Committees: Planning and Transportation [for decision] Projects Sub [for decision] Culture, Heritage and Libraries Committee [for information]	**Dates:** 01 October 2019 16 October 2019 11 November 2019
Subject: Tower Bridge HV System Replacement and Increasing Electrical Resilience **Unique Project Identifier:** 11520 **CS report Number:** CS 395/19	**Gateway 3: Outline Options Appraisal (Complex)**
Report of: City Surveyor **Report Author:** Ruby Raw	**For Information**
PUBLIC	

1. Status update	**Project Description:** In January 2016, your committees approved a GW 1-2 report to undertake a detailed feasibility study into upgrading the High Voltage (HV) and Low Voltage (LV) electrical infrastructure at Tower Bridge and increase its power resilience (i.e. the secondary source of power in the event of a power failure). The existing secondary supply can only power bridge lifts at half speed, subject to complex adjustments to driving machinery, and essential functions. In addition, the secondary power supply is used for River signal and navigation lights, public and safety lighting, and more critically, the security CCTV camera provision across the bridge. This affects the ability to complete bridge lifts as covered under the Corporation of London (Tower Bride) Act 1885.Therefore, it is imperative that the backup power supply provides secure power resilience to these functions. The feasibility study set out to explore the viability and implications of 5 options proposed by the City Surveyors Engineering team to replace existing infrastructure and increase the backup power capacity to carry out bridge lifts at full speed as well as allowing the exhibition and income-generating venue hire activities (£6.5m per annum) to remain open in the event of a power outage. This reduces the existing risk of reputational damage and loss of income in the event of a power outage.

	The feasibility reconfirmed study that the Bridge is currently at risk of power failure due to the existing electrical network and switchgear being over 40 years old. There is currently no reliable source of back up supply due to the age and condition of the infrastructure and parts to carry out repairs to the switchgear are difficult to source as they are no longer readily available. In addition, current legislation requires high voltage and low voltage switchgear to be segregated and we are therefore not compliant as the main switch panel is in the same location as the high voltage transformers and low voltage panel. To highlight this problem, Tower Bridge suffered power issues due to a faulty breaker over the 2019 August Bank Holiday weekend which resulted in the cancellation of 10 bridge lifts. This also resulted in the late opening of the exhibition impacting on income and will continue to present an increasing likelihood of failure; This feasibility study focused on assessing the constraints and condition of the building and viability of the 5 options as outlined in Gateway 1-2 report. The findings from the feasibility study revealed that the 5 suggested options would neither be logistically possible or would fail to fulfil all the brief requirements, in addition this would result in long periods of power down time resulting in severe impact on bridge operations. Therefore 2 further alternative proposals were developed which fulfilled the brief and will allow the bridge to function to full capacity during the works. These 2 options are appraised below, with **Option B** recommended for approval. A more detail rationale for dismissing the 5 options in GW 1-2 is listed at the end of this report. **RAG Status:** None reported at last report committee. Current RAG status Red against original programme and budget estimate **Risk Status:** Medium (at last report to committee) **Total Estimated Cost of Project** (excluding risk) **at GW1-2**: £250K- £5m cost option approved. **Change in Total Estimated Project Cost** (excl. Risk): £800K. **New Total Estimated Project Cost** (excl. Risk): £5.8m **Spend to Date:** £26,059. **Costed Risk Provision Utilised:** £0 Costed Risk Register was not included in the previous report and therefore nothing has been drawn down since the last report.

<table>
<tr><td></td><td>Slippage:
44 months to the latest programme.
An additional 3 months of additional work to the feasibility report was needed to explore construction logistics to arrive at a more robust project programme, cost and risk assessment.
41 months delay is due to the project being put on hold after the officer responsible for the project left the department and allocation of a new internal resource.</td></tr>
<tr><td>2. Next steps and requested decisions</td><td>Next Gateway: Gateway 4: Detailed Options Appraisal
Next Steps:
Appointment of consultant team to develop designs, project costs, risks, programme.
Undertake Surveys to inform the design, mitigate the risk register, cost plan and project programme.
Develop designs to RIBA stage 3 with input from contractors to advise on buildability and logistics of construction.
Consult and seek advice from statutory authorities on approvals such as Listed Building Consent and Planning Approval.
Requested Decisions:
Approve recommend Option B
Approve budget of £303,000 to reach the next Gateway.
Note the revised project budget at £5.8m (excluding risk);
Note the Costed Risk Provision in the total sum of £2,600,000
Note the revised project timeline changes from GW 1-2</td></tr>
<tr><td>3. Resource requirements to reach next Gateway</td><td>Required for recommended Option B up to Gateway 4<table><tr><th>Item</th><th>Reason</th><th>Funds/ Source of Funding</th><th>Cost (£)</th></tr><tr><td>Consultant Fees:
Building Surveyor
MEP Engineer
Project Manager
Principle Designer</td><td>To develop design stages RIBA 2-3</td><td>Bridges Repairs, Maintenance and Major Works Fund</td><td>£164,500</td></tr></table></td></tr>
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	Structural Engineer/ Building Surveyor			
	Staff costs	For CoL project manager time	As above	£18,000
	Surveys	To inform the design and risk register	As above	£95,500
	Statutory Fees	For formal application advice and submissions	As above	£20,000
	CoL internal re-charge legal fees	To undertake any legal documents on behalf of the City	As above	£5,000
	Total			£303,000

Costed Risk Provision at this Gateway is £2,600,000 (Appendix 2)

4. Overview of project options	The existing consultant team was appointed to undertake a viability exercise based on the 5 options listed in the GW 1-2 report. These were discounted during early stages of the exercise. The reasoning for each option is outlined below at the end of this report. The feasibility produced 2 new viable options; **A.** HV & LV Switchgear and transformer replacement; segregate HV and LV services to comply with H&S legislation (via switch room on new mezzanine floor), replacement of HV cables; replace existing generator. **B.** Replace HV & LV switchgear and transformers; segregate HV & LV services (via switch room on new mezzanine floor); replacement of existing HV cables; remove existing generator; provide new secondary HV supply; provide generator plug in connection point
5. Recommendation	**Option B**.
6. Risk	**Option B** is considered to have the lowest risk of impacting on the Bridge's operations due to disruption form power shutdowns whilst achieving all requirements of the brief.

	No costed risk was provided at Gateway 1 / 2 and therefore nothing has been spent. Given the complexity of this project a Risk Workshop was held 16 September and a priced Risk Register developed. Further (Appendix 2) It should be further noted that this project has a high number of risks associated with to the complexities and dependencies involved in obtaining necessary permissions, the physical and logistical constraints of working on the Bridge and the impact which result from the risks, should they manifest.
7. Procurement approach	The team listed below will be appointed services to develop designs up to the next Gateway; GW4. The team comprises: • Project Manager • MEP engineer • Structures / Building Surveyor • QS • Principal Designer The appointments will be made via a Framework or compliant tender process. The consultant appointments will be in line with the City's Procurement Code. The procurement for the Main Contractor and contract route will be defined at GW4.

Appendices

Appendix 1	Project Coversheet
Appendix 2	Risk Register (for recommended option)

Contact

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Options Appraisal Matrix

Option Summary	**Option A**	**Option B**
1. Brief Description	HV & LV Switchgear and transformer replacement; segregate HV and LV services to comply with H&S legislation (via switch room on new mezzanine floor), replacement of HV cables; replace existing generator	Replace HV & LV switchgear and transformers; segregate HV & LV services (via switch room on new mezzanine floor); replacement of existing HV cables; remove existing generator; provide new secondary HV supply; provide generator plug in connection point.
2. Scope and Exclusions	• An inflated allowance for out of hours working, deliveries etc, off site welfare • This includes the construction of a new mezzanine floor and a new switchroom which would provide the logistical ability to install new services and disconnect old without affecting bridge lifts and operations. • This includes replacement of a generator. However, it is not possible to increase capacity to meet 100% demand of all commercial functions and bridge lefts at full speed. This would not increase resilience more than existing conditions allow for.	• This includes the construction of a new mezzanine floor and a new switchroom which would provide the logistical ability to install new services and disconnect old without affecting bridge lifts and operations. • This option will provide a new back up HV supply and the generator point as a secondary back up should both HV supplies fail. • This removes the generator altogether with only the provision of a plug-in point
3. Programme and key dates	Surveys & Procure Consultants: Oct-Dec 2019 Develop designs: Jan -May 2020 GW4: May 2020 Utility and planning applications: May- Aug 2020 Tender contractor: Sept-Nov 2020 GW5: Nov-Dec 2020 Start on site: Jan 2021 Complete: December 2021* *A completion date will be clarified once designs and a scope of works are defined in more detail.	Surveys & Procure Consultants: Oct-Dec 2019 Develop designs: Jan -May 2020 GW4: May 2020 Utility and planning applications: May- Aug 2020 Tender contractor: Sept-Nov 2020 GW5: Nov-Dec 2020 Start on site: Jan 2021 Complete: December 2021* *A completion date will be clarified once designs and a scope of works are defined in more detail.
4. Risk implications	**Low Risk.**	**Low Risk.**

	• Unlikely to impact on Bridge operations • Low Risk to obtain planning and LBC approval. • Low H&S risk for installation of works	• Unlikely to impact on Bridge operations • Low Risk to obtain planning and LBC approval. • Low H&S risk for installation of works
5. Stakeholders and consultees	**External stakeholders:** Transport for London, London Borough of Tower Hamlets, London Borough of Southwark, Historic England, Port of London Authority, UKPN, local businesses and residents **Internal Stakeholders:** Tower Bridge, Department of Built Environments, Chamberlain's department (Finance, Procurement, Insurance),	
6. Benefits of option	• This will reduce the risk of power failure due to poor condition / age of infrastructure. • This will meet H&S legislature (segregation of HV & LV) • This proposal will enable Bridge operations to continue as usual during the works.	• This meets all requirements of the brief; • This will reduce the risk of power failure due to poor condition / age of infrastructure. • This will meet H&S legislature (segregation of HV & LV) • The secondary supply will meet 100% of demand • Increases resilience to almost no risk of power failure as the chances of both HV supplies suffering a power outage is extremely unlikely. In the event that this occurs, a generator can be plugged in to provide power. • This proposal will enable Bridge operations to continue as usual during the works.
7. Disbenefits of option	• This will not increase resilience capacity of backup supply; a new generator cannot be upgraded to meet 100% of the demand due to space constraints. Therefore, the backup supply will power bridge lifts at half speed and essential functions only. • The closure of venue hire and exhibition rooms will have an impact on revenue	• The most expensive option of the two.

	• The cancellation of Bridge Lifts (due to ability to undertake these at half speed) will result in reputational damage.	
8. Total estimated cost	Estimated Construction cost (excluding risk): **£5.030m (including fees, surveys costs)** Anticipated lifetime cost to deliver this project are unknown at this point and will be developed during the next stages of the project.	Estimated Construction cost (excluding risk): **£5.830m (including fees, surveys costs)** Anticipated lifetime cost to deliver this project are unknown at this point and will be developed during the next stages of the project.
9. Funding strategy	Funding Source: Bridges Repairs, Maintenance and Major Works Fund. This will provide funding for the entire project	
10. Investment appraisal	None	None
11. Estimated capital value/return	None	None
12. Ongoing revenue implications	• This will allow the operations at Tower Bridge to function as usual during construction and therefore should not impact on income generation during the works • The replacement of circuit breakers is likely to increase maintenance costs for this element.	
13. Affordability	This scheme is fully funded from the Bridge House Estates Repairs Fund and is included in the forecast for the 50-year plan	
14. Legal implications	• Tower Bridge is a Grade 1 listed Structure. All works undertaken on the bridge will require listed building consent. Any changes to facades / structure and highways will require statutory approval • Periods of power down time during construction is unlikely but could affect the ability to complete bridge lifts as covered under the Corporation of London (Tower Bridge) Act 1885. • The land demised to substations under control of UKPN is often demised as Freehold. It may be necessary for the legal team to investigate/ agree and complete legal status of the land for a new substation as proposed in Option B.	
15. Corporate property implications	This proposal aligns with the Objectives of the Corporate Asset Management Strategy that: • Operational assets remain in good, safe and statutory compliant condition	This proposal aligns with the Objectives of the Corporate Asset Management Strategy that: • Operational assets remain in good, safe and statutory compliant condition

		• Operational assets are fit for purpose and meet service delivery needs • Capital and revenue projects are affordable, sustainable, prudent and directed to the highest corporate priorities • To seek to improve the efficiency and sustainability of operational assets in accordance with corporate objectives and statutory requirements (new)
16. Traffic implications	The works will likely involve at least a pavement closure on one or both sides of the road. A construction logistics plan will consider the delivery of materials and machinery required to carry out the works which may impact on vehicular and pedestrian traffic.	
17. Sustainability and energy implications	• New efficient transformers will deliver less energy losses and reduce the carbon footprint of the bridge • New electrical metering system will allow for deeper analysis of the carbon footprint and enable future carbon reductions to be identified and measured.	• New efficient transformers will deliver less energy losses and reduce the carbon footprint of the bridge • New electrical metering system will allow for deeper analysis of the carbon footprint and enable future carbon reductions to be identified and measured. • Improved air quality by the omission of a generator
18. IS implications	**N/A**	
19. Equality Impact Assessment	Access to operate and maintain electrical infrastructure is restricted by the constructed layout of the building. The Grade 1 listed status of this building prevents alterations to make disabled access possible. Therefore, all engineers and operatives will need to be able bodied persons to access this infrastructure once complete. This is not a change from existing circumstances.	
20. Data Protection Impact Assessment	**N/A**	
21. Recommendation	**Not Recommended**	**Recommended**

Discounted options (GW1-2)		**Reason;**
1	HV Switchgear replacement only	This would not achieve any of the brief requirements; • This will remain non-compliant with H&S legislative requirements

		• This will not reduce the risk of a power outage due to poor condition and age of the infrastructure and therefore, • This will not reduce the risk of failure of secondary and tertiary supplies in the This will not increase resilience capacity to meet 100% demands of bridge operations in the event of a power outage
2	HV Switchgear replacement, including segregating HV and LV services to comply with H&S legislation (via containment),	• This would result in long periods of power down time due to the construction logistics involved in doing this work. It would therefore impact on the operations of the Bridge, CoL reputation and income generation • This will not increase resilience capacity to meet 100% demands of bridge operations in the event of a power outage • This does not propose to replace existing cables and therefore will not reduce the risk of a power outage due to poor condition and age of the infrastructure and therefore, • This will not reduce the risk of failure of a backup supply in the event of power outages
3	HV Switchgear replacement, including segregating HV and LV services to comply with H&S legislation, (via containment). replace existing generator to increase the capacity of services that are protected.	• As above, and; • The space restrictions of cable routes and plant room mean that the LV supply and generator cannot be upgraded to provide additional capacity without building a new plant room and adding new large containment structures for the cables. Given the Grade 1 listed status of this structure, Listed building consent and Planning permission will not be granted.
4	HV switchgear replacement, including segregating HV and LV services, replace existing generator to increase the capacity of services that are protected. LV installations: provide both North and South Towers with a separate LV electric supply complimented by a generator back up. Install new main LV switch panel which will service new sub mains panels located in both Towers of the bridge. These panels will service the existing electrical services.	• As above, and; • Upgrading both HV and LV in one project would expose the Bridge to disruption to operations as the HV would have to be sequenced before the LV, resulting in a long programme. Certainty of the scope of works to upgrade the LV infrastructure would be dependent and be determined by the undertaking of the HV works • Therefore, these works are proposed as a separate project to be undertaken after the completion of this one recommended for approval.

	Install a new cable link between North and South Towers to allow essential services to be maintained from the opposite side of the bridge in the event of a total failure of either North and South supplies.	
5	Disconnect / remove HV services and transfer to new LV installations and replace the existing generator to increase capacity of services that are protected.	• The space restrictions of cable routes and plant room mean that the generator, acting as a backup supply, cannot be upgraded to provide additional capacity without building a new plant room and adding new large containment structures for the cables. Given the Grade 1 listed status of this structure, Listed building consent and Planning permission will not be granted.