

MULTI-TERMINAL TEST ENVIRONMENT (MTTE)  
FOR HVDC SYSTEMS

PROJECT PROGRESS REPORT

Project Number	SSEN001
Transmission Licensee	Scottish Hydro Electric Transmission plc
Reporting Period	December 2013 to June 2014

Document Status	Approved
Author	Simon Marshall (Project Manager)

**Reviewed by**

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Jen Carter	Approved on 18/6/14
Stewart Reid	Approved on 17/6/14

## 1 Executive summary

*This section should be able to stand alone and provide a picture of the progress of the Project in the period to all interested parties not involved in the Project. The Funding Licensee should describe the general progress of the Project, including details of any delays or problems encountered; any notable milestones or deliverables achieved in the period and details of any Dissemination activities carried out in the period.*

### **Overview of MTTE**

SHE Transmission in collaboration with National Grid Electricity Transmission Limited (NGET) and Scottish Power Transmission Limited (SPT) is establishing a collaborative real-time simulation facility which will support the planning, development, testing and maintenance of HVDC transmission systems in GB.

This facility is known as the Multi-Terminal Test Environment (MTTE), and it will combine advanced real-time simulation capability with replica control panels from HVDC schemes.

The MTTE aims to maximise the benefits of GB's significant investment in HVDC systems, by:

- Supporting transmission planning and improve specification of HVDC schemes;
- Facilitating multi-terminal solutions and interconnected DC hubs;
- De-risking control interactions between converters connected in electrical proximity, and also with other fast acting power electronic controllers embedded within the ac network;
- Training and developing Transmission Planning and Operations Engineers;
- Undertaking post-commissioning scenario planning and network analysis; and
- Modeling multiple HVDC technologies.

The MTTE will provide a facility where multiple HVDC schemes on the GB transmission network can be studied to anticipate and resolve potential issues, to ensure the integrity and security of the network. Based on the number of projected HVDC schemes which may be constructed within GB, to neighbouring countries, and to access off-shore renewable energy resources, a facility such as the MTTE will become an invaluable tool for system planners, asset owners and operators.

The MTTE will create a number of unique features which will allow the study of the impact of individual HVDC schemes to a level of detail not possible for individual manufacturers. By using replica control panels coupled with a Real Time Simulation facility, the impact of multi-infeed systems, multi-terminal systems and multi-vendor systems can be studied. The use of the control hardware, installed at a neutral location will allow joint testing of the interoperability of different control systems in the GB network.

The MTTE will facilitate future development of multi-terminal systems and will allow network operators to gain confidence in multi-terminal VSC systems.

### ***Progress within this Reporting Period***

The initial focus of the project was on mobilising the project. The project team is in place, the governance arrangements are up and running, and the phase plan has been agreed.

Good progress has also been made on each of the project workstreams for this phase. The functional requirements have been drafted and reviewed, a preferred location has been identified, we have drafted the specification for the Real-Time Simulator, and we are in the process of procuring replica control panels.

Stakeholder engagement and collaboration continues to be a key element of the MTTE. We are continuing to work closely with the project partners (National Grid and Scottish Power), and also to negotiate collaboration with HVDC suppliers.

Through our project planning process, we have developed the project's work breakdown structure, from which we identified the project's workstreams:

- Project Mobilisation;
- Real Time Simulator Specification;
- Requirements & High-Level Design;
- Building (incl facilities & IT Infrastructure) Requirements;
- Collaboration Agreements with Suppliers, TOs and HVDC Project(s);
- Purchase Replica Control Panels; and
- Project Management & Governance.

The project has specified the requirements for the replica control panels, issued them to the supplier and is currently in commercial discussions with the supplier. The quote for these panels is currently above the budgeted amount, and we are currently investigating options to bring it into line with the budget.

The project has sought to learn from other Transmission System Owners who have built similar facilities and has engaged and visited: RTE's facility (in France), Hydro Quebec/IREQ's facility (in Canada), and Manitoba Hydro's facility (also in Canada). This has provided the project with learning and insight into the practicalities of establishing real-time simulation facilities for HVDC, and laid the foundations for future collaborations.

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### **3 Project manager's report**

*The Project manager's report should be a more detailed version of the executive summary. This section should describe the progress made in the reporting period. Any key issues, deliverables or events should be drawn out and described in detail; referring where necessary to other sections of PPR. This section should also provide an outlook onto the next reporting period. It should describe any key issues or concerns which the Project manager considers will be a major challenge in the next reporting period.*

Through our project planning process, we have developed the project's work breakdown structure, from which we identified the project's workstreams:

- Project Mobilisation;
- Real Time Simulator Specification;
- Requirements & High-Level Design;
- Building (incl facilities & IT Infrastructure) Requirements;
- Collaboration Agreements with Suppliers, TOs and HVDC Project(s);
- Purchase Replica Control Panels; and
- Project Management & Governance.

An update on each of these work packages is provided below:

#### ***Project Mobilisation***

The project has been fully mobilised:

- Project direction was signed on 19th December 2013.
- Project started on 6th January 2014.
- Project Team has been mobilised (including recruiting an ICT Project Engineer).
- Procurement process for HVDC specialist support has been completed resulting in the engagement of Parsons Brinkerhoff.
- All project governance arrangements have been established.

#### ***Requirements & High-Level Design***

The MTTE's functional requirements have been drafted and reviewed by the project partners:

- The high-level functional requirements for the MTTE were agreed with the project partners at the Partners' workshop in February.
- Parsons Brinkerhoff developed these into the Functional Requirements document, which was drafted and reviewed at the Project Partners' workshop in May.

#### ***Real Time Simulator Specification***

Based on the functional requirements, the project team developed the draft specification of requirements for the Real-Time Simulator (RTS), which will form the basis of the Tender documentation.

### ***Building (incl facilities & IT Infrastructure) Requirements***

Based on the functional requirements, the project team developed the specification of requirements for the MTTE Building and facilities.

SSE's building services have been engaged to identify options and suitable locations. They have reviewed and costed all of the potential options, and have recommended a site for the MTTE. We are currently investigating the detail and feasibility of this location.

### ***Collaboration Agreements with Suppliers, TOs and HVDC Project***

- **Suppliers:** The project is engaging with HVDC suppliers and developing collaboration agreements with the 3 main European HVDC suppliers.
- **TOs:** The collaboration agreements with TOs have been agreed in principle, and are in the final stages of formal signing (later than planned).
- **HVDC Project:** The MTTE is working with the Caithness-Moray HVDC Project, which is currently being assessed by Ofgem under the Strategic Wider Works (SWW) process.

### ***Purchase Replica Control Panels***

The specification of requirements of replica control panels has been finalised, and the project is currently going through the procurement process for the replica control panels with a supplier.

The quote for these panels is currently above the budgeted amount, and we are currently investigating options to bring it into line with the budget.

### ***Project Management & Governance***

- A dedicated steering Group for the MTTE has been established and has been meeting monthly, the Terms of Reference for the Steering Group have been signed-off.
- The detailed stage plan has been developed and agreed.
- A safety review workshop has been completed (with the outputs captured in the SHE risk register).
- Two of the quarterly project partner workshop have been completed (as well as a number of intervening Partner Teleconference Project meetings)
- As part of SSEs Major Projects Governance Framework, the project passed through Gate 1.
- Following an initial meeting with Ofgem's project officer, monthly project updates have been scheduled.
- Regular Project Status reports have been circulated to monitor progress.

### ***Collaboration with other TSOs***

There are 5 facilities similar to the MTTE across the world (i.e. TSO led HVDC real-time simulators). One in France, two in Canada and two in China. To learn from their experiences and establish collaborations with these organisations the project team visited the French and Canadian facilities (in May & June 2014).

- RTE (Réseau de Transport d'Électricité);
- Manitoba Hydro; and
- IREQ (L'Institut de recherche d'Hydro-Québec), Hydro Quebec's research institute.

The MTTE intends to form collaborations with these organisations.

***The focus over the next reporting period will be on:***

- Completing the Tender process for the RTS system;
- Finalising the procurement of replica control panels;
- Signing-off the functional requirements;
- Completing collaboration agreements with SPT, NGET and HVDC suppliers;
- Developing the plans for the MTTE building; and
- Preparing for the additional Ofgem submission on meeting additional provisions 9 and 10 of the Project Direction.



#### **4 Business Case Update**

*The Funding Licensee should note any developments or events which might affect the benefits to be gained from the NIC Project. Where possible the Funding Licensee should quantify the changes these developments or events have made to the Project benefits compared to those outlined in the full submission proposal.*

No changes have been made to the Business Case for the MTTE, described in the NIC full submission document.

## 5 Progress Against Plan

*This section should summarise the progress of the Project in the previous six month period. It should describe any issues of note that were faced in the reporting period, and how these issues were managed. Key achievements/notable events should be highlighted. The Funding Licensee should briefly describe key planned activities for the next reporting period. This should include any issues the Funding Licensee envisages facing in the next reporting period.*

### **Summary of Progress**

Overall the project is progressing on plan.

### **Issues**

The project has specified the requirements for the replica control panels, issued them to the supplier and is currently in commercial discussions with the supplier. The quote for these panels is currently above the budgeted amount, and we are currently investigating options to bring it into line with the budget.

While the signing of the collaboration agreements with National Grid Electricity Transmission (NGET) & Scottish Power Transmission Ltd (SPT) is expected to be completed shortly (in line with SDRC 9.1), it has taken longer than anticipated.

### **Key Achievements/Notable Events**

The Key Achievements have been:

- Functional Requirements drafted and reviewed;
- Real-Time Simulator specification drafted;
- Build & facilities specification drafted;
- Replica control panels specification completed; and
- Preferred location identified.

### **Key Activities Next Reporting Period**

The Key Activities between 19 June 2014 and 19<sup>th</sup> December 2014 are planned to be:

- Development of the additional Submission to Ofgem on additional provisions 9 & 10 of the project direction;
- Selection of the RTS system and completion of the tender process;
- Completion of the procurement process for first set of replica control panels;
- Plans for the MTTE building;
- Signing collaboration agreements with HVDC suppliers;
- Signing collaboration agreements with other TOs;
- OFTO & Renewable Developers engagement event; and
- Presenting the MTTE at the LCNI conference.

## 6 Progress against budget

The Funding Licensee should report on expenditure against each line in the Project Budget, detailing where they are against where they expected to be at this stage in the Project. The Funding Licensee should explain any projected variance in excess of five per cent against each line.

Cost Category	Total Budget	Spend to Date	Comment
<b>Labour</b>			
<b>Project team resource costs</b>	£2,181.68k	£87.8k (to end Apr)	40% below plan (as requested by Ofgem, we are keeping costs to a minimum in year 1, by deferring some activities).
<b>MTTE resource costs</b>	£2,032.13k	£0	On Plan
<b>Equipment</b>			
<b>N/A</b>			
<b>Contractors</b>			
<b>Project team resource costs</b>	£288.44k	£16k	58% below plan (as requested by Ofgem, we are keeping costs to a minimum in the year 1, by deferring some activities).
<b>IT</b>			
<b>IT Infrastructure (incl RTS and Replica Panels)</b>	£3,828.21k	£0	On Plan
<b>Annual Running Costs of the MTTE</b>	£304.37k	£0	On Plan
<b>IPR Costs</b>			
<b>N/A</b>			
<b>Travel &amp; Expenses</b>			
<b>Travel &amp; Expenses</b>	£197.40k	£0.054k	99% below plan (spend is not equally spread across the year as the spend profile assumes)
<b>Payments to users</b>			
<b>N/A</b>			
<b>Contingency</b>			
<b>N/A</b>			
<b>Decommissioning</b>			
<b>N/A</b>			
<b>Other</b>			
<b>Academic Support</b>	£827.07k	£0	On Plan
<b>Learning &amp; Dissemination</b>	£165.41k	£0	On Plan
<b>MTTE Building Facility</b>	£2,916.20k	£0	On Plan
<b>Annual Running Costs of the MTTE</b>	£515.09k	£0	On Plan
<b>Recruitment &amp; Training</b>	£137.90k	£0	On Plan
<b>Total</b>	<b>£13,393.91k</b>		

As extracted from the finance system (Harmony) on 6<sup>th</sup> June 2014.

## 7 Bank Account

The Funding Licensee should provide a bank statement or statements detailing the transactions of the Project Bank Account for the reporting period. Where the Funding Licensee has received an exemption from Ofgem regarding the requirement to establish a Project Bank Account it will provide an audited schedule of all the memorandum account transactions including interest as stipulated in the Project Direction.

### Bankline



Statement for account 60-17-21 95285784 from 01/12/2013 to 06/06/2014

Short name:	SCOTTISH HYDRO-ELECT	Currency:	GBP
Alias:	SCOTTISH HYDRO-ELECT	Account type:	SPECIAL INT BEARING
BIC:	NWBKGB2L	Bank name:	NATIONAL WESTMINSTER BANK
IBAN:	GB70NWBK60172195285784	Bank branch:	READING MKT PLACE

Date	Narrative	Type	Debit	Credit	Ledger balance
	<b>CLOSING BALANCE</b>				<b>2,112,032.92Cr</b>
03/06/2014	SCOTTISH HYDRO-E MTTE COSTS REVERSA	EBP		86,856.27	2,112,032.92Cr
27/05/2014	SCOTTISH HYDRO-E MTTE COSTS	EBP	26,063.79		2,025,176.65Cr
15/05/2014	NO 3 PAYMENTS CHARITY-LICENCES	BAC		944,400.00	2,051,240.44Cr
15/05/2014	SCOTTISH HYDRO-E SCOTTISH HYDRO-E	EBP		111,615.94	1,106,840.44Cr
30/04/2014	SCOTTISH HYDRO-E MTTE COSTS	EBP	60,792.48		995,224.50Cr
22/04/2014	SCOTTISH HYDRO-E SCOTTISH HYDRO-E	EBP		111,615.98	1,056,016.98Cr
15/04/2014	NIC FUNDING PCMS5C15784709B NATIONAL GRID EL ECTRICITY TRANS CHAPS TFR	CHP		944,401.00	944,401.00Cr
	<b>OPENING BALANCE</b>				<b>0.00Cr</b>
<b>Totals</b>			<b>86,856.27</b>	<b>2,198,889.19</b>	

NB: Transactions with today's date may still be subject to confirmation and may subsequently be reversed from your account.  
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Note: Some MTTE project costs were allocated to the project bank account in error. Once identified, these were reversed out. A calculation of the interest not earned during this period will be made and added to the account.

## 8 SDRC

The Funding Licensee should provide a brief narrative against each of the SDRCs set out in their Project Direction. The narrative should describe progress towards the SDRCs and any challenges the Funding Licensee may face in the next reporting period.

The MTTE identified eight Successful Delivery Reward Criteria (SDRC) which span both the objectives and the lifecycle of the project. The following table lists each SDRC in chronological order and details the project's progress towards their achievement.

Completed (SDRC met)	Emerging issue, remains on target	SDRC completed late
On target	Unresolved issue, off target	Not completed and late

SDRC	Due	Description	Evidence	Status
SDRC 9.1	31/8/2014	<b>Formal Agreement with Project Partners.</b> The success of this project will be crucially dependent on the involvement of the project partners & stakeholders. Therefore, an early indication of success of the project is the establishment of formal agreements with the project partners (National Grid, Scottish Power and NETSO) and HVDC expert support.	Signed agreements with project partners (National Grid, Scottish Power and the NETSO)(note, agreement will include IP security requirements) and HVDC expert support.	On target to sign agreements with project partners by 31/8/14. Agreement with HVDC Expert Support has been signed.
SDRC 9.2	31/10/2014	<b>OFTOs and Renewable Developers Event</b> Given the anticipated number of HVDC schemes in GB for connection of offshore renewable, the engagement of OFTOs and Renewable Generators is important to ensure the benefits of the MTTE are maximised, therefore the MTTE project will hold an event to inform and encourage their participation.	Holding an event to which all OFTOs and Renewable Generators are invited, to inform and encourage their participation in the MTTE.	On Target Event is currently being planned.
SDRC 9.3	31/12/2014	<b>Engagement with 1st HVDC Project</b> The purchase of the 1st set of replica control panels for the MTTE will be key to its success, and the panels will be purchased through an HVDC project. Therefore the formal engagement of the initial HVDC project is an important early milestone.	Formal agreement between the MTTE project and an HVDC project, which includes the intention to purchase/supply replica control panels through the HVDC project's procurement process.	On Target 1 <sup>st</sup> HVDC Project is expected to be the Caithness-Moray HVDC project.
SDRC 9.4	31/5/2015	<b>Complete Design of MTTE Facility</b> The completed design of the MTTE facility, both technical design and physical design, and the agreement of this design with the project stakeholders (including vendors), is a key milestone for the project. The detailed design will be consolidated within the Design Development Document, and will adhere to the requirements defined in the requirements specification.	Design development document and requirements specification for the MTTE facility endorsed by participating vendors and signed-off by SHE Transmission, NGET, NETSO and SPT.	On Target Requirements Specification has been drafted and reviewed.
SDRC 9.5	31/10/2015	<b>Establishing HVDC Operators' Forum and Website</b> A key component of our knowledge and dissemination strategy is the establishment of the HVDC Operators' Forum (to which all Network Licensees, including OFTOs will be invited), the associated members' website (which provides a secure area to share the MTTE outputs with Transmission Licensees), and the public website.	The establishment of the HVDC Operators' Forum (including holding the 1 <sup>st</sup> event), together with the publishing of the MTTE websites.	On Target Continuing ongoing stakeholder engagement.
SDRC 9.6	31/5/2017	<b>Commence Operation of the MTTE</b> The criteria consolidates the: <ul style="list-style-type: none"> <li>o Completion of the building/upgrade of the MTTE facility;</li> <li>o Commissioning of the IT/RTS infrastructure;</li> <li>o MTTE Resourcing;</li> <li>o Management structure in place;</li> <li>o Processes and procedures agreed;</li> <li>o Data sets of the AC network received (from NETSO); and</li> <li>o Plan of studies and tests agreed.</li> </ul> When all of these are in place, the MTTE will be	Commencement of MTTE Operations.	On Target

		able to commence operations, therefore this is a key milestone and measure of success of the project.		
SDRC 9.7	31/3/2018	<p><b>Publishing Studies &amp; Test results</b></p> <p>The key outputs from the MTTE are the reports on specific scenarios which are completed within the MTTE, which will be disseminated to transmission licensees. Therefore, a key success criterion is the publishing of studies or test reports on the MTTE members' website.</p>	Publishing the first set of reports on a specific Transmission Licensee led project, on the MTTE members' website.	On Target
SDRC 9.8	31/3/2020	<p><b>Future Business Model</b></p> <p>At least 12 months prior to the end of the funded operation of the MTTE (i.e. by end of March 2020), the MTTE management team will submit a proposal for the future operation and funding of the MTTE (post NIC funding), to Ofgem.</p>	Submission of proposal regarding MTTE ongoing operation and funding to Ofgem.	On Target

## 9 Learning outcomes

*The Funding Licensee should briefly describe the main learning outcomes from the reporting period. It should update Ofgem on how it has disseminated the learning they generated as part of the Project over the last six months.*

### **The project is continuously learning as the project develops, for example:**

- Understanding the practicalities of establishing an HVDC real-time facility (from engagement with RTE, IREQ and Manitoba Hydro) [reports on these learnings are available];
- Knowledge of real-time systems (from engagement with OPAL-RT and RTDS Technologies);
- Understanding of HVDC replica controls (from engagement with HVDC suppliers).

### **The project is disseminating these leanings through:**

- Regular meetings with the project partners;
- The planned OFTO & Renewables Developers Event; and
- The planned presentations at the LCNI conference.

### **The following learning objectives have been set for the MTTE project:**

- **Support Transmission Planning of HVDC schemes:** The MTTE will produce analysis and reports on the development scenarios investigated, and will share these the other TOs/OFTOs to increase the understanding of the impact of HVDC development scenarios on the existing network. In addition, the models developed will be shared with Network Licensees.
- **Improve Requirement Specification of HVDC schemes:** The MTTE will produce analysis and reports advising Network Licensees on the specification of HVDC schemes, and these will share these with the other TOs/OFTOs to increase the understanding of specifying requirements for HVDC schemes.
- **Facilitate Multi-Terminal HVDC solutions:** The MTTE will produce analysis and reports on the Multi-terminal scenarios, and will share these with the other TOs/OFTOs to increase the understanding of Multi-Terminal HVDC.
- **Facilitate Competition and Multi-Vendor HVDC schemes:** The MTTE will produce reports on multi-vendor compatibility to inform the development of HVDC standards and interoperability. Acceptance testing reports will also be produced.
- **De-risk Control interactions between co-located and electrically connected converters, and with other active controlled equipment:** The MTTE will produce reports on the impact of planned HVDC systems, providing detail on any control interactions with converter stations in close proximity and active controlled equipment. These reports will be shared with all Licensees to improve sector-wide understanding of the associated issues. This would include reports on the integration of generators into HVDC networks and the associated risk of adverse control interactions and their control protocols and strategies.
- **Train Transmission Planning and Operational Engineers:** The MTTE will produce training material which will be available to all Transmission Licensees.
- **Undertake Post commissioning scenario planning and operational optimisation:** The MTTE will produce recommendation reports on specific HVDC schemes to enable optimisation which will be shared with all Licensees.
- **Model New HVDC Technologies:** The MTTE will produce analysis and reports on the performance, impact and interactions of new HVDC technologies or active controlled devices in accurately simulated GB situations and their suitability for specific applications / locations.

These learning objectives will start to be achieved when the MTTE has been commissioned.

## **10 IPR**

*The Funding Licensee should report any relevant IPR that has been generated or registered during the reporting period along with details of who owns the IPR and any royalties which have resulted. The Funding Licensee must also report any relevant IPR that is forecast to be registered in the next reporting period.*

No relevant IPR has been generated or registered during this reporting period.



## 11 Risk management

The Funding Licensee should report on the risks highlighted in the Full Submission pro forma, plus any other risks that have arisen in the reporting period. The Funding Licensee should describe how it is managing the risks it has highlighted and how it is learning from the management of these risks.

### Update on Risks Highlighted in The Full Submission

Ref	Title	Description	Severity or Impact				Likelihood	Impact of Risk	Mitigation actions	Update
			P	R	O	F				
R001	Loss of Transmission Operator partners	TOs do not sign-up to the collaboration agreement	0	0	3	3	2	Reduced GB-wide MTTE benefits	Agree Memorandums of Understanding with TOs about participation, followed by collaboration agreements.	SPT and NGET are in the final stages of signing the collaboration agreements.
R002	Loss of vendor partners	Vendors do not agree to participate in the project	0	0	3	3	2	This would impact on the ability of the MTTE to test and demonstrate multi-vender operations.	Obtain statements of support from vendors, followed by collaboration agreements.	In discussion with HVDC suppliers, to agree collaboration agreements.
R003	Failure of bid	The project fails to secure NIC funding	0	0	0	3	3	Project unlikely to proceed without NIC funding, although alternative funding would be considered.	None	Project was successful in securing NIC funding, and this risk has been closed.
R004	Incorrect cost estimates	The estimated costs are substantially different than actual costs.	0	0	3	3	4	Potential project funding gap, requiring alternative funding or a reduction in scope.	Major project cost estimates are based on authoritative supplier quotes.	Currently in discussion with the suppliers of all the major cost items. Refer to R016 for risk specific to replica panels.

Ref	Title	Description	Severity or Impact				Likelihood	Impact of Risk	Mitigation actions	Update
			P	R	O	F				
R005	Poor uptake of MTTE outputs	Low uptake of learning outcomes from MTTE	0	2	0	0	2	Reduction in benefit of the MTTE	Application of established knowledge management procedures.	Open – no update
R006	Delayed MTTE opening	Opening of the MTTE is delayed due to unforeseen circumstances	0	0	2	3	1	A short delay could entail reputational damage but would not significantly reduce the benefits.	The project will be managed in accordance with SSEPD's Major Projects Governance Framework.	Open – no update
R007	Commercial failure of MTTE	A sustainable business model is not achieved for the MTTE	0	0	3	3	2	MTTE would be closed or taken over by a single TO, with the objective to recover investment.	Self-sustaining commercial model developed with project partners from the outset.	Open - Continuing to engage with other facilities to understand potential business models.
R008	Failure to recruit or loss of critical operational staff	Failure to recruit or retain essential skilled personnel	0	0	2	2	4	Quality/quantity of studies performed in the MTTE would be reduced.	Collaboration with vendors and academia to negotiate resourcing.	Open – no update
R009	Insufficient resources for project delivery	Unavailable skills and training impact on project delivery	0	0	1	1	1	Delays in resourcing project team would delay project delivery	Key project team resources have already been identified and have committed to the project.	Open - Sufficient and appropriate project resource have been secured for the project.
R010	Discontinuity in project team	Lack of continuity in the project team resource during project	0	0	1	0	3	Potential negative impact on project delivery.	None identified	Open – joint working has been established in the project team and expertise is drawn from broader resource pool available within SHE-T to mitigate negative impact on delivery.
R011	Failure to secure Caithness-Moray HVDC replica control panels	CM project does not supply replica control panels to the MTTE, or the use of the panels is contractually limited.	0	0	3	3	2	MTTE will have to source replicas through other projects and meanwhile study other generic HVDC control schemes.	Agree Memorandum of Understanding with CM project relating to the supply and use of suitable replica control panels.	Open – no update

Ref	Title	Description	Severity or Impact				Likelihood	Impact of Risk	Mitigation actions	Update
			P	R	O	F				
R012	Cancellation of multi-terminal HVDC in GB	The two planned multi-terminal links in GB are cancelled; no other multi-terminal links in GB go ahead.	0	0	3	3	2	Reduced MTTE benefit. However, MTTE outputs are also applicable and significant to point-to-point HVDC links.	Continue engagement with HVDC projects in GB.	Open – no update
R013	Unsuitability of multi-terminal HVDC for GB	MTTE demonstrates that multi-terminal or multi-vendor HVDC is not feasible for GB.	0	0	0	1	1	Considered to be a benefit, since it could save significant capital spend.	Continue engagement with HVDC projects in GB.	Open – no update
R014	Failure to interface with control panels	Failed interfacing between the RTS system and the replica control panels supplied by vendors.	0	0	1	1	1	May incur project delays or additional costs.	Vendors currently test equipment using an RTS system and suitable interfaces, which will also be supplied to MTTE.	Open – Identifying the RTS system early will allow the project to investigate this in more depth.
R015	RTS Failure	RTS system unable to simulate more complex future new topologies of multi-terminal HVDC systems	0	0	2	1	1	Limitation on the studies undertaken by the MTTE. Additional hardware investment will be required.	RTS tender process will look into future requirements for modelling capabilities for new proposed topologies.	Open – RTS specification currently being developed.

**Additional Risks Identified.**

Ref	Title	Description	Severity or Impact				Likelihood	Impact of Risk	Mitigation actions	Update
			P	R	O	F				
R016	<i>Cost of Replicas</i>	Risk that quote for replica panels exceeds project budget.	3	1	2	1	4	If the project is not able to meet the funding gap through an alternative source then the project would not have sufficient budget.	The quoting for the replica panels is planned early in the project to give early visibility..	The initial quote for replica control panels is higher than the budget, and the project is currently in negotiations with the supplier.
R017	Ofgem stop project	Ofgem decide not to proceed with the project, following submission for Clauses 9 & 10 of the Project Direction	4	4	4	2	2	The project would stop.	Work with regulation to ensure that evidence submitted is sufficient	
R018	Interdependency with C-M Project	The MTTE has interdependencies with the Caithness-Moray HVDC project, if the CM project does not process, this will impact on the MTTE	3	4	3	2	2	The delivery of replica panels to MTTE will be delayed if C-M project is delayed. However, MTTE Simulator will be set-up to study other systems and HVDC and AC system integration studies.	None identified.	

**Risk Management**

The project risk log is issued along side the project status reports to maintain its visibility, the risk log is reviewed by the project team and the key project risks are highlighted and discussed at the monthly steering group meetings, where mitigating actions are agreed.

## **12 Other**

*Any other information the Funding Licensee wishes to include in the report which it considers will be of use to Ofgem in understanding the progress of the Project and performance against the SDRC.*

None

### 13 Enhanced Project Plan and Progress Report

It was agreed as part of the Project Direction that the project would provide (as part of the first Sixth Monthly report):

- An update on its progress in meeting additional provisions 9 and 10 of the Project Direction; and
- An enhanced version of its project plan, identifying progress on major cost items.

#### **Additional Provision 9 [extract from Project Direction]**

*The Funding Licensee will be responsible for developing and delivering an approach to ensure the ongoing participation of at least two of the parties described in Table 2 (“HVDC suppliers”). The Funding Licensee will also be responsible for protecting customers’ investment in the project against the risk of non-participation of the HVDC suppliers.*

*As part of discharging this responsibility, the Funding Licensee will submit an application to the Authority providing evidence that it has established appropriate contractual and other arrangements to:*

- A) *ensure the ongoing participation of the HVDC suppliers; and*
- B) *protect customers’ investment against the risk of non-participation of the HVDC suppliers.*

*The Funding Licensee must submit an application to the Authority providing evidence that the arrangements that it has entered into with the HVDC suppliers, either directly or through engagement with HVDC transmission project or its Project Partners (“the arrangements”), are sufficiently robust that it is appropriate to move to full procurement, construction and operation of the MTTE facility. It will do this by demonstrating that the arrangements ensure that the HVDC suppliers will -*

- *allow the replica HVDC control panels (panels procured via suitably authorised HVDC projects) to be installed at the MTTE facility.*
- *participate in developing the studies and scenarios to be tested in the MTTE facility.*
- *as part of its provision of replica panels to HVDC transmission project(s), include the provision of appropriately trained staff to manage the installation of its equipment and support its commissioning and operation during the test programme.*
- *agree terms in respect of the security arrangements (cyber and physical) that the Funding Licensee will provide within and around the MTTE facility. This would encompass the control of access to hardware, software and the dissemination of intellectual property between all parties using the MTTE facility. Such terms would include arrangements in respect of accidental and non-accidental damage or loss arising from the operation of the MTTE facility and or as otherwise agreed between the contracting parties.*
- *conform to the default IPR arrangements as specified in chapter nine of the NIC Governance document (or gain approval from Ofgem for any required deviations to protect foreground IPR).*

*In addition, in making this application the Funding Licensee must demonstrate the arrangements protect customers against the consequential cost of non-participation of the HVDC suppliers.*

#### **Update on Progress on Additional Provision 9**

Of the 3 main European HVDC suppliers we are:

- Currently in detailed technical discussions with the preferred partner for the Caithness-Moray project, on the provision of replica control panels.
- With another supplier we have had a number of meetings and are in the process of agreeing a collaboration agreement.
- With the third, we have had initial high-level engagement.

As part of the negotiations for the provision of replica control panels, we are discussing with the supplier how to protect customers’ investment against subsequent non-participation, which the supplier has agreed to in principle.

Initial indications are that the cost of the replica control panels may be higher than in the project budget, we are currently in negotiation with the supplier and are also investigating options to meet any gap.

### **Additional Provision 10 [extract from Project Direction]**

The Funding Licensee must meet the requirement of either Part 1 or Part 2 of this provision. The Funding Licensee must inform the Authority that Part 1 has been met or submit a notice under Part 2 by the end of December 2014.

#### **Part 1**

The Funding Licensee must enter into contractual agreements (or, in the case of SHE Transmission, other suitable evidence of commitment to use MTTE) with at least one of the parties described in Table 3 (“contracting parties”). The contractual agreement it enters into with the contracting party must include terms which stipulate that the contracting party -

- must provide the replica control panels that it procures through its HVDC project to the MTTE project for testing.
- where appropriate, provide its generation output models to be held and used as part of testing carried out by the Project.
- accepts the adequacy of the arrangements for site security (cyber and physical) that the Funding Licensee commits (through the contract) to put in place within and around the MTTE facility. This would encompass the control of access to hardware, software and the dissemination of intellectual property between all parties using the MTTE facility.
- will conform to the default IPR arrangements as specified in chapter nine of the NIC Governance document (or gain approval from Ofgem for any required deviations to protect foreground IPR).

Table 3

i) One or more wind farm developers holding a Crown Estates Round 3 Zone Development Agreement developing a multi-terminal HVDC scheme; or

ii) One or more GB transmission licensee, or group of licensees, developing a multi-terminal HVDC scheme.

In either case (i) or (ii), the party must have made a full, and evidenced, financial commitment to developing its HVDC transmission project as a multi terminal scheme.

#### **Part 2**

The Funding Licensee must submit an application to the Authority indicating that it believes that the provision of replica control panels from an HVDC transmission scheme (which is either multi-terminal, or which has the potential to become multi-terminal) can be expected and, as such, it now considers that it is appropriate to move to full procurement, construction and operation of the MTTE facility.

In making this application the Funding Licensee must:

- Set out the HVDC project, or projects, that it considers will be built as multi terminal HVDC schemes.
- Explain any agreements that it has in place with the developer(s) of that scheme(s).
- Provide the evidence that has informed its view that the transmission project(s) will eventually be built as a multi terminal HVDC scheme(s) and highlight any risk that the scheme(s) may not proceed on a multi terminal HVDC basis.

### **Update on Progress on Additional Provision 10**

The project team is working with the Caithness-Moray HVDC project (which is being designed as a multi-terminal project) from which it expects to procure replica control panels for use in the MTTE. Caithness-Moray is currently being assessed by Ofgem in accordance with the Strategic Wider Works (SWW) process under the RIIO-T1 framework. Regular dialogue is maintained between the MTTE and Caithness-Moray teams. The progress of this assessment will inform our development of the submission required under Additional Provision 10.

### **Enhanced Project Plan**

Firstly, the project developed the high-level project plan, which provides an overview of the project timescales (refer to Appendix II).

The project then developed the project’s work breakdown structure, from which we identified the project’s workstreams:

- Project Mobilisation;
- Real Time Simulator Specification;
- Requirements & High-Level Design;
- Building (incl facilities & IT Infrastructure) Requirements;
- Collaboration Agreements with Suppliers, TOs and HVDC Project(s);
- Purchase Replica Control Panels; and
- Project Management & Governance.

The 2<sup>nd</sup> diagram in Appendix II shows how the milestones, deliverable and SDRCs align with the workstreams and project stages.

As a deliverable at each stage gate, the next stage’s detailed plan is developed and signed-off by the Steering Group.

The current detailed stage plan can be found in Appendix I – this is reviewed every month at the project’s steering group meetings.

### **Progress on Major Cost Items**

Major Cost Item	Ensuring Value for Money
<b>Internal Resource Costs</b>	We have kept the project team small
<b>External Resource Costs</b>	We completed a tender process for external support, as a result of this process we were able to achieve a significant reduction in costs.
<b>Build Costs and Running Costs</b>	We commissioned SSE’s property services team to undertake a review of building options, and they are current undertaking a feasibility study.
<b>RTS System</b>	We have continued negotiations with the RTS system suppliers, and plan to go through a competitive tender process during the next reporting period.
<b>Replica Panels</b>	We are currently in the process of procuring replica control panels. The initial quote for replica control panels is higher than the budget, and the project is currently in negotiations with the supplier.
<b>IT Infrastructure &amp; Support</b>	These are planned to be delivered by SSEPD’s IT team, to leverage their buying power to get value for money.
<b>Academic Support</b>	As agreed with Ofgem, we are not planning any spend on academic support in the 1 <sup>st</sup> year of the project.



## 14 Accuracy assurance statement

*The Funding Licensee should outline the steps it has taken to ensure that information contained in the report is accurate. In addition to these steps, we require a Senior Manager responsible for NIC Projects of the Funding Licensee to sign off the PPR. This sign off must state that he/she confirms that processes in place and steps taken to prepare the PPR are sufficiently robust and that the information provided is accurate and complete.*

### **PPR Preparation Steps**

To ensure that the information contained in this report is accurate and completed, the following steps have been taken, the report has been:

- Prepared by the Project Manager;
- Reviewed by the Project Team;
- Reviewed by the Steering Group; and
- Approved by the Project Director and Regulation.

### **Sign-off**

As the senior manager responsible for the MTTE project, I confirm that the processes in place and steps taken to prepare this PPR are sufficiently robust and that the information provided is accurate and complete.



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**Stewart A Reid**

Future Networks Manager  
Scottish & Southern Energy Power Distribution

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19<sup>th</sup> June 2014

**Date**

## Appendix I – Detailed Phase Plan

The following is an extract from the project's stage plan, against which progress is monitored in the steering group meetings.

### MTTE

#### Development Phase - Milestones & Deliverables

	Owner	Start	Complete	% Complete	RAG Status
<b>Project Mobilisation</b>					
<b>Recruit Project Resources</b>	Frank	15-Dec-13	05-May-14	100%	Completed
Place Advert (internally first)	Frank	15-Dec-13	24-Jan-14	100%	Completed
Interviews	Frank	17-Feb-14	28-Feb-14	100%	Completed
Resources in Post	Frank	01-Mar-14	05-May-14	100%	Completed
<b>Procure External Support</b>	Simon	15-Jan-14	31-Mar-14	100%	Completed
Internal Sign-off of RFQ	Simon	15-Jan-14	21-Jan-14	100%	Completed
Issue RFQ	Carl	24-Jan-14	21-Jan-14	100%	Completed
External Support in Place	Simon	01-Mar-14	31-Mar-14	100%	Completed
<b>Establish Steering Group</b>	Simon	10-Jan-14	07-Feb-14	100%	Completed
Book monthly meetings	Simon	13-Jan-14	15-Jan-14	100%	Completed
Prepare and submit ToR, Stage Plan and Status Reports	Simon	10-Jan-14	31-Jan-14	100%	Completed
Complete 1st Steering Group Meeting	Simon	15-Jan-14	07-Feb-14	100%	Completed
<b>Kick-off Meeting with CM Team</b>	Frank	15-Jan-14	29-Jan-14	100%	Completed
Agree with Peter Dale	Frank	15-Jan-14	24-Jan-14	100%	Completed
Complete kick-off meeting	Frank	27-Jan-14	29-Jan-14	100%	Completed
<b>Detailed Stage Planning</b>	Simon	14-Jan-14	07-Feb-14	100%	Completed
Sign-off Stage Breakdown Structure	Simon	14-Jan-14	07-Feb-14	100%	Completed
Sign off Development Stage Plan (this document)	Simon	14-Jan-14	07-Feb-14	100%	Completed
<b>Safety Review Workshop</b>	Simon	15-Jan-14	21-Feb-14	100%	Completed
Arrange Safety Review Workshop	Simon	15-Jan-14	04-Feb-14	100%	Completed
Complete Safety Review Workshop	Simon	27-Jan-14	17-Feb-14	100%	Completed
Document outputs/actions	Simon	07-Feb-14	21-Feb-14	100%	Completed
<b>Sign Contracts with NGET, SPT &amp; NETSO</b>	Frank	15-Jan-14	31-Mar-14	67%	Red
Draft Partner Contract	Debbie	15-Jan-14	24-Jan-14	100%	Completed
Share/Discuss with Partners	Frank	27-Jan-14	07-Feb-14	100%	Completed
Partners Sign and Return Contracts	Frank	08-Feb-14	31-Mar-14	0%	Red
<b>Project Management &amp; Governance</b>					
<b>Mobilise Project Team</b>	Simon	15-Dec-13	12-May-14	100%	Completed
Conduct individual meeting with project team members	Simon	15-Dec-13	24-Jan-14	100%	Completed
Share Plans with Project team	Simon	20-Jan-14	25-Jan-14	100%	Completed
Hold Project Team workshop when new recruits are in post	Simon	01-Mar-14	12-May-14	100%	Completed
<b>Gate 1</b>	Simon	15-Jan-14	25-Feb-14	100%	Completed
Prep for Gate 1	Simon	15-Jan-14	17-Feb-14	100%	Completed
Submit Material for Gate 1	Simon	18-Feb-14	20-Feb-14	100%	Completed
Hold Gate 1 (with Steering Group)	Simon	25-Feb-14	25-Feb-14	100%	Completed

<b>Weekly Project Team Meetings</b>	Simon	15-Jan-14	31-Dec-14	73%	Green
Book Weekly Meetings	Simon	15-Jan-14	17-Feb-14	100%	Completed
Agree Standard Agenda	Simon	20-Jan-14	25-Jan-14	100%	Completed
Hold Weekly Meetings	Simon	20-Jan-14	31-Dec-14	20%	Green
<b>Monthly Project Partners Meeting</b>	Simon	15-Jan-14	31-Dec-14	50%	Green
Book Monthly meetings (every 3 should be Face-2-Face), and draft Agenda	Simon	15-Jan-14	22-Jan-14	10%	Completed
Hold 1st Meeting	Simon	01-Feb-14	18-Feb-14	100%	Completed
Hold Monthly Meetings	Simon	01-Mar-14	31-Dec-14	40%	Green
<b>Monthly Steering Group</b>	Simon	20-Jan-14	31-Dec-14	25%	Green
Submit material in advance	Simon	20-Jan-14	31-Dec-14	10%	Green
Hold Steering Group Meetings	Simon	20-Jan-14	31-Dec-14	40%	Green
<b>CM Team Engagement</b>	Simon	15-Jan-14	31-Dec-14	70%	Green
Agree Ongoing engagement with CM team	Simon	15-Jan-14	31-Jan-14	100%	Completed
Undertake ongoing engagement with CM team	Simon	01-Feb-14	31-Dec-14	40%	Green
<b>Status Reports</b>	Simon	12-Jan-14	31-Dec-14	80%	Green
Draft format of status reports	Simon	12-Jan-14	17-Jan-14	100%	Completed
Agree format of status reports	Simon	07-Feb-14	07-Feb-14	100%	Completed
Complete and issue weekly status report to team and steering group	Simon	20-Jan-14	31-Dec-14	40%	Green
<b>Detailed Project Plan</b>	Simon	15-May-14	29-Jun-14	93%	Green
Complete full project plan to meet Ofgem's requirements	Simon	15-May-14	15-Jun-14	100%	Completed
Internal sign-off of full project plan	Simon	15-Jun-14	29-Jun-14	100%	Completed
Issue full project plan to Ofgem with 6 month report	Simon	30-Jun-14	19-Jun-14	80%	Green
<b>6 month report to OFGEM</b>	Simon	01-Apr-14	19-Jun-14	75%	Green
Provide guidance on reporting requirements	Jenny	01-Apr-14	16-May-14	100%	Completed
Draft Report	Simon	15-May-14	06-Jun-14	100%	Completed
Review and sign-off report	Simon	06-Jun-14	19-Jun-14	100%	Completed
Submit report to Ofgem	Simon	18-Jun-14	19-Jun-14	0%	Green
<b>Gate 2</b>	Simon	01-Jun-14	30-Sep-14	0%	Green
Arrange Gate 2 Meeting	Simon	01-Jun-14	30-Jun-14	0%	Green
Prepare & submit Gate 2 Material	Simon	25-Aug-14	23-Sep-14	0%	Green
Hold Gate 2 review meeting	Simon	01-Sep-14	30-Sep-14	0%	Green
<b>Check Costs</b>	Simon	15-Aug-14	15-Sep-14	0%	Green
Check RTS Costs	Simon	15-Aug-14	15-Sep-14	0%	Green
Check Building & Facilities Costs	Simon	15-Aug-14	15-Sep-14	0%	Green
Check Academic costs	Simon	15-Aug-14	15-Sep-14	0%	Green
Check Replica Costs	Frank	15-Aug-14	15-Sep-14	0%	Amber

## Purchase Replica Control Panels

<b>Issue Spec to Supplier</b>	Yash	03-Jan-14	28-Feb-14	100%	Completed
Issue Replica specification to preferred supplier	Stuart MacLeod	03-Jan-14	28-Feb-14	100%	Completed
<b>Receive Quote</b>	Simon	15-Feb-14	31-Mar-14	100%	Completed
Receive quote for the provision of replica panels from preferred supplier	Simon	15-Feb-14	31-Mar-14	100%	Completed
<b>Negotiate Supply contract</b>	Yash	01-Mar-14	30-Jun-14	35%	Green
Negotiate Supply contract with supplier (note this will refer to the MTTE-Supplier collaboration agreement).	Yash	01-Mar-14	30-Jun-14	50%	Red
Ensure this fits with the CM project contractual arrangements	Yash	01-Mar-14	30-Jun-14	20%	Green
<b>Finalise Draft Supply Contract</b>	Frank	01-Jul-14	30-Aug-14	10%	Green
Internal approval to finalise/sign supply contract (conditional on CM project and Ofgem continuing funding)	Frank	01-Jul-14	30-Aug-14	10%	Green

## Collaboration Agreements with Suppliers, TOs and HVDC Project

<b>Collaboration Agreements with Suppliers</b>	Frank	15-Feb-14	30-Aug-14	33%	Green
Draft Collaboration Agreements	Frank	15-Feb-14	30-Apr-14	100%	Completed
Negotiate with Suppliers	Frank	01-May-14	30-Jul-14	0%	Green
Finalise and sign	Frank	01-Jun-14	30-Aug-14	0%	Green
<b>Collaboration Agreements with HVDC Project(s)</b>	Frank	01-Apr-14	30-Aug-14	10%	Green
Finalise agreement with CM project	Frank	01-Apr-14	30-Jul-14	20%	Green
Identify other suitable HVDC project	Frank	01-Apr-14	30-Jul-14	10%	Green
Finalise agreements with other HVDC projects	Frank	01-Jun-14	30-Aug-14	0%	Green
<b>Collaboration Agreements with NGET, SPT &amp; NETSO</b>	Frank	15-Feb-14	30-May-14	67%	Green
Draft Collaboration Agreements	Frank	15-Feb-14	01-Apr-14	100%	Completed
Negotiate with Partners	Frank	01-Apr-14	30-May-14	100%	Completed
Finalise and sign	Frank	01-Jun-14	31-Mar-14	0%	Red
<b>Collaboration with Scottish Enterprise</b>	Frank	15-Jan-14	30-Nov-14	37%	Green
Agree involvement of SE	Frank	15-Jan-14	15-Feb-14	100%	Completed
Draft Collaboration Agreements	Frank	15-Feb-14	31-Jul-14	10%	Amber
Finalise and sign	Frank	01-Jun-14	30-Nov-14	0%	Green
<b>OFTO Engagement</b>	Frank	01-Apr-14	30-Aug-14	0%	Green
Start engagement with Oftos	Yash	01-Apr-14	31-Jul-14	0%	Green
Hold Engagement event	Yash	01-Jun-14	30-Aug-14	0%	Green
Agree level of involvement with MTTE	Yash	01-Jul-14	30-Aug-14	0%	Green

## Requirements & High-Level Design

<b>Draft Requirements &amp; High-Level Design</b>	Simon	01-Feb-14	30-Jun-14	100%	Green
Draft Structure of Requirements document	Simon	01-Feb-14	31-Mar-14	100%	Completed
Draft requirements document	Norman	01-Mar-14	30-Apr-14	100%	Completed
External review and update	Consultant	01-Mar-14	15-May-14	100%	Completed
Internal Review, approval and issue	Simon	23-Mar-14	30-Jun-14	10%	Green
<b>Signed-off Requirements &amp; High-Level Design</b>	Simon	01-Jun-14	30-Jul-14	0%	Green
Engage with Suppliers, TOs, OFTOS, Developers and SE to sign-off specification	Simon	01-Jun-14	30-Jul-14	0%	Green

## RTS Specification and Procurement

<b>Procurement Strategy</b>	Simon	17-Jan-14	30-Apr-14	100%	Completed
Develop RTS procurement Strategy	Carl	17-Jan-14	31-Mar-14	100%	Completed
Steering Group approve procurement strategy	Simon	18-Feb-14	30-Apr-14	100%	Completed
<b>Draft RTS Spec</b>	Simon	01-Feb-14	30-Jul-14	63%	Green
Draft Structure of Requirements document	Colin	01-Feb-14	15-May-14	100%	Completed
Draft requirements document	Colin	01-Mar-14	30-May-14	100%	Completed
External review and update	Colin	01-Mar-14	25-Jun-14	50%	Green
Internal Review, approval and issue	Simon	23-Mar-14	30-Jul-14	0%	Green
<b>Run RTS Procurement Process</b>	Simon	01-Jun-14	30-Oct-14	0%	Green
Issue Tender	Simon	01-Jun-14	30-Jul-14	0%	Green
Visit Suppliers	Simon	01-Jun-14	30-Aug-14	0%	Green
Receive responses	Simon	14-Jul-14	14-Sep-14	0%	Green
Evaluate and select preferred supplier	Simon	14-Aug-14	30-Sep-14	0%	Green
Agree supply terms	Simon	01-Sep-14	30-Oct-14	0%	Green

## Building (incl facilities & IT Infrastructure) Requirements

<b>Initial Building Requirement</b>	Simon	01-Feb-14	30-Jun-14	100%	Green
Capture requirement based on bid submission	Simon	01-Feb-14	15-Feb-14	100%	Completed
Draft Building Requirements	Simon	23-Mar-14	30-May-14	100%	Completed
Final Building Requirements	Simon	01-Jun-14	30-Jun-14	0%	Green
<b>Site/Building</b>	Simon	15-Jan-14	30-Aug-14	100%	Green
Engage with Property	Simon	15-Jan-14	30-Jan-14	100%	Completed
Identify site/building options	Simon	01-Feb-14	30-Mar-14	100%	Completed
Select Site	Simon	15-Mar-14	30-Apr-14	100%	Completed
Outline Planning Permission for site/building	Simon	01-May-14	30-Aug-14	0%	Green
<b>High-level Design</b>	Simon	01-Mar-14	30-Jul-14	33%	Green
Identify resourcing for high-level building design	Simon	01-Mar-14	30-Mar-14	100%	Completed
Complete high-level design	Simon	01-Jun-14	30-Jul-14	0%	Green
Refine building costs	Simon	01-Jul-14	30-Jul-14	0%	Green

## Academic Requirements

<b>Academic Requirements</b>	Simon	01-May-14	15-May-14	100%	Completed
Capture academic requirements within main requirements document	norman	01-May-14	15-May-14	100%	Completed
<b>Draft Academic Programme</b>	Simon	15-May-14	30-Jul-14	0%	Green
Based on requirements develop work programme	Yash	15-May-14	30-Jul-14	0%	Green
<b>Academic Engagement</b>	Simon	01-Jul-14	30-Aug-14	0%	Green
Discuss work programme with academic organisation (+ EPRI & PNDC)	Simon	01-Jul-14	30-Aug-14	0%	Green

## Submission to Ofgem

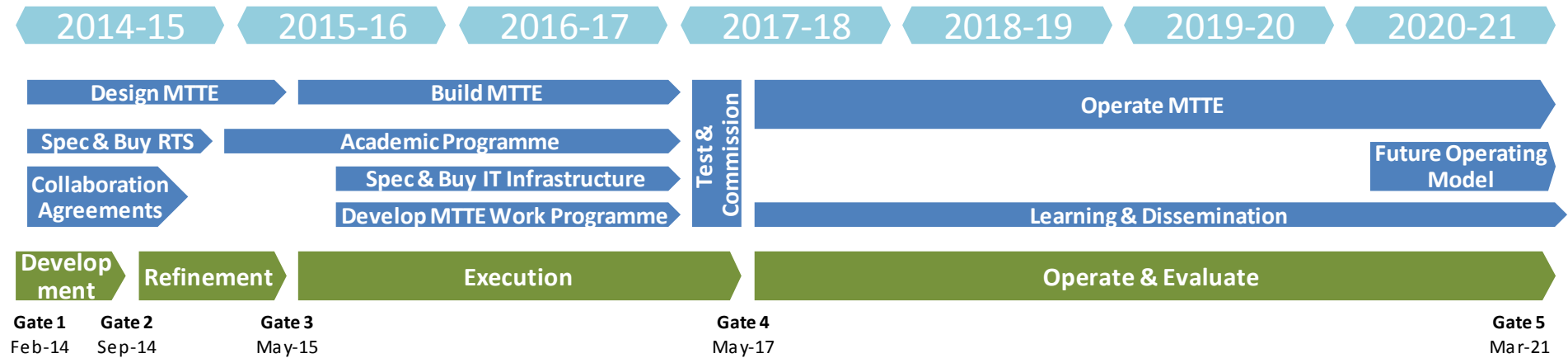
<b>Ofgem Additional Submission</b>	Frank	07-Jan-14	28-Feb-15	17%	Green
Agree Format of Ofgem Submission	Frank	07-Jan-14	07-Feb-14	100%	Completed
Draft Submission	Frank	01-Oct-14	30-Oct-14	0%	Green
Inform Ofgem of Intent to submit	Frank	30-Oct-14	30-Oct-14	0%	Green
Review & Sign-off Submission	Frank	14-Nov-14	29-Nov-14	0%	Green
Submit Submission	Frank	30-Nov-14	30-Nov-14	0%	Green
Post-Submission Ofgem Engagement	Frank	01-Dec-14	28-Feb-15	0%	Green

## Appendix II – Project Plan

The diagram below provides an overview of the MTTE project plan; for each stage a detailed stage plan will be developed (as Appendix I).

The plan is split into the stages with stage gates between each.

### High-Level Overview of MTTE Project Plan



The diagram on the following page shows the key milestones, deliverables and SDRC for each stage, broken-down by the project workstreams.

# Workstream Breakdown of Deliverables, Milestones & SDRCs

All dates are final deadlines, and will be planned to be delivered earlier.

