

Trust Board Committee : Wednesday 14 January 2014

TB2015.13

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| Title | Business Case for the Replacement of a 16 Slice CT Scanner in the John Radcliffe Radiology Department |
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| Status | A paper for decision |
| History | Approved by the Clinical Support Services Divisional Management Executive – 12/12/14 Supported by the Business Planning Group – [16/12/14] and Trust Management Executive - [8/1/15] |

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|--------------------|--|-----------|--------|--------------------|
| Board Lead | Mr Paul Brennan, Director of Clinical Services | | | |
| Key purpose | Strategy | Assurance | Policy | Performance |

Executive Summary

1. The purpose of this case is to secure approval for the replacement of an existing 16 slice CT scanner (CT2) located on the John Radcliffe Hospital site, with a 64 slice CT scanner (that offers 128 slice reconstruction). The core function of this 16 slice CT scanner (along with a 64 slice CT scanner) is to provide 24/7 diagnostic imaging for the Emergency Department (ED) and inpatients. This accounts for 75% of all patients undergoing a CT scan at the JR. Imaging by this scanner forms an integral support function to the following referral sources; Major Trauma Centre, Thames Valley Vascular Network, Stroke, Cardiology and Paediatric Oncology.
2. The operation of the 16 slice CT scanner is becoming increasingly unreliable resulting in increasing levels of unplanned downtime, which is putting patient safety at risk and resulting in patient cancellations, backlogs and potential breaches. There is an urgent need for it to be replaced.

As the scanner mainly supports inpatients, Major Trauma Centre (MTC), Children's Radiology and ED, reliability and imaging quality are crucial to ensure patient safety. It is also essential to meet existing and growing CT activity.

It is proposed that the new scanner will be a modern technology 64 slice mid-range scanner (that offers 128 slice reconstruction) with the following benefits:

 - Improved service continuity and reliability for the CT service across the Radiology Directorate, as a new scanner should have minimal unplanned down-time.
 - Improved image quality and ability to carry out all the current standard requirements for CT diagnostics.
 - Radiation dosages will be reduced, thereby reducing the risk to patients, especially paediatrics.
 - The image reconstruction process will be faster, facilitating more rapid review of images by clinical teams and radiologists.
3. If this proposal is not approved the existing CT scanner will become increasingly unreliable leading to inpatient bed pressures, multiple patient cancellations and associated breaches of the 4 hour ED standard, 6 week and 2 week cancer diagnostic access waiting time standards.
4. The financial implications of this proposal are capital investment of £1,819k to purchase the 64 slice CT scanner, and for enabling work to allow its installation. Funding has been identified within the Capital Programme of c. £800k, so additional funding will need to be identified from within the Capital Programme.

Non recurrent investment of £276k (a combination of £112k capital and £164k revenue) will be required to address displaced work during the period of installation (estimated February 2015 - May 2015).

Total revenue costs will include additional costs for providing temporary cover whilst the main refurbishment occurs. The total investment will be £138k in 2014/15, increasing to £409k in 2017/18. The majority of the increase in revenue costs, relates to capital charges, depreciation and overheads.

5. Recommendation

The Trust Board is asked to approve :

- Replacement of the CT scanner in room 1680 Level 1 Radiology at the JR, with a modern technology CT 64 slice scanner
- Capital expenditure of £1,931k for equipment replacement and refurbishment. This includes the costs of providing temporary cover arrangements.
- Annual revenue investment in 2014/15 of £138k increasing to £409k in 2017/18.

Business Case for the Replacement of a 16 Slice CT Scanner in the John Radcliffe Radiology Department

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| Trust Management Executive Reference | TME2015.07 |
| Appendices | Appendix A – Financial Analysis – Options 3a, 3b and 3c |
| Background papers | N/A |
| Action/decision required from TME | Recommend to the Trust Board, approval to : <ul style="list-style-type: none"> • Replacement of the 16 slice CT scanner in room 1680, Level 1 Radiology at the JR, with a 64 slice CT scanner • Capital expenditure of £1,931k • Annual increase in revenue expenditure of £409k (including capital charges), by 2017/18 |
| Strategic Objectives that the case will help deliver | SO1 - To be a patient-centred organisation, providing high quality, compassionate care with integrity and respect for patients and staff – “delivering compassionate excellence” SO2 -To be a well-governed organisation with high standards of assurance, responsive to members and stakeholders in transforming services to meet future needs - “a well-governed and adaptable organisation” |
| Proposed date that revenue spend will begin: | February 2015 |
| Proposed date that capital spend will begin: | February 2015 |
| Conclusion of Equality Analysis | No Impact |
| Review Date | January 2016 |
| Acronyms and abbreviations used | CSSD – Clinical Support Services Division CT – Computerised Tomography ED – Emergency Department JR – John Radcliffe Hospital MTC – Major Trauma Centre TVVN – Thames Valley Vascular Network WW – West Wing |
| Author | Ms Debbie Tolley, JR Radiology Clinical Unit Operations Manager |
| Lead Finance Manager | Ms Doreen Carter, Senior Finance Business Partner |
| Lead Estates Manager | Mr Geoff Wakeling, Project Manager |

Business Case for the Replacement of a 16 Slice CT Scanner in the John Radcliffe Radiology Department

1. Strategic Context and Case for Change

1.1. Overview and Current Utilisation

- 1.1.1. Computerised tomography (CT) at the John Radcliffe Hospital (JRH), Level 1, is currently carried out by a 16 slice scanner (CT2) and a 64 slice scanner (CT1). In 2013-14 these scanners performed 21,500 CT scans. 16,000 of these (75%) were performed on inpatients and for the Emergency Department (ED) and 5,500 were performed on outpatients. This equates to 38% of the Trust's total CT activity.
- 1.1.2. Both scanners are required to support this volume of activity. This is because one CT scanner operating 12 hours per day/7 days per week (20 minute slots) can perform around 12,378 scans per annum. The activity at the JR in 2014/15 (current forecast outturn is anticipated to be 23,000 scans) will be almost double this. Secondly, the high percentage of acute and emergency patients at the JR require a minimum of 2 scanners to ensure that urgent access can be maintained and inpatient beds are not blocked.
- 1.1.3. This activity will continue to grow. CT activity is increasing nationally at 10.3% per annum (KH12 stats). In Oxfordshire it increased by 10% in 2013-14. Given national increases it is estimated that this activity will have increased to 36,500 scans per annum by 2019/20.
- 1.1.4. This scanner must currently be available 24/7 to ensure that patients receive immediate access to CT to enable imaging, prompt diagnosis and treatment. It supports ED, urgent inpatients and the following JR services:
 - Thames Valley Vascular Network (TVVN) – reliance on immediate access to CT scanning to ensure appropriate radiological intervention of patients with vascular injury, e.g. ruptured aortic aneurysm.
 - The JR hospital became a Major Trauma Centre (MTC) in October 2012 – reliance on early imaging of critically ill patients is essential (time to CT is a reportable measure within TARN).
 - Acute Ischaemic Stroke & Thrombolysis service - requires immediate CT scanning and perfusion studies are critical to the pathway.
 - Oncology services - CT is often the first diagnostic tool used to confirm lung, colon, urological and liver cancers in the cancer pathway. Patients are often directly referred to radiology via the triage system. The national cancer target time from GP referral to first appointment is two weeks. CT imaging may also be required as part of the national 31 day cancer pathway (diagnosis to treatment) to advise on the extent or stage of the disease or to help in guiding procedures.
- 1.1.5. All other OUH CT scanners (except one CT at the HGH which will be the subject of a separate business case) have been upgraded to a minimum of 64 slice technology.

- 1.1.6. This case seeks approval for capital and revenue funding to replace the existing 16 slice CT scanner in room 1680 Level 1, with a modern technology 64 slice CT scanner (with 128 slice reconstruction capability) and associated enabling works.

2. Issues with the Current CT scanner

2.1. Equipment Age and Reliability

- 2.1.1. The JR 16 slice CT scanner (CT2) was installed 13 years ago. It is presenting an increasing risk to service continuity, due to its age, availability of parts and system reliability. There have been 16 days of unplanned downtime and 2 replaced x-ray tubes over the last 12 months. This approximates to 500 patient appointments cancelled or re-scheduled, resulting in a backlog of ED, inpatients and outpatients.
- 2.1.2. To put the age of the scanner into context, the Royal College of Radiologists advise that the life span of a CT scanner is 7 years. This scanner has been used for almost double that life span.
- 2.1.3. Recently both JR scanners broke down. This resulted in major trauma and critically ill patients being transferred from ED to the remaining JR CT scanner in Neuroradiology in the West Wing (WW). This requirement results in a potential risk to patients and the Trust. Firstly it has a significant impact on ED, as critical staff and portable life support equipment are removed from ED to WW for periods of approximately one hour. Secondly as WW CT is further away, the time from admission to CT diagnosis increases, in turn delaying clinical management and potentially reducing survival rates in critically ill patients. There was also a delay in discharging patients as inpatients waited for scanning.
- 2.1.4. CT1 (existing 64 slice scanner at the JR) is being heavily utilised (24/7) and is 6 years old, the WW CT scanner is 7 years old. The age and reliability of the other JR & WW scanner is compounding the risk to the trust of a failure to support ED.
- 2.1.5. Irrecoverable breakdown of the equipment would have a critical impact on the MTC/TVNN/ED/stroke throughput of inpatients from ED, and acute wards, paediatric, adult high dependency and cardiac wards. There is insufficient capacity to deliver the service sustainably where only one CT scanner at the JR is available. A backlog of approx. 30 patients per day would develop, delaying diagnosis and subsequent clinical management of patient's conditions and could result in increased morbidity. ED and SEU delays will cause 4 hour emergency access breaches. The requirement for in-patient beds would increase as in-patient discharges are delayed.

2.2. Technology Limitations

- 2.2.1. CT technology has improved rapidly since the 16 slice CT scanner was installed. The current generation of CT scanners have larger detectors and greater slice capability, which gives much better image resolution.
- 2.2.2. The 16 slice CT is increasingly no longer fit for purpose, particularly for imaging patients in the following categories; major trauma, vascular, stroke and paediatric imaging. This is because:

- The image quality is poor
- Scan time is slow
- The time taken to reconstruct images for reporting is slow.
- In addition reformatting in other planes other than axial is performed manually by the radiographer. Automatic reformatting in modern CT speeds the time from the scanner to the reading room to the clinician.

2.2.3. The 16 slice scanner cannot perform procedures such as visualisation of coronary arteries, blood perfusion studies, CT fluoroscopy to aid localisation of the lesion during biopsy and drainage procedures and lower gastro-intestinal tract imaging - these procedures can only currently be performed on the 64 slice scanner (CT1) at the JR.

3. Justification for 64 Slice Technology (128 slice Reconstruction)

- 3.1. A clinical specification has been completed for the new CT scanner, based on the patient types and cardiac/trauma work that the scanner will support. Many of the procedures outlined in paragraph 2.2.3 - demand the image resolution of 64 slice technology as a minimum. Colon studies for 2WW, perfusion studies and cardiac CT imaging will benefit significantly from the ability to reconstruct images to 128, by providing more detailed images (e.g fine blood vessels in the heart or vital organs).
- 3.2. CT has been the highest source of medical radiation exposure. Therefore, many advances in CT technology have concentrated on reducing radiation doses to patients, which is especially critical for paediatric patients and those requiring repeat scans. In modern CT technology dose reduction has been reduced greatly (up to 50%) by the introduction of iterative reconstruction software. This allows scans to take place at lower radiation doses, with reduced contrast levels, yet provides high quality images with reduced noise. Statistical and model based iterative reconstruction will be an important feature of the replacement scanner.

4. Operational Risks Associated with Current Service Provision

- 4.1. **Unreliability** – The age of the scanner, together with the increasing lack of availability of spare parts leading to unplanned downtime and patient cancellations.
- 4.2. **Potential to compromise patient safety and delay the discharge process** – Delays in performing scans to support diagnosis will lead to an increase in the number of beds occupied by patients who do not need to be in the hospital. This is a particular problem during the winter months when there is an acute increase in the demand on the hospital.
- 4.3. **Reputation** – The failure of the Trust to deliver a timely service will undermine its reputation with Commissioners, GPs, patients and their families.
- 4.4. **Patient experience** – Unplanned delays in patients undergoing scans with the potential to delay diagnosis and treatment will not lead to an optimal patient experience.

5. Objectives and Benefit Criteria

- 5.1. The following objectives and benefit criteria have been identified for this case :

- 5.1.1. Optimise service continuity and reliability for the CT services across the Radiology Directorate.
- 5.1.2. Offer improved image quality to provide greater diagnostic accuracy.
- 5.1.3. Reduce radiation dosage to the patient by a minimum of 40% as modern technology is able to produce optimum image quality with less radiation.
- 5.1.4. Minimise the risks of unplanned equipment downtime, by increasing maintenance service contracts to include 24/7 cover.
- 5.1.5. Improve flexibility of service delivery by enabling the full range of CT investigations to take place on both of the Level 1 scanners This is currently not the case, trauma, paediatric and larger patients have their CT scans performed on the 64 slice CT scanner because of the limitations of the 16 slice machine.
- 5.1.6. Support the improved delivery of national access standards and internal access standards, avoiding financial penalties.
- 5.1.7. Maintain compliance with the designation criterion for the MTC and TVVN, which require immediate access for patients requiring a CT scan.

6. Options

6.1. The following options have been considered:

- 6.1.1. **Option 1 – Do nothing** - This is not an option given the clinical risks associated with irretrievable breakdown.
- 6.1.2. **Option 2 – Replace with a 16 slice CT scanner** – This is not considered further given the activity levels and the technological requirements to meet the clinical needs for imaging the patients referred to JR radiology e.g. cardiac patients, as outlined in paragraphs 3.1-3.2 above (which cannot be provided by a 16 slice CT scanner).
- 6.1.3. **Option 3 – Install a replacement modern 64 slice CT scanner in the existing room (1680).** A 64 slice CT scanner is required to replace the 16 slice, given the clinical specification completed, based on the patient types and cardiac/trauma work that the scanner will support. Many of the procedures, as outlined in paragraph 2.2.3, demand the image resolution of 64 slice technology as a minimum. Virtual colonography, perfusion and cardiac imaging will benefit significantly from the ability to reconstruct images to 128, by providing more detailed images (e.g. fine blood vessels in the heart or vital organs). This will involve removing CT2, pre-enabling works to upgrade power, cooling, network supply, refurbishment and installation of the new CT scanner and training of staff. This will require provision of supplementary capacity for the 600 patients per month scanned on average on CT2 as outlined in the sub-options (3a, 3b and 3c) below.
 - Option 3a – Interim capacity to be provided by internal relocation of CT2 and using an external mobile scanner
 - Options 3b - Interim capacity to be provided by an internal temporary scanner

- Option 3c – Interim capacity to be provided by a mobile scanner and/or cross site working

6.2. Options for provision of interim additional capacity and associated risks

- 6.2.1. The projected time scale for replacement of CT2 is 12-13 weeks. CT2 is essential to support ED and inpatient scanning at the JR. Recent events involving breakdown of CT1 and CTWW have highlighted the importance of retaining adequate CT capacity. The risk associated with losing the inpatient capacity of CT2 whilst it is replaced is therefore high.
- 6.2.2. Option 3a and 3b, provide additional inpatient CT capacity at the JR by moving CT2 (Option 3a), or installing a temporary 16 slice GE scanner within the JR (Option 3b). The approach preferred by the Radiology Service is to retain additional inpatient CT scanning during the full replacement time period (Option 3b), by installing a temporary CT scanner in another room in JR radiology.
- 6.2.3. An alternative option (3c) for dealing with interim capacity would displace work across other sites and onto a CT mobile van. The option to use a CT mobile van does not mitigate the risks for inpatients and ED cover so its usefulness is limited, given that JR CT has a 75% case mix of inpatients and ED patients, only 25% OPDs. The 25% OPDs are also complex cases, cardiac and CT colons that are not suitable to be performed on a 16 slice scanner in a car park. Therefore this is not a preferred option by radiology.
- 6.2.4. For all mitigation options there will be a reliance on CT1 and WW CT scanners for 14 weeks. The reliance is greatest for Option 3c. If CT1 breaks down, the ward portering and nursing cover in ED would need to temporarily increase so they could escort patients to WW if required. It is difficult to put a cost allowance against this in the business case.

6.3. Option 3a

- 6.3.1. Move CT2 (from room 1680) into CT bed bay or Room 1317 to ensure continuity of inpatient scanning. There will be a time delay of 1-2 weeks whilst this occurs. During this downtime, there would be circa 150 patient appointments displaced per week. To fill this shortfall a mobile scanner would be required. The mobile scanner would be placed at the JR for up to 4 weeks (the timescale would depend on the completion of the CT relocation process). It is anticipated that the scanner will operate 5 days per week at £2,500 per day (£50,000). Workload would be managed within Radiology to scan up to 125 ambulant out-patients per week on the mobile scanner.
- 6.3.2. The mobile scanner will be supported by hired staffed (which resolves training issues and saves VAT charges). Once CT 2 is relocated and working the mobile scanner can be removed.
- 6.3.3. Room 1317/CT bed bay is smaller than the existing CT room, therefore throughput will be lower, but with extending staffing to 12 hour days - it will allow approximately 20 in-patients to be imaged per day (as well as providing emergency back up to CT1 and CTWW).

- 6.3.4. This room will be staffed using existing staff and two additional agency radiographers.
- 6.3.5. The remaining displaced patients (c. 35 per week) can be scanned by staffing additional hours at the Churchill, HGH or WW until the new CT scanner is able to scan patients (estimate 11 weeks cover and 4 weeks training of agency contingency staff required). This will require 1 agency radiographer.
- 6.3.6. Two patient trolleys are required to transport inpatients between the wards and the temporary CT scan room as there is not sufficient room to accommodate patient beds. This will cost £9k.
- 6.3.7. A pedestal pressure injector is required during the period of temporary relocation to ensure the complete range of acute and emergency in-patient work can be provided. This will cost £5k.

| Costs | Information | Technical Detail | Where costs originated from | Costs (-vat) | Costs + VAT |
|--|-------------|------------------|--|--------------|------------------|
| ADDITIONAL CAPITAL COSTS ASSOCIATED WITH MITIGATING OPTIONS | | | | | |
| Option 3a - move existing CT to Room 1317 | | | | | |
| CT Trailer installation and enabling | | Estates | Estates Quote £12k | | £ 12,000 |
| Room 1317 Enabling Costs | | Estates | Estates Estimate (now increased due to additional works) | | £ 112,000 |
| Movement of CT2 from Rm 1680 to rm 1317 | | GE | Actual Quote | £ 12,485.55 | £ 14,983 |
| Total | | | | Total | £ 138,983 |

| Non Recurring Revenue Costs | Information | Technical Detail | Where costs originated from | Costs (-vat) | Costs + VAT |
|--|---|------------------|--|--------------|------------------|
| Option 3a - move existing CT to Room 1317 | | | | | |
| Staffed External scanner | (£2500 per day, 4 weeks, 5 days per week) | | Inhealth | vat free | £ 50,000 |
| Purchase of 2 patient trolleys | | Stryker MX-Pro | Estimate as will need more than just basic trolley | £7,400 | £ 8,880 |
| Hire of pedestal pressure injector | | GE | Estimate based on £30k purchase price | £ 4,166.67 | £ 5,000 |
| Agency Staff (3*15 weeks) | | NHSP | Current rates | | £ 84,375 |
| Total | | | | Total | £ 148,255 |

6.4. Option 3b – Radiology Preferred Option

- 6.4.1. Site a temporary GE 16 slice CT scanner into CT bed bay or room 1317 and get it up and running, before CT2 is removed. The room is smaller so throughput will be lower, but with extending staffing to 12 hour days, c. 20 inpatients to be imaged per day can be imaged (as well as providing emergency back up to CT1 and CTWW).
- 6.4.2. This room will be staffed using existing staff and two additional agency radiographers.
- 6.4.3. The remaining displaced patients (approx. 35 per week) can be scanned by staffing additional hours at the Churchill, HGH or WW until the new CT scanner is able to scan patients (estimate 13 weeks cover of and 4 weeks training of agency contingency staff required). One agency radiographer will be required.
- 6.4.4. Two patient trolleys are required to transport inpatients between the wards and the temporary CT scan room as there is not sufficient room to accommodate patient beds. This will cost £9k.

6.4.5. A pedestal pressure injector is required during the period of temporary relocation to ensure the complete range of acute and emergency in-patient work can be provided. This will cost £5k.

| Costs | Information | Technical Detail | Where costs originated from | Costs (-vat) | Costs + VAT |
|--|---------------------|------------------|---|--------------|------------------|
| ADDITIONAL CAPITAL COSTS ASSOCIATED WITH MITIGATING OPTIONS | | | | | |
| Option 3b - site temporary GE CT in Room 1317 | | | | | |
| Room 1317 Enabling Costs | | Estates | Estates Estimate (now increased due to additional works) | | £ 112,000 |
| Total | | | | | £ 112,000 |
| Non Recurring Revenue Costs | | | | | |
| Option 3b - site temporary GE CT in Room 1317 | | | | | |
| Temporary Internal scanner - | GE 16 slice scanner | Devon Medical | £3,000 per week (13 weeks, + 1 week training). Estimate from GE | £ 42,000.00 | £ 50,400 |
| Install and remove scanner | | | £3,000 installation and removal. Estimate from GE | £ 3,000.00 | £ 3,600 |
| Purchase of 2 patient trolleys | | Stryker MX-Pro | Estimate as will need more than just basic trolley | £7,400 | £ 8,880 |
| Hire of pedestal pressure injector | | GE | Estimate based on £30k purchase price | £ 4,166.67 | £ 5,000 |
| Agency Cost (17 weeks) | | NHSP | Current rates | | £ 95,625 |
| Total | | | | | £ 163,505 |

6.5. Option 3c

- 6.5.1. During the CT2 downtime, there would be circa 150 in-patient appointments displaced per week. Radiology will manage its workload and patient groups across sites to ensure that CT1 and CTWW are fully available for in-patients/ED.
- 6.5.2. Out-patients from CT1/CTWW requiring a 64 slice scanner (cardiac CT) or additional patient requirements (such as pneumocolons) will be moved to additional lists at the Churchill Hospital/HGH Hospital. The agency staffing requirement for these additional lists will be the equivalent of 48 hours per week, for 13 weeks plus 4 weeks prior training (£40,800).
- 6.5.3. Ambulant outpatients that can be scanned on a 16-slice CT, will be scanned on a trailer mobile CT scanner that would be placed at the JR outside OCMR or another site for up to 13 weeks. It is anticipated that the scanner will operate for a maximum of 5 days per week (dependent on workload) at £2,500 per day (£162,500).
- 6.5.4. This option will provide the most risk to inpatient scanning continuity, as it provides no additional inpatient capacity.

| Costs | Information | Technical Detail | Where costs originated from | Costs (-vat) | Costs + VAT |
|---|--|------------------|-----------------------------|--------------|------------------|
| Non Recurring Revenue Costs | | | | | |
| Option 3c - temporary mobile van | | | | | |
| Staffed External scanner | (£2500 per day, 13 weeks, 5 days per week) | | Inhealth | vat free | £ 162,500 |
| Agency Staff (17 weeks) | | NHSP | Current rates | | £ 40,800 |
| Total | | | | | £ 203,300 |

6.6. **Option 4 – Install a replacement 64 slice scanner in a new ED suite** - With the current levels of annual growth, it is recognised that there will need to be a step change in CT capacity in the near future. This would need to be met by the

purchase of a 3rd CT scanner. Given the current development of plans to modernise ED, the opportunity exists within this scheme to consider the options for expanding and reconfiguring the CT service. As these plans are in the early stages of development, it is not possible to consider options to relocate the replacement scanner. As such this option is not considered further at this stage. It is intended that if required it could be moved at a later stage to meet the overarching trust strategy.

7. Option Appraisal using Benefit Criteria

| | OPTION 1 Do Nothing | OPTION 2 Replace the 16 slice CT (like for like) | OPTION 3 Replace the 16 slice CT with a 64 slice CT scanner in Room 1680 | | |
|--|------------------------------------|---|---|---|--|
| | | | Option 3a Interim capacity to be provided by internal relocation of CT2 and using an external mobile scanner | Option 3b Interim capacity to be provided by an internal temporary scanner | Option 3c Interim capacity to be provided by a mobile scanner and/or cross site working |
| Optimise service continuity and reliability | X | √ | √ Inpatient lists from CT2 would be moved to CT1 and outpatients would be temporarily moved to a mobile scanner (2-4 weeks). | √ Minimal disruption to in-patient scanning at the JR whilst implementation is in train | Higher risk Inpatient lists from CT2 would be moved to CT1 and outpatients would be moved to a mobile scanner or other sites. There is no fall back for a break down in CT1. |
| Improve the diagnostic quality of the CT service | X | Not sufficiently | √ | √ | √ |
| Reduce radiation dose to patient by minimum of 40% | X | X | √ | √ | √ |
| Minimise risks by increasing service contracts to include 24/7 | X | √ | √ | √ | √ |
| Improve flexibility of the service by enabling the full range of CT investigations to take place on both scanners on Level 1 | X | X | √ | √ | √ |
| Support the improved delivery of targets, avoiding penalties | X | X | √ | √ | √ |

| | OPTION 1 Do Nothing | OPTION 2 Replace the 16 slice CT (like for like) | OPTION 3 Replace the 16 slice CT with a 64 slice CT scanner in Room 1680 | | |
|--|------------------------------------|---|---|---|---|
| Maintain compliance with the designation criteria for MTC and TVVN | X | X | √ During the replacement time another in-patient scanner will be available. | √ For most of the replacement time another in-patient scanner will be available. | √ For all of the replacement time only CT1 and CTWW will be able to scan in-patients. This is higher risk. |

8. Recommended option and how it meets the case for change

- 8.1. Option 3 meets the requirements of the current case for change, i.e. to address and mitigate the existing clinical and operational risks associated with the current equipment and replace it with a product that is fit for purpose. Interim capacity measures have been outlined in Options 3a, 3b and 3c (Appendix A provides a financial analysis of these options).
- 8.2. Option 3a -- This option would cost £1,958k capital (including enabling works for temporary replacement) and £128k increased revenue spend in 2014/15 and £277k in 2015/16.
- 8.3. Option 3b – This option would cost £1,931k capital (including enabling works) and £138k increased revenue spend in 2014/15 and £279k in 2015/16.
- 8.4. Option 3c – This option would cost £1,819k capital (including enabling works) and £125k increased revenue spend in 2014/15 and £298k in 2015/16.
- 8.5. The radiology preferred option is Option 3b as there is the lowest risk to continued inpatient and ED care. The figures for the enabling/pre-installation works and the temporary scanner facility, whilst remaining subject to some further investigations, derogations, single tender waiver, and exclusions, are based on reasonable estimates at this time.

9. Financial Analysis of Preferred Option

9.1. Revenue Costs

- 9.1.1. Estimated increase in maintenance cost of £28k p.a. (from £103k to £131k per annum). This cost will not be incurred until 2016 as there is a 1 year manufacturer's warranty following installation. Additional operational estates revenue costs have been estimated at £20k in a full year associated with maintaining and providing facilities to the refurbished and upgraded CT room.
- 9.1.2. The main savings will only come from not incurring maintenance costs for the 1st year after installation. There may be potential to sell this existing CT scanner (£45k) but this is not confirmed nor has been included within the financial analysis.

9.2. Capital Costs

- 9.2.1. Capital investment totalling £1,931k will be required. The costs of a 64 slice CT scanner (that offers 128 slice reconstruction) totals £1,309k (CT scanner £1007k, 30% additional funding of £302k to provide

system options, such as workstations, patient integral monitoring, pads, mattress etc, PACS storage costs and QA equipment £50k, enabling works £460k).

9.2.2. This also includes the additional cost of ensuring temporary cover will also be required at a cost of £112k.

9.2.3. Provision of c. £800k has been made within the Capital Programme for this investment. Additional funding will need to be identified to fully fund this proposal.

9.3. Cost of Capital

9.3.1. Based upon £1,931k under option 3b, capital expenditure; depreciation and capital charges will have a maximum charge of £257k (full year) falling to £237k by 2018/19.

9.4. Income

9.4.1. No increase in income is expected.

9.5. Contribution

9.5.1. Reduced contribution will be the net additional costs of £409k by 2017/18.

9.6. Impact on Profitability

9.6.1. The replacement is not expected to have an impact on patient numbers. Any anticipated increase in maintenance cost arising from the new equipment, will be included in budget setting and will remain within the directorate expenditure budget.

10. Market Assessment (including commissioner discussions)

10.1. The John Radcliffe hospital is an acute and emergency care hospital. It is designated as a Major Trauma Centre so is required to care for patients with complex traumatic injuries. CT is a fundamental diagnostic tool for acute surgical, medical and trauma patients and often determines the next diagnostic procedure or course of treatment required. The CT service increases year on year by approximately 10%, with peak activity above this level over the winter months.

11. Benefits Realisation

11.1. The table below shows the quantifiable benefits of the proposal and the plan for achieving them.

| Benefit | Performance Measure | Current Value | Target Value | Target Date |
|--|--|---|---|-------------|
| Service Continuity | Reduction in downtime and number of patient cancellations. | CT2 has had 16 days unplanned downtime over the last 12 months. | Reduced downtime and patient cancellations. | 01/05/15 |
| Enable the full range of CT investigations | All CT scans can be performed on any scanner in | 16 slice CT scanners at JR cannot perform | Full flexibility | 01/05/15 |

| Benefit | Performance Measure | Current Value | Target Value | Target Date |
|---|--|--|---|-------------|
| on JR CT scanners. | the JR | all types of CT scans. | | |
| Improved diagnostic image quality | Comparison of image quality with current facilities within Radiology | Current image quality not comparable with 64 Slice equipment | Comparable image quality | 01/05/15 |
| Reduction in radiation dose to patient. | Average radiation dose levels given to patients | Current radiation dose average | 40% reduction in average radiation dose | 01/05/15 |

12. Management of Risks of Implementation of Proposal

12.1. The table below lists the risks that would remain if the proposal is agreed and the plan to manage them:

| Risk | Impact (I) | Likelihood (L) | Total (IxL) | Mitigating Action | Residual Risk | Contingency plan to address risk |
|--|------------|----------------|-------------|--|---------------|--|
| Maintaining service continuity, particularly for in-patients and ED. Approx 600 patients per month would need to be re-allocated appointments. There is insufficient capacity across CT (trust wide) to absorb the total activity and patient type workload. | 5 | 5 | 25 | Option 3b - A temporary internal scanner could be located in an existing Ultrasound room. This would ensure that an additional inpatient scanning facility is retained at all times. | 8 | Additional sessions to scan the remaining displaced out-patients are possible at the Churchill and Horton hospital. |
| Completing project to anticipated timescale | 3 | 3 | 9 | Project team meetings. Review against plan. Corrective action taken to address slippage. | 6 | If project overruns – mobile scanner will be required for longer (costs of project will increase). It is vital that the project stays on track due to risks highlighted above. |
| Completing project within allocated budget | 2 | 2 | 4 | Contingency within budget for addressing unforeseen building issues. Estates project management. | 2 | None identified |

12.2. Governance arrangements around the interim capacity

- 12.2.1. The projected time scale for replacement of CT2 is 12-13 weeks. CT2 is essential to support ED and inpatient scanning at the JR. 90% of its throughput is in-patients. Recent events involving breakdown of CT1 and CTWW have highlighted the importance of retaining adequate CT capacity.
- 12.2.2. An important aspect of governance arrangements is to ensure that in-patients have continuity of access to be scanned during the replacement time frame, which is why Option 3b, followed by Option 3a are the preferred clinical options.
- 12.2.3. Options 3a and 3b ensure that a scanner with the same resolution factor as CT2 is in place for most or all of the replacement period within the hospital building.
- 12.2.4. The temporary scanner will be a GE scanner, same manufacturer as CT2, ensuring there are no staff training issues.
- 12.2.5. The scanner will be on the same floor as CT2 in the radiology suite, to minimise additional distance travelled by patients.
- 12.2.6. Existing staff will be able to operate the scanner, although some additional staff will be required for extended hours.
- 12.2.7. If it is not feasible to have a temporary internal scanner, inpatients will need to be scanned on CT1 or CTWW and outpatient lists would be moved where appropriate to an external mobile scanner or another site. (Option 3c)
- 12.2.8. A risk assessment has been carried out on the types of patients acceptable to be treated on a 16 slice trailer CT scanner. This has determined that it should only be used for ambulant out-patients.
- 12.2.9. Consideration has been given to the type of imaging required for outpatients where higher resolution imaging is required. These patients will be imaged at the Churchill hospital on a 64 slice CT. More complex outpatients will also be scanned at the Churchill, during the working week, allowing comprehensive staffing cover.
- 12.2.10. Cross site rotation and training of staff will provide consistency of care. All staff training will be carried out in advance.

13. Implementation Plan

- 13.1. The Estates Project Manager to co-ordinate meetings and planning process with external contractors and service users. Procurement Lead to lead on turnkey costs for full replacement and place order, The Clinical Director for Radiology will be the project lead for the service, supported by the Clinical Unit Operational Manager.

| Action | Timeline |
|---------------------------------------|-------------------------------|
| Business Case approved by CSS DME | December 2014 |
| Business Case approved by the TME | 8 th January 2015 |
| Business case approved by Trust Board | 14 th January 2015 |
| Pre-installation works start on site | February 2015 |
| Works completed on site | May 2015 |

| Action | Timeline |
|-----------------------------------|----------|
| Commissioning completed | May 2015 |
| Room brought into operational use | May 2015 |

13.2. The impact and intended effect of this project will be reviewed and reported on 6 months following completion of the scheme.

14. Conclusion

14.1. The existing equipment requires replacement. Option 3b of this proposal would deliver equipment that is fit for purpose and as a result will reduce the clinical and operational risks that exist with the current equipment.

15. Recommendations

15.1. The Trust Board is asked to approve Option 3b:

- This will result in replacement of the existing equipment in in room 1680, with a product that is fit for purpose mitigating the risks that exist with the current equipment.
- Capital expenditure of £1,819k for the replacement costs. Further capital expenditure for enabling temporary cover of £112k.
- Annual revenue investment in 2014/15 of £138k increasing to £409k in 2017/18.

Paul Brennan, Director of Clinical Services

Professor Fergus Gleeson, Divisional Director, CSS

Ms Suzie Anthony, Clinical Director, Radiology

Debbie Tolley, JR Radiology Clinical Unit Operations Manager

January 2015