

Gate two query process

Strategic solution(s)	Severn to Thames Transfer
Query number	STT009
Date sent to company	24/01/2023
Response due by	To be confirmed

Query

Please can you provide:

- a discussion on the range and impact of uncertainties and a plan to mitigate them
- a discussion on how a focus on carbon has helped to mitigate the solution costs.

Solution owner response

a) Discussion on the range and impact of uncertainties and a plan to mitigate them.

Gate 2 of the RAPID gated process provided an opportunity to further develop the conceptual designs for the Severn to Thames Transfer (STT) and provides a mechanism for reducing risk and uncertainty. These uncertainties are discussed in the Gate 2 Annex A3.2 Carbon Strategy Report, whose purpose is to provide an analysis of the whole life carbon (WLC) emissions for the STT scheme. There is inherent uncertainty in carbon estimating due to the developing maturity of carbon accounting practices and associated data. There is also additional uncertainty driven by scope uncertainty associated with level of design information available at given stages within the project lifecycle.

There is currently no standardised or established guidance to assess uncertainty in carbon estimates in a consistent way and directly applying the range of uncertainty

associated with cost estimates and optimism bias would likely overstate the level of uncertainty associated with the Gate 2 carbon estimate. The STT work has been conducted in parallel with guidance from the All Company Working Group (ACWG), which ensures that water companies with SROs are using a consistent approach where possible¹. It is noted however that the embedded carbon assessment will be further enhanced in Gate 3 following the updated ACWG guidance of 8th August 22 (this update came late in Gate 2 and may not have been fully implemented across all SRO's as discussed at the QLM on 1st December 2022).

Further ongoing work is required at a carbon estimating and accounting discipline level and within the infrastructure sector to establish a more formalised approach to assessing carbon uncertainty. Whilst no formal uncertainty range has been presented at this stage it is estimated an uncertainty range of +/-30% would be suitable for the gate two estimate based on expert judgement.

This uncertainty range would account for:

- Uncertainty in carbon factors related to the quality and representativeness of industry level emissions factors to the specific activities undertaken and materials used on the scheme.
- Scope uncertainty associated with ensuring the carbon estimate has captured all scope requirements to fully deliver the scheme.

Chapter 6 of the Gate 2 main report and Annex A3.2 highlight the carbon associated with the different options, and the efforts made to reduce associated capital and operational carbon at each stage. The reports' mitigation approach aims to prioritise efforts in the areas where there are the greatest opportunities for reductions and feasibility of successful decarbonisation interventions. It outlines what these opportunities may be while identifying sources of risk throughout the project's lifespan. This high-level analysis can be found in the Annex A3.2 Carbon Strategy Report, Section 5 Carbon Mitigation Approaches. Following review, these opportunities are summarised and ranked according to their potential impact on emissions reductions and alignment with the emissions hierarchy in order to reflect the recommendations of PAS 2080 and the Water UK Net Zero 2030 Route map (Table 2).

The Gate 2 Annex A3.2 provides a guide for the next stages of embedding low carbon initiatives into the STT scheme. The project approach going forward will

¹ <https://www.wrse.org.uk/media/muvl5thv/acwg-low-capital-carbon-alternatives.pdf>

encourage continuous improvement with established management systems, leadership, and processes in order to minimise uncertainties and hence increase the potential for success.

The uncertainties associated with carbon reporting of the Gate 2 SRO have been minimised by implementing the following measures:

- **Standardised methods:** Using standardised and widely accepted methods, such as Inventory for Carbon and Energy (ICE), and the Civil and Engineering Standard Method of Measurement (CESMM4) Carbon and Price Book, for estimating emissions and costs has helped to reduce methodological uncertainties.
- **Comprehensive data collection:** Gathering comprehensive and accurate data from all relevant sources, has helped to reduce data uncertainties. These sources from the design team detailed “before use” and “after use” boundaries to breakdown the materials used at each stage in the project.
- **Expert review:** Engaging internal experts in the field of carbon assessment has provided additional insight and helped to identify and address uncertainties. Our expert knowledge in large scale infrastructure projects, helped reduce errors, increase sector knowledge, and promote tailored carbon mitigation options such as renewable energy.
- **Regular updates:** Putting the SRO through multiple gates allows increased granularity of the carbon assessment as new data becomes available and as the project progresses it has helped to reduce uncertainties and improve the accuracy of the results.
- **Mitigation measures:** In addition to the measures detailed above, internal thorough reviewing process ensures that the options have been calculated appropriately, such as data checks, comparisons with similar projects, and using up to date methodologies and data sources.

As we further develop the concept design in Gate 3 of the STT SRO, we will refine our carbon calculations and continue to seek carbon reduction opportunities.

b) Discussion on how a focus on carbon has helped to mitigate the solution costs.

The carbon assessments methodology for the STT SRO have followed PAS 2080 principles in its carbon management approach through the emission reduction hierarchy: build nothing, building less, build clever, build efficiently.

The Gate 2 focus on carbon supported the mitigation of the cost of the proposed solution in several areas including infrastructure sizing, operations optimisation and options assessment. These are detailed in the Gate 2 (Chapter 6) report and Annexes (A1.3 ‘Interconnector Options Appraisal Summary Report’ and A1.1

‘Interconnector Deerhurst to Culham pipeline conceptual design report’), with the principal areas summarised below.

Infrastructure sizing

The most significant carbon hotspot on the interconnector is the pipeline due to the pipeline material (cement lined steel). The size of the pipeline was optimised in the Gate 2 design and resulted in a smaller pipe diameter and therefore lower carbon footprint and cost. Opportunities have also been identified for Gate 3 to reduce carbon through material selection choices and supply chain engagement.

Operations Optimisation

The energy and chemical consumption of the treatment and transfer has been optimised particularly around the sweetening flow. The volume required for sweetening has been reduced in Gate 2 thereby reducing carbon related to energy and chemical consumption. The optimisation of operations also reduces the running costs due to the increase in efficiency and decreased need for electricity and chemicals.

Opportunities have also been highlighted for Gate 3 around Nature Based Solutions for the Interconnector treatment works, hydro-power energy generation for both bypass and interconnector, and optimisation of the power supply provision.

Options assessment

Options assessment of different pipeline routes and of the pipeline options, including canal based options, were carried out in Gate 2 and Carbon was one of the factors used in the decision making process. All pipeline routes that minimised length and optimised the pumping head/ gravity flow balance provide lower carbon emissions.

The minimisation of excavation, disposal, and imported materials quantities of any proposal were considered beneficial due to their associated carbon impact. Opportunities have again been highlighted for Gate 3 to minimise excavation and disposal and minimise the need for imported materials.

Other opportunities

There are other areas where opportunities exist but which also need to be balanced against broader environmental considerations. For example:

- Increased direct discharges into the river Vyrnwy will reduce sizing of the bypass pipeline and therefore reduce carbon. However, direct release volumes into the River Vyrnwy were reduced in Gate 2 from 75Ml/d to 25Ml/d resulting in a larger capacity and longer bypass pipeline with an associated increased capital carbon. At Gate 3 we will explore if there are opportunities to refine the direct release

- opportunity (i.e. somewhere between 25Ml/d and 75M/d) or whether the 25Ml/d is optimal.
- Levels of treatment for Minworth and Netheridge STW's are significant with advanced 'polishing' processes that are likely worst-case scenarios. In particular, the requirement to add more advanced treatment at Minworth to allow the water to be discharged into the receiving water courses, compared to its current discharge into the River Tame, is responsible for significant construction and operational carbon. At Gate 3, with conjunction with the Severn Trent Sources SRO, we will explore further the impacts on river water quality and if this provides opportunities to refine the process requirements, reducing both capital and operation carbon on those associated SRO's.

In summary, we have actively sought to mitigate carbon impacts in Gate 2 and identify opportunities for further cost and carbon reduction in future phases of the project, by changing the size and routes, operation, and by minimizing excavation, disposal, imported materials. Overall, the focus on carbon was a key factor in determining the cost-effective solution for the project.

Date of response to RAPID	7 th February 2023
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