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Author:	Charlotte Higgins (charlotte.higgins@tnei.co.uk) Gordon McFadzean (gordon.mcfadzean@tnei.co.uk) Jason McGray (jason.mcgray@tnei.co.uk) James Hollender (james.hollender@tnei.co.uk)
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TNEI Services Ltd		
Bainbridge House	Milburn House	Queens House
86 – 90 London Road	Dean Street	19 St Vincent Place
Manchester	**Newcastle Upon Tyne**	**Glasgow**
M1 2PW	NE1 1LE	G1 2DT
Tel: +44 (0) 161 233 4800	Tel: +44 (0) 191 211 1400	United Kingdom
Fax: +44 (0) 161 233 4801	Fax: +44 (0) 191 211 1432	Tel : 0141 428 3180

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Executive Summary

Ofgem is exploring the introduction of competitive tendering to onshore transmission through its Extending Competition in Transmission (ECIT) project. Under the proposed regime, Competitively Appointed Transmission Owners (CATOs) would be appointed through a competitive tender process. Ofgem has commissioned TNEI Services Ltd ("TNEI") and Pöyry Management Consulting Ltd ("Pöyry") to investigate what information would need to be included in the tender specification for the 'late CATO build' model. This has included consideration of the consultation responses on "Extending competition in electricity transmission: arrangements to introduce onshore tenders" and some detailed stakeholder engagement with a range of participants across the electricity transmission industry.

Objectives

The objectives of this study are to assess:

- What bidders will need in the tender specification and the data room to be able to produce fully costed, robust bids to construct, finance and operate the transmission assets;
- How the contents of the tender specification and the data room would affect the preliminary works outputs.

Methodology

Our methodology is based on evaluation of key factors that could influence the tender specification and tendering process, as well as overall project cost efficiencies including:

- Timing of development works e.g. works completed prior to consent application;
- Complexity of development works and qualitative assessment of potential impact on project risk costs if development works outputs are not available during the tendering process; and
- Quantification of the risk associated with development works outputs, mitigations and efficient allocation risk between the parties.

Risk Characterisation, Quantification and Management

Key risks relating to availability of data/information in the tender specification were identified through analysis of development works including those which are not generally required for the consent application or EIA and could therefore be completed by either the incumbent TO/SO or the CATO. A qualitative assessment was then undertaken of the potential impact on project risk costs.

Key project risks that have been identified through this analysis and through industry stakeholder engagement include: consenting flexibility, transfer of land access and consents, geotechnical data (onshore and offshore), flood risk data, archaeology data, and outage planning.

Our stakeholder engagement has also indicated that, in general, potential CATOs would prefer to have some opportunity for innovation and flexibility in design, tending towards a more 'functional' rather than a 'detailed' specification. Our view is that, to facilitate this, the consent application submitted by incumbent TOs/SO would need to incorporate some flexibility e.g. limits of deviation and route corridors. Potential CATOs also told us that they would prefer to have a clear view on the potential constraints and limitations which could impact upon their design, with access to as much information as possible within the tendering process to enable an acceptable level of risk management. It should be noted however that individual CATOs seem to have varying levels of appetite for risk.

We expect that projects coming forward will predominantly be using HVAC technology, for which there is limited supply chain risk. However, potential CATOs and the incumbent TOs/SO highlighted early supply chain engagement during the preliminary design stage as an important consideration for HVDC projects, especially where there are limited suppliers for a particular solution. Potential CATOs also stated a general preference for the HVDC supplier not being contracted prior to tendering. We agree that early engagement by the incumbent TO/SO with the HVDC supply chain during preliminary design should help to guide technical specifications and appropriate consent envelopes, and to mitigate risks to timescales for HVDC design and manufacture whilst still enabling the CATO to incorporate some design innovation.

For HVAC equipment, which is generally more standardised with a wider supply chain, there was felt not to be a significant need for early engagement with suppliers during the preliminary design stage.

Each key risk identified was quantified in terms of probability, severity and given an overall risk rating. The ability/appetite and efficiency of the CATO or the incumbent TO/SO to manage the risk was then assessed in order to provide a view on the most efficient allocation of risk.

Recommendations on Tender Specification Contents

The risk analysis directly informed the development of the proposed late CATO tender specifications. The findings from this analysis indicate that the following data/information should be included in the tender specification:

- **Land Access**: Information on land agreements and land ownership profiles;
- **Consenting:** A summary of consents (in place and progress) as well as final/draft conditions and requirements of consent;
- **Design:** Information on concept design and preliminary design (functional specification, single line diagram, route corridor study report, initial drawings/designs). Design choices within the consent should be supported through reliable and robust preliminary works outputs with details provided on third party interfaces;
- **Geotechnical:** A detailed Ground Investigation Report to reduce ground risk, also any areas of high risk of archaeological impacts and a Flood Risk Assessment;
- **Logistics:** Initial access studies and sufficiently detailed feasibility of highway access to progress modification designs and access arrangements;
- **Outages:** Reliable outage plans and details of TO/SO interfaces and DNO crossings;

- **Subsea (where applicable):** Detailed subsea bathymetric information should be included in the tender specification, including topographies and ground conditions. For installation vessels, consented designs should be as flexible as possible to keep options for procurement open;
- **Supply Chain:** Although in general, these should be avoided where possible, if any potentially limiting design choices have been made, supporting information should be provided and details of any early procurement;
- **Warranties:** Details of transfer of warranties for preliminary works.

Based on our analysis summarised above, our recommendation is that the late CATO tender specification should be based on development works that would be carried out as part of preliminary design and to inform front-end engineering design (FEED) and the detailed design.

However, the late CATO tender specifications will likely require a level of survey and study work beyond that which would typically be undertaken in order to complete an Environmental Impact Assessment (EIA) and planning consent application. In deciding upon the level of detail in the information/data provided, there is a balance to be struck between;

- Ensuring sufficient information to enable the CATO to 'de-risk' tendered project costs (even though some further survey/study rework *may* be required once the successful CATO progresses the design further) and;
- Minimising potentially costly survey/study re-work (detailed survey/study work would anyway be carried out by the successful CATO following tender award)

The appropriate level of detail to minimise risks was considered in the development of a baseline tender specification as part of this study. We recommend that this baseline specification is reviewed and evaluated following the first few late CATO tendering processes once industry has more experience of the process. Improvements can then be applied.

Impact on Preliminary Works Outputs

The proposed tender specification is broadly consistent with the concept design and preliminary design development works that are typically completed in the first 1 to 2 years of large-scale transmission project development. This aligns with our proposed anticipated tendering timeline for late CATO build. This would mean that the incumbent TO would not need to significantly advance any existing development activities in order to provide the tender specifications as recommended.

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1 Introduction

1.1 Background

Ofgem, through its Extending Competition in Transmission (ECIT) project, is exploring the introduction of competitive tendering to onshore transmission. This would be done with CATOs (Competitively Appointed Transmission Owners).

Ofgem set out its initial thinking on the implementation of onshore transmission competition in its October 2015 consultation[1]. In this consultation, Ofgem explored two models - the 'late CATO build' model and the 'early CATO build' model. The late CATO build model would see the competitive tender process taking place alongside the consenting process, whereas under the 'early CATO build' model the CATO would carry out all consenting activities. The key differences between the models are highlighted in Figure 1-1. This shows that under the late CATO build model the detailed design of assets would be the responsibility of the CATO, but that the initial solution design, surveys/studies, and the obtaining of consents would be completed by the Transmission Owner (TO) or the System Operator (SO).

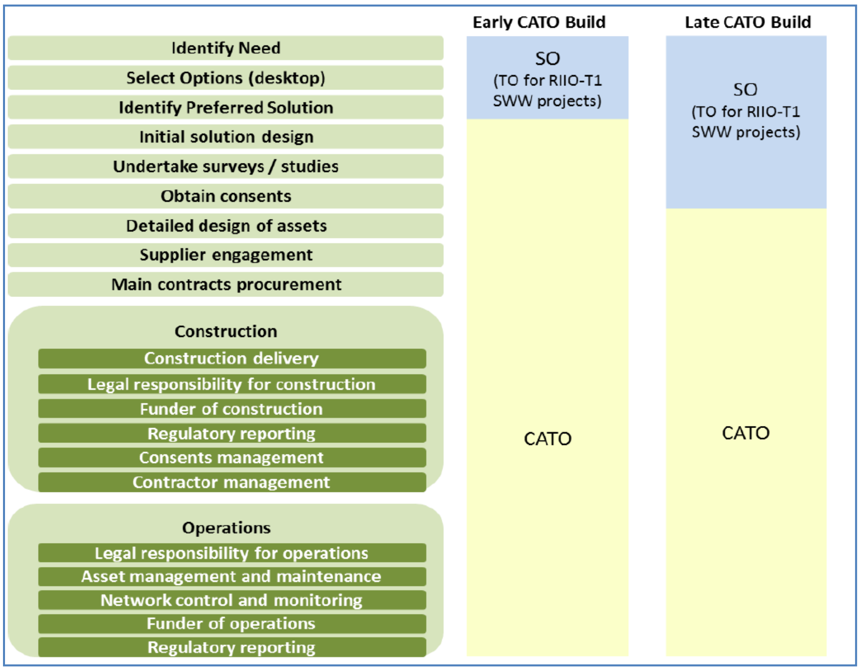


Figure 1-1: Responsibilities of the CATO under 'late' and 'early' tender models[1]

In its consultation, Ofgem has set out, at a high level, its expectations on the data which would inform the tender specification under the late CATO build model:

- General system requirements including, for example, any required boundary transfer capacity;

[1] Extending competition in electricity transmission: arrangements to introduce onshore tenders, Ofgem, October 2015, Available from: https://www.ofgem.gov.uk/sites/default/files/docs/2015/10/ecit_consultation_v6_final_for_publication_0.pdf

- Any relevant connection agreements, for example between the SO and generation or demand customers. This would include the capacity required for new or existing connections, as well as the location of connection points and interfaces;
- The design requirements in the planning consent application. Specifically the details of route corridors and planning envelopes, including any requirements from the environmental statement; and
- Other preliminary works, including early design works and surveys or system studies.

1.2 Objective

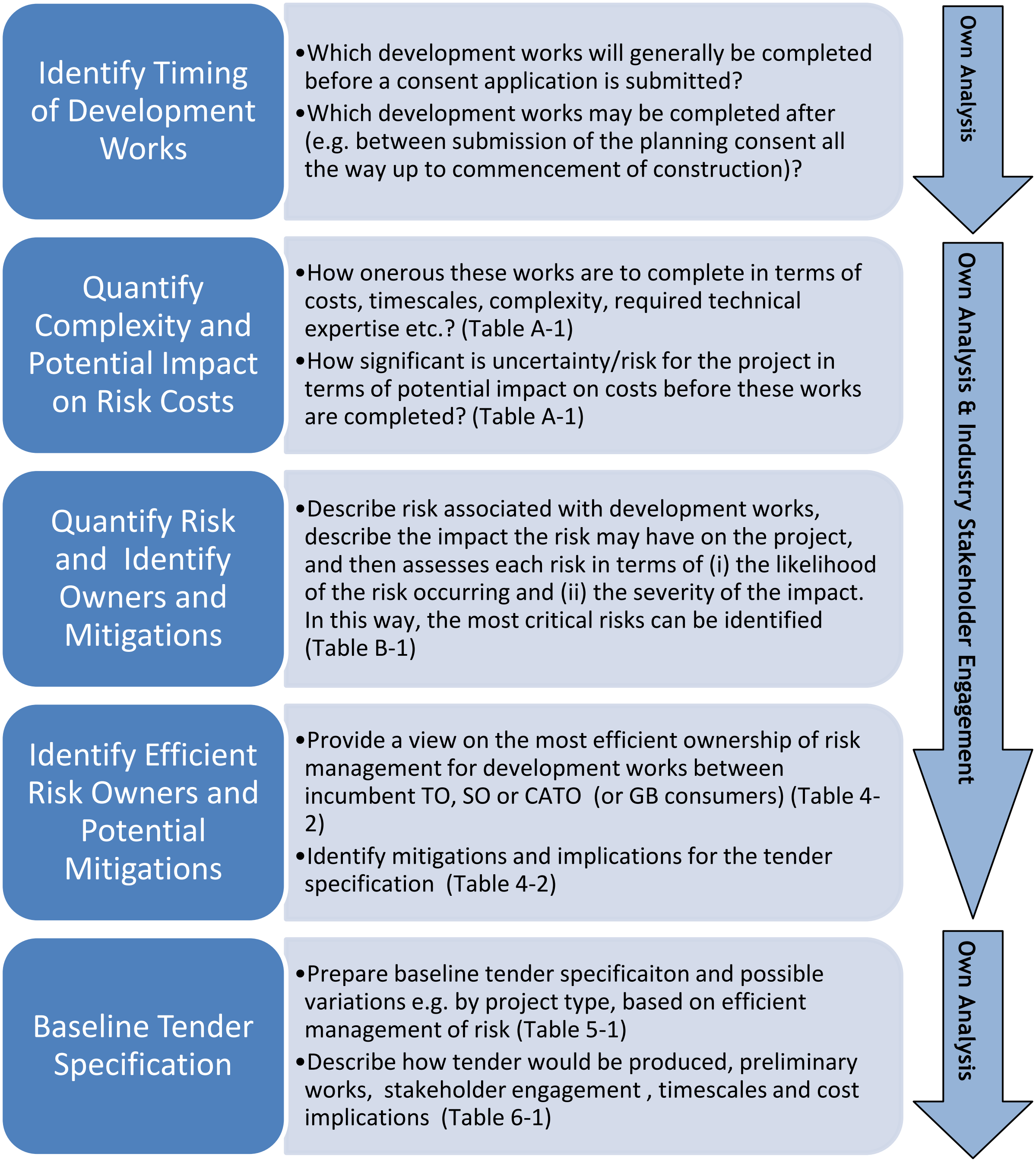
Ofgem has commissioned TNEI Services Ltd ("TNEI") and Pöyry Management Consulting Ltd ("Pöyry") to explore further what information would need to be included in the tender specification in the 'late CATO build' model.

In particular, the work considers:

1. What the bidders will need in the tender specification and the data room to be able to produce fully costed, robust bids to construct, finance and operate the transmission assets, including:
   - the different areas that should be covered and the level of detail within each area;
   - the extent to which the TOs/SO will need to engage with the supply chain to develop a tender specification;
   - the importance of different areas to CATO costs, i.e. what will have a high impact on CATO costs and what will have less of an impact;
   - the point in the project development process that the bidders will have access to the tender specification and the impact this may have on the detail provided in the tender specification;
   - whether the tender specification should be output or outcomes based. This may, for example, be determined by the specificity of the planning permissions or consents applications;
   - any differences that might arise due to the location of the project, i.e. in Scotland or England and Wales;
   - any differences that might arise for a non-electrically contiguous project.
2. How the contents of the tender specification and the data room would affect the preliminary works outputs.

1.3 Methodology

The methodology which has been followed to produce this report is set out below.



The outputs of those development works which will have been completed prior to submission of the planning application are assumed to form part of the tender specification and accompanying data room.

1.4 Report Structure

The rest of this report is structured as follows:

- Section 2 provides an overview of the development works required for large scale electrical infrastructure. The interactions with the consenting process are described, and the works which may be undertaken after submission of a consent application are described in detail;

- Section 3 describes the input from industry, both through the responses to Ofgem's consultation and TNEI and Pöyry's stakeholder engagement exercise;
- Section 4 describes TNEI and Pöyry's assessment of risks associated with development work outputs and efficient management of that risk;
- Section 5 describes the proposed form and contents of the tender specification;
- Section 6 discusses the preparation of the tender specification including interaction with preliminary works.

2 Development Works

Project development works are the full suite of activities and studies which need to be completed to apply for consent and before construction of the transmission infrastructure commences. This section describes the development works that typically need to be completed in order to begin construction of a project.

2.1 Consenting Regime Overview

2.1.1.1 Scotland

For land use planning, developments of this nature will fall under the category of National Developments. These are designated under the National Planning Framework for Scotland 2. Inclusion in NPF2 means that the need for development cannot be questioned.

This type of project constitutes development under S26 of Town and Country Planning (Scotland) Act 1997. S57(2) of that act enables Scottish Ministers, where consent has been granted under S37 of the Electricity Act, to deem that planning permission has been granted.

2.1.1.2 England

Planning Act 2008 introduced a new consent process for Nationally Significant Infrastructure Programmes (NSIPs). Amended by the Localism Act 2011 which abolished the Infrastructure Planning Commission so that the National Infrastructure Directorate of the Planning Inspectorate makes recommendations in line with the national policy statement to the relevant Secretary of State (SoS). Consent is via a Development Consent Order (DCO) and obtained through a prescribed application process.

2.1.1.3 Wales

Major electricity lines are consented under the NSIP process because responsibility for these had previously been reserved by the UK Government.

2.2 Pre-Consent Works

These works are typically undertaken prior to submission of consents and are required for the Environmental Impact Assessment (EIA) and the consent application. These are summarised below:

- Concept Design
- Preliminary Design that informs the EIA and planning application
- Subset of electrical system studies based on preliminary design
- Desk based geotechnical studies/surveys
- Detailed ecological studies/surveys
- Desk based archaeological and hydrological studies/surveys

- Initial engagement with landowners for access

We would expect that outputs of all of these works would be available when the late CATO tender specification is published.

Sequential design activities are described below.

2.3 Design

For most large-scale transmission projects, design activities generally progress from Concept Design, Preliminary Design and FEED through to Detailed Design.

Concept Design activities will be undertaken early in a project in order to, for example, inform other surveys/studies and to support initial cost assessments and engagement with suppliers. This will include a conceptual single line diagram, a functional specification, and some other supporting information. In parallel with the concept design, optioneering reports and route corridor assessments are undertaken.

Preliminary Design of some elements will be required in order to inform the Environmental Statement and Planning Application. This may consist of design drawings and siting/layout drawings for major components, as well as high-level plans for construction techniques and management of logistics. At this stage, designs for many major components are relatively standardised and will be available ‘off-the-shelf’. For example, there are suites of steel lattice tower designs which have been in use for decades by transmission network owners. Although it is recognised that where appropriate, these may be replaced in the future by the new T-Pylon design. There can be exceptions to these standard designs for complex projects.

Front End Engineering Design (FEED) is currently carried out by contractors bidding for work with incumbent TOs and includes drawing and specification of all major components and layouts. In the late CATO regime, FEED design may be completed or progressed by the CATO (either internally or contracted) during the tender process. It is our view that this will best enable CATOs to introduce design innovations such as an innovative substation design or novel construction techniques, and to develop robust bids.

Designs and costs for many transmission components are well understood. A notable exception is high capacity HVDC converter stations which are somewhat more complex. As long as the tender specification is suitably detailed and accurate, our view is that FEED for CATOs should be relatively straightforward for many projects although it will vary depending on the individual project risk profile. The CATO will require reliable information about any potentially constraining factors in order to quantify risk as accurately as possible and develop mitigation strategies (e.g. geotechnical, consenting) – this will be explored throughout the remainder of this report.

Detailed Design for large infrastructure projects will involve production of finalised component designs and layout drawings. These will be informed by the functional specification, the FEED, the limitations in the Environmental Statement and the findings of more detailed survey work (particularly geotechnical surveys).

In order to finalise the detailed design, plans for logistics and construction techniques need to be formalized. These will have been set out at a high-level in earlier stages. Closer engagement with the supply chain may be required at this stage, and there may be scope for innovation in construction and management techniques driven by EPCs.

2.3.1 Design Programme

An illustrative timeline of design and consenting activities is shown in Figure 2-1 for a large-scale HVAC transmission project under the existing incumbent TO build. A number of assets would be designed interdependently so the process is not completely sequential with some design and construction activities carried out in parallel. The typical timing of consent application is shown as approximately 18 months however the consent award is indicative and would very much depend on the individual project. It is noted that some of the RIIO-T1 projects that could be tendered under a late CATO regime (Strategic Wider Works projects) may already be fairly well progressed in terms of development works and have achieved planning consent.

Please note that this is a stylised process and does not take into account any regulatory approvals that may be required.

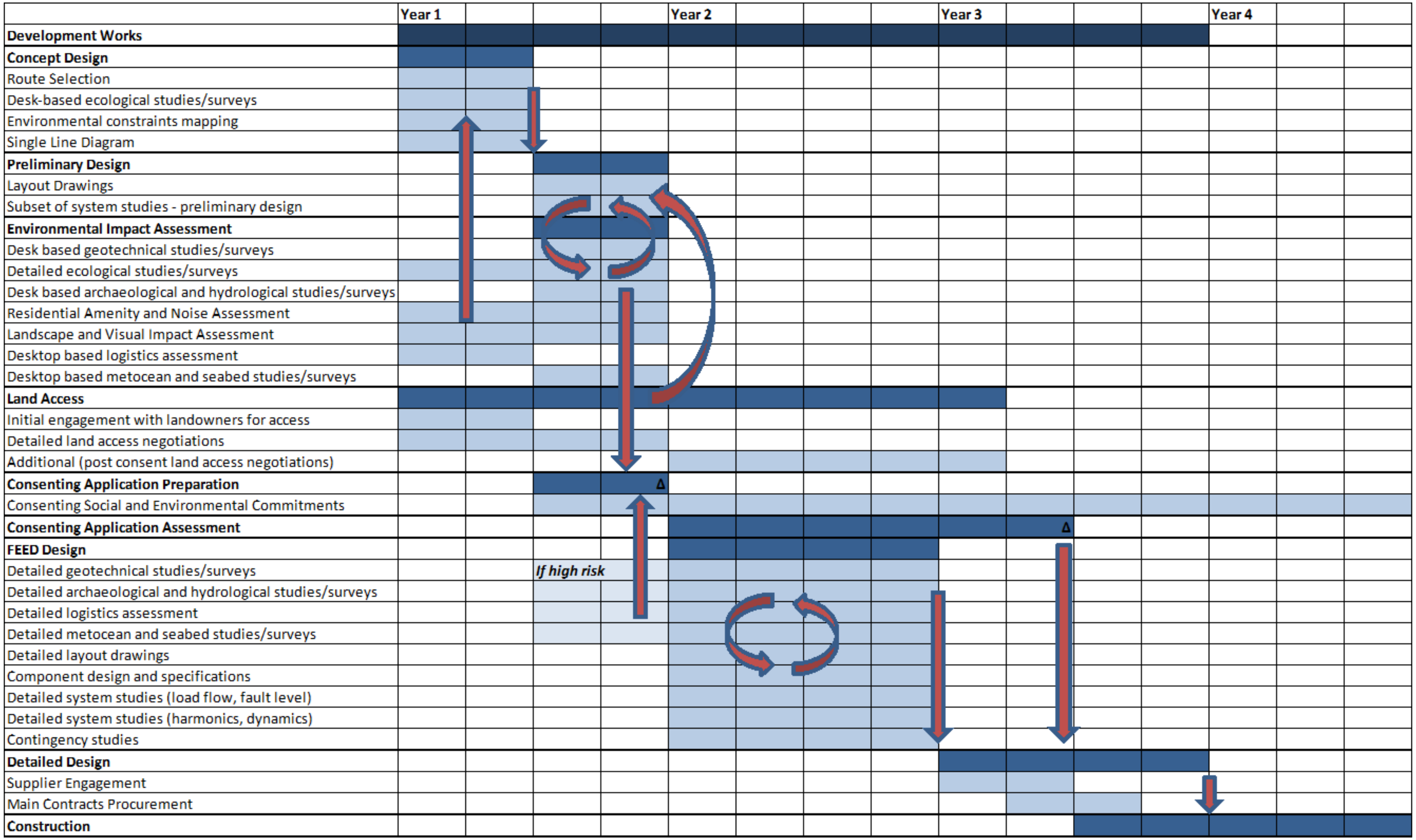


Figure 2-1 Illustrative Timeline of Design Activities (Δ indicates milestone, arrows represent the flow of information)

2.4 Surveys/Studies

A broad range of surveys and studies are required to complete the design of, and gain consents for, transmission projects. These will inform the design and allow assessment of environmental impacts. This covers everything from protected species surveys to detailed system studies which assess the interactions between the new project and the wider electrical network.

Various levels of survey are described and it is indicated where they are typically undertaken ahead of the completion of the Environmental Impact Assessment (EIA) and obtaining the necessary consents and where more detailed, surveys and assessments are typically undertaken following consent and prior to, or during, construction. This is also presented diagrammatically in Figure 2-1.

2.4.1.1 Ecological

Desk-based studies and constraints mapping would inform initial route selection and options appraisal. Habitat and protected species surveys would then be undertaken as part of the Environmental Impact Assessment. Much of the ecological survey effort is seasonally dependent and so there is a need to coordinate this within programmes. Due to the levels of protection in place, protected species surveys must be carried out as part of the EIA and prior to submission of the consent application(s).

Survey findings would allow impacts to be minimised and the risks associated with requirements for post consent checking surveys, monitoring, licensing requirements and mitigation measures to be understood by prospective CATOs.

2.4.1.2 Noise Assessment

Assessment will identify sensitive receptors within the vicinity of the route corridor. Background noise monitoring will establish the baseline noise environment and industry standard software will provide predictions of sound power levels at the receptors. The assessment will feed into the iterative design process. This is typically carried out during preliminary design and for the EIA at present.

2.4.1.3 Residential Amenity

An assessment of the impacts on residential amenity will be undertaken considering noise, visual amenity, traffic and electromagnetic interference. This is typically carried out during preliminary design and for the EIA at present.

2.4.1.4 Landscape and Visual Impact Assessment

An assessment will be undertaken of the impact of the proposed development on landscape fabric and character. This will take into account the baseline landscape character and its sensitivity to development.

An assessment will also be carried out considering the likely impacts in visual amenity taking into account the likely receptors, their sensitivity and the magnitude of change to the view.

This is typically carried out during preliminary design and for the EIA at present.

2.4.1.5 *Geotechnical*

Ground conditions are a key risk with potential implications for route selection, siting of infrastructure, civil engineering and electrical design and construction methodology.

Varying levels of investigation may be undertaken for the EIA depending on the results of initial desk based assessment. Intrusive works such as trial trenching and borehole surveys require access to land and a reasonably well defined design to target locations of high risk requiring detailed assessment. Sampling along a route can provide an indication of ground conditions ahead of doing detailed investigations at all required locations.

2.4.1.6 *Hydrological*

Assessment of flood risk can be undertaken at a high level using publically available flood risk mapping and data. Flood Risk Assessment will be undertaken within the EIA process and it is likely that preliminary designs will take flood risk into account.

More detailed survey and assessment would be required to input into detailed design including where detailed Sustainable Drainage Systems (SuDS) design was required.

2.4.1.7 *Archaeological*

At the most basic level, desk-based assessment can consider archaeological potential including review of historic environment records and map data. Aerial survey and LIDAR[2] can be used to provide a higher degree of certainty.

Geophysical walkover surveys can increase the understanding by identifying magnetic anomalies. These require access to land as do intrusive (e.g. geotechnical) surveys which provide more definitive evidence of archaeological interest within the development footprint.

A detailed survey of identified areas of high risk is typically carried out during preliminary design and for the EIA at present.

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[2] LIDAR systems fire rapid pulses of laser light at a surface and measure the time taken for them to return. Archaeological interest can be identified using airborne LIDAR systems that can reveal micro-topography otherwise hidden by tree canopies and vegetation.

2.4.1.8 *Logistics*

Desk-based assessment can consider impacts on the highway network and its users based on predicted trip generation numbers and available highways data. Additional data may require collection through traffic counts. These would be undertaken along the public highway and so are not subject to access to land agreements. Changes to design and construction methods, for example following detailed geo-technical surveys, are likely to affect trip generation numbers so that impacts need to be re-assessed.

Preliminary designs will require access assessment considering physical restrictions along a route. It is likely that these would include high level consultation on required agreements with highways authorities.

Topographical surveys would be required at pinch points or where detailed design of any highways modifications was required.

2.4.1.9 *Metocean (where applicable)*

Metocean data consists of wave height and current data presented in a probabilistic manner. This can be prepared from regional satellite data and numerical modelling as well as on-site measurements and informs cable routing design and installation methodology.

2.4.1.10 *Seabed (where applicable)*

For subsea cable routing and burial, it is important to understand the seabed geology and to avoid any natural or manmade obstacles. Typically, this focuses on the top ten metres.

Required seabed information includes:

- Variation of seabed surface (bathymetry);
- Variation of seabed layers vertically and horizontally (stratigraphy);
- Layer material types and characteristics e.g. strength, thermal capacity;

Seabed data is collected through geotechnical surveys undertaken in discrete locations through drilling, pushing or digging the seabed, and geophysical surveys undertaken through continuous scanning of the seabed from above. Geophysical surveys can cover the entire cable route and corridor whereas geotechnical surveys are limited to specific locations.

2.4.1.11 *Electrical*

A full suite of system studies will be required in order to plan and design a large transmission project, including load flow studies, short circuit studies etc. Under a late CATO model, the majority of these studies may be completed by the incumbent TO or the SO during preliminary design, with results available in the data room. Some detailed studies which may not be undertaken by the incumbent TO/SO during preliminary design (but during FEED) such as dynamic and transient studies and harmonics studies could be completed by the CATO in order to drive innovation. Contingency studies would support the production of the TO/SO outage programme.

2.4.2 Access to Land

Licence holders currently have rights of access to undertake survey work under Section 53 of the 2008 Planning Act in England or under Schedule 4 in the Electricity Act.

Understanding the position in relation to being able to obtain access to land is extremely important. Information on the progress of agreements will need to be collated and reviewed to allow risks to be identified.

2.5 Interaction between Consenting, Design and Surveys/Studies

Consenting requires a level of detail in design that allows a robust assessment of the likely environmental effects. However, the consenting regimes accommodate a level of flexibility so that minor, non-material changes can be made within the confines of a consented design envelope. This is typically achieved through the ability to micro-site infrastructure[3] within agreed Limits of Deviation (LoDs) and to have consents based on maximum dimensions such as tower heights.

EIA involves an iterative design process where assessment findings feed into the design in parallel with technical studies and requirements to arrive at a solution where environmental impacts have been mitigated as far as possible within all other constraints.

Sufficient survey effort is required to provide a detailed baseline against which a thorough and detailed EIA can be undertaken. There is typically a variation in the level of survey effort required to gain consent and that needed to inform final detailed design and the construction process. There is also an interaction with technical design where more detailed studies require final detailed design that is, often purposely, not available pre-consent. For example final substation design would allow detailed assessment of noise emissions and impacts on nearby sensitive receptors.

2.6 Works Undertaken After Consent Application

Those development works which need to be completed prior to submission of a planning application will be completed by the TO/SO and will therefore be included in the tender specification/data room (see Section 2.1.2 and Figure 2-1). Therefore any of the development works which are not required for the consent application or EIA included in FEED and detailed design could either be completed by the TO/SO, with results included in the tender specification/data room, or

[3] Micro-siting involves relocating elements of infrastructure short distances within agreed limits to accommodate previously unrecognised constraints to development such as unknown archaeological interest or localised ground conditions.

could be completed by the CATOs. The outputs of these development works and the risks and issues associated with them are summarised in Annex A, Table A-1 and then analysed in more detail in Section 4 to identify key risks and party that can most efficiently manage each risk.

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3 Input from Industry

This section summarises industry input on the form and content of the tender specification. This input has been provided from two principal sources:

1. Responses to Ofgem's consultation[14];
2. A targeted stakeholder consultation, carried out by TNEI and Pöyry.

Key areas of exploration included the level of detail that a potential CATO would want to see in a late CATO tender specification (to maximise their scope for innovation) and exploration of risks and ownership of risk associated with various data and information. Specifically for the targeted stakeholder consultation, the timing of data availability was discussed and any dependencies on the consent application process. Interfacing with incumbent TOs/ SO and the supply chain was also a discussion area.

Review and analysis of industry input has informed the development of tender specification and data room requirements that will enable CATOs to provide a reasonably costed and de-risked bid, and also how it will affect the incumbent TO/SO preliminary works outputs.

Both responses to Ofgem's consultation and targeted stakeholder consultations are presented here without TNEI/Pöyry views or commentary.

3.1 Consultation Responses

Consultation responses have been summarised in tables in this section. Responses are separated out into those provided by all respondents (including EPCs, OFTOs, TOs, SO, financiers and financial advisors) and those specifically provided by and relevant to incumbent TOs and the SO.

Please note that these do not represent the views of the authors of this study, also in some cases views are contradictory between respondents.

3.1.1 Overview of Responses

Table 3-1: Summary of Relevant Responses

Topic	Comment

[4] Extending competition in electricity transmission: arrangements to introduce onshore tenders, Ofgem, October 2015, Available from: https://www.ofgem.gov.uk/sites/default/files/docs/2015/10/ecit_consultation_v6_final_for_publication_0.pdf

Topic	Comment
Design	• Tender specification should be as detailed as possible, allowing bidders to focus on design, procurement and construction. • The more developed the projects are at the time of tendering, the broader the range of investors they will attract to maximise competition. • More thought is needed on how CATOs can manage the uncertainty of a project needs case being changed or deferred. • Ofgem needs to explore whether equipment standards are required.
Consenting Process	• For compulsory wayleave hearings or Public Inquiries, responsibilities have to be clearly defined. • In order to get consents and land rights, detailed design and development activities will have to been undertaken including substation designs and layouts, overhead line tower designs, construction techniques, access arrangements, traffic management plans etc.
Consenting Commitments	• Consent conditions may have to be transferred over to the CATO, with potential for obligations throughout the entire project lifecycle and beyond. • Bidders may be reluctant to commit too much time and resource to submissions until planning applications or decisions are complete
Supply Chain	• Early supply chain engagement is needed to inform consenting, for consideration of design and constructability. Detailed knowledge of design and construction techniques is needed in order to get consents and land rights. • No need to engage with supply chain to get consents. • If the SO is required to procure plant (e.g. HVDC), then there is less scope for competition. HVDC converters and cable may need to be tendered together. Supply chain lead times is an issue for many plant items, not just HVDC.
Risk Allocation	• Bids should reflect that CATOs have taken account of project risks which they can influence or manage e.g. through hedges or insurance.
Technical	• TO preliminary works should involve a properly considered and designed interface with the CATO main works, which takes into account physical and commercial separation of the assets

3.1.2 Overview of Responses from Incumbent TOs/SO

Responses from the incumbent TOs/SO and relevant to the position of incumbent TOs/SO are summarised in Table 3-2. Please note that this comprises GB transmission operators but does not include OFTOs.

Table 3-2: Summary of Relevant Responses from Incumbent TOs/SO

Topic	Comment
General	• Needs to be clear guidance on information and documentation needed to populate a data room so that bids are prepared on an equitable basis. • Tender specifications should be done to facilitate as broad a range of innovative designs and technical solutions as possible, however there will be a number of parameters that bidders will require of the SO and/or incumbent TO e.g. boundary capacities, reactive power parameters, fault clearance times, fault levels, impedance levels as well as compliance with the relevant electrical standards document.
Technical Challenges	• For HVDC, assessment of designs for system integration is critical and can be an iterative process.
Supply Chain	• Need to engage suppliers in almost all high value transmission projects before get consents.
Standards	• Certain strategically important infrastructure may require higher resilience/redundancy (e.g. for security reasons). The SO would need to set out any additional requirements.

3.2 Stakeholder Engagement

To support the information from the consultation responses, a number of companies have been directly engaged by TNEI and Pöyry as part of the work. These companies are presented in Table 3-3. Stakeholder responses are summarised in the following subsections. It should be noted that reference to prospective CATOs in the text below generally covers all respondents in Table 3-3 apart from the SO e.g. stakeholder engagement with incumbent TOs was also to understand their views on tender specifications as potential CATOs.

Please note that these do not represent the views of the authors of this study, also in some cases views are contradictory between respondents.

Table 3-3: Summary of Stakeholder Engagement

Category	Organisation
Engineering, Procurement and Construction (EPC) Contractors	Amey
	Babcock
	Balfour Beatty Transmission & Distribution
	Carillion
	John Laing
	Laing O'Rourke
Finance	Balfour Beatty Investment
	Jones Lang LaSalle Limited
Incumbent TOs/SO	National Grid
	Scottish Power Transmission
	Scottish Hydro Electric Transmission
Original Equipment Manufacturers (OEMs)	GE Grid Solutions (Formerly Alstom)
	Siemens
Offshore Transmission Owners (OFTOs)	Diamond Transmission
	Frontier Power
	Transmission Investment

Table 3-4: Summary of Relevant Responses

Topic	Comment
Contents of Tender Specification	• Level of detail should be consistent with the complexity of the project • Balance between providing enough detail as well as room for design innovation
Tendering Process	• Should be an appropriate balance of work that is completed in advance to avoid inefficiencies
Consenting	• Appetite for consenting risk depends on CATO risk profile • Risk varies depending on the location, nature and complexity of a scheme • Degree of flexibility should be built into the consent in terms of design layouts and route corridors where possible
Survey Effort	• Key risks were geotechnical and ground conditions, flood risk and archaeology • As much detail should be provided within the tender specification as possible
Land Access	• Land access (voluntary/involuntary transfers) was identified as a major risk, in particular in Scotland
Design Detail	• Preferred level of design detail in the tender specification should be consistent with a functional specification • Functional specification may make selection of bidders more difficult in terms of developing and applying appropriate selection criteria for design suitability across a potentially wide range designs
Supply Chain Engagement	• For HVAC equipment, which is generally more standardised with a wider supply chain, there was felt not to be a significant need for early engagement with suppliers • Early engagement with HVDC OEMs was generally seen as preferable to essential by most respondents to carry out some preliminary design but without tying into a particular supplier • If the HVDC supplier is already engaged, this may limit some innovation/competition

Topic	Comment
Outages	● Identified as a key risk area, outage programmes to be provided along with specific windows and milestones for the project being tendered ● If the scheme was non-contiguous, then the number of interfaces would be higher and thus, the outage programme would need to be more detailed ● Crossing DNO network assets e.g. overhead lines, was also identified as a major risk
Standards	● Using industry standards such as IEC will provide access to a wide market ● Use of National Grid standards should ensure that there are no issues with compliance with many of the equipment suppliers into the UK already certified for these standards

3.2.1 Contents of Tender Specification

The level of detail should be consistent with the complexity of the project. One respondent noted that the level of information provided in the tender should be consistent with the level of risk for various aspects of the project and signposting of risks would be welcome. This would enable a robust costing. Respondents indicated that where risks are high and difficult for the CATO to manage e.g. weather risks for subsea cable lay, there should be reopeners and Ofgem should provide clarity on reopeners at the bidding stage.

Generally, it was felt that there should be a balance between providing enough detail as well as room for innovation in the late CATO regime. One respondent commented that too much detail should be avoided as this reduces the envelope for innovation and may reduce the attractiveness of the project. However, an incumbent TO suggested that a detailed design specification wouldn't necessarily preclude consideration of other design solutions.

In the case of a detailed design, the tender process would become a much more traditional procurement approach where innovation can only be achieved through construction, financial or operational techniques e.g. OFTOs. Design flexibility e.g. route corridors, limits of deviation, would need to be accommodated within the consent application and process.

In terms of the data room, this is usually populated concurrently with work to progress the consenting. Some TOs engage EPCs early, prior to consent application submission so that they 'come along for the journey'. To prepare a tender data room for CATOs is likely to require additional TO resource. Several respondents gave an indicative timescale for tender data room preparation of approximately 6 months with several weeks of dedicated work based on project experience but that this would vary with project size and complexity.

Generation connection agreements would be required if the project is (partly or fully) to facilitate generation connections.

3.2.2 Tendering Process

Generally, the view was that as there will be multiple bidders, there should be a balance of work that is completed in advance to avoid inefficiencies. One respondent noted that a timeframe for information availability should be provided where it is not yet available.

Another respondent noted that the initial rounds of tendered projects should be de-risked to the greatest degree possible to ensure that the Extending Competition in Onshore Transmission regime gained momentum with some early successes. Also, it is key for potential CATOs and incumbent TOs to have visibility of the pipeline of CATO projects.

3.2.3 Consenting

3.2.3.1 Obtaining Consent

Stakeholders provided differing views on the necessity of having consents in place prior to the tender process. Prospective CATOs appetites to take on consenting risk is dependent on their overall approach to risk and respondents pointed out that they balance risk across their whole portfolio. While two prospective CATOs considered that not having consents in hand would lead to a decision not to bid, others felt that they could progress with a bid but subject to risk mitigation through re-openers or pricing strategies. The approach to risk is likely to vary depending on the location, nature and complexity of a scheme and one respondent pointed out that they would pay particular attention to the responses received during the consenting process. There was a feeling that national level consenting provided more comfort and so where some elements are submitted at a local level (e.g. individual substations) there was an inferred increased level of risk.

3.2.3.2 Flexibility of Consents

Discussions explored the issue of flexibility of consents and whether they would allow deviation to initial design and therefore opportunities for innovation and cost savings. The risk of programme delays should there be a need to undertake additional consenting was widely recognised.

In Scotland, an incumbent TO felt that the Scottish system did not allow as much flexibility in the consented design as is the case in England. Therefore they considered that detailed design was required to inform a narrowly defined consent that would then allow little variation to accommodate change required as a result of additional survey works (discussed in Section 3.2.4) or to accommodate innovation. The Energy Consents Unit (ECDU), when contacted direct to discuss this point, confirmed that the use of LoDs is standard practice in Scotland and that, while there is no guidance on the extent of LoDs, ECDU work with applicants throughout the Section 37 process to define the parameters of the planning application.

The majority of respondents recognised that LoDs provided flexibility providing that the environmental effects of any variations would be less than those assessed within the EIA and determined to be acceptable. One prospective CATO, which currently contracts to deliver schemes, pointed out that the consent can be very limiting and that currently TOs apply for very detailed consent orders. However, an incumbent TO respondent indicated that they generally look to obtain consent for corridors that are as wide as feasible dependent on other constraints.

Prospective CATOs are looking for a degree of flexibility to be built into the consent in terms of design layouts and route corridors. It was recognised that the level of flexibility may vary case by case and if this is not possible and the consent needs to be very prescriptive then the tender specification should explain why.

One potential CATO pointed out that prescriptive consents can promote innovation as engineering solutions are required to work within a narrowly defined permission. A similar response relating to the selection of HVDC technologies was received from one of the equipment suppliers who commented that, provided the consented envelope for converters is large enough, a range of HVDC suppliers can be accommodated but if there’s little flexibility it simply becomes an engineering challenge.

3.2.4 Survey Effort

The level of detailed survey data made available and ability to access the developable area to undertake surveys to inform a bid were highlighted. The main areas of risk were:

- Geotechnical and ground conditions;
- Flood risk; and
- Archaeology.

Again, attitudes to risk varied amongst prospective CATOs and would be likely to vary on a scheme-specific basis. Some respondents stated that they would be happy to undertake detailed survey works at high risk areas as part of the bid process during the tender window while others would be less keen. Overall it was recognised that having individual bidders undertake survey work independently was costly and inefficient. Several options were suggested for sharing or removing survey costs from the bid process.

Under the current regime, licence holders have rights to access land to undertake surveys and an incumbent suggested that prospective CATOs not having such rights would be problematic. However, one stakeholder pointed out that CATOs could achieve this under provisions within the Electricity Act or the 2008 Planning Act (The Electricity Act states that anyone authorised by a licence holder can obtain access to undertake surveys and so incumbents will have the ability to provide access for prospective CATOs. However there are likely conflicts of interest during a competitive tender process, where a TO may also want to bid as a CATO and may be reluctant to assist compilation of competitive bids.

Requirements to carry out ecological surveys and obtain protected species licences during project development were also discussed. Prospective CATOs pointed out the high levels of programme risk associated with seasonal survey requirements and that as much detail should be provided within the tender specification as possible, ideally accompanied by independent due diligence.

3.2.5 Access to Land

Land access was identified throughout the discussions as a major risk. Current actors highlighted the differences between the DCO system in England and Wales and Consent under the Electricity Act in Scotland. Compulsory purchase rights are attached to a DCO and would transfer to the CATO. However, in Scotland, several respondents indicated that necessary (involuntary) wayleaves obtained under statutory powers available to licence holders are not transferrable.

If this is indeed the case, necessary wayleaves not being transferrable places a greater requirement on the ability to negotiate voluntary servitudes. An incumbent expressed an expectation that there would be little chance of securing a voluntary wayleave without a high level of design detail. The question was raised about the ability to negotiate a deal when the eventual developer/operator was unknown. (That is a common scenario in the development of large wind farms. However, the financial incentives for individual landowners along a route corridor may be less attractive). One incumbent TO indicated that they have successfully used an approach in which landowner negotiations are based initially on the route corridor and then on micro-siting at a later design stage.

Similar to consenting risk, prospective CATOs had differing views on the ability to manage land access risk with individual respondents generally displaying the same levels of risk aversion to both issues. Responses ranged from all access agreements having to be in place to attract a bid, due to funding restrictions, to a feeling that the issue could be managed given sufficient lead in time. However given the overall CATO bidding process timescales, the uncertainty over impacts on programme is high and the majority of respondents saw the risk associated with land rights as needing to sit outside of the bid process.

Within the tender specification, stakeholders agreed that as much detail as possible on the situation relating to access arrangements should be provided.

3.2.6 Level of Design Detail

The view of the many potential CATOs was that the preferred level of design detail in the tender specification should be consistent with a functional specification (e.g. MVA, voltages, HVAC/HVDC, performance criteria such as availability, reliability and losses, interfaces), and that this would allow innovation in design and would be less likely to tie-in a certain supplier. It was thought by some that a single line diagram (supported by electrical studies if possible) should be provided to define equipment ratings. The circuit route corridor and tower heights for overhead lines for example will already be defined within the EIA. One respondent commented that the disadvantage of running a tender process based on a functional specification compared to a detailed design specification is that it may make selection of the successful tenderer by Ofgem more difficult. Ofgem would need to develop and apply appropriate selection criteria for design suitability across a potentially wide range of designs. Another respondent noted that it may also result in greater uncertainty in design and price and more exclusions and caveats. There needs to be confidence that the scheme is actually deliverable e.g. interface design and this is a potential risk of a more functional specification.

For this approach, and in the case of HVDC for example, the EIA would need to be based on a footprint/envelope that would allow choice of supplier. Respondents indicated that this should widen the supply chain and thus increase competition.

There is a view from some potential CATOs that if a functional specification is provided then some degree of design work would be done during the tendering exercise by the CATO e.g. FEED type study, in order to allow more accurate pricing. Further design would then be undertaken in the post-contract award period in partnership with the supply chain and possibly the TO/SO. This would enable the suppliers of HVDC for example to finalise price.

There may be less opportunity for innovation in overhead line design because of the level of design detail required in the consent application.

A description of the system technical interfaces should be provided and how this will influence and govern asset operation.

3.2.7 Level of Supplier Engagement

For HVAC equipment, which is generally more standardised with a wider supply chain, there was felt not to be a significant need for early engagement with suppliers but this will depend on the specifics of the project.

The broad view is that it is preferable that an HVDC supplier is not contracted prior to tendering although for some investors, early procurement is not seen as necessarily unattractive, as long as acceptable due diligence is carried out. Early engagement was generally seen as preferable to essential by most respondents to carry out some preliminary design but without tying into a particular supplier.

If the HVDC supplier is already engaged, this may limit some innovation/competition. Also, the CATO is taking on the commercial terms e.g. warranty and thus the risk associated with the commercial terms without having negotiated it which would have to be considered in costing. The attractiveness of early procurement depends on the project timelines, prescriptiveness of the design and if there is room for further collaborative development of design with OEM.

There is a limited market for HVDC supply so it is possible for the CATOs to engage with a number of suppliers during tendering. However, the HVDC supplier may not be keen on developing FEED designs for 5-6 CATOs and alliances may form or there may be pre-existing relationships. Also, an OEM indicated that it may result in significant resource and development ‘at-risk’ for them as high capacity designs are still relatively bespoke. One respondent noted that for example, some HVDC converter designs and cable designs are closely aligned, indicative of greater efficiency as a turn-key solution although this may result in reduced market competition. Also, there may be confidentiality issues if the OEM collaborates with each bidder during bidding. Consultants can support, to an extent, on developing the system FEED design.

One approach suggested is to specify several HVDC suppliers in the tender based on early engagement to efficiently leverage the supply chain while being cognisant of risk to timescales for HVDC equipment manufacture.

3.2.8 Outages

Most potential CATOs identified this as a key risk area and requested that outage programmes (e.g. TO/SO outage planning/access plans for 1 year ahead and 3 to 5yr horizons) be provided with the tender specification along with specific windows and milestones for the project being tendered. The view is that this would be scheme specific and would vary depending on the complexity of the transmission asset, the expected tie-in date, how embedded the asset was within the system and any circuit crossings. Outage programmes should be reasonably robust and flexible where possible e.g. a ‘constrained window’, potential CATOs indicated that this would enable de-risking of the construction and connection programme. Also, a description of how outages will be managed in the event of bottlenecks and emergency outages for the TO/SO should be included. The SO pays for the cost of moving outages (under STC provisions Section C, Part 2, Clause 5.9.5) and the SO may need to manage outages for a number of CATOs.

If the scheme was non-contiguous, then the number of interfaces would be higher and thus, the outage programme would need to be more detailed. The greater the number of interfaces, the greater the project risk in terms of managing outages.

Crossing DNO network assets e.g. overhead lines, was identified as a major risk by one potential CATO due to required outages and available backfeeds. DNOs will not be directly linked to the CATO project, unlike TOs/SO however, this was not seen as a major risk by several incumbent TOs. The tender should indicate the number and location of DNO crossings as a minimum. Incumbent TOs indicated that typically, the TO would co-ordinate with the DNO at an early stage. However, respondents suggested that some level of outage planning may be desired in the tender specification if not an outage window to enable alignment of windows.

One respondent indicated that outages for other infrastructure e.g. water, transport, and statutory authorities, should also be considered.

Many potential CATOs and incumbent TOs/SO highlighted that technical and commercial interfaces should be defined between TO/SO/DNO and CATO contractually and/or through regulation to provide incentives for appropriate behaviour. An incumbent TO indicated that they currently have a close engagement with the SO on outages, assessing outage windows and constraints, with the SO providing input on flexibility and other considerations. A number of potential CATOs suggested that they would expect to have some similar engagement and influence on the outage plan, this could be facilitated through a Network Access Policy, similar to those between incumbent TOs and the SO. This describes how the TO interacts with the SO in the short term, medium term and long term up to 8 years ahead. This would also provide for ongoing maintenance co-ordination. One respondent commented that there is an incentive on bidders to develop a design that minimises required outage time.

Outages for other services e.g. water, transport will also be required so crossing information will be important.

3.2.9 Standards

Each onshore TO has equipment standards which are broadly similar but recognise differences in geographical conditions and network systems.

In terms of standards for CATO assets, the general (but not overall) view of potential CATOs was that the use of existing TO standards may reduce the opportunity for design and supply chain innovation and increase cost for CATOs with non-approved equipment. For example, National Grid standards are more rigorous than those in other European countries which typically follow IEC standards. One respondent suggested that using industry standards such as IEC will provide access to a wide market and combining this with best industry practice should ensure that the equipment can be operated and maintained without posing a threat to rest of the system and complying with UK H&S legislation. Generally the view was that this approach along with applying the appropriate availability and reliability incentives should ensure compliance without limiting innovation or transfer of risk and ensuring that tender costs can be compared effectively. One respondent suggested that when other sectors introduced more competition, standards became more commercial which drove innovation market appetite.

However, it was suggested that use of National Grid standards should ensure that there are no issues with compliance and that this approach also minimises risk, with many of the equipment suppliers into the UK already certified for these standards. When interfacing with existing TO assets, it will be necessary to work to existing TO equipment standards and details of the technical interfaces should be clearly indicated in the tender. It was also indicated by a respondent that Grid Codes may require amendments to ensure that CATO projects can be integrated seamlessly into the existing grid infrastructure.

There was some discussion around CATO specific standards which could be developed as a minimum set of standards and performance specifications without a prescriptive level of detail. However, this could also increase cost for some suppliers and reduce capability to innovate.

4 Risk Management

In order to define what needs to be included in the tender specification, it is necessary to consider how each element of the development work would impact on the ability of the CATOs to produce a firmly costed bid and to determine project risks and corresponding impact on CATO bid costs. The following approach has been used in order to determine how each risk can be most efficiently managed between CATOs, the incumbent SO/TOs, and the GB consumer:

1. Risks are identified based on the minimum works which will have been completed when planning application is submitted, and our assessment of which areas could have the most impact on CATO costs. This is supported by the contributions from stakeholders;
2. The impact of each risk is described and the significance of each risk is assessed in terms of probability and severity;
3. The ability/appetite and efficiency of CATOs to manage risks is assessed and described;
4. The ability/appetite and efficiency of the incumbent TOs/SO to manage risks is assessed and described;
5. TNEI and Pöyry's view on the most efficient allocation of risk is provided;
6. Based on the consideration of risks, the implications for the tender specification are highlighted.

The output of this analysis is presented in Table 4-2.

The implications for the tender specification are summarised below:

- **Land Access:** Information on land agreements should be included in tender spec, including finalised agreements, agreements in principle, progress made with voluntary agreements and details of involuntary agreements. Land ownership profile should be provided. This should cover both offshore and onshore land ownership.
- **Consenting:** Summary of consents (in place and progress), and full copies to be included, as well as final/draft conditions and requirements of consent. Summaries and evidence of commitments (environmental/social) to be included.
- **Design:** Design choices within the consent should be supported by information within the tender specification, and preliminary works to support these choices should be reliable and robust. An independent assessment of these works may give bidders comfort and reduce the amount of due diligence which CATOs need to undertake.

  Specifications should reference requirements for standards and Duty of Design (which may need to be 'with reasonable skill and care'). Appropriate information is required on third party interfaces.

- **Geotechnical:** Detailed Ground Investigation Report to be included in the tender specification. Should also include borrow pit assessment and UXO assessments.
- **Logistics**: Initial access studies completed by the TO/SO should be included in the tender specification/data-room. TO/SO to conduct sufficiently detailed feasibility of highway access to progress modification designs and access arrangements as appropriate.
- **Outages:** Outage plans need to be reliable so that CATOs can comfortably plan programmes around these outages. There needs to be sufficient information on TO/SO interfaces and DNO crossings, e.g. design of electrical boundaries.
- **Subsea (where applicable):** Detailed subsea bathymetric information should be included in the tender specification, including topographies and ground conditions. For installation vessels, consented designs should be as flexible as possible to keep options for procurement open. If the TO/SO has to conduct early procurement of an installation vessel, then all necessary details should be included in the tender specification and data-room (e.g. contracts).
- **Supply Chain:** Although in general, these should be avoided where possible, if any potentially limiting design choices have been made, supporting information should be provided. If any early procurement has been carried out, then details should be provided (including contracts, technical designs, manufacturing timescales).
- **Other:** Any areas of high risk of **archaeological** impacts should be highlighted, with reference to the Ground Investigation Report and accompanying survey data. Flood Risk Assessment, requirements for flood defences, and any infrastructure layouts/designs relating to **hydrological** impacts should be included. EIA **noise** assessment requirements should be highlighted.
- **Warranties:** The outputs of any works sub-contracted by the incumbent TO/SO should in theory be transferable to CATO however, for potential late CATO projects during RIIO-ED1 which may be well progressed, this will depend on existing contractual arrangements and may require renegotiation.

Table B-1 in Annex B provides a full assessment of the impact of risks relating to development works including; a description of the risk, a description of the impact, the probability and severity of the risk and a risk rating. The risk matrix which has been used to determine the risk rating is presented in Table 4-1. The application of this as follows:

- the probability of the risk being realised is represented by one square for low probability (nominally < 10%) up to four squares for high probability (nominally > 90%), the risk rating is broadly linear between these two values;

- The severity of the risk, if realised is qualitatively evaluated on the basis of the risk impact which is predominantly financial although it also will contain elements of environmental or reputational impact in some cases.

Table 4-2 summarises the risk description and risk rating as well as indicates who, in our view, is currently likely to be best placed to most efficiently manage or control the risk. However it should be recognised that this is a 'snap-shot' in time. As the regime develops, the risk profile and party best placed to most efficiently manage risk is likely to shift further towards the CATO from the incumbent TO – as experience is gained and CATO capability is developed.

Table 4-1: Matrix Used for Assessment of Risks

Risk Matrix		Probability			
		■	■■	■■■	■■■■
Severity	■	E	E	D	C
	■■	E	D	C	B
	■■■	D	C	B	A
	■■■■	C	B	A	A

4.1 Management of Risks Related to Development Works

Table 4-2: Management of Risks Related to Development Works

Risk	Risk Level	Is it Efficient for the CATOs to Manage this Risk?		Is it Efficient for the TOs/SO to Manage this Risk?		Recommendation	Implications for Tender Spec
Land Access/ Gaining Agreements *The CATO may be unable to gain voluntary access agreements for all the land required for construction*	A	Y	CATOs can accept some risk if the progress to date in gaining access is clear and those risks can be assessed. They are unlikely to accept risk if there is no 'last resort' option to obtain involuntary agreements. They may not have the appetite to enforce access. Gaining voluntary access may require a high level of design detail.	Y	The TO/SO can begin access negotiations at an early stage. However, voluntary agreements may be obtained after consents are granted and this may not be possible for the TO/SO under the late model. If the TO/SO cannot get voluntary agreements, then they have powers to obtain involuntary agreements.	The TO/SO should progress land access agreements as far as possible, prior to the tender starting and land access issues should be de-risked during concept and preliminary design where possible. Where some agreements are outstanding, as much information as possible should be made available to the CATO.	Up to date information on the process, and progress, with land access agreements should be compiled and presented within the tender specification and data-room. This should include a land ownership profile.
Land Access/ Transferring Agreements *The CATO may be unable to take over involuntary access agreements obtained by TO/SO.*	A	Y	The CATO may be able to manage this risk if all information on the process to date is provided. This is subject to the potential for agreements to be transferred to the CATO.	Y	The TO/SO will undertake access negotiations at an early stage, seeking to reach voluntary agreement wherever possible. Design will need to be sufficiently detailed to allow agreement to be reached while still allowing flexibility for innovation and delivery.	The TO/SO should undertake access negotiations at an early stage to obtain voluntary agreements if possible.	Full details of the position regarding access agreements will be required within the tender specification, with areas of risk highlighted. Please note that this is less of a risk in England and Wales where a DCO can have CPO powers attached.
Land Access/ Offshore Agreements *The necessary agreements for offshore works may not be in place and the CATO has to acquire these.*	A	Y	CATOs could manage this risk to an extent but would require a clear understanding of the current position and of the likely conditions attached to any lease or agreement. Ideally, an agreement in principle would be available.	Y	The TO/SO will begin the process to obtain offshore agreements at the earliest opportunity.	The TO/SO should progress offshore agreements as far as possible. If finalised agreements cannot be obtained in time, then in-principle agreements should be obtained. There is no guarantee that the TO/SO will be able to obtain these consents, however, and it is unlikely that the CATO would be willing to accept risk relating to access.	Information on the progress of consents should be compiled and included. The tender specification should include a summary along with copies of agreements and any draft agreements in principle along with schedules of likely conditions.

Risk	Risk Level	Is it Efficient for the CATOs to Manage this Risk?		Is it Efficient for the TOs/SO to Manage this Risk?		Recommendation	Implications for Tender Spec
Archaeological *Completed archaeological survey work may be insufficient to identify unidentified archaeological interest*	B	Y	The CATO will have access to archaeological assessment conducted within the EIA. Bidders could undertake investigative works as part of the tender process but this can be expensive and requires access to land. Lack of assessment data is potentially a high impact risk which the CATO would not be willing to accept.	Y	The TO/SO will be undertaking desk based assessment within the EIA. As they have statutory access rights for survey works, they would be able to carry out evaluation works in high risk areas as part of the pre-consent studies. This may well be required to gain consent.	The TO/SO should identify high risk areas during the EIA through standard impact assessment and consultation. Onsite evaluation works could then be carried out, potentially to a greater level of detail than would be required to gain consent, to better understand the risks.	Areas of high risk for archaeological impacts should be highlighted in the tender specification, with all survey data and reporting included. This would probably require more detailed ground investigation work than is typically undertaken pre-consent.
Consenting/ Process *All necessary consents may not be in place when the CATO is preparing their bid*	A	N	CATOs are unlikely to accept consenting risk due to the unforeseen programme implications. A reopener may be required in the case where consenting is significantly delayed and impacts on CATO programme and thus costs.	Y	The TOs currently manage consenting risk when developing their projects. While the SO may be reluctant to carry consenting risk in the future (e.g. RIIO-T2 onwards), the TOs still could.	The incumbent TO/SO should manage the consenting process, ensuring that the consent is flexible enough to ensure delivery of the project and allow for innovation.	Summary of all consents and the consenting process should be included. Copies of all consents or draft consents to be made available in the data room.
Consenting/ Environmental Commitments *Environmental commitments made during the EIA process may lead to programme delays or additional costs*	D	Y	CATOs will be able to undertake Due Diligence on the Environmental Statement, survey data and consultation responses to identify commitments, adjusting their price and programme accordingly. With multiple bidders, this may not be efficient.	Y	The TO/SO can influence the environmental commitments made within the Environmental Statement. These should be proportionate to the likely effects and effective while still allowing innovation and efficient delivery of the project.	The TO/SO should ensure that the Environmental Commitments within the Environmental Statement are proportionate, likely to be effective and would allow delivery of the project. The CATO should be able to interpret, understand and manage any risks relating to environmental commitments, however, risks and issues should be summarised to reduce the amount of due diligence which CATOs need to undertake.	Commitments should be identified and summarised in the tender specification. Survey data, consultation responses and the Environmental Statement will be included in the data room.

Risk	Risk Level	Is it Efficient for the CATOs to Manage this Risk?		Is it Efficient for the TOs/SO to Manage this Risk?		Recommendation	Implications for Tender Spec
Consenting/ Conditions *Requirements of the consent (e.g. planning conditions) may be more onerous than anticipated*	D	Y	Post-consent, CATOs will have visibility of requirements/ conditions and can consider any risks and implications. If pre-consent, the TO/SO should have worked closely with the determining authority and consultees so that CATOs will be able to predict likely requirements/conditions.	Y	Post-consent the TO/SO will fully understand the attached requirements/conditions. Pre-consent the TO/SO will have good insight into likely requirements/conditions through consultation with the determining authority and consultees.	Ideally, consents will be in place and requirements/conditions will be formalised. If not the TO/SO should provide as much detail as possible on discussions with the consenting authority and consultees and a schedule of draft requirements/ conditions. This would allow the CATO to produce a bid based on expected conditions.	Conditions of consent (final or draft) should be included within the tender specification or data room, along with relevant correspondence.
Consenting/ Social Commitments *There may be onerous social commitments made during the EIA process*	D	Y	CATOs will be able to undertake due diligence on the Environmental Statement, Statement of Community Engagement and consultation responses to identify commitments and price and programme in requirements.	Y	The TO/SO can influence the social commitments made during project development, and should ensure that these are deliverable and do not unnecessarily affect the buildability/operability of the project.	The TO/SO should ensure that the social commitments are deliverable. The CATO should be able to interpret, understand and manage any risks relating to social commitments, however, risks and issues should be summarised to reduce the amount of due diligence which CATOs need to undertake.	Commitments should be identified and summarised in the tender specification. The Statement of Community Engagement, consultation responses, any Community Liaison Group minutes and the Environmental Statement will be included in the data room.
Design/ 3rd Party Interfaces *The CATO may have insufficient information about third party interfaces (including both technical and commercial aspects)*	B	Y	The CATO should be able to adapt their approach to management of third party interfaces once further information is available, however this will potentially increasing risk costs of the project	?	The TO/SO should provide sufficient information to the CATO on third party interfaces e.g. planned large-scale generation, and act as a 'middleman' between the CATO and the third party, where appropriate, to provide an interface "hand-over" to the CATO.	The CATO should be comfortable managing 3rd party interfaces, but they need sufficient information to do this (and to ensure that costs/risks for their bid are accurate). It would not be efficient for the TO/SO to act as a 'middleman' between the parties.	If the CATO is going to interface with any third parties (e.g. other CATOs and particularly generators) then copies of relevant agreements and designs should be available
Design/ Duty of Care *The CATO could be required to design and build an asset which is 'fit for purpose', rather than with 'reasonable skill and care'*	B	N	CATOs unlikely to accept risk that changes to standards/legislation could introduce	Y	SO/TO cannot manage risk of regulatory regime change, but can ensure specification is to the appropriate standard	CATO assets should, in general, be specified for design/construction/ maintenance with' reasonable skill and care' - we expect EPCs will not accept 'fit for purpose' requirements. GB consumer carries risk if standards/legislation change	The specification will require assets to be built with reasonable skill and care

Risk	Risk Level	Is it Efficient for the CATOs to Manage this Risk?		Is it Efficient for the TOs/SO to Manage this Risk?		Recommendation	Implications for Tender Spec
Design/ Transparency in Decision *There may be a lack of transparency in existing design decisions taken by the TO/SO, or these designs may not be considered to be reliable by the CATO*	B	Y	The CATO can manage this risk by undertaking comprehensive due diligence on the design documentation available within the tender spec and data room	?	The TO/SO can take some steps to ensure that their decisions are reliable and transparent (e.g. by making sure that decisions are well documented)	The TO/SO are not well placed to comment on the validity of their own preliminary works. It is likely that all CATO bidders will do this to some level of detail. Although it will add to the cost of bidding, it should reduce risk and thus project bid costs.	It is most efficient for CATOs to manage this risk by undertaking their own due diligence on the design documentation.
Design/ General Technical Characteristics *General technical characteristics of the project may need to change e.g. due to unexpected changes on the transmission system*	C	N	If the technical parameters change substantially (e.g. different voltages) then it is unlikely that the CATO could manage this, as it would have significant implications on costs and programme, especially if the CATO had to go back through the planning process	Y	Concept design and definition of technical requirements is the responsibility of the SO/TO. They should be able to manage uncertainty to a degree and progress optimal solutions.	The TO/SO should have responsibility for ensuring that the high-level technical design is robust.	The preliminary works that inform the design in the tender specification need to be robust and reliable
Design/ System Harmonics *CATO's assets could exacerbate general harmonic distortions in the wider system*	C	N	Generally, harmonic filters are installed close to the source of harmonic distortion. If installation of the CATO assets introduces harmonic issues elsewhere, it is unlikely that this would be observed until a subsequent generation connection.	Y	The TO/SO will assess harmonics for subsequent generation connections. Even if the issue is exacerbated by the change to the harmonic impedance caused by the CATO, the TO/SO would require the relevant generator to install harmonic filters.	It would be inefficient for the CATO to have to install, own and operate harmonic equipment which is remote from their assets, especially as it is hard to robustly prove whether it is their asset that is causing the issue. Therefore, it is best that wider harmonic issues are managed by the TO/SO.	There is no real requirement for any additional information to be included in the tender specification.
Design/ Local Harmonics CATO's assets could exacerbate harmonic currents from sources which are directly connected to the CATO	C	Y	If the CATO is directly connecting harmonic sources to the system (e.g. a generator connection) then it may be appropriate to require them to mitigate harmonic currents by installing filters	Y	The TO/SO could require the generator to install and own the necessary harmonic filters, or could install and own them themselves.	The most efficient filtering solution may change on a project-by-project basis. In general, would not expect harmonics to be a significant issue (unless projects involve long AC cables). May be most efficient to allow the SO/TO to manage this as they have oversight of the whole system and can determine the best location for any required filters.	If the TO/SO does any harmonic analysis in advance, then the results of this should be in the tender specification if they think the CATO needs to construct a filter. Otherwise, could include harmonic models for the CATOs to undertake their own assessment.

Risk	Risk Level	Is it Efficient for the CATOs to Manage this Risk?		Is it Efficient for the TOs/SO to Manage this Risk?		Recommendation	Implications for Tender Spec
Design/ Consents *Design choices are constrained due to the contents of the planning consent*	C	?	The CATO will be able to design/engineer around most constraints within the planning consent as long as the consented development is buildable. The CATO may not be able to manage the risk of design choices which favour certain suppliers	Y	Throughout development, the TO/SO will be able to ensure that the planning consent is as flexible as possible, and that design choices are only made where this is necessary in order to achieve consents.	CATOs should be able to engineer around most potentially limiting design choices, however the TO/SO may need to speak to CATOs/EPCs/independent experts to ensure that their preliminary designs are buildable. In general, the TO/SO should try to incorporate as much flexibility as possible into their preliminary designs, and only make limiting decisions where the case for doing so is robust.	In a situation where consents have limited design options, there should be justification for this included within the tender specification (particularly if it reduces the scope for competition in the tender e.g. by advantaging certain companies within the supply chain)
Design/ Detailed Technical Characteristics *The detailed technical characteristics (e.g. detailed equipment specifications) of the project may need to change*	D	Y	In general, the detail of the technical parameters will be defined by the CATO. Our engagement suggests that, generally, they will be willing to take responsibility for the detailed design of the project in order to drive innovation, and are reasonably happy to approach limitations as an engineering problem.	?	If detailed design is undertaken by CATOs then the TO/SO will not have any influence on this, although they could affect this by undertaking detailed design themselves.	As long as the CATOs are undertaking detailed design, then they should be responsible for design decisions. They will need to know in advance about likely limitations so that they can engineer around these.	CATOs are likely to be happy to undertake detailed design activities themselves, but the tender specification needs to include enough information about limitations for the CATOs to produce robust designs.
Design/ Needs Case *There could be uncertainty in the need's case which underpins the entire project*	D	N	The CATO is unlikely to have any influence on the needs case driving the project and therefore cannot manage the risk	?	The TO/SO should take some uncertainty on the need's case into account when developing the project through earlier stages (e.g. the Least Worst Regret approach which NGET use in their Network Development Policy) but there will always be a risk that projects cancel at a later stage.	Neither the TO/SO or the CATO can fully manage the risk of wholesale changes to the project needs case, but the TO/SO can influence this by staging development activities and preparing a robust needs case before undertaking preliminary works.	Including the needs case within the data room may provide comfort to CATOs that the project will progress. In general, would expect the cost elements to be managed contractually but would allow CATOs to assess other risks e.g., reputational risk of building stranded assets.

Risk	Risk Level	Is it Efficient for the CATOs to Manage this Risk?		Is it Efficient for the TOs/SO to Manage this Risk?		Recommendation	Implications for Tender Spec
Design/ Transient Phenomena *Transient/dynamic phenomena could have an adverse impact on CATO assets*	D	Y	CATO can complete switching studies in order to appropriately coordinate insulation, size switchgear, and design surge arrestors. If more cost efficient, CATO can oversize equipment without undertaking studies.	Y	More efficient for the TO/SO to oversize equipment rather than undertake studies for late CATO build model	May be more efficient to allow the CATOs to manage this risk as, if efficiency gains are possible, they can explore this by undertaking studies.	The TO/SO may need to include network models or data (as a minimum) in the tender data room so that CATOs can undertake detailing transient/dynamic modelling in order to ensure that designs are efficient
Design/ Standards *If CATO design standards vary on a project-by-project basis, this may inhibit efficient design and engagement with the supply chain*	E	Y	As long as information about the required standard is specified, the CATO should be expected to design their assets accordingly.	?	Required standards may be outside of the control of the TO/SO.	It seems unlikely that requirements will vary on a project-by-project basis. Instead, it seems more likely that either (i) a common set of standards will apply to all CATO assets or (ii) standards will change based on project type in a transparent way, defined (for example) in licences or other regulations.	If a project does have specific requirements for standards, then it should be relatively easy to reflect this within the tender specification.
Geotechnical/ Ground Conditions *There may not be detailed information about ground conditions along the route due to a lack of site work*	A	Y	Prospective CATOs could undertake survey work to inform bids subject to gaining access to land. CATOs could potentially combine efforts between several bidders with agreed recourse/recovery of money for none successful bidders.	Y	The TO/SO can complete this survey work as part of a more inclusive scope of works during the EIA and design process.	The TO/SO could undertake more detailed ground investigation works during an early stage of project development. An element of ground risk will still remain, however, this will be significantly reduced compared to a position where only desk based assessments have been completed. It would not be efficient for all CATOs to undertake this work during bidding, and it seems unlikely that fixed costs could be bid without this work having been completed. If the TO/SO did not want to progress this work upfront, there are options for CATOs to share costs during the bidding stage.	All geotechnical investigation (incl. design/spec, intrusive / non-intrusive works, laboratory testing and reporting) should be completed for inclusion in the tender specification.

Risk	Risk Level	Is it Efficient for the CATOs to Manage this Risk?		Is it Efficient for the TOs/SO to Manage this Risk?		Recommendation	Implications for Tender Spec
Geotechnical/ Borrow Pits *There may not be sufficient information about the borrow pits needed in order to complete aggregate costings*	C	Y	Prospective CATOs can make reasonable and educated assumptions on available aggregate but would still include sufficient risk contingency in tender pricing. Even with contingencies, they may not be willing to accept this risk if it is not well understood.	Y	The TO/SO can conduct borrow bit assessments in parallel with other survey activities, using statutory powers to get land access when necessary.	The TO/SO is best placed to conduct further borrow pit assessments (alongside geotechnical investigations) in order to better quantify the volume and quality of aggregate, allowing the CATO to have far more certainty on costs and programme.	Include detailed borrow pit assessments in any geotechnical investigation work such that information is included in tender documentation
Geotechnical/ UXO *There may not have been sufficient work (e.g. on-site work) completed to determine risk of unexploded ordinance (UXO) and unexploded bombs (UXB)*	C	N	Without initial risk assessment works, CATO would either (i) levy large risk contingencies for UXO risk and include significant down time in programmes or (ii) refuse to carry the risk and include caveats. Most CATOs would probably take the second approach, particularly in marine environments.	Y	The TO/SO can conduct preliminary risks assessment at very low cost which could significantly reduce risk, or highlight requirement for further works. Further works would identify risk areas and quantify the level of risk.	The TO/SO should conduct UXO risk assessments as part of geotechnical desk studies. Any significant risks could then be identified and costed by CATOs. Alternatively, if CATOs are not willing to manage any risk, then more detailed intrusive surveys could be completed by the TO/SO in parallel with other surveys/studies.	Any UXO risk assessments undertaken by the TO/SO (including geotechnical desk studies at a minimum, and potentially more intrusive surveys) should be summarised and included in the tender specification and data-room.
Hydrological *Significant modifications to consented designs or construction techniques may be required as result of hydrological conditions*	B	N	The CATO would be unlikely to take on design risk which could significantly alter appearance of buildings/structures as this could mean cost and programme risk, and may potentially even invalidate planning consent.	Y	The TO/SO can undertake more detailed Flood Risk Assessments and hydrological surveys in parallel with other surveys which inform the Environmental Statement.	The TO/SO should ensure that flood risk assessments are conducted at preliminary works stage and that these are sufficiently detailed to identify flood protection measures which can be incorporated into the design/layout of infrastructure.	Flood risk assessment and infrastructure layouts/designs to be included in tender documentation, sufficiently detailing requirements for flood defences

Risk	Risk Level	Is it Efficient for the CATOs to Manage this Risk?		Is it Efficient for the TOs/SO to Manage this Risk?		Recommendation	Implications for Tender Spec
Logistics/ Highway Modifications *Significant unforeseen highway modifications are required in order to get access to sites*	A	Y	The CATO is expected to have reasonable foresight and stakeholder contact from previous experiences so that issues can be managed without a need for excessive risk contingencies. However, CATOs may not be best placed to sign-up unforeseen third party landowners.	Y	The TO/SO can conduct feasibility, initial design and stakeholder liaison during earlier stages of project development to ensure that routes are suitable and necessary landowners are signed up to accommodate works.	The TO/SO should conduct sufficiently detailed feasibility and design such that third party landowners can be signed up and significant areas of works can be identified. Lesser areas of work can be left to the detailed design of CATOs.	Initial studies and design to be completed by the TO/SO for inclusion in the tender specification, together with details of relevant landowners
Logistics/ Access *Logistic plans are not feasible with existing (or Approved in-Principle (AIP)) access agreements*	B	Y	The CATO is expected to have reasonable foresight and stakeholder contact from previous experiences so that issues can be managed. Initial access assessments can only be done on a generic basis as each CATO will handle/plan logistics differently. CATOs should be capable of handling and planning their own logistics without excessive risk contingencies, based upon generic information provided by the TO/SO.	N	The TO/SO can only assess existing access arrangements and agree Approvals in Principle (AIPs) based on best practice and generic requirements. AIPs will be agreed with highways authorities so, on the whole, these can be assumed to be robust, although information on existing infrastructure may be limited.	The TO/SO should conduct initial assessments and place AIPs outlining access routes required works and detailing stakeholder consultations. CATO can then use this information to finalise works plans and coordinate logistics in accordance with their preferred practices.	Initial studies conducted by the TO/SO for preliminary/planning works should be included in the tender documentation. CATOs can accommodate this in their proposals for tender return.
Noise *There could be a requirement for mitigation measures if there is unacceptable noise. For example, complaints could be received during construction and operation*	B	Y	Prospective CATOs can review noise assessment and undertake studies to satisfy themselves that design is workable within the noise limits. Construction noise can be managed through the EPC contract.	Y	Desk based noise assessment will be undertaken to inform the EIA. Initial siting and design can ensure that noise limits relative to background levels can be met. A preliminary design noise assessment could be undertaken to confirm compliance. This would be based on candidate equipment, expected to emmit worst case noise levels.	The TO/SO should manage the EIA and design process to ensure that there is flexibility to allow delivery of the project within the required noise limits. All data should be made available in the tender specification, including a detailed design noise assessment if required.	Requirement for the EIA noise assessment and detailed design noise assessment to be included in the data room. As much design detail as is available should be included to allow assessment of buildability.

Risk	Risk Level	Is it Efficient for the CATOs to Manage this Risk?		Is it Efficient for the TOs/SO to Manage this Risk?		Recommendation	Implications for Tender Spec
Outages/ Emergency Changes *There could be emergency/last minute changes made to the outage programme by the SO/TO during construction*	B	N	The CATO may be able to include some flexibility in their own programme, but this is unlikely to be enough to allow for significant last minute changes.	Y	When coordinating outages, the TO/SO should retain flexibility to accommodate emergency changes. Outage plans should be reliable and robust.	The TO/SO should manage this risk by having as much flexibility as possible in their outage programme, that is reasonable within wider network outage planning. Likely that some emergency situations could not be managed by either the TO/SO or the CATO.	Outage plans should be reliable/robust and retain a degree of flexibility if possible. Under STC provisions, the SO pays the CATO if they initiate an outage change. The STC also contains provisions for management of TO Construction Terms.
Outages/ DNO Crossings *There could be emergency changes made to the outage programme in order to accommodate DNO crossings during construction*	B	N	The CATO may be able to include some flexibility in their own programme, but this is unlikely to be enough to allow for significant last minute changes.	Y	When coordinating outages, the DNO should retain some flexibility to accommodate emergency changes. Outage plans should be reliable and robust. However, it should be noted that the DNO is not incentivised to provide this flexibility and are working to their own outage drivers and windows.	The DNO should manage this risk by retaining flexibility in their outage programme as is reasonable within their wider outage programme. Likely that some emergency situations could not be managed by either the DNO or the CATO (may need a re-opener). There should be a regulatory interface established between the DNO and CATO for CATO build to enable efficient management of this.	The tender should indicate the number of DNO crossings and outage plans should be provided if possible. Outage plans should be reliable/robust and retain a degree of flexibility where possible.
Outages/ Flexibility *Planned outage programmes may have very little flexibility for negotiation or adjustments by the CATO or by the relevant TO or other third parties due to other parallel works or maintenance*	C	Y	As long as the TO/SO's programme is robust, the CATO should be able to manage their own programme so that outages are achieved.	Y	The TO/SO has some control over the level of flexibility which they build into their outage programme although practicalities of outage planning will constrain this.	The TO/SO should produce a programme which has as much flexibility as possible, but ultimately, once the CATO should has committed to the programme, they should be responsible for managing their own programme in order to meet the outage requirements.	Outage plans should be reliable/robust and retain a degree of flexibility where possible.

Risk	Risk Level	Is it Efficient for the CATOs to Manage this Risk?		Is it Efficient for the TOs/SO to Manage this Risk?		Recommendation	Implications for Tender Spec
Outages/ TO/SO Interfaces *The CATO may have insufficient information on TO/SO interfaces (including technical and commercial aspects) in order to adequately plan their programme to meet required outage windows*	C	Y	CATOs will probably have some experience of managing interfaces with the TO/SO (e.g. through OFTO or EPC experience), although this may be slightly more complicated than under historical arrangements where the TO would interface with the SO, and the EPC would interface with the TO only.	Y	The SO will be used to interfacing with multiple TOs (e.g. through Scottish experience and OFTOs). TOs have experience of interfacing with each other and EPCs. Therefore, they should be able to ensure that appropriate levels of information are provided.	The CATO should be comfortable to manage TO/SO interfaces as long as they are provided with sufficient information and the appropriate (regulatory and/or contractual) framework is in place. All parties should work to ensure that interfaces are efficient.	The tender specification should include technical and commercial information on interfaces with the TO/SO. This is likely to include the detailed design of electrical boundaries, and outage programmes.
Subsea/ Metocean Data *There may be insufficient metocean data available e.g. on weather conditions, which could affect construction and maintenance of offshore assets*	A	N	CATO unlikely to accept weather risk for offshore projects e.g. due to delays in cable lay, in any case due to uncertainties and unpredictability of ocean conditions and the large cost it will dictate in a delay scenario for cable lay vessels for example. These are generally not insurable.	N	Similarly, SO unlikely to accept any weather risk for offshore projects based on metocean data in tender. However, SO should provide sufficient preliminary metocean data at tender stage.	Either, CATO take on limited risk (e.g. allow for X amount of days weather risk) if insurable with balance of delay/cost recovered from SO/GB consumer, or all risk carried by GB consumer.	Project specific metocean data to be contained within the tender to inform design and installation and enable some quantification of weather risk/delay in contract, with contingency set aside by SO/GB consumer to cover anything outside agreed quantity.
Subsea/ Seabed Data *For projects with an offshore/subsea element, there may be insufficient seabed data available*	B	Y	CATO to rely on survey data provided by SO at tender stage to take a view on risk. This is also linked to offshore weather risks as any delays to cable laying process could result in significant delays to overall construction programme and high costs associated with cable lay vessels.	N	SO to provide sufficient preliminary survey data at tender stage. If data is lacking CATO likely to include large risk contingency.	SO to conduct subsea surveys of a sufficient detail at preliminary works stage to limit risk amount raised by CATO. Any related weather risks realised due to delays in cable laying will not be insurable so need to be carried by GB consumer.	Subsea surveys to be included in tender documentation.

Risk	Risk Level	Is it Efficient for the CATOs to Manage this Risk?		Is it Efficient for the TOs/SO to Manage this Risk?		Recommendation	Implications for Tender Spec
Subsea/ Installation *For projects with an offshore/subsea element, project programmes could be heavily dependent on the availability of installation vessels*	C	Y	The subsea cable laying installation vessel will be constrained by the cable capacity and voltage and thus cross-sectional area, also routing near shore. CATOs should be able to assess this during the tender and identify suitable cable laying vessels that can be reserved upon successful tender. The CATO can then manage the programme to an extent to suit vessel availability within required timescales.	Y	The size/capacity of the cable and the design of the cable routing near shore will influence the vessels that can be utilised for installation. This would be done at conceptual design stage by the TO and should enable flexibility in installation vessel choice. The project completion date should provide sufficient time to allow the CATO to efficiently manage the risk of subsea cable-lay vessel unavailability.	This risk can be managed efficiently by both the TO and CATO managing different elements. The CATO can manage through construction programme design and the TO can manage through near-shore routing design and providing a reasonable timescale for project completion based on capacity of subsea cable and thus number of suitable cable-laying vessels.	No additional data requirements
Supply Chain/ HVDC Design *Engagement with the HVDC supply chain could influence project design choices*	B	N	Supply chain for HVDC is small enough that early design choices could essentially mean that HVDC OEM is decided upfront. In a fully competitive environment, CATOs could manage this by competing for contract from this OEM, although this would not be efficient. With OEM/CATO/EPC consortia, competition in tender would be reduced.	Y	TO/SO can include as much flexibility as possible in their early designs so as to maximise scope for competition and innovation. If significant detail is required, then TO/SO should procure.	CATOs will not necessarily be able to engineer around any design limitations on HVDC equipment. Therefore, the TO/SO should make sure that designs are as flexible as possible (i.e. no limiting decision choices should be made without justification). If HVDC equipment has to be procured early, this should be done in an efficient manner (e.g. with oversight on behalf of Ofgem) and all appropriate information should be made available to bidders.	Where potentially limiting early design choices are made, supporting information should be set out in the tender specification/data room. Information (contracts, technical designs etc) on any procured equipment will need to be in the specification.

Risk	Risk Level	Is it Efficient for the CATOs to Manage this Risk?		Is it Efficient for the TOs/SO to Manage this Risk?		Recommendation	Implications for Tender Spec
Supply Chain/ HVDC Timescales *Engagement with the HVDC supply chain could influence timescales for the supply of components*	A	Y	If the HVDC OEM is not selected upfront, the CATO could engage with multiple OEMs during the tendering process with OEM selection prior to or following CATO selection. Availability of manufacturing timeslots could be discussed with each OEM to inform tendering but it is unlikely that these would reserved until OEM selection. Partnering with OEMs during the tendering process may mitigate this risk but reduces the tender competitiveness.	N	Supply chain for HVDC is small enough that early design choices could essentially mean that HVDC OEM is decided upfront and manufacturing timeslots can be provisionally reserved by the TO/SO. This could constrain the CATO project programme but would mitigate the risk of programme delays due to cable manufacture	Manufacturing timeslots to be provisionally reserved by the TO/SO where possible and form part of the tender specification. This may not be possible if the subsea cable supplier is not yet procured	Details of supply chain engagement to date between TO/SO and HVDC OEM, specifically potential availability of manufacturing timeslots if possible.
Supply Chain/ HVAC Design *Engagement with the HVAC supply chain could influence project design choices*	E	Y	Early stages of AC design are generally industry best practice. EPCs (and hence most CATOs) should be comfortable to engineer around most limitations.	Y	TO/SO can include as much flexibility as possible in their early designs so as to maximise scope for competition and innovation.	CATOs will be able to engineer around most design limitations on AC equipment, but TO/SO should make sure that designs are as flexible as possible (i.e. no limiting decision choices should be made without justification).	Where potentially limiting early design choices are made, supporting information should be set out in the tender specification/data room.
Supply Chain/ EPC Design *Engagement with EPC suppliers could influence project design choices*	E	Y	EPC elements of design (e.g. logistics, construction) are generally industry best practice. EPCs (and hence most CATOs) should be comfortable to engineer around most limitations.	Y	TO/SO can include as much flexibility as possible in their early designs so as to maximise scope for competition and innovation.	CATOs will be able to engineer around most design limitations on EPC/logistics, but TO/SO should make sure that designs are as flexible as possible (i.e. no limiting decision choices should be made without justification).	Where potentially limiting early design choices are made, supporting information should be set out in the tender specification/data room.

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5 Forms of Tender Specification

5.1 Basis for Tender Specification

The initial view of TNEI and Pöyry is that, in order to maximise the scope for innovation and efficiency savings, the tender specification should be output-based (i.e. a functional specification) to the degree that this is possible.

However, CATOs/bidders need to have a clear view on potential constraints and limitations which could impact upon their design. This would require a level of survey and study work beyond that which would typically be undertaken in order to complete an EIA. In some cases, these constraints may actually force the TO/SO to make design choices early on, which would result in the tender specification looking more like an input/technical specification than an output specification.

For the majority of CATO projects, we do not think an outcome-based tender specification is appropriate, as, in the Late model, the project outcomes will be well defined (e.g. by the needs case and by the concept design).

5.2 Baseline Tender Specification

Based on the discussion in Sections 2, 3 and 4, a baseline tender specification is suggested in Table 5-1. This table includes information that would be included within the specification and within the data-room.

The baseline tender specification has been developed with regard to the following:

- A general preference from prospective CATOs/bidders to have as much information as possible in the tender-specification/data-room (as discussed in Section 3);
- Consideration of the extent of development works which can be completed before submission of the consent application (i.e. the works which will definitely be available at the earliest point that the ITT *could* be launched, Section 2.1.2); and
- The risks identified and quantified for development works that may not be completed for the EIA or consenting application and how these might be addressed through the contents of the tender specification (Table 4-2).

Please note that offshore data would only be applicable for offshore or 'wet' onshore projects.

A more detailed baseline tender specification is provided in Annex C providing further description of the various documents/information, justification for inclusion in the tender and indicating whether the information would be contained within the tender specification or the dataroom.

Generally, the late CATO tender specification proposed is based on development works that would be carried out as part of preliminary design and to inform FEED and detailed design. However, it comprises some level of detailed survey work for geotechnical data for example as there will be a balance between provision of sufficient data to enable the CATO to de-risk tendered project costs, carry out their own due diligence on the data and to minimise potential further survey/study rework which may be required once the FEED design is more progressed. This is illustrated in Figure 2-1.

This approach should efficiently enable some flexibility in design and design innovation for the CATO.

Table 5-1 Baseline Tender Specification

Category	Type	Documents
Minimum typically required for EIA and Consent Application		
Design	**Concept**	Needs Case Report; Optioneering Report; Functional Specification; Single Line Diagram
	Preliminary	Route corridor study report; Initial drawings/designs and specifications for major components; initial plans and specifications for construction techniques access and logistics
Studies/ Surveys	**Geotechnical**	Geotechnical desk study; peat slide risk assessment report and data; Phase 1 contaminated land report; preliminary UXO/UXB risk assessment; borrow pit assessment report; ground investigation report; targeted topographical survey report.
	Ecological	Phase 1 Habitat report; protected species survey reports; hedgerow survey reports; national vegetation classification survey report; ornithological survey reports
	Logistics	Initial access studies and feasibility; Traffic Impact Assessment; Approval in Principle (AIP) with relevant highways authorities
	Other	Noise assessment report (initial design); construction noise assessment; Landscape and Visual Impact Assessment; Electro-magnetic Field assessment; flood risk assessment; archaeological assessment.
Consenting	**Social Commitments**	Statement of Community Engagement.
	Application Process	Application documents, draft or final consents/licences.
Development Works but not typically required for EIA and Consent Application		
Design	**Concept**	Records of supply chain engagement; conceptual project plan/programme

Category	Type	Documents
	Preliminary	Reporting on any supply chain limitations due to initial design choices; contracts, designs etc for any early procurement
Studies/ Surveys	**Electrical**	System studies reports; contingency analysis reports; TO/SO Outage schedule; detail of DNO crossings; system models/data; harmonics data; information on TO/SO interfaces (e.g. design of electrical boundaries); information on third party interfaces (e.g. generators, other CATOs);
	Offshore	Offshore geotechnical report based on geophysical surveys as a minimum; Metocean study based on regional modelling as a minimum; Information on availability of offshore installation vessels
	Other	Noise assessment report (detailed design); detailed geotechnical assessment of ground conditions; detailed archaeological assessment.
Consenting	**Social Commitments**	Summary of (or copies of) consultation responses; community liaison group minutes
	Application Process	Summary of pre-application discussions; submissions and documents (e.g. Gatecheck Reports; Written Responses; Inquiry Reports).
	Consents	Development Consent Order; Section 37 Consents & Deemed Planning Consents; Marine Licences; Planning Consents for elements consented through the Local Planning Authority/Local Authority.

5.3 Due Diligence

Input from stakeholders suggests that it could be beneficial for Ofgem to complete some due diligence on the preliminary works completed by the TO/SO, and include this report in a prominent place within the tender specification/data-room.

An independent view from technical experts on the quality of the preliminary works could provide more certainty for bidders and financiers. This could also 'sign-post' the risk areas for bidders and allow them to focus their attentions on those activities which may be more difficult/problematic. However, we would expect that all bidders would undertake some level of due diligence internally to provide reassurance on their quantification of project risk and correspondingly risk costs.

By undertaking some due diligence upfront, the total effort required by bidders may be reduced. However, it may extend the timeline prior to tendering as we expect that it would generally be completed subsequent to completion of all pretendering works (e.g. surveys and studies) although some due diligence could be carried out earlier as soon as specific works were completed.

An illustrative project programme the late CATO regime is presented in Figure 2-1 for reference. Please note that this is a stylised process and does not take into account any regulatory approvals that may be required. Independent due diligence could potentially make the entire tendering exercise more efficient however the impact on timelines would need to be considered.

5.4 Variations to Baseline

5.4.1 Level of Design Detail

The level of design detail within the tender specification may vary on a project-by-project basis. The key drivers for variation will be:

- Complexity of project and corresponding design, construction and supply chain risks; and
- The degree of flexibility within the consented design.

More novel or complex projects (e.g. HVDC, subsea) could present more risk for some CATOs so an increased level of design detail in the tender specification may help to mitigate this to ensure sufficient competition and de-risked tenders. The EPC elements within some CATOs would probably be comfortable with 'traditional' HVAC projects. It should be noted that there will be some CATOs that will be prepared to take on higher levels of risk due to relevant experience or portfolio risk profile and the generally acceptable level of risk may increase over time as the CATO regime becomes more established.

Level of design detail in the consent application and tender specification should be balanced with including some flexibility e.g. in design envelopes, to enable the CATO to incorporate greater design innovation where possible. In general, potential CATOs seem to favour functional specifications which will allow them to innovate and maximise efficiencies in design. However, this generally corresponds to increased risk in terms of project design, procurement and construction. These design (and cost) efficiencies would ultimately be shared with the consumer.

However, in some cases, tender specifications may be more detailed, e.g. with detailed layout and design drawings etc. This is true for projects within RIIO-T1 where design is well progressed. For projects where equipment suppliers were already contracted or locked-in due to design specifications, the TO/SO would be expected to provide a strong justification for the need to contract the supply chain prior to tendering.

Early engagement with potential CATOs on the upcoming project pipeline should facilitate an improved understanding of appetite for risk across the market for specific projects, following on from this assessment. Also, the first few tender processes should be robustly reviewed by Ofgem to identify key areas for refinement of the tendering process including tender specifications and data.

5.4.2 Project Location

Project location may impact broadly across the tender process and specifications in terms of consideration of consenting, land access, design risk and construction risk. Differences between the consenting regime in England and Wales and that in Scotland have been described in the sections above.

Regardless of which regime a project falls under, CATOs consideration of risk will be informed by its location. For example a route that passes through an area of sensitive landscape requiring extensive mitigation or that crosses an area of difficult ground conditions will have a higher degree of risk allocated to it and require more detailed survey works and data as discussed in Table 4-2.

Additional project complexity exists where there are a mix of onshore and offshore elements, and therefore a range of consents and licences along with additional delivery risks. Accordingly tender specifications are likely to be more complex and require a broader range of data.

5.4.3 Project Types

Project types that may have specific requirements for the tendering specifications included HVDC and subsea cable projects as well as non-electrically contiguous. These are considered in more detail below.

5.4.3.1 HVDC Projects

Experience, analysis, and input from stakeholders suggests that for the majority of typical HVAC projects, consenting choices and early design choices are unlikely to bias the project towards any particular suppliers.

For HVDC projects, the use of limits of deviation should mitigate the need for early procurement due to consenting requirements and the dependency on differences in designs between each HVDC manufacturer. However, we recognise that there may be cases where required technical specifications favour a certain supplier over another.

Early procurement of HVDC equipment may also be driven by supply chain constraints, particularly on HVDC cables, the choice of which may also lock the project into a particular choice of HVDC converter.

Within Table 5-1 there is design information described which is required when potentially limiting decisions are taken by the TO/SO for design or consenting reasons (e.g. records of supply chain engagement, reporting on any supply chain limitations due to initial design choices; contracts, designs etc for any early procurement). In general, it is anticipated that this will be most relevant to HVDC projects, depending on the tendering approach.

5.4.3.2 Subsea Cable

For the majority of onshore transmission reinforcements, the ‘offshore’ documents described in Table 5-1 will not be relevant. However, for any CATO projects with subsea elements (in particular, 'bootstrap' links and island connections, these items *will* be required.

5.4.3.3 *Non-Electrically Contiguous Projects*

There may be a greater number of technical interfaces for a non-electrically contiguous project and thus, potentially higher risks particularly with network outages. There may also be more commercial interfaces e.g. with generation developers and distribution network operators. For these projects, a greater focus should be applied to data provided for outage programme planning by the TO/SO.

5.5 Preliminary Works Outputs

We have outlined proposed data requirements for a late CATO tender baseline specification above in Table 5-1 and Annex C. This will have a corresponding influence on the preliminary works carried out by the incumbent TO or SO prior to tendering.

All development works required as a minimum for submission of the consent application would be available, these are outlined in Section 2. Typically for onshore projects, surveys and studies are carried out within the first 1 to 2 years of project development prior to commencement of construction. Award of consent must be in place before construction begins. For 'wet' onshore projects, with offshore elements, development works may take longer due to seasonal requirements for subsea geotechnical surveys for example and greater complexity of design.

Currently the incumbent TO typically carries out a number of development works in parallel following submission of the consent application, progressing various studies and design elements through concept, preliminary design, FEED and detailed design, depending on the expected timescales of consent award and conditions attached. This is illustrated in Figure 2-1. Consent conditions may potentially require some design modification post-award which is a design risk.

Our recommendations for the late CATO tender specification are based on development works that would generally be carried out as part of preliminary design and to inform FEED and detailed design in the first 1 to 2 years of development of transmission projects. This envisages that the FEED and detailed design would be within the late CATO remit. This was informed by our assessment of risks associated with various development work outputs and whether it was efficient for the incumbent TO/SO or CATO to manage the risk.

Detailed surveys or studies should be carried out where these have the ability to significantly reduce risk (and in which case, may be carried out for the consent application), as assessed in detail in Section 4. This should allow the CATO some flexibility in design innovation whilst minimising potential survey/study rework if the resultant design is somewhat different and should also help to reduce risk costs within the project tender. Also, the incumbent TO should not need to bring any existing development activities significantly forward. The success of this approach in terms of efficient tendering and preliminary works costs and outputs should be reviewed following several tendering exercises.

5.6 Supply Chain Engagement

In general, our view is that for conventional HVAC projects, supply chain engagement prior to launching the tender can be relatively low level. This was supported by input from most stakeholders that we engaged with during this study. Essentially, the incumbent TO/SO needs to ensure that the design for which they are seeking consent is practical and buildable. This could be done by engaging at a high level with the supply chain and/or by relying on appropriate in-house expertise or external consultants.

However, the design decisions made and encapsulated within the consent application should not, in most cases, bias the project towards any particular OEM or supplier since (i) HVAC equipment designs are generally relatively standardised, and (ii) experienced EPC companies should be able to work within a reasonable level of engineering constraint without limiting procurement.

However, for HVDC projects, equipment specifications e.g. voltage, capacity, and dimensions (e.g. onshore converter stations) are not so standardised particularly for high capacity assets, and therefore layout designs and footprints for consenting will vary which is the case across each of the three major suppliers (Siemens, ABB, GE Grid Solutions).

There should be some level of engagement by the incumbent TO/SO with HVDC suppliers in order to ensure that the layout designs and footprints which go into the consent application are appropriate and do not unnecessarily restrict supply chain. A limits of deviation approach should be used wherever possible in order to maximise flexibility in the consent.

For HVDC projects, engagement may be driven to a greater degree by supply chain constraints e.g. manufacturing for HVDC subsea cables. If supply chain constraints would otherwise have a significant detrimental impact on the project programme and/or costs, then it may be most efficient for the incumbent TO/SO to carry out early engagement and procurement of large assets prior to tendering. This process would need to be undertaken transparently and efficiently so that it did not negatively affect the CATO tender or the subsequent activities of the appointed CATO. Also, the final contract would need to be transferable in entirety.

Annex A: Qualitative Assessment of Development Works Influence on Project Cost Uncertainty

Development works which are usually completed after the consent application, that could either be completed by the TO/SO or by the CATOs are summarised below in Table A-1.

Qualitative Assessment Methodology

Table A-1 includes a Red-Amber-Green (RAG) rating of (i) the level of complexity of completing each development activity, and (ii) the potential impact on tendered project costs if the outputs from the specific development activity are not available.

'Level of Complexity' considers interdependent factors such as technical or logistical complexity, required technical expertise, cost of completion, typical timescales etc. A green rating describes a development activity that would not be onerous for the CATO or TO/SO to complete; a red rating suggests that the associated works would be very onerous for a CATO or the TO/SO to complete.

'Potential impact on Project Costs' is based on impact on tendered project costs if the outputs from the specific development activity are not available and includes programme risk and more broadly, cost risk. This column could be interpreted as qualitatively describing the degree of uncertainty in project cost which exists prior to the completion of the specific development activity. A green rating suggests that the outputs of the development activity do not influence cost uncertainty significantly for the CATO, whereas a red rating suggests that, until the development activity is completed, there is a significant cost uncertainty for the CATO.

This evaluation is useful for assessing qualitatively the influence of various development activities on project cost uncertainty, development works timescales and parties best placed to carry out the works. In doing so, it can help to provide an indication of whether these works should be carried out by the TO/SO and included in the tender specification to techno-economically de-risk cost estimates.

For example, a geophysical survey ground investigation report can be undertaken through non-intrusive techniques and is easily deployable even over large areas and difficult terrain at relatively low cost so is not complex. It significantly reduces ground risk and thus clearly should be included in the tender specification.

Conversely, for targeted trial trenching and/or borehole surveys, large areas may be time consuming to conduct fieldworks and access may be problematic. Although the impact on cost uncertainty is significant, due to the complexity and timescales associated with the work and the limitations that would this would impose on the final design (or the potential for further costly surveys due to design changes), it may be preferable for the CATO to include risk cost contingencies in the tender to address this.

Table A-1: Influence of Development Works Typically Undertaken after Submission of a Consent Application on Project Cost Uncertainty

Category	Description	Documentation	Level of Complexity		Potential impact on Project Costs	
Design/Detailed	**Detailed Electrical Studies**	Load Flow Report. Fault Level Report	🟠	Network modelling expertise would be required, may require data about the wider system. Complexity will likely scale with the size of the project.	🟠	Load flows and fault levels will likely be quite well understood from the preliminary/concept designs, and equipment sizing. Any issues could probably be mitigated by making relatively modest modifications to designs (e.g. increasing equipment capabilities). May be more complex for more complicated projects
Design/Detailed	**Detailed Engineering Calculations**	Equipment sizing calculations report	🟢	Some interaction with electrical studies, but these calculations can probably be spreadsheet based.	🟠	Equipment requirements will be generally understood at a high level (e.g. from previous project experience) but will directly impact on the detailed design of the project. May be more complex for more complicated projects.
Design/Detailed	**Detailed Single Line Diagram**	Detailed single line diagram	🟢	Based on conceptual single line diagram, adding in details on design developed through the FEED.	🟠	Basic layout/interfaces etc unlikely to change significantly. Protection coordination etc may have some impact on costs.
Design/Detailed	**Detailed Component Designs**	Detailed component drawings and specifications	🟢	Component designs are relatively standardised.	🟠	Without having detailed knowledge of component designs etc it will be hard to robustly cost up the project.
Design/Detailed	**Detailed Layout Designs**	Detailed layout drawings and Specifications	🔴	Producing detailed layout drawings requires consideration of environmental and geotechnical constraints as well as clearances and designs.	🔴	Detailed layout designs can have a big impact on, for example, foundation design, access arrangements etc
Design/Detailed	**Detailed Construction/ Logistic Design**	Detailed plans, drawings and specifications	🟠	Construction processes and logistics issues can be planned at quite a high level in order to produce a cost.	🟠	EPCs are generally comfortable with generic logistic techniques and construction management techniques and will have a good idea of costs
Design/Detailed	**Interaction with Procurement**	Procurement specifications, designs and contracts	🟠	In order to finalise detailed designs, supply chain will need to be in place (e.g. in order to fix costs)	🔴	Supply chain will dictate final cost of construction of components

Category	Description	Documentation	Level of Complexity		Potential impact on Project Costs	
Design/Detailed	**Detailed Project Programme**	Detailed Project Plan/Programme	🟠	Programmes are not overly difficult to put together, however a lot of information is required to inform the development of the programme	🔴	Changes to, or uncertainly, in programmes can have huge implications for cost (for example, if outages are missed then this could delay the project significantly which would have a cost impact)
Surveys & Studies/ Electrical	**Harmonics**	Harmonics Report	🔴	Harmonics studies will require appropriate data and modelling expertise.	🟠	Harmonic issues could mean that there is a requirement for harmonic filters to be constructed, or for designs to be revised
Surveys & Studies/ Electrical	**Transient/Dynamics**	Transient Reports	🔴	Dynamics studies will require appropriate data and modelling expertise.	🟢	Experience suggests that most transient phenomena can be mitigated by over-specifying certain items of equipment e.g. circuit breakers
Surveys & Studies/ Electrical	**Outage Planning**	Outage Schedule	🔴	Only the TO/SO (and DNO for DNO crossings) will be able to prepare outage plans as this will need to consider system wide impacts and interactions.	🔴	Availability of outages can fundamentally affect a project programme, which means there is significant potential for programme risk and, by extension, cost risk
Surveys & Studies/ Geotechnical	**Targeted Trial Trenching and/or Borehole Surveys**	Ground Investigation Report (GIR)	🟠	Large areas will be time consuming to conduct fieldworks, access may be problematic if no existing infrastructure and difficult terrain to traverse	🔴	Costs to project of not having sufficient info are high as CATOs likely to include large risk contingencies in pricing to cover unknowns
Surveys & Studies/ Geotechnical	**Geophysical Survey**	Ground Investigation Report (GIR)	🟢	Easily deployable even over large areas and difficult terrain, relatively low cost. Non-intrusive techniques	🔴	Complements intrusive geotechnical fieldworks, and significantly contributes to reducing ground risk monies/contingencies
Surveys & Studies/ Geotechnical	**Phase 2 Contaminated Land (aligned with trial trenching and boreholes)**	Ground Investigation Report (GIR)	🟠	Large areas will be time consuming to conduct fieldworks; access may be problematic if no existing infrastructure and difficult terrain to traverse. Suspected contaminants can dictate protective measures/working methods and increase costs.	🔴	Costs to project of not having sufficient info are high as CATOs likely to include large risk contingencies for possibly having to remediate land, can be costly depending on measures adopted (dig and dispose or remediate in situ)

Category	Description	Documentation	Level of Complexity		Potential impact on Project Costs	
Surveys & Studies/ Geotechnical	**Detailed UXO/UXB Risk Assessment**	Detailed UXO/UXB Risk Assessment (incl. mitigation plan)	🟢	Report is relatively easy, quick and low cost. Findings make dictate costly measures though.	🟢	Cost of report is relatively low but may dictate costly remedial measures/works
Surveys & Studies/ Geotechnical	**Intrusive UXO/UXB Survey**	Free From Explosives (FFE) certificate	🔴	If no existing infrastructure and difficult terrain to traverse, intrusive works can become costly, particularly if large areas are to be covered	🔴	If findings lead to disposal of ordnance, costs can become extremely high if large areas are at risk. Small/localised UXO's may be able to be dealt with quickly/easily/low cost.
Surveys & Studies/ Geotechnical	**Further Topographical Surveys**	Full topographical site survey data and drawings in an interrogable format (e.g. CAD data)	🟠	If large areas are to covered, works can be time consuming	🟠	If difficult/undulating terrain is not identified, design of infrastructure can be difficult/costly to finalise. Overall cost of topographical survey relatively low but increases with areas to be covered.
Surveys & Studies/ Geotechnical	**Detailed Borrow Pit Assessment**	Extraction and management plan (incl. volume and quality of aggregate)	🟢	Fieldworks required to quantify volume and quality of extractable aggregate. Works fairly localised and low cost, best combined with geotechnical works	🟠	If sufficient aggregate can be sourced on site, construction costs can be greatly reduced
Surveys & Studies/ Ecological	**Checking Surveys**	Update Reporting, Licence Applications	🟢	Would be undertaken by a qualified ecologist. Access to land required but this is assumed at the point that these would be undertaken.	🟠	Potentially expensive and has potential to cause programme delays. However, implications for works would typically be limited and manageable. There may be programme implications (e.g. waiting for breeding birds) but these can be identified within the tender specification.
Surveys & Studies/ Ecological	**Updates to Protected Species Surveys**	Update Reporting, Licence Applications	🟠	Would be undertaken by a qualified ecologist. Some species specific seasonal requirements e.g. great crested newts.	🟠	Potential to be costly and could cause some programme delays both through survey effort and mitigation measures / licensing requirements.
Surveys & Studies/ Hydrological	**Detailed SuDS Designs**	Design Drawings and Specifications	🟠	Could be onerous if extensive infrastructure is required (e.g. settlement lagoons, attenuation ponds etc.) which increases footprint/area of development.	🟠	Impact on overall project costs would depend on the solution(s) required.

Category	Description	Documentation	Level of Complexity		Potential impact on Project Costs	
Surveys & Studies/ Hydrological	**Detailed Design Input**	Design Drawings and Specifications		Interaction with detailed design process.		Low cost to incorporate assessment findings. Mitigation measures may be relatively expensive to adopt.
Surveys & Studies/ Archaeological	**Geophysical Surveys**	Archaeological Evaluation Report		Undertaken by a specialist contractor with results analysed by an archaeological specialist. Requires access to land. Can have time constraints depending on current land use (e.g. state of arable crops).		Survey itself can be relatively expensive. Timing requirements may lead to some programme delays. The implications of the findings on overall cost are high due to the level of mitigation that may be required (preservation options), the possibility that layouts may need to be amended (possibly through amendments to the consent) and the potential for programme delays.
Surveys & Studies/ Archaeological	**Geotechnical Surveys**	Archaeological Evaluation Report		Requires access to land and agreement for intrusive surveys. Requires plant to be able to gain access to the trenching locations.		Trial trenching itself can be relatively expensive. The implications of the findings on overall cost are high due to the level of mitigation that may be required (preservation options), the possibility that layouts may need to be amended (possibly through amendments to the consent) and the potential for programme delays.
Surveys & Studies/ Logistics	**Swept Path/Clearance Analysis**	Drawings		Desk based analysis using industry standard software.		Analysis itself is low cost. If access constraints are identified this may lead to a requirement for upgrade works or further land deals. There is potential for substantial project delays.
Surveys & Studies/ Logistics	**Further assessment of Traffic following Geotechnical Works**	Updated TIA and mitigation measures		Update to assessment is straight forward.		Low cost assessment. Should trip numbers increase significantly, additional highways and community consultation may be required. The cost implications of needing to import far more material could be high.

Category	Description	Documentation	Level of Complexity		Potential impact on Project Costs	
Surveys & Studies/ Logistics	**Detailed Design of Highways Modifications**	Detailed plans, drawings, specifications and legal agreements with highways authority		Design process is straight forward. Requires landowner agreement and consultation with the highways authority.		Low cost for design process. Should modifications require access to 3rd party land not already under option then this could lead to additional costs and project delays.
Surveys & Studies/ Logistics	**Topographical Surveys for Access**			May require access to land to undertake the surveys. Survey effort itself is straight forward.		Low cost for survey effort. Should modifications require access to 3rd party land not already under option then this could lead to additional costs and project delays.
Surveys & Studies/ Noise Assessment	**Assessment of Construction and Operational Noise Impacts**	Detailed Design Noise Assessment Report		Carried out by qualified acousticians. Short term access to land required for background monitoring. Detailed engineering design required to accurately predict emissions with noise input into design required.		If required, mitigation measures could be expensive.
Surveys & Studies/ Metocean	**Assessment of Wave and Current Conditions**	Metocean report		Detailed onsite surveys would be carried out by qualified surveyors to better inform conditions along cable route for cable design and installation.		Helps to better understand probabilistic weather conditions to inform cable installation programme and assess potential weather related delays which can have a significant impact due to cable installation vessel costs.
Surveys & Studies/Seabed	**Assessment of Seabed Geotechnical Conditions**	Seabed Geotechnical Report		Detailed surveys would be carried out at discrete locations to understand seabed geotechnical conditions along cable route. This could be lengthy and weather dependent.		Delays to cable laying due to encountering unanticipated geotechnical conditions can have a significant impact due to cable installation vessel costs. Aim is to de-risk this as much as possible during pre-construction routing design.
Land Access/ Land Access	**Any Required Further Negotiations with Landowners**	Copies of agreements. Overview Report		Negotiations may be protracted and involve numerous parties.		If agreement cannot be reached then necessary wayleaves or CPO would be required. This is more problematic in Scotland where CPOs aren't included within the consent.

Category	Description	Documentation	Level of Complexity		Potential impact on Project Costs	
Land Access/ Land Access	**Completed Negotiations with Landowners**	Copies of draft agreements. Overview Report	🔴	Negotiations may be protracted and involve numerous parties.	🔴	If agreement cannot be reached then necessary wayleaves or CPO would be required. This is more problematic in Scotland where CPOs are not included within the consent.
Land Access/ Land Access	**Application for Compulsory Purchase Order or Necessary Wayleaves (if not already submitted)**	Compulsory Purchase Orders or applications made. Necessary wayleave applications or orders	🔴	Risk of Public Inquiry subject to objections. Necessary wayleaves are not transferrable to 3rd parties.	🔴	Potentially significant programme delays and the risk of the need to realign to avoid having to use compulsory powers.
Land Access/ Land Access	**Crown Estate Lease, Crossing Agreements, Port/Harbour Agreements**	Draft / final agreements, summary report	🔴	Negotiations may be protracted and involve numerous parties.	🔴	Risk of programme delays if lease arrangements are not finalised.
Consenting/ Social Commitments	**Establishing the Social Commitments throughout Delivery of the Project e.g. timing of works, delivery routes**	Community Liaison Group commitments	🟢	Community engagement is central to the consenting process. Commitments should be understood ahead of the tender.	🟢	Commitments should be known and able to be built into the delivery programme without significant risk.
Consenting/ Consenting	**Obtaining Consent**	Decision Notices, Planning Conditions	🟠	Rigorous process which may include the need for a Public Inquiry.	🔴	Delays in gaining consent and the need for a Public Inquiry can result in programme delays and significant cost implications.

Category	Description	Documentation	Level of Complexity		Potential impact on Project Costs	
Consenting/ Environmental Commitments	**Agreeing the Detail of the Environmental Commitments throughout Delivery of the Project e.g. habitat enhancements, screening.**	Licences / licence applications, Environmental Management Plans	●	Commitments should be established throughout the EIA process. They should be generally understood ahead of the tender process.	●	Commitments should be known and able to be built into the delivery programme without significant risk.

Annex B: Development Works Risk Assessment

Table B-1: Impact of Risks Related to Development Works

Risk	Description of Risk	Description of Impact	Assessment		
			Probability	Severity	Risk
Land Access/ Gaining Agreements	The CATO may be unable to gain voluntary access agreements for all the land required for construction, if not in place upon submission of consent application/grant.	This could have a significant impact on project programmes e.g. could require extensive negotiation and/or route realignment.	■■■	■■■■	A
Land Access/ Transferring Agreements	The CATO may be unable to take over involuntary access agreements obtained by TO/SO. Please note that this applies in Scotland while in England &Wales a DCO can have CPO powers attached so will be of lower risk.	The CATO would need to seek voluntary or involuntary agreements. There is potential for significant delays, additional costs and (possibly) the requirement to amend the design.	■■■■	■■■■	A
Land Access/ Offshore Agreements	The necessary agreements for offshore works may not be finalised and the CATO has to negotiate these.	This could cause significant programme delays and additional costs particularly for projects with significant offshore works.	■■■	■■■■	A
Archaeological	Completed archaeological survey work may be insufficient to identify unidentified archaeological interest resulting in delays to the programme or affecting the 'buildability' of consented designs.	Archaeological interests require mitigation which may delay construction works or require amendments to the design and access to additional landholdings.	■■	■■■■	B
Consenting/ Process	All necessary consents may not be in place when the CATO is preparing their bid.	There could be delays in obtaining consents which will delay start on construction. Additional costs could be incurred by the CATO e.g. due to Public Inquiries and management of applications.	■■■	■■■■	A
Consenting/ Environmental Commitments	The environmental commitments made during the EIA process may lead to programme delays or additional costs.	Additional ecological surveying and licensing requirements could result in programme delays and additional costs. Compensatory habitat measures or screening of visual impacts may require further land access arrangements.	■	■■■	D
Consenting/ Conditions	The requirements of the consent (e.g. planning conditions) may be more onerous than drafted or anticipated.	This could lead to programme delays and additional costs associated with discharging any unexpected requirements/conditions.	■	■■■	D

Risk	Description of Risk	Description of Impact	Assessment		
			Probability	Severity	Risk
Consenting/ Social Commitments	There may be onerous social commitments made during the EIA process, or working with communities and delivering these may be more difficult than expected.	Construction or operational practices could be restricted due to social commitments, which may result in additional costs or programme delays.	■	■■■	D
Design/ 3rd Party Interfaces	The CATO may have insufficient information about third party interfaces with DNOs, OFTOs or generators for example (including both technical and commercial aspects).	If there is not enough technical/commercial information on third party interfaces, then the CATO designs and programmes may not be adequate. Risk costs may be higher.	■■■	■■■	B
Design/ Duty of Care	The CATO could be required to design and build an asset which is 'fit for purpose', rather than with 'reasonable skill and care'. 'Fit for purpose' would result in an ongoing unknown risk to the CATO. If legislation, regulation or standards changed in the future so that, while fit for purpose at the time of design and construction, this may not remain the case throughout the operational lifetime of the asset. 'Reasonable skill and care' is a more transparent risk as the CATO's liability relates to demonstration of the adoption of reasonable skill and care in the context of contemporary legislation, regulation, standards and best practice.	If assets have to be built 'fit for purpose' then the CATO could be non-compliant if standards and/or legislation change.	■■■	■■■	B
Design/ Transparency in Decision	There may be a lack of transparency in existing design decisions taken by the TO/SO, or these designs may not be considered to be reliable by the CATO.	If existing design decisions need to be revisited this could add programme delays and increase project costs.	■■■	■■■	B
Design/ General Technical Characteristics	The general technical characteristics (e.g. voltage, required capacity) of the project may need to change due to unexpected changes in the transmission system for example.	If general technical characteristics of the project change it could significantly affect costs, lead times etc (e.g. if required tower heights need to change then the CATO may have to go back through the consenting process).	■■	■■■	C
Design/ System Harmonics	The CATO's assets could exacerbate general harmonic distortions in the wider system.	Harmonic filtering equipment may need to be installed to address any harmonic issues.	■■■	■■	C

Risk	Description of Risk	Description of Impact	Assessment		
			Probability	Severity	Risk
Design/ Local Harmonics	The CATO's assets could exacerbate harmonic currents from sources which are directly connected to the CATO.	If CATO is connecting a generator to the system (like an OFTO), then any harmonic current distortions could be amplified (particularly with long AC cables), with requirements for filtering equipment.	■■	■■■	C
Design/ Consents	Design (and correspondingly procurement) choices are significantly constrained due to the contents of the planning consent.	This could limit the CATO's ability to innovate (e.g. increasing project costs) or limit the scope for competition if it biases the project to certain suppliers.	■■■	■■	C
Design/ Detailed Technical Characteristics	The detailed technical characteristics (e.g. detailed equipment specifications) of the project may need to change.	If the detailed technical characteristics/designs of the project change it could affect costs and lead times etc.	■■■	■	D
Design/ Needs Case	There could be uncertainty in the need's case which underpins the entire project.	If the needs case driving the project changes, it could mean going back to the concept design stage or even potentially terminating the project entirely (e.g. if it is driven by a generator connection).	■	■■■	D
Design/ Transient Phenomena	Transient/dynamic phenomena, such as transient overvoltages during could have an adverse impact on CATO assets.	If (for example) switching studies are not undertaken, there could be a risk that assets are not constructed to the required standard.	■■	■■	D
Design/ Standards	If CATO design standards vary on a project-by-project basis, this may inhibit efficient design and engagement with the supply chain.	This could lead to the supply chain potentially having to redesign equipment and increase in project lead times and costs.	■	■■	E
Geotechnical/ Ground Conditions	There may not be detailed information about ground conditions along the route due to a lack of site work.	Unknown ground conditions and therefore unknown risks would likely lead to (i) significant delay due to the CATOs' inability to properly plan works, (ii) increased costs through CATOs applying large risk contingencies and/or (iii) the need for reopeners if CATOs cannot manage ground risk (e.g. if designs need to be radically altered.	■■■■	■■■■	A
Geotechnical/ Borrow Pits	There may not be sufficient information about the borrow pits needed in order to complete aggregate costings.	Assumptions would have to be made by the CATO on the quality and quantity of aggregate available for extraction. Sufficient risk contingencies would have to be included to cover import of all / or substantial volume of material. Inaccurate assumptions on material could have time and cost implications.	■■■	■■	C

Risk	Description of Risk	Description of Impact	Assessment		
			Probability	Severity	Risk
Geotechnical/ UXO	There may not have been sufficient work (e.g. on-site work) completed to determine risk of unexploded ordinance (UXO) and unexploded bombs (UXB).	This poses greatest risk for work in (or adjacent to) densely populated cities/towns and open moorland, although other areas including marine environments are still at risk. The implication of discovering a UXO/UXB during site works could be catastrophic in terms of human safety. At best this could significantly delay and/or increase the costs of construction works.	■■	■■■	C
Hydrological	Significant modifications to consented designs or construction techniques may be required as result of hydrological conditions (e.g. flood risk).	This could increase costs and timescales if designs have to change. Significant design changes could alter material appearance of buildings/structures (e.g. increase in height) which may not be compliant with planning consents.	■■	■■■■	B
Logistics/ Highway Modifications	Significant unforeseen highway modifications are required in order to get access to sites e.g. additional works to an existing field entrance required by highways officers.	There is potential for significant cost increases and delays associated with the design of new works. Legal agreements with highways authorities and private land owners may need to be obtained.	■■■	■■■■	A
Logistics/ Access	Logistic plans are not feasible with existing (or Approved in-Principle (AIP)) access agreements.	Whole or partial areas of the development are unable to be accessed. This has lead time and cost implications, as, either new designs will need to be developed or new access agreements will have to be obtained.	■■	■■■■	B
Noise	There could be a requirement for mitigation measures if there is unacceptable noise. For example, complaints could be received during construction and operation.	Particularly for substations, mitigation measures may be required to achieve the necessary limits relative to background noise levels. Complaints during operation can require costly retrofitting of mitigation measures and can impact on goodwill/reputation.	■■	■■■■	B
Outages/ Emergency Changes	There could be emergency/last minute changes made to the outage programme by the SO/TO during construction.	Last minute changes to outage programmes could have significant impacts on CATO project timescales if CATOs cannot meet new outage windows.	■■	■■■■	B
Outages/ DNO Crossings	There could be emergency changes made to the outage programme in order to accommodate DNO crossings during construction.	Last minute changes to DNO crossings outage programmes could have significant impacts on CATO project timescales if CATOs cannot meet new outage windows.	■■	■■■■	B

Risk	Description of Risk	Description of Impact	Assessment		
			Probability	Severity	Risk
Outages/ Flexibility	Planned outage programmes may have very little flexibility for negotiation or adjustments by the CATO or by the relevant TO or other third parties due to other parallel works or maintenance.	If outage programmes are not flexible then small variations in the project programme could pose significant programme risk.	■■	■■■	C
Outages/ TO/SO Interfaces	The CATO may have insufficient information on TO/SO interfaces (including technical and commercial aspects with planned or existing generation for example) in order to adequately plan their programme to meet required outage windows.	If there is not enough technical/commercial information on TO/SO interfaces, then the CATO designs and programmes may not be adequate.	■■	■■■	C
Subsea/ Metocean Data	For projects with an offshore/subsea element, there may be insufficient metocean data available e.g. on weather conditions which could affect construction and maintenance of offshore assets.	Extreme environmental conditions can present unacceptable risk in terms of cost and delay particularly for projects with significant offshore works.	■■■■	■■■■	A
Subsea/ Seabed Data	For projects with an offshore/subsea element, there may be insufficient seabed data available e.g. on the geotechnical characteristics of the seabed.	Unexpected changes in depth of ocean floor, obstacles, or seabed layer depths and characteristics could have significant impact upon programme and cost for any subsea cable laying.	■■	■■■■	B
Subsea/ Installation	For projects with an offshore/subsea element, project programmes could be heavily dependent on the availability of installation vessels (e.g. for subsea cable installation).	Subsea or near-shore cable lay could be delayed due to lack of availability of the appropriate vessels which could impact on the project programme and costs particularly for projects with significant offshore works.	■■	■■■	C
Supply Chain/ HVDC Design	Engagement with the HVDC supply chain could influence project design choices (e.g. if supplier-specific design parameters are reflected in the consent).	This could reduce the scope for competition in HVDC procurement. This would be an especially significant risk if CATOs are consortia including OEMs/EPCs.	■■	■■■■	B
Supply Chain/ HVDC Timescales	Engagement with the HVDC supply chain could influence timescales for the supply of components.	Lack of availability of manufacturing timeslots in a constrained market (e.g. HVDC cable) may delay the supply of plant and thus the programme. This is particularly significant if seasonal weather windows for subsea cable laying are missed.	■■■	■■■■	A
Supply Chain/ HVAC Design	Engagement with the HVAC supply chain could influence project design choices (e.g. if supplier-specific design parameters are reflected in the consent).	This could reduce the scope for competition in HVAC procurement. This would be an especially significant risk if CATOs are consortia including OEMs/EPCs.	■■	■	E

Risk	Description of Risk	Description of Impact	Assessment		
			Probability	Severity	Risk
Supply Chain/ EPC Design	Engagement with EPC suppliers could influence project design choices (e.g. the design of logistic arrangements and construction techniques).	This could reduce the scope for competition in EPC appointment. This would be an especially significant risk if CATOs are consortia including OEMs/EPCs.	■ ■	■	E

Annex C: Detailed Baseline Tender Specification

Table C-1: Detailed Baseline Tender Specification

Category	Type	Document	Justification for Inclusion/Data Details	Location
Tender Specification				
Design	Concept	Functional specification	Required thermal capability, required technology, other functional requirements, required withstand capabilities (e.g. short circuits), required standard.	Tender Spec
Design	Concept	Single Line Diagram	Shows technical interfaces with existing assets and ownership boundaries.	Tender Spec
Design	Concept	Conceptual project plan/ programme	Summary to inform overall bid process.	Tender Spec
Design	Preliminary	Initial drawings/designs and specifications for major components	If available, to inform CATO tender development.	Tender Spec
Design	Preliminary	Initial plans and specifications for construction techniques, access and logistics	To inform CATO tender development, if available.	Tender Spec

Category	Type	Document	Justification for Inclusion/Data Details	Location
Design	Preliminary	Summary	Where any early procurement has been necessary, justification should be available to inform CATO tender development.	Tender Spec
Studies/Surveys	Geotechnical	Summary	General overview of ground conditions and risk apportionment in tender spec.	Tender Spec
Data Room				
Design	Project Need	Needs case report	Provides certainty for the CATO on the project need.	Data Room
Design	Concept	Optioneering report	Supports initial design choices (e.g. technology).	Data Room
Design	Concept	Conceptual project plan/ programme	To inform overall bid process.	Data Room
Design	Concept	Records of supply chain engagement	Provides some continuity to supply chain engagement particularly for HVDC projects.	Data Room
Design	Preliminary	Route corridor study report	As required for EIA.	Data Room

Category	Type	Document	Justification for Inclusion/Data Details	Location
Design	Preliminary	Contracts, designs etc for early procurement	Where any early procurement has been necessary, detailed information and justification should be available to inform CATO tender development.	Data Room
Design	Preliminary	Reporting on any limitations arising from initial design choices	To justify situations where any design choices have been made which could limit options for CATOs.	Data Room
Studies/Surveys	Geotechnical	Ground investigation report	Reports in data room detailing the results of the fieldworks (when, where, methods, depths, observations, type of strata encountered, extent and results of in-situ and laboratory testing). GIR should be factual, no opinions but should highlight areas lacking detail and recommendations for further works (if necessary).	Data room
Studies/Surveys	Electrical	Load flow system studies report	Based on preliminary design, to inform CATO tender development.	Data Room
Studies/Surveys	Electrical	Contingency analysis report	Based on preliminary design, to inform CATO tender development.	Data Room
Studies/Surveys	Electrical	Short circuit system studies report	Based on preliminary design, to inform CATO tender development.	Data Room

Category	Type	Document	Justification for Inclusion/Data Details	Location
Studies/Surveys	Electrical	TO/SO outage schedule	To allow the CATO to understand outage constraints and reflect accordingly in tender. This could include a proposal on outage window/s for specific project.	Data Room
Studies/Surveys	Electrical	Details of DNO crossings including number of crossings and outage plan ideally	To enable the CATO to appropriately cost and plan for DNO crossings, this would require some details of engagement with relevant DNO.	Data Room
Studies/Surveys	Electrical	System models/data	To allow CATOs to undertake detailed electrical studies (particularly transient/dynamic studies).	Data Room
Studies/Surveys	Electrical	System harmonics data (e.g. harmonic loci)	To allow CATOs to undertake harmonic studies in situations where CATOs are building out generation connections.	Data Room
Studies/Surveys	Electrical	Information on TO/SO interfaces e.g. design of electrical boundaries	To enable the CATO to develop the appropriate interface design and plan accordingly in project construction programme.	Data Room
Studies/Surveys	Electrical	Information on 3rd party Interfaces, e.g. generation connections	This would be in the form of generation connection agreements primarily to inform study inputs and technical and commercial third party interfaces.	Data Room
Studies/Surveys	Geotechnical	Geotechnical desk study	Compilation and assessment of all published data relating to the project (geological maps, borehole records, historical maps etc.), presenting high level assessment of ground risks and recommendations for intrusive works.	Data Room

Category	Type	Document	Justification for Inclusion/Data Details	Location
Studies/Surveys	Geotechnical	Peat slide risk assessment report and data.	Report presenting results of peat probing (drawings showing grids and depth of peat), assessing likelihood of peat slide in areas (zoned plan) and detailing remedial measures to limit risk(s).	Data Room
Studies/Surveys	Geotechnical	Phase 1 Contaminated Land Report.	Compilation and assessment of all published data relating to the project (geological maps, historical maps, trade directories, pollution incidents, abstraction licenses, LA controlled areas/activities etc.), detailing potential areas of contamination (hot spots), likely contaminants and recommendations for further investigations (if necessary).	Data Room
Studies/Surveys	Geotechnical	Preliminary UXO/UXB Risk Assessment.	Desk study highlighting negligible/low/medium/high risk of UXO/UXB. If medium/high recommendations for detailed risk assessments.	Data Room
Studies/Surveys	Geotechnical	Borrow pit assessment report	Report identifying locations of potential borrow pits, the type of strata to be encountered including depth/overburden and quantity of extractable (high quality) rock. Detailed report would include recovery and testing of rock samples and reinstatement plans for exhausted pits. Required to enable bidders to cost the gaining of materials.	Data Room

Category	Type	Document	Justification for Inclusion/Data Details	Location
Studies/Surveys	Geotechnical	Targeted topographical survey report	Drawings dwg/dxf or similar format. (data presented in format that can be interrogated / edited, pdfs offer limited benefit).	Data Room
Studies/Surveys	Ecological	Phase 1 Habitat Report	Mapping of habitats within the study area and an assessment of ecological value and the likelihood of the presence of protected species.	Data Room
Studies/Surveys	Ecological	Protected species survey reports.	Data collected during non-avian protected species surveys along with assessment of likely effects and proposed mitigation.	Data Room
Studies/Surveys	Ecological	Hedgerow survey reports	Data collected during hedgerow surveys along with assessment of value and likely effects and proposed mitigation.	Data Room
Studies/Surveys	Ecological	National Vegetation Classification survey report	Data collected during NVC surveys along with assessment of likely effects and proposed mitigation.	Data Room
Studies/Surveys	Ecological	Ornithological survey reports	Data collected during ornithological surveys along with assessment of likely effects and proposed mitigation.	Data Room

Category	Type	Document	Justification for Inclusion/Data Details	Location
Studies/Surveys	Noise	Noise assessment report (initial and detailed design)	Data on the baseline noise environment along with modelling and assessment of predicted effects and proposed mitigation measures. Identification of features of, and an assessment of the potential for, archaeological interest.	Data Room
Studies/Surveys	Hydrological	Flood Risk Assessment	Identification of features of, and an assessment of the potential for, archaeological interest.	Data Room
Studies/Surveys	Archaeological	Desk based archaeological assessment report	Identification of features of, and an assessment of the potential for, archaeological interest.	Data Room
Studies/Surveys	Logistics	Initial access studies and feasibility	Reporting on assessment of access arrangements including modelling of pinch points and identification of additional areas of land that might be required and any highways works.	Data Room

Category	Type	Document	Justification for Inclusion/Data Details	Location
Studies/Surveys	Logistics	Traffic Impact Assessment	Report detailing existing traffic flow data (either from surveys or existing datasets), adjusted for seasonal and growth factors. Estimation of construction and operational traffic numbers and percentage increase to baseline, impact determined based upon types and numbers of sensitive receptors and percentage increases. TIA also covers qualitative factors such as severance, pedestrian amenity, dust etc. Report should identify remedial measures to be adopted (permanent or temporary) to alleviate severity of impact.	Data Room
Studies/Surveys	Logistics	Approval in Principle (AIP) with relevant highways authorities	AIP document outlining the works to be done (temporary or permanent - diversions, strengthening work to bridges, overrun of footways, removal of street furniture etc.) and confirming the relevant highway authority's approval subject to detailed design and assessment work at a later date. AIP gives developer comfort to progress further with a project but gives no authority to complete works.	Data Room
Studies/Surveys	Offshore	Offshore geotechnical report	Report detailing the results of the intrusive/non-intrusive works (when, where, methods, depths, observations, type of strata encountered, extent and results of in-situ and laboratory testing). Report should be factual, no opinions but should highlight areas lacking detail and recommendations for further works (if necessary).	Data Room

Category	Type	Document	Justification for Inclusion/Data Details	Location
Studies/Surveys	Offshore	Metocean study	Primarily for HVDC projects for subsea cable lay.	Data Room
Studies/Surveys	Offshore	Information on availability of offshore installation vessels	Primarily for HVDC projects where subsea cable lay may be limited by availability of suitable offshore installation vessels.	Data Room
Consenting	Social Commitments	Statement of Community Engagement, Summary of (or copies of) consultation responses, community liaison group minutes	Reporting of community engagement activities and identification of the social commitments.	Data Room
Consenting	Application Process	Application documents, draft Development Control Order, summary of pre-application discussions, submissions and documents (e.g. Gatecheck Reports, Written Responses, Inquiry Reports)	Reporting of all assessments along with supporting data that have fed into the consenting process. Details of stakeholder responses and how they have been addressed. Details of the consents along with any conditions and requirements.	Data Room

Category	Type	Document	Justification for Inclusion/Data Details	Location
Consenting	Consents	Development Consent Orders or draft Development Consent Orders, Section 37 Consents & Deemed Planning Consents, Marine Licences, Planning Consents for elements consented through the Local Planning Authority/Local Authority	Copies of all consents along with any conditions and requirements.	Data Room
Consenting	Environmental Commitments	Environmental Statement, Environmental Management Plans (e.g. Waste Management Plans, Habitat Management Plans, Visual Impact Mitigation Schemes), Statutory Consultee Responses, Environmental Liaison Group Minutes	Details of all environmental commitments (e.g. compensatory habitat measures, visual mitigation schemes, requirements to install bird scarers).	Data Room
Land Access	Land Access	Any finalised land agreements	Copies of all agreements.	Data Room
Land Access	Land Access	Agreements in principle	Copies of all agreements.	Data Room

Category	Type	Document	Justification for Inclusion/Data Details	Location
Land Access	Land Access	Information on progress made with voluntary agreements	A schedule of agreements detailing the progress to date and identifying potential risks.	Data Room
Land Access	Land Access	Details/status of any involuntary agreements	A schedule of involuntary agreements sought identifying potential risks.	Data Room