

Lister Hospital; Site wide electrical infrastructure FBC

PURPOSE:

To provide the Trust Board with a Full Business Case submission for the works required to upgrade the electrical services infrastructure at the Lister Hospital

Implications:	The implementation of this project will secure full electrical incoming service and full back up on site generated supplies to safeguard power services to all hospital functions and fully supports the estimated demands of the OCH programme.
Risks:	Risks have been identified for the two individual projects and phases comprising the proposal, and these are regularly being reviewed and managed at Project Team meetings
Financial:	The financial impact of these works has been set out in the Carbon and Energy Strategy 2009 -2015 as approved by the Board with amendments as shown in the FBC. The cost is to be met from the Capital programme.
Human Resources:	The FBC identifies improved benefits for staff and patients from the reliability of supplies
National Policy:	Our NHS, Our Future: NHS Next Stage Review, Towards The Best Together.
Links to Corporate Objectives:	Patient safety and clinical efficiency: <ul style="list-style-type: none"> ➤ To consolidate acute services on to a single site ➤ To improve the quality of all aspects of our service
Legal:	None Identified
Other:	None Identified

Recommendations:

The Trust Board is asked to approve the Full Business Case.

DIRECTOR: Director of Strategic Development
PRESENTED BY: Director of Strategic Development
AUTHOR: Director of Strategic Estates
DATE: 13th October 2009



Business Case Template

The template is intended for use by all Trust Divisions and departments when presenting a case for capital and / or revenue investment

The case will be presented to the Executive Committee for decision to proceed

Division:	Strategic Estates
Divisional Chair name	Richard Harman
Confirmation of support from Divisional Chair:	Stephen Posey. Considered by Finance and Performance Committee 21 st October 2009.

1. Introduction

Briefly set out the case and what benefits it will deliver. The case must be consistent with the Trust's Strategy as set out in the Annual Plan and IBP

On 24th June 2009 the Trust Board approved the Carbon & Energy Strategy (Lister Hospital) for 2009 – 2015. This document identified the need to implement a number of major schemes to ensure the continued availability of distribution supply for electricity to the Lister site over the coming years and included schemes to fully modernise the electrical infrastructure, secure an increased incoming supply capacity, ensure the availability of 100% electricity generation back up and to invest in modernising energy generation through the installation of a Combined Heat and Power plant.

This document presents the full business case for the new incoming electricity mains supply, redevelopment of site wide high voltage electricity engineering services and the provision of electricity generation for standby supply purposes:

- A new electricity mains incoming supply from Coreys Mill Lane to a new High Voltage switch room
- The renewal of the Trust's high voltage ring main switchgear and high voltage / low voltage transformers
- Provision of new electricity generation plant for high voltage generation onto the Trust HV ring main for standby supply

The main benefits from this proposal would be;

- Provision of full generating capacity to serve entire hospital, eliminating "essential" user operation; this will ensure no future disruption to clinical services during power outages/ generator tests.
- Provision of new a HV / LV sub station sited next to and essential for serving the Phase 2 (Women's and Children unit)
- Availability of adequate incoming electricity supply, with confidence in the continuation in supply
- Increase of incoming supply from present available maximum load of 1.39 MVA to 5 MVA



- Confirmation from electricity distribution company that the new supply is dedicated to the Hospital from the main HV sub station some 4Km away.
- These works are essential to facilitate the installation of the CHP as a further phase in the development; when introduced this will be a significant milestone in enabling the Trust to show reduction in carbon emissions and to achieve Government set targets
- These works will provide technical compatibility of all the HV engineering controls systems between the mains supply, the standby generators and the future CHP installation (G59 terminology ;' see page 28))
- Elimination of penalty payments due to present over use above Maximum Demand level
- Agreement from electricity distribution company that the Trust can run its standby generators in parallel with the draw of electricity from the mains thereby allowing seamless use of electricity for the hospital whether from incoming supply or from own generation (G59 terminology; see page 28) with no manual switching of supplies
- Achievement of “resilience” in supply as required by Health Technical Memorandum HTM 06; the Trust has access to full demand load whether by incoming supply or self generation at all times
- Ability to retain, without hindrance or use, the existing incoming supply , adjacent to residences, for possible future use by arrangement with distribution company (this is the present supply and has been subject to sporadic interruption but may be of value for any future development if loadings were to exceed the maximum level now assessed). This may allow the Trust some flexibility in allocating supply to any future cancer satellite centre, the shop area, third party interests and the multi storey car park.
- Replacement of old high voltage ring main, previously sized for the original hospital, the cabling capacity will be renewed at 7.2MVA, in lieu of the old 2MVA
- Replacement of old standby generators, only capable of supplying 1MVA to essential users, with new generators delivering up to 8MVA of supply; this will comply with HTM 06 requirement of (n+1) technology (see page 28); reconfiguration of existing HV / LV sub stations for new service
- Provision of automatic control panels, eliminating delays in restoration of supply following breaks in service

The case is consistent with Trust's strategic development plan :

The proposal will support the Trust in achieving some of its key organisational objectives through;

- Securing confidence in Trust staff by guarantee of continuous supply to service hospital departments
- Elimination of the “essential user only” supply at times of break in supply of the



incoming electricity ; the whole hospital can be served by the Trust standby generation with 100% generator backup supplies

- The increased supply availability and the construction of the new HV / LV transformer are required in time for the start of commissioning of the new Phase 2 building, October 2010, and this timescale underlines the necessity for the implementation of this scheme proposal
- Eliminating any break in electricity supply following incoming mains failure or generator testing when reinstatement of the mains occurs and with a seamless transition to electricity generated on site
- The supply will service the full calculated load demand for the entire development up to the completion of Phase 4
- Elimination of the need for manual reinstatement of supply following break in service , i.e. fully automatic
- The new controls system will allow compatibility with the proposed CHP plant and opens the way for the installation of up to date energy systems, which is part of the Trust drive to reduce carbon emissions and also reduce its carbon footprint by on site electricity generation; all in accordance with the Carbon and Energy Strategy approved by the Board in June 2009.
This business case only addresses the HV mains (excluding HV switchgear in existing intake substation S7 and the installation of two main LV switch panels) It does not address the low voltage infrastructure mains.
- This Business case, whilst being consistent with the Trust strategic development plan is for a greater capacity proposal than put forward in the Strategy document. Preliminary electricity demand estimates at the time of the preparation of the Carbon & Energy Strategy indicated that 3.8MVA would be required. This was calculated on the basis of the DQHH proposed development schemes whereby Phase 5 would provide a substantial development of 16000m2 funded by a PFI scheme, which would have taken its own electrical supply from the electrical supply company. The latest electricity demand estimates (see Appendix 2) to deliver the OCH development now indicates that 4.628MVA would be required and accordingly an application to EDF Energy of 5MVA has been made.



2. The Case

2.1 Patient Needs

Outline the clinical quality case for the investment in the box below

The site rationalisation and service changes that comprise this strategic plan will support a number of clinical and financial challenges which the Trust faces;

- It will support the achievement of best clinical practice and improve productivity across the organisation through removal of doubt over the integrity of electricity supplies and standby generator testing
- It will enable more effective use of resources at Estates through the elimination of the need to manually re-set control panels after electricity outages
- It will facilitate the modernisation of facilities and augment the drive to monitor use of energy thereby helping to control the usage of energy

The case relates to an improvement in the quality and cost effectiveness of the electricity supply, which is a key clinical support service by:

- Minimising supply outages
- Enabling electricity supply from mains or generator to be available to the entire hospital over a 24/7 period

2.2 Market Opportunity

Outline Trust and competitor analysis of current service.

National / local policy drivers (PCT, PBC, Network commissioning intentions).

The case augments the "Our Changing Hospitals" plan, which is consistent with the "Delivering Quality Health Care for Hertfordshire" strategy, which is fully aligned with the commissioning intentions of local PCTs.

In terms of market opportunity, change is required to

- Create the infrastructure for the advent of more efficient energy use and consequently reductions in cost, and enabling the drive towards the Trust Carbon Reduction Commitment
- Optimise the energy costs by gearing demand to availability
- Paves the way for the CHP proposal which in turn yields efficiencies and carbon reduction
- Demonstrate the Trust commitment towards improved sustainability by allowing the opportunity for the use of the CHP; thereby allowing alternative fuels and these proposed developments are as set out in the Carbon and Energy Strategy.



2.3 Project Description – Provide details of the:

2.3.1 Project Objectives

The objectives of the project are;

- To provide adequate electricity at all times for the entire planned development of the Lister site
- To mitigate against power outages
- To remove the 40 year old HV electrical installation
- Particularly to provide adequate electrical supply in time for the completion of the new Phase 2 development
- To ensure full time back up supplies to the entire site at all times
- To eliminate penalty tariffs that apply when more energy is demanded than is contracted for.
- To ensure minimal disruption to the Hospital during installation
- To provide for up to date controls systems which will be compatible between generators and CHP
- To undertake the development within one year.
- To achieve the above objectives whilst integrating the construction activities with the other developments being carried out under OCH.

2.3.2 Project Deliverables

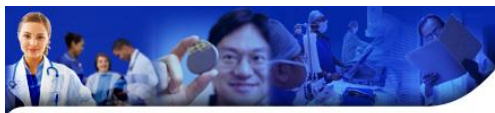
- The installation of new incoming service main and HV intake switch room
- The replacement of the Trust's HV ring main, distribution cables and switchgear
- The construction of new HV / LV transformers and substations
- The installation of new standby generators and the replacement of existing

2.3.3 Timetable for Realisation

	Milestone	Start Date	End Date
	Approval of Full Business Case	28 Oct 09	28 Oct 09
	Tenders for HV ring main works	04 Sept 09	19 Oct 09
	Tenders for new Incoming service main	04 Sept 09	19 Oct 09



	Place orders for HV ring main	30 Oct 09	30 Oct 09
	Construction of electric mains	01 Nov 09	25 Oct 10
	Place orders for Incoming mains	30 Oct 09	30 Oct 09
	Construction of incoming mains	01 Jan 01	31 Jul 10
	OJUE procedure for tendering generators	Oct 09	Nov 09
	Place order for new standby generator	Dec 09	
	Installation of standby generators ; first phase		30 Jun 10
	New transformer works ready for Phase 2	October 09	July 10
	Installation of standby generators ; last phase		2012
	Final phase for end Phase 4		2013



2.3.4 Measures of Success

The measures of success for this project are;

On completion of the project

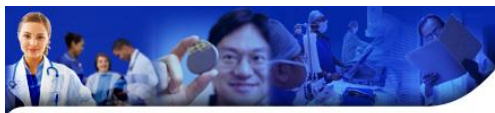
- Adequate electricity power available to service full OCH projects and provision for future flexibility
- No unplanned power outages associated with the works
- Full standby electricity power generating capacity without need for “essential user” demarcation
- Removal of significant Trust backlog maintenance for works associated with HV / LV generation
- Elimination of tariff penalties
- Provision of complete site infrastructure with capacity to serve all parts of the development works as set out in OCH
- A significant reduction in the level of the Trust’s exposure to risk in relation to provision of electricity power to any department.
- The delivery of the project within the identified timeframe
- The delivery of the project within the agreed budget, quality and programme
- Facilitates the CHP installation proposal

During the project

- The maintenance of at least the existing level of power provision during construction works
- Avoidance of conflicts of construction works during the development of Phases 2 (Women’s and Children) and 3 (multi storey car park) and the works for Cardiology catheter lab, new CT scanner, other Phase 4 enabling schemes
- Continuity of standby generation whilst existing generators are decommissioned and removed
- Minimal site disruption associated with civil engineering and cabling installations
- No unplanned power outages caused by the works

3. Activity / Capacity & Operational Issues

3.1 Forecast activity (based on details assumption) for both NHS & PP activity



Ability to provide safe reliable electrical service to the Trust for the foreseeable future.

3.2 Summarise how the proposal will impact operationally, including impact on other divisions, services and patients

Service Users & Patients

There should be no effect on the Trust's clinical activity as a result of the installation works or change over of standby generation.

Similarly, there should be no impact upon the patients. There will be improvement in the service provided,

The installation will comply with current electrical regulations and ensure full compliance with Health and Safety issues.



3.3 Risks – indicate key risks

The following is a list of the key risks that have been identified together with an indication of the likelihood of their occurrence and the action required to mitigate against these risks.

RISK	LIKELIHOOD	ACTION TO MITIGATE
Failure by electrical distribution company to deliver new supply in time for Maternity scheme Phase2	Low	Alternative option prepared to temporarily utilise spare capacity very short term in second electrical energy intake at substation S6
Activity max demand calculations not accurately predicted ; failure to correctly estimate future demand ; inadequate new infrastructure	Low	Full discovery of all plans proposed up to Phase 4; workshop with stakeholders to confirm requirements
Project budget underestimated	Low	Budget based on informed figures and quotes;
Contractor insolvency	Low to Medium	All tenderers have been vetted and Dun & Bradstreet reports are Condition 1 and 2
Lack of availability of estates HV/LV approved persons	Low	Further training provided; additional personnel now recruited
Construction programme may be unrealistic	Low	Indications given by tenderers confirm timetables
Failure to orientate and train all staff for management of new infrastructure	Low	Training strategy produced
Change over of supplies ;	Low	Comprehensive plans in progress
Obstruction of emergency services routes	Low	Part of the comprehensive planning and bulletin papers via intranet will be issued
HSE Interventions	Low	CDM Coordinator appointed; tenderer will be Principal contractor
Delay in planning consent	Low	Only required for Intake switch room ; already applied
Inability to effectively deal with incident during works	Low to Medium	Actions plans included in tender documents
Design not permitting safe evacuation	Low	Design to be vetted by TB&A to comply Building Regulations
Exposure to asbestos	Low	Walkthrough survey after routes agreed
Poor traffic management	Low	Traffic management plan to be agreed with contractor and to accord with overall site management plan
Work causes loss of supply	Low	Back up available for all critical areas



4. Financial Analysis

4.1 Please see Appendix 4

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4.2 Capital Cost and funding source (Capital Programme, PPP, Fundraising)

Funding is from Trust Capital programme as agreed in strategy June 2009

The four Trust strategic objectives taken from IBP

- | |
|---|
| <ul style="list-style-type: none"> • To consolidate acute services for complex or serious conditions onto a single site. • To work with colleagues in primary care to expand local access to specialist acute services • To undertake more cancer care locally. • To improve the quality of all aspects of our services |
|---|

Executive Committee outcome (taken from minutes of the meeting)

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When complete please send to:

Victoria Fisher	Trust Secretary
Richard Harman	Director of Strategic Estates
Dean Goodrum	Capital Development Manager
Barbara Jenkins	Assistant Director Clinical Reconfiguration
James Quinn	Medical Director
John Sloan	Deputy Director of Finance



Appendices

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Appendix 1

The Case for change

The case for change was set out in the Board's approval of the Carbon & Energy Strategy (Lister Hospital) 2009 – 2015 approved 24th June 2009 and this Full Business Case meets the key objectives as follows:

- Security of electrical mains and backup supplies
- Provision of a new Electricity Distribution Company intake substation sized to cater for OCH and replacement of the old HV and LV mains distribution equipment, significantly reducing back log maintenance associated with these systems.
- Increase in generator backup supplies to provide 100% cover in the event of a mains Electricity Company supply failure, utilising the new HV cable distribution system.
- Connection of the recently purchased generator to the HV system.
- Provision of a resilient distribution system to accord with the latest HTM standards and to rebalance the loads of the existing substations on the site.
- To ensure the future connectivity of Combined Heat Power (CHP) into the HV distribution and specialist control protection systems (G59).
- Enable the generators to be run in parallel with the incoming mains during generator tests allowing a no break in supply on reinstatement after a power outage or routine generator testing

Scope of works

The scope of works for this investment covers the following main elements:

- Increase in electricity supply capacity to the site boundary

The current maximum demand recorded for the site is 1.672MVA which exceeds the current agreed contract limit of 1.388KVA. Current load estimates associated with the DQHH indicates that this could reach up to 5MVA (see Appendix 2). The electrical distribution company will need to upgrade the offsite substations and cabling in order to provide the site with the forecast increased capacity.

The existing electrical distribution company supply intake adjacent to the residential area will however be retained but their second supply intake by Strathmore Wing will be disconnected and the transformer incorporated into the new hospital distribution system.

- Replacement and upgrading of the site high voltage (HV) distribution system

The provision of a new electricity distribution company energy intake substation with new HV ring main cabling connecting to the existing substations and a new Maternity substation.



New larger capacity transformers and associated low voltage (LV) switch panel will also be provided for the existing substation feeding the main tower block.

Increased LV capacity at substation S6

- Increase in generator backup supplies to provide 100% cover in the event of an EDF Energy mains electricity supply failure.

Utilisation of the site HV ring main cabling to provide 100% backup in the event of mains supply failure.

A new generator substation will be provided to connect the new 2MVA generator already purchased and on site with the provision of a further three new 2MVA generators.

Comparison of this Case with the Energy Strategy and current projected electricity demand estimates

Preliminary electricity demand estimates at the time of the approval of the Carbon & Energy Strategy indicated that 3.8MVA would be required. This was calculated on the basis of the DQHH proposed development schemes whereby Phase 5 would provide a substantial development of 16000m² funded by PFI scheme, which would have taken its own electrical supply from the electrical supply company.

The latest electricity demand estimates (see Appendix 2) to deliver the OCH development now indicates that 4.628MVA would be required and with this figure in mind an application to EDF Energy of 5MVA has been made.



Appendix 2

Electricity load demand calculations

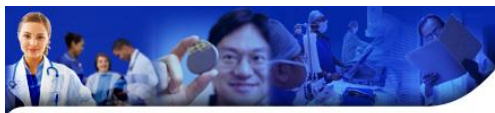
East & North Herts NHS Trust

Lister Hospital

Maximum Demand Projection KVA

Revision 5

Phase	Development	Spatial area of department m2	Sub A T1	Sub B			Sub C T4	Sub D T6	Sub E T7 & T8	Future	Total
				T2	T3	T5					
existing			220	410	270		700	100			1700
1	New CT Scanner				150						150
	Upgrade Cath Lab							150			150
sub-total			0	0	150	0	0	150			300
total after Phase 1			220	410	420	0	700	250			2000
rationalisation of Sub B			220	460	460	460	200	200			2000
2	New Maternity (3000sq m)			-65	-65	-70			800		600
3	New Car Park		200								200
4	Tower Block Upgrade:-										
4	Ward refurbishments ; no significant changes; no A/C			50	50	50					150
	Isolation unit level 11; new A/C etc					200					200
4/5	Phase 4 enabling schemes ; minor changes		25	25	25	25					100
4/5	A & E rationalisation and new block UCC/ radiology/ fracture clinic	3900		200	200						400
4/5	(5 storey) ward block	7000					500				500
4/5	(4) theatres block; 2 day surgery 5 endoscopy	1180 1220 2250						200 300	200		200 200 300
4/5	Pathology off site; Mortuary 50 spaces	0 285				100					0 100
4/5	others; med records/	0	0	0	0	0	0	0	0		0
sub-total			225	210	210	305	500	500	1000		2950
total after Phase 4/5			445	670	670	765	700	700	1000		4950
future increase allowance say 10%			45	67	67	77	70	70	100		495
total after Phase 4/5 including 10% allowance			490	737	737	842	770	770	1100		5445
Total after 85% diversity			416	626	626	715	655	655	935		4628



Appendix 3

Options Considered

The scheme proposals comprise three separate parts but which form an integral infrastructure works programme, the whole only fully functioning when all parts are in place.

Each of these has a number of Options but from which only one of each is feasible but nevertheless all options have been considered:-

A Incoming mains replacement

Option A1 Do Nothing

Option A2 Do Minimum

Option A3 Increase existing incoming mains supply

Option A4 Maintain existing and supplement with Trust generated power

Option A5 Provide new incoming mains supply

B High Voltage ring main works (Trust property)

Option B1 Do Nothing

Option B2 Do Minimum

Option B3 Replace existing HV ring main with new HV ring main

Option B4 Replace existing HV ring main with new LV ring main

C Standby Generation

Option C1 Do Nothing

Option C2 Do Minimum

Option C3 Generate and distribute at LV

Option C4 Generate at LV, distribute at HV

The preferred Option is Option A5 combined with Option B3 combined with Option C4.

Options appraisal

Incoming mains replacement

Option A1 Do Nothing

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The present available electric supply is 1.39MVA to which the Trust is contracted. The Trust draws up to 1.7MVA at critical winter times and pays a penalty for this. The electrical distribution company, EDF, has indicated that the mains service supply cannot be increased in its present size; it is also unreliable and outages occur from time to time due to poor infrastructure in North Stevenage.

Dialogue with EDF has concluded that no further substantial supply over the present routing is feasible.

To do nothing will continue to put the electricity supply at risk due to its unreliability and result in continued use of the old standby generators and these can only service about 40% of the current need, on an essential user basis.

To do nothing will mean that no electricity service can be made available for neither the Phase 2 Maternity scheme when completed nor any other subsequent development. Other developments will come on line during 2010, such as the new Cardiology Catheter Lab and an additional CT Scanner and power for these is becoming problematic with additional ad hoc standby generators needed to support them.

This Option does not support the OCH programme and is dismissed.

Option A2 Do Minimum

There is no solution which can provide the additional demand required without major change to the incoming supply.
There is no Do Minimum Option.

Option A3 Increase existing incoming mains supply

As indicated in option 1 above the present incoming supply has been identified by EDF as not able to be increased; under discussion with EDF they have indicated that a minor increase to 2MVA may be possible under critical use but this does not serve any significant part of the new proposal for OCH which requires approx. 4.5MVA. This minor increase would provide only a very marginal extra supply and still puts the Trust at the edge of the supply capability.

This Option is dismissed.

Option A4 Maintain existing and supplement with Trust generated power

The DH requires “resilience” of supply. This means that even if the Trust generated all of its own power it is still require to be connected to a fully adequate incoming mains supply; this allows full supplies in the event of a failure of supply from one source. The resilience required is fully covered by the proposal in the Option A5.



This Option , A4, is dismissed

Option A5 Provide new incoming mains supply

This is the only Option which will provide full power for the Trust needs, both now and for the anticipated future needs. It provides for a new incoming supply with assurance of dedication to the hospital, with outages not expected. It provides also for full back up standby generation.

Supply demands have been calculated on the total complement of accommodation for OCH with some margin for future use. The Trust's HV ring main and standby generating capacity are sized to cope with this full demand.

This is the only Option which addresses all the demands of OCH and is thus the preferred Option.

High Voltage ring main works (Trust property)

Option B1 Do Nothing

The high voltage ring main, the Trust's property, was installed when the Hospital was constructed. There are a number of sub stations which house transformers from HV to low voltage and these are also original. The HV ring main was sized to cope with a capacity of up to 2MVA. This installation is now significantly undersized for any expansion of development at the Lister, and the substation transformers are close to the end of their life expectancy, spare parts becoming difficult to source.

The existing HV ring main cannot cope with any expansion of power to the site.

This option is dismissed.

Option B2 Do Minimum

The size of the HV ring main dictates the limit of its use. Any increase in load demands cabling of greater size and capacity and thus necessitates its replacement

There is no do minimum option.

Option B3 Replace existing HV ring main with new HV ring main



A new HV ring main can be installed into the underground ducting, walkway tunnels and trenches and the existing redundant cabling removed. Although a substantial task, this process is straightforward and new transformers will be installed during the works.

The distribution of electricity by high voltage is efficient, uses smaller cabling and there is much less voltage loss over the transmission lines.

Standby generators will be connected to the HV ring main. All generators will be located together at the Energy Centre (Boiler House) with central fuel storage; all will be linked for compatibility.

This is the preferred Option

Option B4 Replace existing HV ring main with new LV ring main

The sizing of low voltage supply cabling is extraordinarily large compared to HV cabling. It is not feasible to install cabling of the sizes required within the ducting or walkway tunnels. The cost of such cable sizes is prohibitively expensive.

The voltage loss over the distances between LV stations would be significant. Standby generators would need to be located at separate points all around the hospital, each requiring separate fuel storage and delivery.

This option is dismissed



Standby Generation

Option C1 Do Nothing

The existing two standby generators which are in the Energy Centre generator hall are nearing the end of their useful life expectancy and spare parts are becoming unavailable. Each is connected to the low voltage site main; these generators cannot run together and capacity is therefore limited to a maximum of 1 MVA. In times of mains supply outage the service has to operate on an “essential user” basis, served also by a number of small ad-hoc generators sited around the hospital which are discrete to particular needs. The use of these generators demands manual interruption and restoration of supplies causing further delays in power restoration. The demand for “essential user” need has now outstripped ability to service this from these generators.

Further demand, such as the completion of the Phase 2 unit cannot be serviced.

The linking of standby generation to the low voltage system, beyond present capacity, is not feasible due to the cost and the very large cabling required and the considerable loss of voltage due to the distances between LV load centres

The Do Nothing option is not feasible to service the Hospital beyond its present state.

This Option is dismissed.

Option C2 Do Minimum

The concept of a do minimum option cannot be defined as no proposal for this exists which could improve the present status in order to serve OCH developments.

Option C3 Generate and distribute at LV

For the reasoning set out in option C1 above it is not economically feasible to generate onto the low voltage mains to provide for complete standby loading for the entire hospital; the cable sizing being prohibitively expensive and the considerable voltage drops associated with the distances required be unacceptable

There would be practical problems in siting LV generators at individual sites around the hospital and the noise generation, fuel storage, fuel delivery and testing would lead to considerable problems

This Option is dismissed

Option C4 Generate at LV, distribute at HV



The use of High Voltage yields two main advantages:-

Voltage drop is very much reduced

Cabling sizes are much smaller and the cost is significantly lower

The generators proposed are capable of stepping up to HV and generating 2MVA each; the distribution of high voltage around the site from the standby generator sets located at the Energy Centre is an improved reliable engineering solution as well as being more economic.

This is the preferred Option.



Appendix 4

Capital and revenue costs

Capital Costs

The capital costs are set out in Appendix 5. The FBC capital costs are based on pre tender estimate and indicative EDF Energy costs. Actual costs will be known towards the end of October 2009 when tenders are returned.

All costs include all predicted charges including fees and VAT

A substantial part of these costs have been tested by market quotations and the scheme tenders for the HV infrastructure works are expected on October 19th.

The capital cost is presumed to be written off over 30 years and this is funded through depreciation and won't increase the overall capital related costs to the Trust.

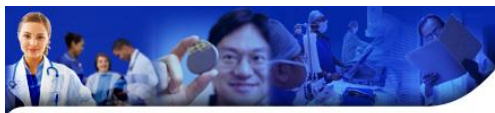
A summary of the forecast annual expenditure is;

	2009 / 10		2010 /11		2011/12/13	
<i>Phase</i>	<i>Strategy Cost £</i>	<i>Full Business Case Cost £</i>	<i>Strategy Cost £</i>	<i>Full Business Case Cost £</i>	<i>Strategy Cost £</i>	<i>Full Business Case Cost £</i>
1	1,748,700	1,800,000				
2			1,964,730	2,146,930		
3					500,000	1,163,086
Total	1,748,700	1,800,000	1,964,730	2,146.930	500,000	1,163,086

Total Strategy approved Investment £ 4,213,430

Total Full Business Case £ 5,110,016

This FBC shows a capital spend of £ 1,800,000 in this financial year and the amount included in the capital programme is £1,800,000



Reconciliation of present estimated capital cost with that approved in the Strategy.

The increase in capital cost arise from the change from an estimated total electricity loading of 3.8MVA as forecast in the Carbon and Energy Strategy to a capability of 5MVA, which is the value now applied for from the electricity supply company.

	£	Nett increase £
The sum now shown in the forecast cost for incoming electricity supply connections at 5MVA	1,100,000	460,000
The quotation for incoming electricity supply connection at 5MVA	640,000	
Further standby generator required to support 5MVA; estimated cost		300,000
	Nett increase	760,000
Addition of VAT	Approx. increase	895,000

Revenue costs

Operational Costs

Capital Charges – the costs will be based on the application of capital charges in relation to the increased value of the investment.

Staffing Costs

A provision of approximately £ 500 per calendar month should be made for staff training.

It is estimated that the staff costs in re-setting switchgear after breaks in supply currently cost £1,600 per month. The new installation should mitigate against breakdowns. This should represent a saving of approx. £ 1,600 per month.

Costs of Testing of the infrastructure

There is a statutory requirement to have all High Voltage installations tested. The maintenance cost for the HV installation is currently £ 2,600 per annum. This is quoted will rise to £ 10,000 per annum.

Generator testing

It is estimated that fuel for testing the generators at the required six weekly intervals will rise from £7,500p.a. at present to approximately £ 18,600 p.a when the whole installation is completed.

Generator Maintenance

A budget cost for the comprehensive maintenance of the generators is given as £ 5,000 per annum.



Capital expenditure and revenue

	<u>p.a.</u>	<u>Yr 1</u> <u>2009/10</u>	<u>Yr 2</u> <u>2010/11</u>	<u>Yr 3</u> <u>2011/12</u>	<u>20112/13</u>	<u>etc</u>
Capital expenditure (incl VAT and fees)		1,800,000	2,146,930	1,163,086	-	
Capital charges		Capital charges equate to £ 340,000 It is assumed that the capital is funded by depreciation and does not materialise in an additional cost to the Trust				
Revenue						
Addnl staff training	6,000	6,000	6,000	6,000	6,000	6,000
Reduction in re-setting switchgear	- 19,200	- 19,200	- 19,200	- 19,200	- 19,200	- 19,200
Testing HV old system	- 2,600	- 2,600	- 2,600	- 2,600	- 2,600	- 2,600
Testing HV new system	10,000	10,000	10,000	10,000	10,000	10,000
Generator testing ; old	- 7,500	- 7,500	- 7,500	- 7,500	- 7,500	- 7,500
Generator testing ; new	18,600	18,600	18,600	18,600	18,600	18,600
Comprehensive maintenance new generators & controls	7,500	7,500	7,500	7,500	7,500	7,500
Saving on transformer replacements	- 1,000	- 1,000	- 1,000	- 1,000	- 1,000	- 1,000
Nett additional revenue £	11,800	11,800	11,800	11,800	11,800	11,800

The nett additional costs per annum of operating the system amount to an estimated £ 11,800.

Energy costs and sustainability

Whilst this Case is for the reconstruction of the electricity supply it is prepared in the light of the need to minimise energy and carbon emissions.

The sizing of the installation is calculated on the basis of the whole site needs for the demands of the OCH programme and to ensure resilience. The need to draw energy at any one time will be assessed and the Maximum Demand for power will be procured in accordance with the Trust needs at that time and the appropriate tariff agreed with the electricity supply company. The total energy demand is expected to follow the data profile as set out in Appendix 4 showing a rise to approx 2.8MVA after Phase 2 and Phase 3 and rising to approx 4.5MVA after OCH completion.

The installation of this new infrastructure paves the way for the CHP proposal with its compatible working in conjunction with the standby generating sets.

Sustainability issues, such as those that need to be considered in connection with Phase 4 development, ground source heat pumps, solar energy for hot water, do not affect the principles for the distribution of electricity to the site as set out in this engineering Case.

Appendix 5

Spreadsheet showing capital costs phasing

East & North Herts NHS Trust		Preliminary Pre-Tender Estimate				
Site Electrical Infrastructure HV Upgrade		PHASE 1A	PHASE 1B	PHASE 2A	PHASE 2B	PHASE 3
<i>Sub-Station S1</i>						
New EDF Supply	#	1,100,000.00				
Site Civil Work		10,000.00				
HV Switchgear- EDF Side, 3 Panel Board	#	85,000.00				
HV Switchgear- Trust Side 5 Panel Board	#	130,000.00				
Civil/Builders Work/Ancil. Services		95,000.00				
Planning		5,000.00				
<i>Sub-Station S2</i>						
LV C/O Switchpanel Reconfiguration				20,000.00		
<i>Sub-Station S3</i>						
HV Switchgear 8 Panel Board	#	160,000.00				
4 Step Up Transformers	#		25,000.00	25,000.00		50,000.00
LV Cable Connections			30,000.00	10,000.00		20,000.00
3 2MVA Generators	#			400,000.00		460,000.00
GRP Enclosure	#	40,000.00				
Civil/Builders Work/Ancil. Services		80,000.00				
<i>Sub-Station S4</i>						
HV Switchgear/2 Transformers	#	50,000.00				
LV Switchpanel 2	#	50,000.00				
LV Cable Connection		8,000.00				
Civils as part of MO GMP Maternity Unit		0.00				
Load Shed MHU to S4		30,000.00				5,000.00
Load Shed Existing Maternity to S4		15,000.00				5,000.00
GRP Enclosure		20,000.00				
<i>Sub-Station S5</i>						
HV Switchgear- 6 Panel Board	#	60,000.00				
Removal of redundant HV Switchgear & Transformers	#	1,000.00				
3 Transformers	#			100,000.00		
LV Switchpanel 1	#			55,000.00		
LV Cable Connection				50,000.00		
Civil Works/Ventilation/Relocate existing Small Power/Asbestos Removal etc.		5,000.00	10,000.00	7,000.00		
HV Switchroom Builders Work		2,500.00				
<i>Sub-Station S6</i>						
HV Switchgear/Reconfiguration		10,000.00				
EDF Disconnection		5,000.00				
LV Panel Modifications incl PFC		15,000.00				
Civil Work		2,000.00				
Interim and Permanent Load Shedding		20,000.00				
<i>Sub-Station S7</i>						
HV Switchgear (Reconnection/Reconfigure)					15,000.00	
EDF Disconnection					5,000.00	
Civil Work					5,000.00	
<i>Site Wide HV Cables</i>		#	150,000.00			
<i>Site Wide Controls (G59, PLC & SCADA)</i>			150,000.00	5,000.00	5,000.00	5,000.00
<i>Existing 2MVA Generator Connection/Commissioning</i>				10,000.00		
<i>Existing Generator Room</i>						
Remove existing Generators and LV Switchpanel		15,000.00				
Remove all other equipment		5,000.00				
Structural Modifications				60,000.00		
Temporary Generator G1 LV Connection		10,000.00				
<i>Temporary Generators Hire</i>			10,000.00	10,000.00		
<i>Provisional Sums</i>						
Alternative Intake Supply		20,000.00				
Generator Controls		5,000.00				
G59 Work		5,000.00				
Fault Limit Reactors		25,000.00				
Mains Failure Scenario Workshop		5,000.00				
T2 Transformer & LV Cables						35,000.00
T9 Transformer & LV Cables						35,000.00
Existing Substation Earthing		10,000.00				
Enhanced Controls System		100,000.00				
Controls System Workshops		20,000.00				
Asbestos Removal		15,000.00				
		2,543,500.00	80,000.00	742,000.00	25,000.00	615,000.00
plus Contingency 5%	5%	127,175.00	4,000.00	37,100.00	1,250.00	30,750.00
sub total		2,670,675.00	84,000.00	779,100.00	26,250.00	645,750.00
plus Fee 4%	4%	106,827.00	3,360.00	31,164.00	1,050.00	25,830.00
VAT (no VAT on fees)	17.5%	467,368.13	14,700.00	136,342.50	4,593.75	113,006.25
Total		3,244,870.13	102,060.00	946,606.50	31,893.75	784,586.25
Total Phase 1 & 2		4,325,430.38				
Phase 3		784,586.25				
TOTAL		5,110,016.63				
Notes						
1. # denotes by quotation						
2. Cash Flow						
						Totals
2009/2010		1,800,000.00				1,800,000.00
2010/2011		1,444,870.13	102,060.00	600,000.00		2,146,930.13
2011/2012				346,606.50	31,893.75	378,500.25
2013						784,586.25
check		3,244,870.13	102,060.00	946,606.50	31,893.75	784,586.25
						5,110,016.63



Appendix 6

Procurement route

Incoming mains replacement

These works comprise the installation of a new electric mains from some 4Km distance and are subject to EDF authority, as network provider. Quotations for this work are being sought and the process has proven to be long. A number of indicative quotations have been given and we are nearing the time for precise prices. Offers have been sought from not only EDF but also from approved network installers, each of whom has been checked for acceptable financial status with Dun & Bradstreet. Tony Lamberti Consulting have been acting for the Trust, as HV advisor, in the development of this work proposal and in consultations with the network provider.

Following receipt of offers a report will be issued and sanction is sought in this Business Case submission for approval to place an order provided that the recommended offer is within the approved sum. It is anticipated that a significant portion of the quotation price will be identified, as a condition of tender, as an advance payment in respect of the substantial materials and switch gear element of the works and this has been calculated into the cash flow forecasts.

Tony Lamberti Consulting will continue to act for the Trust as Trust HV Authorising Engineer and as Contract Administrator.

The Planning Application for the new Switchroom, to be sited near to the private residential site, has already been made. There will be no noise nuisance from this building.

High Voltage ring main works (Trust property)

These works have been the subject of performance specification and outline design by Consulting Engineers, Troup Bywaters and Anders and with Tony Lamberti Consulting acting as Trust HV Authorising Engineer and as Contract Administrator.

Full tender documentation was issued to seven contractors on 4th September; tender returns from five are set for Monday 19th October. Each of the tenderers was selected on an interview basis with particular reference to their technical skill and experience and each was checked for acceptable financial status with Dun & Bradstreet. The form of contract specified is the MF/ 1 model form issued by IMech E & IEE (see page 28)

Following tender receipt a tender report will be issued and sanction is sought in this Business Case submission for approval to place an order provided that the recommended tender is within the approved sum.

The detailed design will be the responsibility of the contractor. Troup Bywaters and Anders will continue to act in the capacity of technical reviewer. Tony Lamberti Consulting will continue to act for the Trust as HV Authorising Engineer and as Contract Administrator.

It is anticipated that the Trust Estates staff will also act as inspectors of the works as the contract works proceed and each of these bodies will act in their respective roles on the commissioning and final inspection testing in accordance with HTM06- Permits to Work on HV/LV System.

Troup Bywaters and Anders Services Management Ltd is commissioned to act as CDM Coordinators and will continue to advise the Trust on Health and Safety issues during the construction.



Integration and coordination of works between this contract and the other OCH contracts under way, namely Phase 1, (ISTC) Phase 2 (Women's and Children) and Phase 3 (Multi storey car park) and other minor schemes will be carried out by the Strategic Development project management and capital projects department.

Standby Generation

A new 2MVA standby-by generating set was purchased by the Trust in 2008 in anticipation of its use for these works and this will be set to work and connected to the new HV ring.

Three further sets are required and the existing two generators will be removed from the Energy Centre and disposed of. (These are virtually life expired and only connect to the Trust low voltage system, thereby serving only "essential users" as the available load is small. They can only cover about 40% of the existing site load. These two existing sets cannot operate in tandem, thus reducing their effectiveness.)

Implementation

- The first generator (already owned) will be required during 2010 to enable the site load to be carried including that to serve the new phase 2 development.
- The subsequent two generators will be required in 2012 for (n+1) to serve the additional load from Phase 4.
- There is already adequate bulk storage on site for the light oil needed to fuel all the proposed generators.
- The existing (new) generator will remain where it is currently sited, adjacent to the generator hall but externally
- The new generators will be positioned inside the existing generator hall when the two old generators are removed
- Some building works are required to the generator hall

Method statement in brief for the generators change over:-

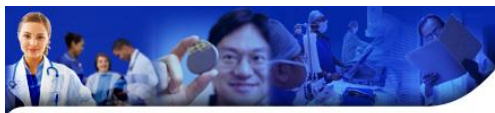
- The first step is to temporarily connect the existing new generator to the low voltage main in substation S2 to supply existing "essential users". This enables the removal of the two old generators in the energy centre; these will be stripped out and sold
- By July 2010 to install one new generator in the generator hall connected to HV with a step up transformer
- Disconnect the first (new) generator from the LV and install this first set with step up to HV
- This then creates a total of 4 MVA available for standby; this can support the whole load for the Hospital at this time, other than the residences blocks which will remain on the old substation S7.
- During changes to the standby generation sets we will provide up to 8 temporary generators around the site to cover for changes while organising set 1 and set 2 to run in compatible mode; this includes controls with G59 that will run sets 1 and 2.
- All of the above will be ready before Phase 2 makes demand for power.
- The various small ad-hoc generators sited around the site will be decommissioned
- A third and fourth generator can be added to the system to support the additional loads that will come on stream for phase 4 (all G59 compliant).
- The fee for designing and assessing the operation in G59 mode has already been paid to EDF Energy and this mode of working has been provisionally approved by EDF.



Appendix 7

Description of technology and abbreviations

G 59	Technical term for the technology that allows the provision of mains electricity through the service supply while the customer is able to generate supply at the same time; thus allowing two separate sources of supply at the same time.
(n + 1)	The DH HTM06 requires resilience to the service; this means that at all times the hospital must have sufficient capacity equally both from the incoming supply and adequate self generation; to achieve adequate self generation it is a requirement that all HV transformer equipment items must have at least one spare available in case of breakdown.
IMechE & IEE	Institute of Mechanical Engineers Institute of Electrical Engineers



Appendix 8

Site Management plan

The purpose of the Phase 4 Site Management Plan together with attached site plan detailing on site activities is to provide an overview of the works programmed to take place to facilitate Phase 4, together with details of the phasing of these works and the timetable for undertaking each aspect connected with Phase 4.

Enabling / Infrastructure

Some preparatory and survey work has already been undertaken on the Lister site and part of this involves the formation of the Strathmore car park to Corey's Mill Lane together with an access duct beneath, which will enable High Voltage (HV) cabling to be pulled through and connected.

Early works therefore scheduled to take place on site around December 2009 / January 2010 involve the excavation and trenching along the access road adjoining the Elderly Care Unit and ECU Day Hospital behind the Strathmore car park (see blue dashed line on attached plan).

These major excavation works will provide ducting and HV cable runs for a new HV ring and Combined Heat Power (CHP) ring. The route will follow the access road before connecting into a new electrical intake constructed on the left. The cable route will split and follow a route around the rear of the Estates Building and Boiler House before connecting to a new electrical substation located adjacent to existing car parking on the boundary to the North Road adjacent to the rugby club.

An additional cable run will then follow a route between Kitchens and Paediatric Wards into the Tower Block and follow a line through ducts beneath the existing hospital building and Mental Health Unit before connecting into another new electrical substation.

During the excavation and trenching works for the HV cabling it has been identified that there will be a need to ensure continual access along the roads around the site. A one way system including traffic lights will be initiated where excavation takes place along the ECU Day Hospital route that follows up towards the Estates Section to ensure that the movement of 'tugs' around the hospital providing clinical waste removal and linen services can be maintained without restriction. The use of traffic lights for single lane traffic will also be replicated as appropriate on the North Road when cabling or excavation works are taking place for connections into the new substations.

A&E Wards & Theatres

Once the enabling works for HV cabling has been installed on site, works can be planned for commencement on the A&E Wards and Theatres at the front of the site.

Works here are scheduled to commence June 2010 – November 2011 and will involve demolition of part of the existing hospital building to provide a new Ward extension together with a new extension and refurbishment to A&E.

The demolition works at the front of the hospital on this phase will necessitate usual hoardings and safety protection to both staff and public areas, but also suitable additional measures to mitigate noise and dust in view of the type of works and its adjacency to the existing hospital building. The bus stop area to the front of the hospital is not anticipated to be affected by proposed works at the current time.

The contractor site compound for this project will be located on the temporary Strathmore car park (outlined orange on attached plan) with suitable protection being provided to the existing oak tree to the corner of the site.

The use of the Strathmore car park will involve the loss of 46 staff car park spaces. However the loss of these spaces will be mitigated by the completion of the MSCP (multi-storey car park) completing in March 2011 and also by the additional flexibility and availability of parking at the preferred off site car parking option at St. Georges multi-storey car park located in the town centre, together with the option of continuing with any of the other existing temporary car parking arrangements close by being undertaken for earlier project phases at the Lister.

Theatres

Theatres will commence at the completion of Phase 2 Maternity due to site logistics and occupancy of the land for the Theatres development by the site and construction compounds for new maternity unit.

Maternity is scheduled to complete in October 2011 and therefore the Theatres construction should commence towards the end of 2011 and will complete in 2013.

These timescales and start dates on site may be assisted by the use of existing contractors carrying out Phase 2 Maternity subject to the designated procurement route chosen.

Should the Theatres project be undertaken by Medicinq Osborne who are currently undertaking the Maternity unit, lead in times, site set up and mobilisation for the project will likely take place more rapidly due to their existing presence on site and the ease with which they should be able to reorganise their existing site set up and site management to accommodate the new Phase 4 Theatres project to naturally follow on from completion of Maternity.

If a different procurement option is followed on site mobilisation by the appointed contractor will take place in the normal manner after the maternity contractor has cleared away their site set up and compounds from the location.

Site Management

The Site Management Plan will be managed under the project structure for all elements of the Phase 4 programme. The project team is resourced and draws support from the Estates and Facilities Management Teams together with the H&S department and on site Car Park Contractor.

The site management plan will be reviewed and updated regularly by the project team to ensure that accessibility for the sites and the phasing of works is maintained with minimal disruption to the hospital, staff and patients during each of the phased works.

General

Fire escape routes will be maintained throughout the works where applicable and these will be agreed in advance and monitored by the Fire Risk Manager.

Clear and visible signage will be located around the site where appropriate. This will include both health safety and directional signage.



The risk of falling objects from construction sites will be risk assessed under each individual phase and appropriate safety measures provided including fencing, lighting, hoardings and signage etc

Construction activities on phased works will be monitored to ensure disruption due to access, dust, fumes and noise are kept to acceptable levels.

Complaints and/or onsite initiatives will be addressed by the project team on an individual basis to ensure smooth running and continual improvement of activity on site during phased works.

The need for clear communications in managing the Site Management Plan is recognised and the project team will liaise and work closely with the Trust's Communications Department.

The trust's website will be utilised in order to inform patients, public and staff of arrangements taking place on site during phased works.

Loss of car parking to areas of the site will be addressed by existing measures utilising the completed MSCP, the large off site car parking option and smaller temporary off site car parking locations close by to Lister.

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