Focus coil #1	UK
LH_2 system A	UK
Lithium hydride	US
LH2 absorber	Japan
Diffuser	UK
Virostek plate & TOF cage assy	UK, US
Substation upgrade	UK
EMR	Geneva
(Radiation shutter	*UK)*
AFC Moving platform #1	UK
SS platforms Installation	UK
Partial Return Yoke	UK, US

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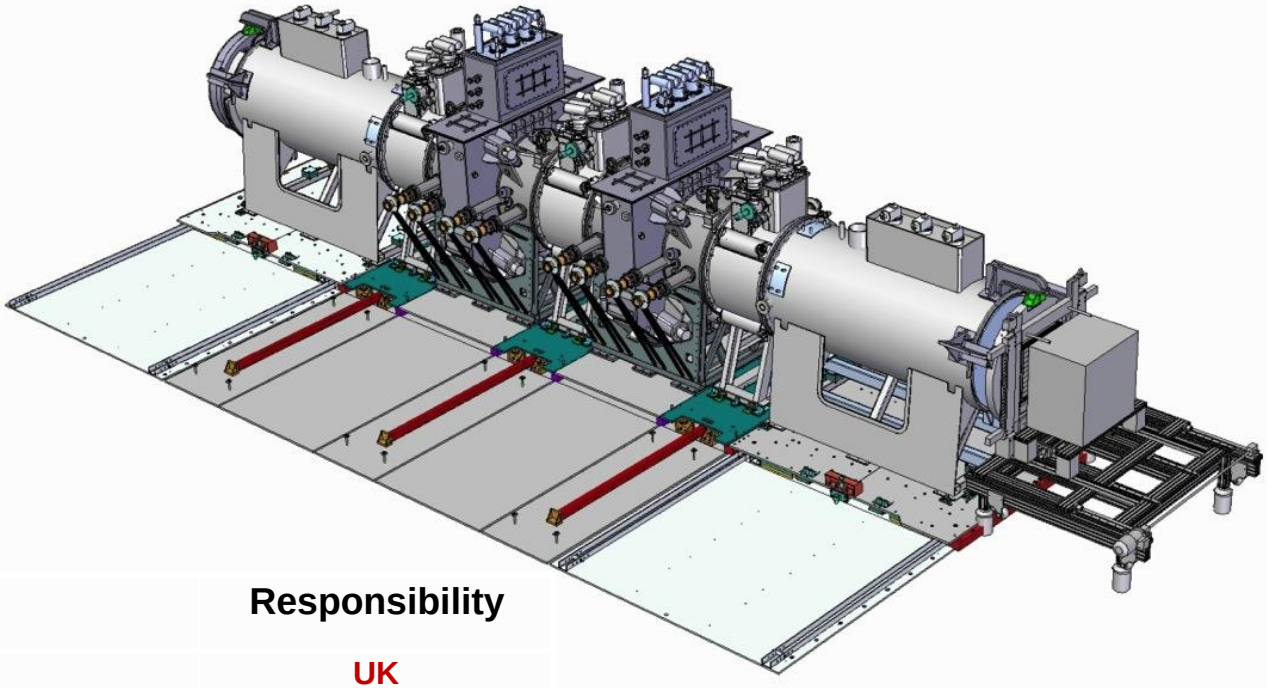
Responsibilities for Step VI equipment



Sub-system	Responsibility
Focus coil #2 and #3	UK
LH_2 system B and C	UK
LH2 absorbers #2 and #3	Japan
RFCC modules [magnets/RF hardware]	US
RF power system	UK
AFC moving platforms #2 and #3	UK
RFCC moving platforms #2 and #3	UK
Partial Return Yoke	UK, US

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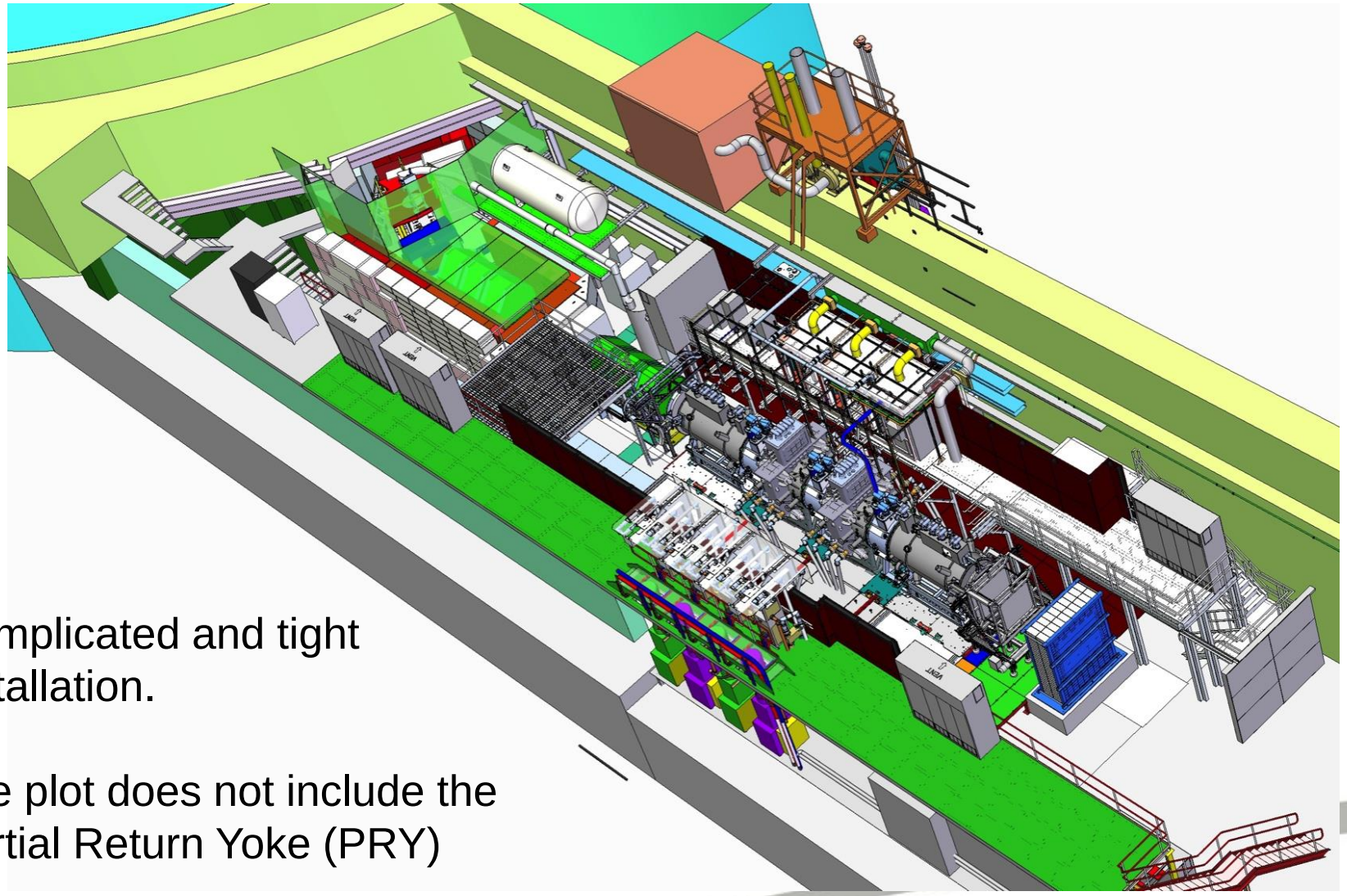
Infrastructure



Complicated and tight installation.

The plot does not include the Partial Return Yoke (PRY)

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Status of the MICE Construction Project

Top Level Schedules

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Preface to budget/schedule presentations from UK and US PIs:

- US leveling; based on budget assumptions presented to the RLSR Panel in May13:
  - Changes delivery dates for some components;
  - Includes contingency and appropriate float;
    - More robust going forward:
      - Principal issue:
        - » Impact and management of R&D risks

- UK analysis of spend profile which will include explicitly called out working margin and contingency:
  - Document(s) [cost, schedule, risk] in preparation:
    - Requires another iteration to take into account full outcome of US leveling;
      - Principal issue:
        - » Management of contingency

- So, cost/schedule analysis still “a work in progress”:
  - But, more advanced on both sides than in May13;
  - Now seek to re-baseline full project (Step IV; Step V or VI) by ~March 2014

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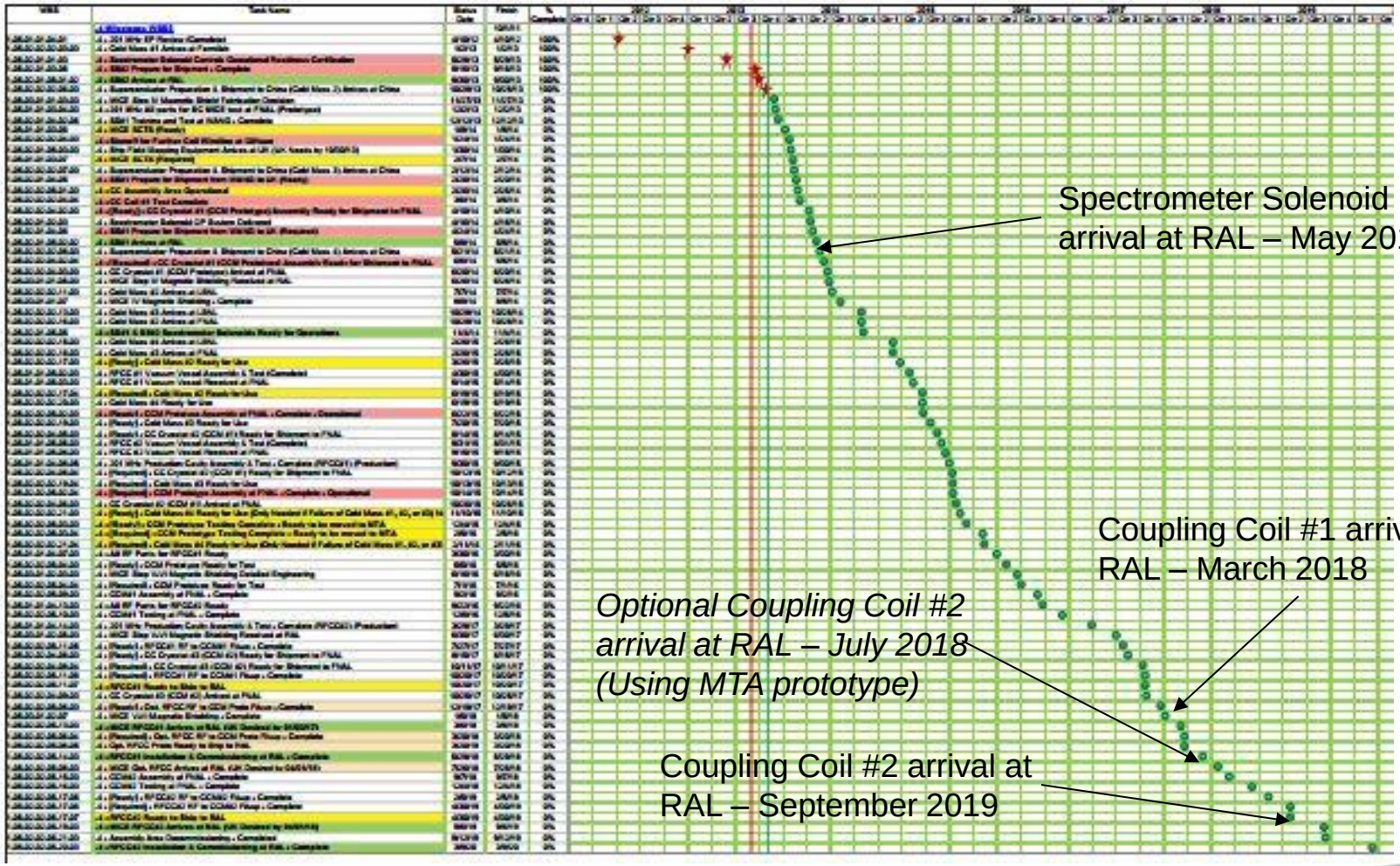
US Deliverables

★ = Complete



- Incorporates schedule contingency and levelling based on funding profile presented in May.
  - Delays from this analysis are fully consistent with the estimates made at the May review.
- Mitigating action of taking the prototype magnet from the MTA for RFCC#2 detailed discussions later in P.Garbincius.

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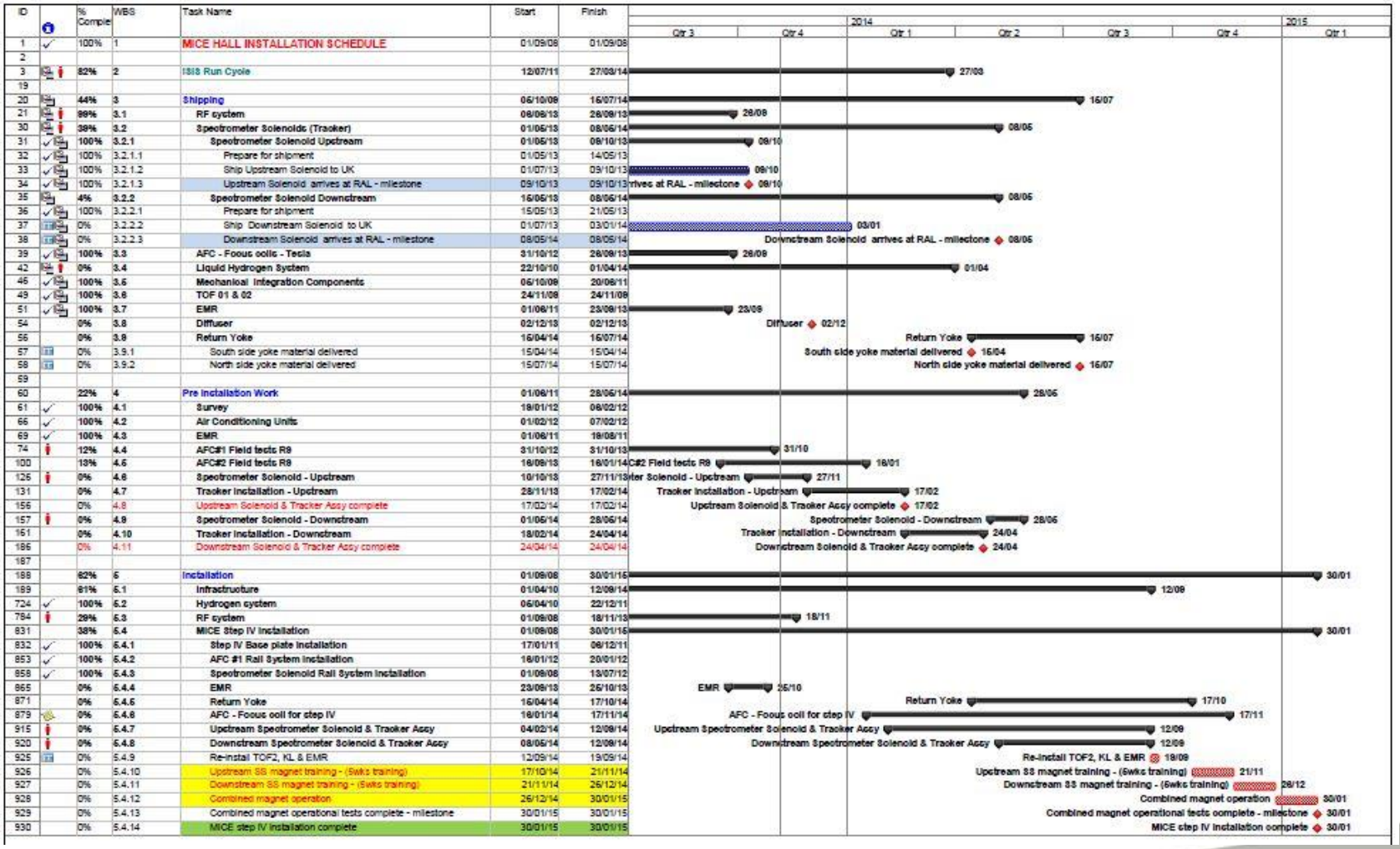
Integration of Step IV



ID	% Comple	WBS	Task Name	Start	Finish
1	100%	1	MICE HALL INSTALLATION SCHEDULE	01/09/08	01/09/08
2					
3	82%	2	ISIS Run Cycle	12/07/11	27/03/14
19					
20	44%	3	Shipping	06/10/08	16/07/14
21	88%	3.1	RF system	08/08/13	28/08/13
30	38%	3.2	Spectrometer Solenoids (Tracker)	01/05/13	08/05/14
31	100%	3.2.1	Spectrometer Solenoid Upstream	01/05/13	09/10/13
32	100%	3.2.1.1	Prepare for shipment	01/05/13	14/05/13
33	100%	3.2.1.2	Ship Upstream Solenoid to UK	01/07/13	09/10/13
34	100%	3.2.1.3	Upstream Solenoid arrives at RAL - milestone	09/10/13	rives at RAL - milestone 09/10
35	4%	3.2.2	Spectrometer Solenoid Downstream	16/05/13	08/05/14
36	100%	3.2.2.1	Prepare for shipment	15/05/13	21/05/13
37	0%	3.2.2.2	Ship Downstream Solenoid to UK	01/07/13	03/01/14
38	0%	3.2.2.3	Downstream Solenoid arrives at RAL - milestone	08/05/14	08/05/14
39	100%	3.3	AFC - Focus coils - Tesla	31/10/12	28/08/13
42	0%	3.4	Liquid Hydrogen System	22/10/10	01/04/14
46	100%	3.6	Mechanical Integration Components	06/10/09	20/08/11
49	100%	3.8	TOF 01 & 02	24/11/08	24/11/08
51	100%	3.7	EMR	01/08/11	23/09/13
54	0%	3.8	Diffuser	02/12/13	02/12/13
56	0%	3.9	Return Yoke	16/04/14	16/07/14
57	0%	3.9.1	South side yoke material delivered	15/04/14	15/04/14
58	0%	3.9.2	North side yoke material delivered	15/07/14	15/07/14
59					
60	22%	4	Pre Installation Work	01/08/11	28/06/14
61	100%	4.1	Survey	18/01/12	08/02/12
66	100%	4.2	Air Conditioning Units	01/02/12	07/02/12
69	100%	4.3	EMR	01/08/11	18/08/11
74	12%	4.4	AFC#1 Field tests R9	31/10/12	31/10/13
100	13%	4.6	AFC#2 Field tests R9	16/09/13	16/01/14
126	0%	4.6	Spectrometer Solenoid - Upstream	10/10/13	27/11/13
131	0%	4.7	Tracker Installation - Upstream	28/11/13	17/02/14
156	0%	4.8	Upstream Solenoid & Tracker Assy complete	17/02/14	17/02/14
157	0%	4.9	Spectrometer Solenoid - Downstream	01/05/14	28/06/14
161	0%	4.10	Tracker Installation - Downstream	18/02/14	24/04/14
186	0%	4.11	Downstream Solenoid & Tracker Assy complete	24/04/14	24/04/14
187					
188	62%	5	Installation	01/09/08	30/01/15
189	61%	5.1	Infrastructure	01/04/10	12/09/14
724	100%	5.2	Hydrogen system	06/04/10	22/12/11
784	29%	5.3	RF system	01/09/08	18/11/13
831	38%	5.4	MICE Step IV Installation	01/09/08	30/01/15
832	100%	5.4.1	Step IV Base plate installation	17/01/11	09/12/11
853	100%	5.4.2	AFC #1 Rail System installation	18/01/12	20/01/12
858	100%	5.4.3	Spectrometer Solenoid Rail System installation	01/09/08	13/07/12
865	0%	5.4.4	EMR	23/09/13	25/10/13
871	0%	5.4.5	Return Yoke	16/04/14	17/10/14
879	0%	5.4.6	AFC - Focus coil for step IV	18/01/14	17/11/14
915	0%	5.4.7	Upstream Spectrometer Solenoid & Tracker Assy	04/02/14	12/09/14
920	0%	5.4.8	Downstream Spectrometer Solenoid & Tracker Assy	08/05/14	12/09/14
925	0%	5.4.9	Re-install TOF2, KL & EMR	12/09/14	19/09/14
926	0%	5.4.10	Upstream SS magnet training - (6wks training)	17/10/14	21/11/14
927	0%	5.4.11	Downstream SS magnet training - (6wks training)	21/11/14	28/12/14
928	0%	5.4.12	Combined magnet operation	28/12/14	30/01/15
929	0%	5.4.13	Combined magnet operational tests complete - milestone	30/01/15	30/01/15
930	0%	5.4.14	MICE step IV installation complete	30/01/15	30/01/15

- Schedule now incorporates the use of the Partial Return Yoke (PRY)
  - Provides some slack in installation timeline for other components.
  - Utilising the slack for further magnet quality control.
- Step IV targeted installation completion; January 2015.

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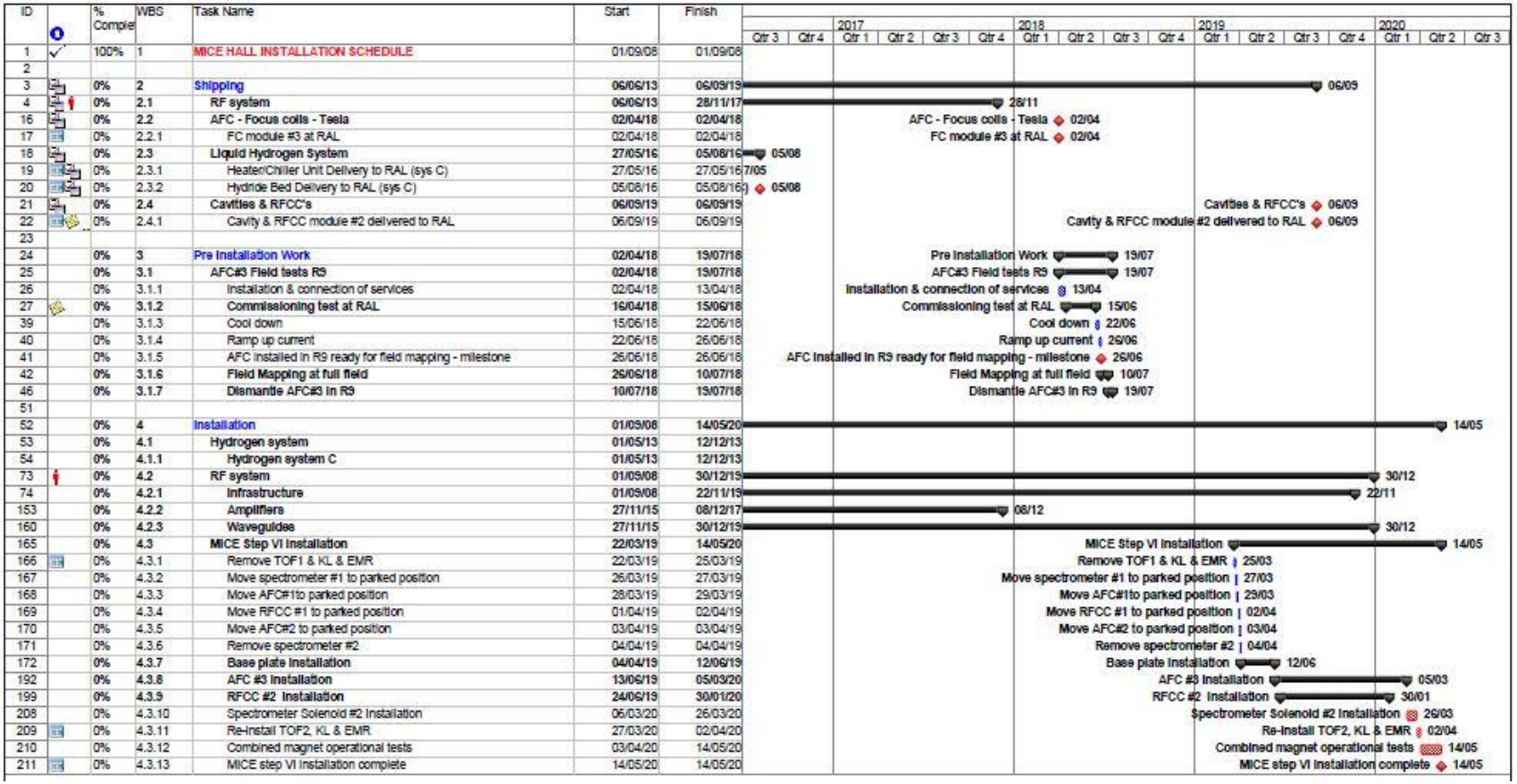
Integration of Step VI



ID	% Complete	WBS	Task Name	Start	Finish
1	100%	1	MICE HALL INSTALLATION SCHEDULE	01/09/08	01/09/08
2					
3	0%	2	Shipping	06/06/13	06/09/19
4	0%	2.1	RF system	06/06/13	28/11/17
16	0%	2.2	AFC - Focus coils - Tesla	02/04/18	02/04/18
17	0%	2.2.1	FC module #3 at RAL	02/04/18	02/04/18
18	0%	2.3	Liquid Hydrogen System	27/05/16	05/08/16
19	0%	2.3.1	Heater/Chiller Unit Delivery to RAL (sys C)	27/05/16	27/05/16
20	0%	2.3.2	Hydride Bed Delivery to RAL (sys C)	05/08/16	05/08/16
21	0%	2.4	Cavities & RFCC's	06/09/19	06/09/19
22	0%	2.4.1	Cavity & RFCC module #2 delivered to RAL	06/09/19	06/09/19
23					
24	0%	3	Pre Installation Work	02/04/18	19/07/18
25	0%	3.1	AFC#3 Field tests R9	02/04/18	19/07/18
26	0%	3.1.1	Installation & connection of services	02/04/18	13/04/18
27	0%	3.1.2	Commissioning test at RAL	16/04/18	15/06/18
39	0%	3.1.3	Cool down	15/06/18	22/06/18
40	0%	3.1.4	Ramp up current	22/06/18	26/06/18
41	0%	3.1.5	AFC installed in R9 ready for field mapping - milestone	26/06/18	26/06/18
42	0%	3.1.6	Field Mapping at full field	26/06/18	10/07/18
46	0%	3.1.7	Dismantle AFC#3 in R9	10/07/18	19/07/18
51					
52	0%	4	Installation	01/09/08	14/05/20
53	0%	4.1	Hydrogen system	01/05/13	12/12/13
54	0%	4.1.1	Hydrogen system C	01/05/13	12/12/13
73	0%	4.2	RF system	01/09/08	30/12/19
74	0%	4.2.1	Infrastructure	01/09/08	22/11/19
153	0%	4.2.2	Amplifiers	27/11/15	08/12/17
160	0%	4.2.3	Waveguides	27/11/15	30/12/19
165	0%	4.3	MICE Step VI Installation	22/03/19	14/05/20
166	0%	4.3.1	Remove TOF1 & KL & EMR	22/03/19	25/03/19
167	0%	4.3.2	Move spectrometer #1 to parked position	26/03/19	27/03/19
168	0%	4.3.3	Move AFC#1to parked position	28/03/19	29/03/19
169	0%	4.3.4	Move RFCC #1 to parked position	01/04/19	02/04/19
170	0%	4.3.5	Move AFC#2 to parked position	03/04/19	03/04/19
171	0%	4.3.6	Remove spectrometer #2	04/04/19	04/04/19
172	0%	4.3.7	Base plate installation	04/04/19	12/06/19
192	0%	4.3.8	AFC #3 installation	13/06/19	05/03/20
199	0%	4.3.9	RFCC #2 installation	24/06/19	30/01/20
208	0%	4.3.10	Spectrometer Solenoid #2 Installation	06/03/20	26/03/20
209	0%	4.3.11	Re-Install TOF2, KL & EMR	27/03/20	02/04/20
210	0%	4.3.12	Combined magnet operational tests	03/04/20	14/05/20
211	0%	4.3.13	MICE step VI installation complete	14/05/20	14/05/20

- Nominal delivery date of the RFCC#2 ~ September 2019.
  - Use of the prototype magnet would enable delivery mid 2018. Consistent for moving to Step VI operations in 2019.
  - Considering a plan to re-baseline for presentation in the spring 2014.
- AFC #3 installation completed March 2020.
- Step VI completion of May 2020.

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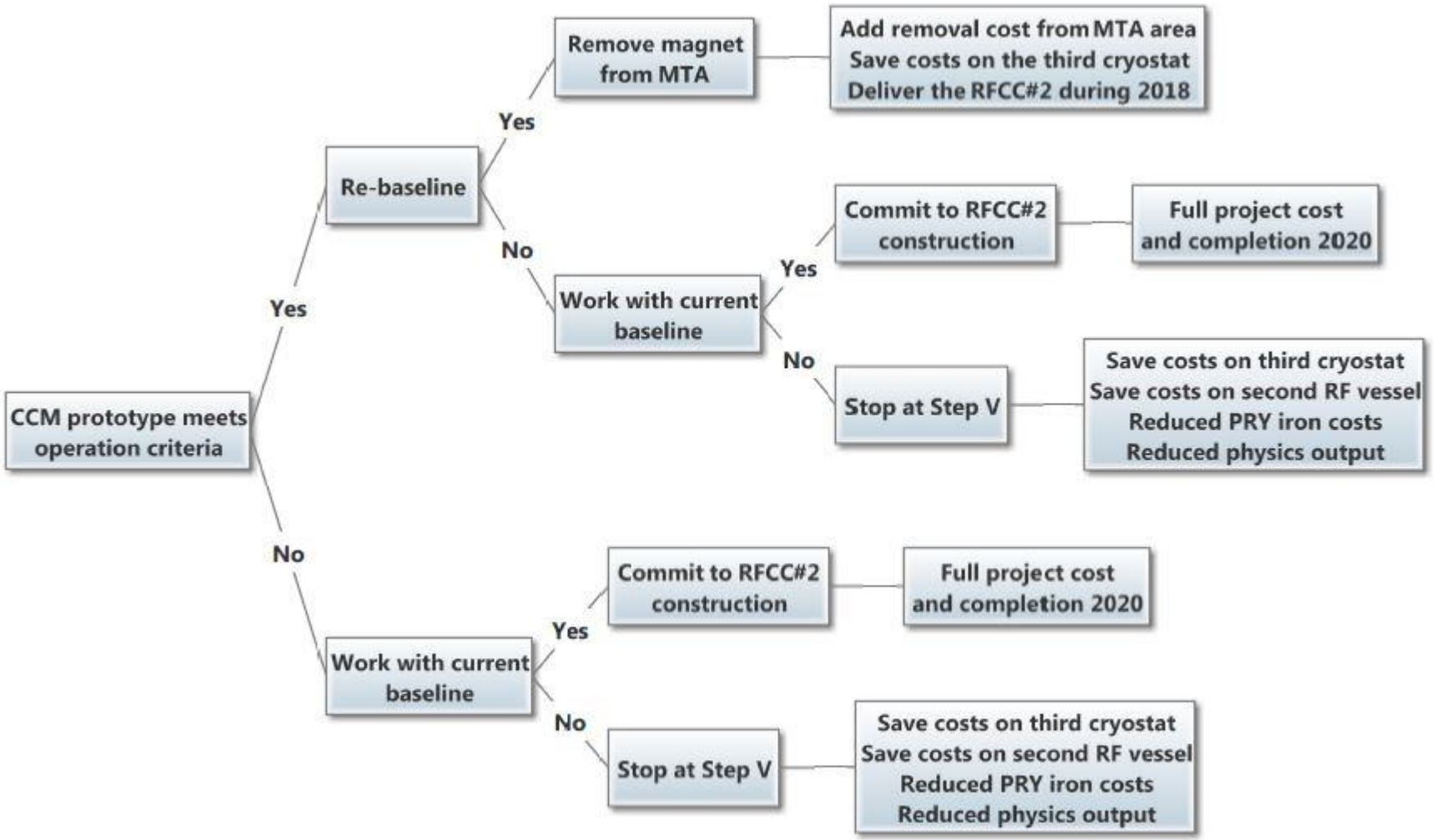
CCM prototype meets operation criteria
Yes
Re-baseline
Yes
Remove magnet from MTA
Add removal cost from MTA area
Save costs on the third cryostat
Deliver the RFCC#2 during 2018
No
Work with current baseline
Yes
Commit to RFCC#2 construction
Full project cost and completion 2020
No
Stop at Step V
Save costs on third cryostat
Save costs on second RF vessel
Reduced PRY iron costs
Reduced physics output
No
Work with current baseline
Yes
Commit to RFCC#2 construction
Full project cost and completion 2020
No
Stop at Step V
Save costs on third cryostat
Save costs on second RF vessel
Reduced PRY iron costs
Reduced physics output

Status of the MICE Construction Project

Interface and Decision Points

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	May-13		Oct-13		Nov-13	
Description	Delivered	Desired	Delivered	Desired	Delivered	Desired
Step IV						
Spectrometer Solenoid 2 Upstream	24-Jul-13	13-Aug-13	07-Oct-13	17-Oct-13		
Spectrometer Solenoid 1 Downstream	23-Sep-13	30-Nov-13	03-Jan-14	10-Jan-14	08-May-14	10-Jan-14
Mapping equipment	23-Sep-13	30-Oct-13	03-Jan-14	10-Dec-13	03-Jan-14	10-Dec-13
Focus Coil 1	08-Jul-13	30-Oct-13	03-Oct-14	10-Dec-13	03-Oct-14	10-Dec-13
Liquid Hydrogen A	16-Apr-14	16-Apr-14	16-Apr-14	16-Apr-14	16-Apr-14	16-Apr-14
Step IV integration complete	19-Aug-14	29-Jan-15	30-Jan-15	29-Jan-15	30-Jan-15	29-Jan-15
Step V and VI						
RFCC 1	20-Dec-16	03-Jan-17	20-Dec-16	03-Jan-17	06-Mar-18	03-Jan-17
RFCC 2	26-Jul-18	26-Jul-18	26-Jul-18	26-Jul-18	06-Sep-19	26-Jul-18
Liquid Hydrogen B	18-Oct-16	18-Oct-16	18-Oct-16	18-Oct-16	18-Oct-16	18-Oct-16
Liquid Hydrogen C	05-Jan-18	05-Jan-18	05-Jan-18	05-Jan-18	05-Jan-18	05-Jan-18
LH2 Absorber 2		18-Oct-16		18-Oct-16		18-Oct-16
LH2 Absorber 3		05-Jan-18		05-Jan-18		05-Jan-18
Focus Coil 2	18-Jan-17	18-Jan-17	18-Jan-17	18-Jan-17	18-Jan-17	18-Jan-17
Focus Coil 3	30-Jan-19	30-Jan-19	30-Jan-19	30-Jan-19	30-Jan-19	30-Jan-19
Step V integration complete	01-Sep-17		01-Sep-17		28-Aug-18	
Step VI intergration complete	08-May-19		08-May-19		14-May-20	
Decision Points						
Magnetic Sheilding decision Step IV		30-Sep-13	27-Sep-13			
Magnetic Shielding decision Step VI		01-Jun-15		01-Jun-15		01-Jun-15
Step V and Stop or Step V ahead of Step VI		01-Jun-15		01-Jun-15		01-Jun-15

Completed Item	Date	Change of date	Date

- Delivery of the SS#2 completed
- Magnetic Shielding review for Step IV carried out and completed.
- Decision point to be added – use the MTA magnet and deliver RFCC#2 in 2018 for Step VI operation. Date: early 2016 after magnet testing is completed.
- November-13 dates given include the full contingency and levelling analysis.

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Status of the MICE Construction Project

Top Level Financial Summary

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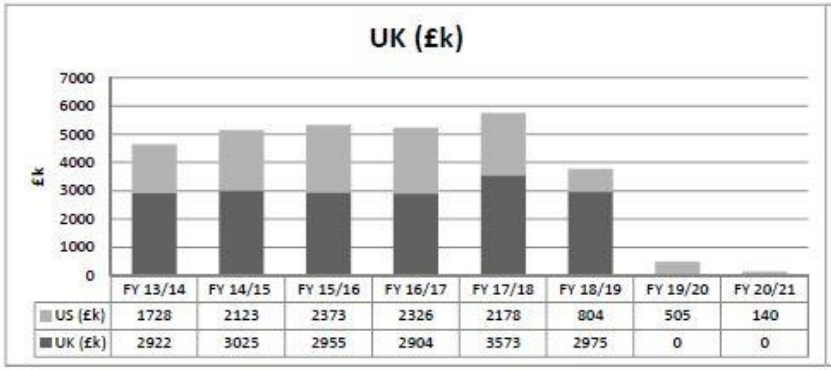
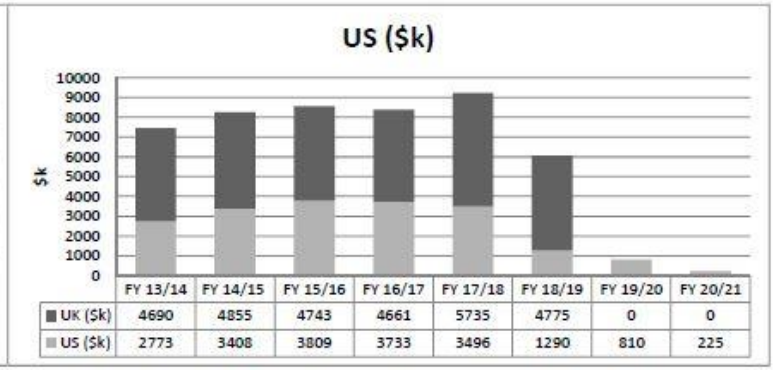
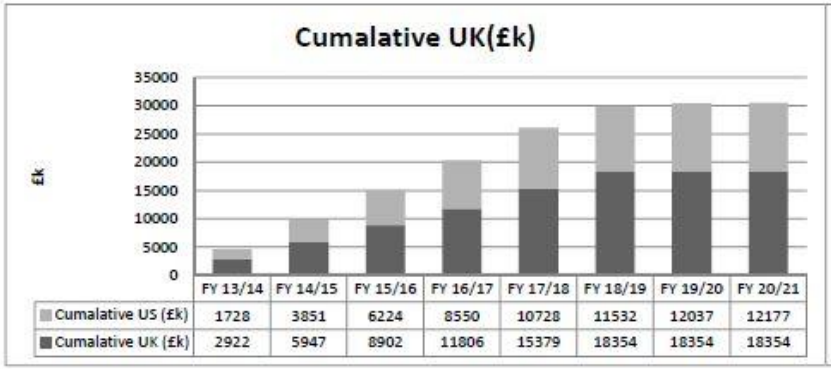
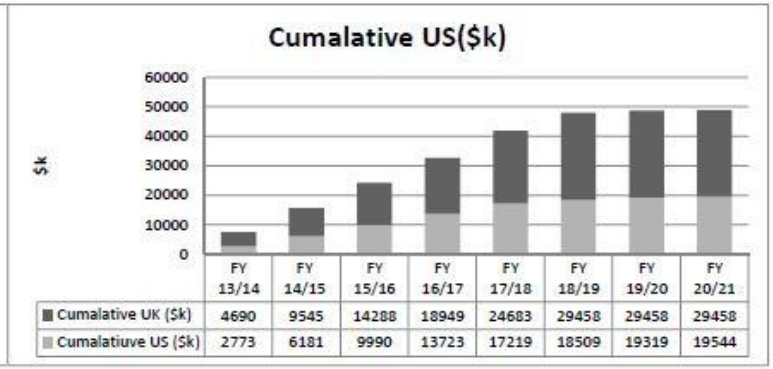
	FY 13/14	FY 14/15	FY 15/16	FY 16/17	FY 17/18	FY 18/19	FY 19/20	FY 20/21
UK (£k)	**2922**	**3025**	**2955**	**2904**	**3573**	**2975**	**0**	**0**
Cumalative UK (£k)	**2922**	**5947**	**8902**	**11806**	**15379**	**18354**	**18354**	**18354**
UK ($k)	*4690*	*4855*	*4743*	*4661*	*5735*	*4775*	*0*	*0*
Cumalative UK ($k)	*4690*	*9545*	*14288*	*18949*	*24683*	*29458*	*29458*	*29458*
US ($k)	**2773**	**3408**	**3809**	**3733**	**3496**	**1290**	**810**	**225**
Cumalatiuve US ($k)	**2773**	**6181**	**9990**	**13723**	**17219**	**18509**	**19319**	**19544**
US (£k)	*1728*	*2123*	*2373*	*2326*	*2178*	*804*	*505*	*140*
Cumalative US (£k)	*1728*	*3851*	*6224*	*8550*	*10728*	*11532*	*12037*	*12177*

Exchange rates	
UK - US	1.605
US- UK	0.623









- For the profile shown, neither the UK or US figures include contingency.
- The funding profile presented in the table for the UK is not adjusted for 2019 delivery of RFCC#2.
  - The option to re-baseline by using the CC prototype from MTA for RFCC#2 can resolve most of this discrepancy
- There remains the issue of how to properly incorporate contingency in the UK schedule

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Status of the MICE Construction Project

Top Level Risk Summary

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UK- US Project Level Risks

ID	Risk Description	Potential impact on project	Risk score			Ownership	Proposed Action	Post-action risk score			Comment / Conclusion	Cost of mitigation		Likely retirement of requirment
			L	I	LxI			L	I	LxI		Staff years	Non-staff (£k)	
UK 1	Extended solenoid commissioning	Delayed step IV delivery	5	5	25	MICE - USA	Resolve ALL solenoid operational issues in USA prior to shipping	2	5	10	Design reviews in place to identify all operational issues. Testing of SS1 completed.			end of step IV
UK 2	Extended focus coil commissioning	Delayed step IV delivery	4	4	16	MICE- UK	Resolve ALL solenoid focus coil issues in R9 prior to installation	2	5	10	Practices in place and operating	1	30k	end of step IV
UK 3	Delays to step V & VI owing to focus on delivering step IV in FY 2014/15	Funding allocation targeted at integrating step IV. Delays to step V & VI.	5	5	25	MICE - UK and MICE US	Absorb risk - but Integrate as much of step V & VI as allocation allows	2	5	10	Delivery of step V & VI extended to FY 20/21			end of project
UK 4	Magnetic field effecting operation of electrical equipment relating to the continued operation of the cooling channel magnet systems and detectors.	Inability to operate the cooling channel	5	5	25	MICE - UK and MICE US	Mag field study by Magnetic Shielding group to identify potential issues. Move equipment to areas of low field. Installation of a partial return yoke.	1	5	5	Much work has been completed and provision of additional rack room has enabled the majority of the sensetive equipment to be moved away from the hall.	5	500k	End of project
UK 5	Extended period of re-training for the lattice of magnets for Step IV - SS1/AFC/SS2.	Timescales for the training period, cost of the amount of LHe required to carry out the training the avaiability of the LHe	4	5	20	MICE	Discussions with BOC (or suplier) to agree delivery timescales and availablity during heavy use periods	3	5	15	Each re-cool and fill of the Spectrometer Soenoid can take upto 500l LHe, AFC around 100L. Each full lattice quench could cost in the region of 7K.	0.2	50	End step IV
UK 6	AFC Module #2 has the same type of fault as AFC module #1	Extended delay and uncertain cost burden.	4	5	20	MICE AFC Group	Bring forward test of module #2	4	5	20	Investigation testing underway to accertain the issues with the first module currently in R9	0.1	0.5	Oct-13
UK 7	Inability to recruit a full operations team in time to begin Step IV operations.	Delays to Step IV operations (3-6 months)	4	4	16	MICE - UK	Integrate LH2 responsibilities into remit of overall MICE operations team	2	4	8	Operations team construction under way	0.2		Acceptence of operations team by MICE/ISIS safety committee
UK 8	VAT payable on the delivery of all equipment imported from the non-UK collaborators	Budgetary constraints resulting in reduced work force and installation activities being carried out.	4	5	20	MICE UK	Escalation of the issue to the legal department of the STFC	4	5	20	At the moment it is unknown if the cost can be mitigated. STFC to bear the cost burden, 20% of the value of each item imported.	0.5	2000k	Impacts Step IV and all other steps.
UK 9	Resourcing issues	inabality to complete significant sections of work on agreed time or cost scales.	4	5	20	MICE - UK and MICE US	Escalation of the issue to the STFC and DOE.	4	5	20	Only action open to the project is to review and reduce the scope.			Impacts Step IV and all other steps.

- Field mitigation work, design and review has reduced the residual risk.
- Staffing for the operational team.
- VAT issue.

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Status of the MICE Construction Project

Response to recommendations

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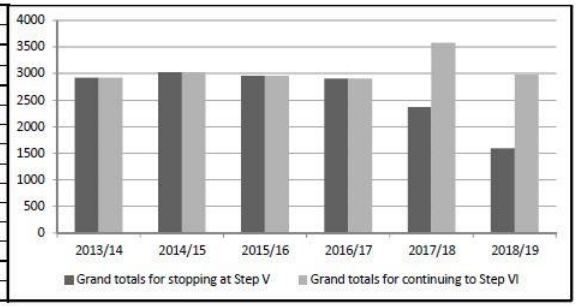
1. *Develop a risk-cost-benefit decision tree that shows how decisions regarding performance/cost-schedule trade-offs might be taken.*

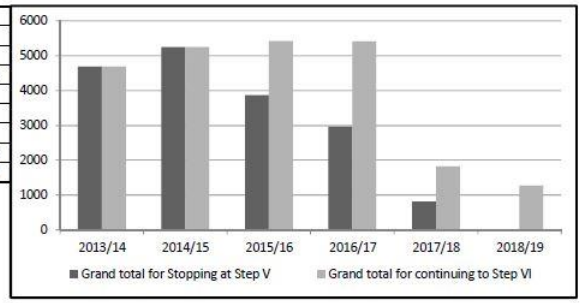
- Decision trees in the report for Downstream Solenoid, Partial Return Yoke, Focus Coil and operation of the magnet lattice to gaining scientific output.
- Single decision tree produced large and un-workable chart.
- Further developments to the current trees, has produced a useful and usable tool.

2. *Complete the financial analysis presented in the meeting of the saving of not proceeding beyond Step V.*

Work package		2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	Total
Id	Name	£k	£k	£k	£k	£k	£k	£k
Total staff and non-staff by work package								
MICE-UK								
1	Project management and project office	385	456	471	506	521	0	1873
2	Mechanical integration	217	300	283	323	98	0	1087
3	Electrical Integration	357	258	148	138	82	0	957
4	Focus-coil module	480	105	0	0	15	0	497
5	Hydrogn Delivery System	21	125	227	46	34	14	419
6	RF power	275	352	331	356	60	31	1502
7	Magnetic Mitigation	123	42	47	74	61	0	
8	Software and computing	258	260	273	265	274	283	1614
9	Operations and analysis	806	1127	1175	1197	1224	1264	5589
	Grand totals for stopping at Step V	**2922**	**3025**	**2955**	**2905**	**2369**	**1592**	**15769**
	Grand totals for continuing to Step VI	***2922***	***3025***	***2955***	***2904***	***3573***	***2975***	***18354***



	Work package	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	Total
		$k	$k	$k	$k	$k	$k	$k
5.1.	RF Design, Fabrication and Testing	500	640	1168	117	120	0	2545
5.2	Magnet Design, Fabrication and Testing	3659	3712	1934	1514	209	0	11028
5.3.	Magnetic Shielding	301	201	292	861	0	0	1655
5.4.	MICE Detectors	131	272	39	20	21	0	483
5.5.	Component Integration	103	425	435	448	458	0	1869
	Grand total for Stopping at Step V	**4694**	**5250**	**3868**	**2960**	**808**	**0**	**17580**
	Grand total for continuing to Step VI	***4694***	***5250***	***5421***	***5411***	***1822***	***1280***	***23878***



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3. *Perform a cost-benefit analysis to support the final decisions on potential delays to key staff appointments.*

The urgency of the recruitment of an operations team sufficient to support the experiment was brought home to the project team when a failure to follow procedure led to the failure of a high-T_C lead in the decay solenoid. The project team swiftly took steps to establish the recruitment necessary to deliver the required operations team.

Of the operations team of four identified as a requirement during the construction, commissioning and operations phases, 2 persons (T. Stanley, RF and M. Tucker, cryo and vacuum) are now on the strength. An individual with extensive experience in the delivery of services to large accelerator systems has been identified and has agreed to serve as Operations Manager. Negotiations with his line management are in hand to ascertain when the individual may begin to transition to MICE. The remaining member of the Operations Team (the magnet expert) has yet to be recruited. An individual has been identified and negotiations with her line management have been initiated.

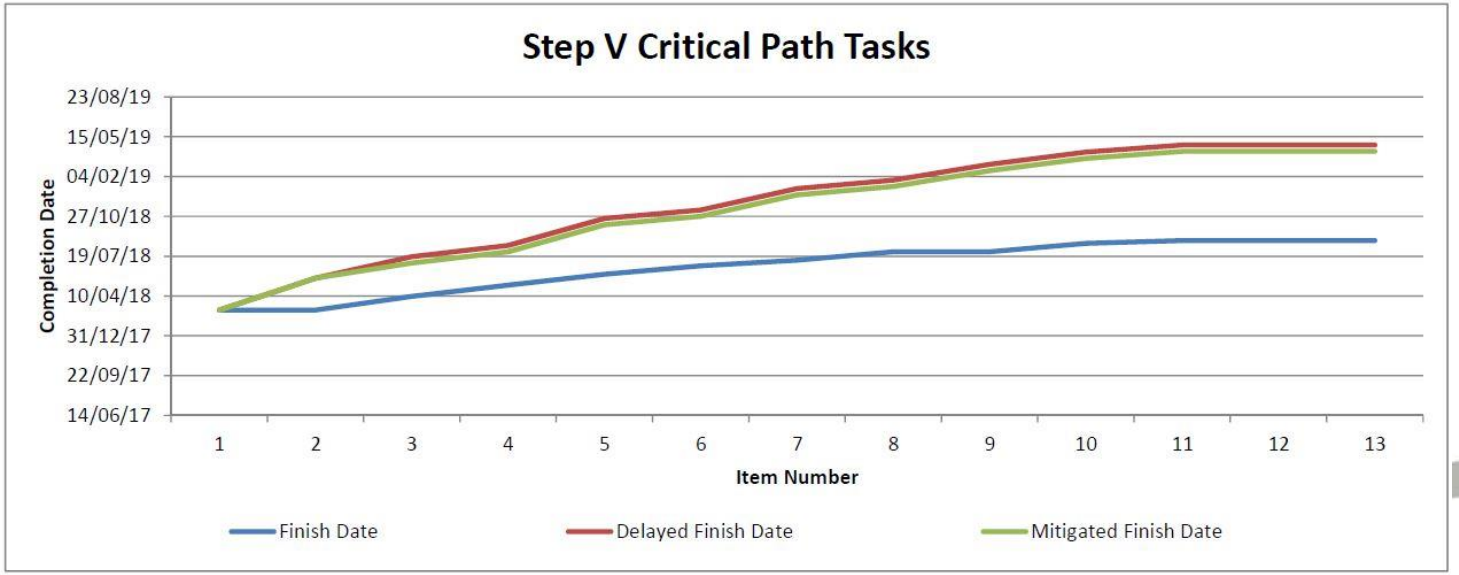
- All MIPO roles which were unfilled in May have now been filled as outlined in the presentation by K.Long

4. *Establish a set of criteria for the demonstration of the successful conclusion of Step IV.*

- *The criteria paper has been produced and can be found at the following link :-*
  - http://www.eng.dl.ac.uk/secure/mice/RLSR/Reports/

5. *Update the project schedule to present the best, most probable and worst-case dates for Step V and Step VI.*

WBS	Name	Finish Date	Risk Level	Risk Impact	Delay Duration (days)	Delayed Finish due to Risk Impact	Risk Mitigation Strategy	Cost of Risk Mitigation	Delay Duration after Mitigation (days)	Delay Finish After Mitigation
3.4	Cavities & RFCC's	06/03/18			0	06/03/18		0	0	06/03/18
3.4.1	Cavity & RFCC module #1 delivered to RAL	06/03/18	(RISK)-(R1)	Late delivery - Delays to step V	80	25/05/18		0	0	25/05/18
5.3.7.3	Install RFFC module #1 and align	09/04/18	(RISK)-(R3)	Installation problems - Delays to step V comple	20	18/07/18	Ensure all prep work in complete - Weekend Working	£4,500	-10	02/07/18
5.3.7.4	Cooldown RFFC #1	07/05/18			0	15/08/18		0	0	30/07/18
5.3.7.5	RFFC magnet test period	04/06/18	(RISK)-(R2)	Magnet test problems - Delays to step V compl	40	22/10/18	Already Assumes Weekend Working	0	0	06/10/18
5.3.7.6	Connect RF wave guides	25/06/18			0	12/11/18		0	0	27/10/18
5.3.7.7	RF Amplifier test period	09/07/18	(RISK)-(R2)	RF amplifier test problems - Delays to step V co	40	05/01/19	Already Assumes Weekend Working	0	0	20/12/18
5.3.7	RFCC #1 Installation	30/07/18			0	26/01/19		0	0	10/01/19
5.3.7.8	RFFC test period	30/07/18	(RISK)-(R2)	Commissioning problems - delay to stepV comple	40	07/03/19	Already Assumes Weekend Working	0	0	19/02/19
5.3.8	Spectrometer Solenoid #2 installation	20/08/18	(RISK)-(R4)	Installation issues	10	07/04/19	Weekend Working	£2,700	-6	22/03/19
5.3	MICE Step V Installation	27/08/18	(RISK)-(R4)	Installation issues	10	24/04/19	Weekend Working	£1,800	-4	08/04/19
5.3.9	Re-install TOF2, KL & EMR	27/08/18			0	24/04/19		0	0	08/04/19
5.3.10	**MICE step V installation complete**	**27/08/18**			**0**	24/04/19		**0**	**0**	08/04/19
							Overtime working	**£9,000**	**-20**	
							Standing Army Costs - based on 7mths delay to mitigated finish	**£ 249,083**		
							Total Cost	**£ 258,083**		



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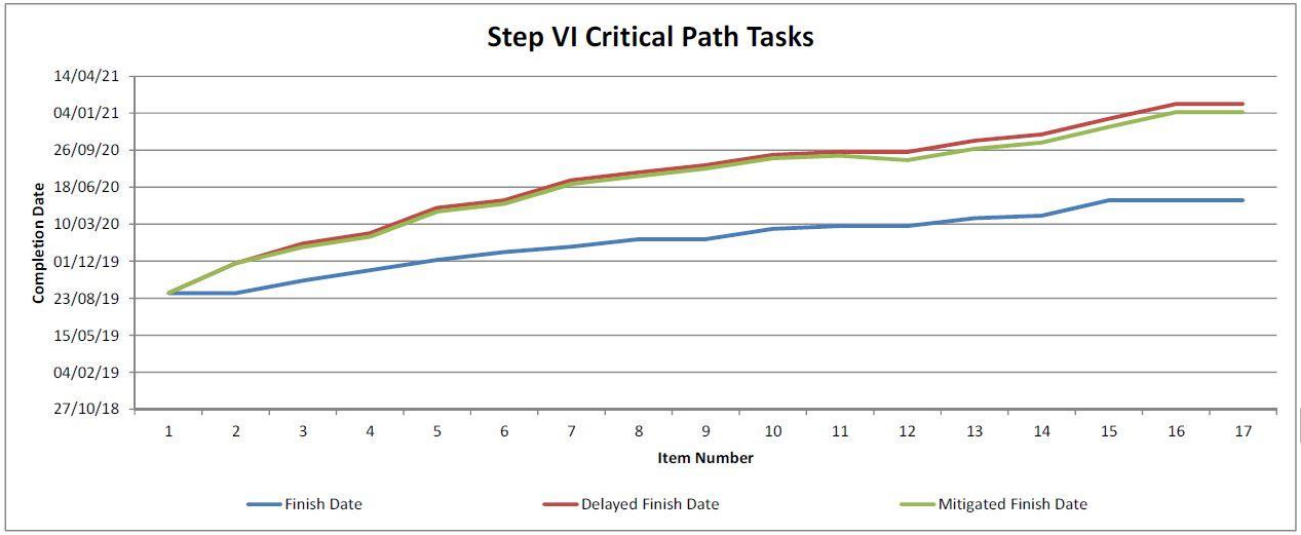
5. *Update the project schedule to present the best, most probable and worst-case dates for Step V and Step VI.*

WBS	Name	Finish Date	Risk Level	Risk Impact	Delay Duration (days)	Delayed Finish due to Risk Impact	Risk Mitigation Strategy	Cost of Risk Mitigation	Delay Duration after Mitigation (days)	Delay Finish After Mitigation
2.4	Cavities & RFCC's	06/09/19			0	06/09/19		0	0	06/09/19
2.4.1	Cavity & RFCC module #2 delivered to RAL	06/09/19	(RISK)-(R1)	Late delivery - Delays to step VI	80	25/11/19		0	0	25/11/19
4.3.9.3	Install RFCC module #2 and align	10/10/19	(RISK)-(R3)	Installation problems - Delays to step VI completion	20	18/01/20	Ensure all prep work in complete - Weekend Working	£4,500	-10	08/01/20
4.3.9.4	Cooldown RFCC #2	07/11/19			0	15/02/20		0	0	05/02/20
4.3.9.5	RFCC magnet test period	05/12/19	(RISK)-(R2)	Magnet test problems - Delays to step VI completion	40	23/04/20	Already Assumes Weekend Working	0	0	13/04/20
4.3.9.6	Connect RF wave guides	26/12/19			0	14/05/20		0	0	04/05/20
4.3.9.7	RF Amplifier test period	09/01/20	(RISK)-(R2)	RF amplifier test problems - Delays to step VI completion	40	07/07/20	Already Assumes Weekend Working	0	0	27/06/20
4.3.9	RFCC #2 Installation	30/01/20			0	28/07/20		0	0	18/07/20
4.3.9.8	RFCC absorber test period	30/01/20	(RISK)-(R3)	Absorber problems	20	17/08/20	Already Assumes Weekend Working	0	0	07/08/20
4.3.8.5	AFC #3 magnet test period	27/02/20			0	14/09/20		0	0	04/09/20
4.3.8	AFC #3 Installation	05/03/20			0	21/09/20		0	0	11/09/20
4.3.8.6	Connect R&D LH2 system	05/03/20			0	21/09/20	Weekend Working	£2,700	-6	30/08/20
4.3.10	Spectrometer Solenoid #2 Installation	26/03/20	(RISK)-(R4)	Installation issues	10	22/10/20	Weekend Working	£2,700	-6	30/09/20
4.3.11	Re-install TOF2, KL & EMR	02/04/20	(RISK)-(R4)	Installation issues	10	08/11/20	Weekend Working	£1,800	-4	17/10/20
4.3	MICE Step VI Installation	14/05/20			0	20/12/20		0	0	28/11/20
4.3.12	Combined magnet operational tests	14/05/20	(RISK)-(R2)	Combined magnet operation problems	40	29/01/21	Already Assumes Weekend Working	0	0	07/01/21
4.3.13	**MICE step VI installation complete**	**14/05/20**			**0**	29/01/21		**0**	**0**	07/01/21
							Overtime working	£11,700	-26	
							Standing Army Costs - based on 8mths delay to mitigated finish	£284,667		
							Total Cost	£296,367		



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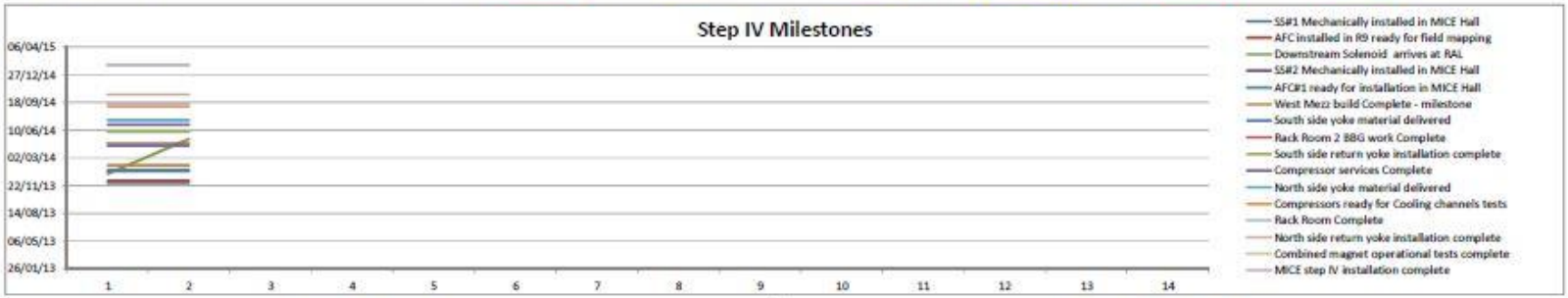
6. *Identify a set of appropriate intermediate milestones as a means of monitoring and reporting.*

- The project board had a similar request for a milestone tracker
- Since the review in May the re-scheduling and levelling of the US project to include contingency, baseline dates have changed.
- These dates have been used to illustrate how the milestone tracker will be used. The milestones will be re-baslined.

Dashboard link can be found :- http://micewww.pp.rl.ac.uk/dashboard/

	Baseline Date	1	2	3	4	5	6	7	8	9	10	11	12	13
Step IV Top Level Milestones														
SS#1 Mechanically installed in MICE Hall	02/12/13	02/12/13												
AFC installed in R9 ready for field mapping	10/12/13	10/12/13												
Downstream Solenoid arrives at RAL	03/01/14	[illegible]												
SS#2 Mechanically installed in MICE Hall	13/01/14	13/01/14												
AFC#1 ready for installation in MICE Hall	16/01/14	16/01/14												
West Mezz build Complete - milestone	04/02/14	04/02/14												
South side yoke material delivered	15/04/14	15/04/14												
Rack Room 2 BBG work Complete	23/04/14	23/04/14												
South side return yoke installation complete	04/06/14	04/06/14												
Compressor services Complete	30/06/14	30/06/14												
North side yoke material delivered	15/07/14	15/07/14												
Compressors ready for Cooling channels tests	04/09/14	04/09/14												
Rack Room Complete	12/09/14	12/09/14												
North side return yoke installation complete	17/10/14	17/10/14												
Combined magnet operational tests complete	30/01/15	30/01/15												
MICE step IV installation complete	30/01/15	30/01/15												
Step V Top Level Milestones														
LH2 absorber #2 at RAL (KEK)	28/09/12	28/09/12												
AFC#2 ready for installation in MICE Hall	28/10/13	28/10/13												
Amplifier#2 installation complete	26/08/14	26/08/14												
Cavity & RFCC module #1 delivered to RAL	03/01/17	[illegible]												
MICE step V installation complete	26/06/17	[illegible]												
Step VI Top Level Milestones														
Amplifier system #3 Delivered	26/11/15	26/11/15												
Amplifier system #4 Delivered	28/11/17	28/11/17												
FC module #3 at RAL	02/04/18	02/04/18												
Cavity & RFCC module #2 delivered to RAL	26/07/18	[illegible]												
AFC#3 ready for installation in MICE Hall	19/07/18	19/07/18												
Amplifier#3 installation complete	10/12/15	10/12/15												
Amplifier#4 installation complete	08/12/17	08/12/17												
MICE step VI installation complete	03/04/19	[illegible]												

Change since last update	Reduction	Date	No Change	Date	1 - 2 weeks	Date	2 - 4 Weeks	Date	1 -2 months	Date	2+ months	Date	Complete	Date



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