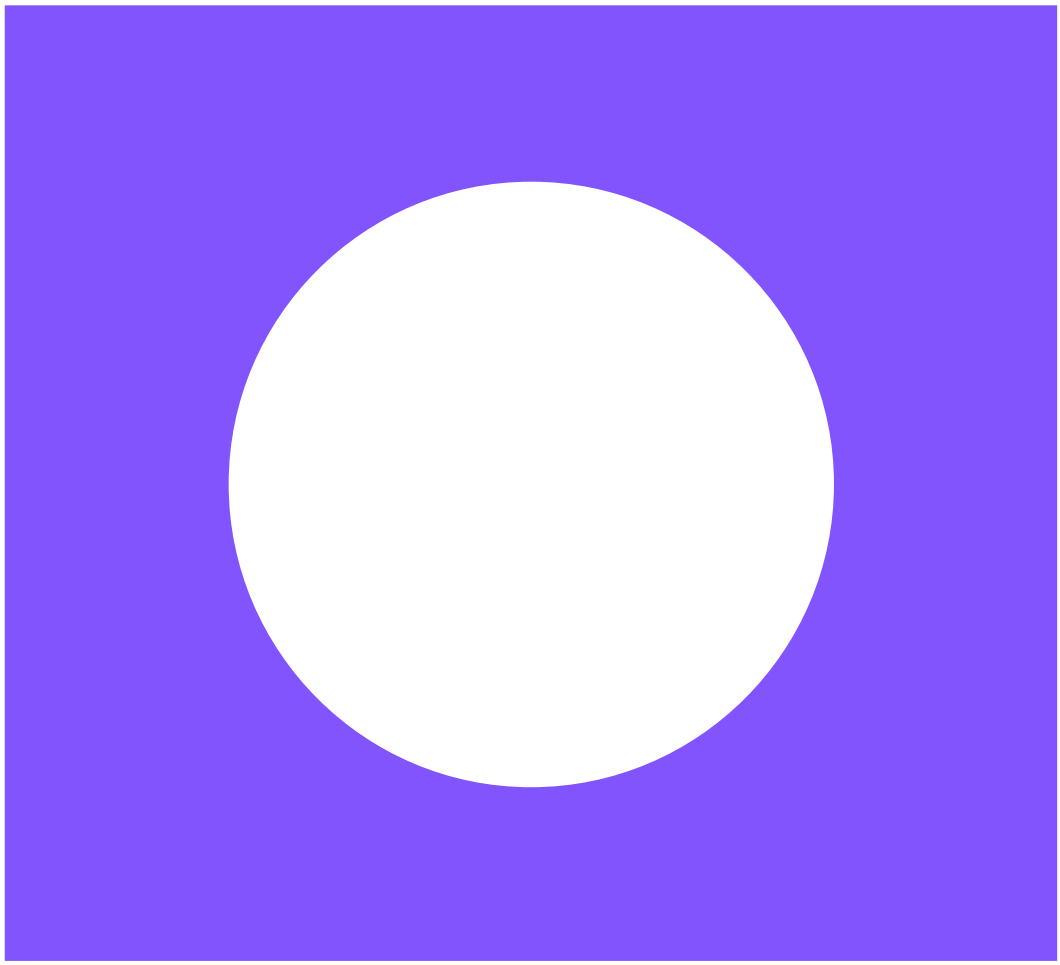

CP0982 Flagford – Srananagh Project

Step 3 Emerging Best Performing Technology Option Report

August 2025

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CP0982 Flagford – Srananagh Project

Step 3 Emerging Best Performing Technology Option Report

August 2025

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Glossary

ACA	Architectural Conservation Areas
ACSR	Aluminium-Conductor Steel-Reinforced
BPO	Best Performing Option
CENELEC	European Committee for Electrotechnical Standardisation
CFRAM	Catchment Flood Risk Assessment and Management
CP	Capital Project
CSO	Central Statistics Office
EBES	Evidence Based Environmental Studies
EBPO	Emerging Best Performing Option
EMF	Electric and Magnetic Fields
EPA	Environmental Protection Agency
ESB	Electricity Supply Board
ESBN	Electricity Supply Board Networks
GSI	Geological Survey of Ireland
HDD	Horizontal Directional Drilling
HTLS	High Temperature Low Sag
ICNIRP	International Commission for Non-Ionizing Radiation Protection
IEC	International Electrotechnical Commission
LCA	Line Condition Assessment
MCA	Multi-Criteria Assessment
NHA	Natural Heritage Area

NIAH	National Inventory of Architectural Heritage
NPWS	National Parks and Wildlife Service
NWR	Northern and Western Region
OHL	Overhead Line
OPW	Office of Public Works
PLC	Power Line Carrier
pNHA	Proposed Natural Heritage Area
RCDP	Roscommon County Development Plan
RMP	Record of Monuments and Places
RPS	Record of Protected Structures
SAC	Special Area of Conservation
SCDP	Sligo County Development Plan
SEM	Single Electricity Market
SMR	Sites and Monuments Record
SOEF	Shaping Our Electricity Future
SPA	Special Protection Area
TLAR	Transmission Line Assessment Report
TSDC	Transmission Standard Development Costs
UGC	Underground Cable
WFD	Water Framework Directive
ZoN	Zones of Notification

1 Introduction

1.1 Introduction

The purpose of this report is to identify the emerging best performing technology option for the proposed CP0982 Flagford – Sligo Capacity Needs (hereafter referred to as the 'Project').

1.2 Overview of the Project

The Northwest area of Ireland (Mayo, Sligo and Donegal) has seen a significant increase in renewable electricity generation over the last number of years. As these connections continue to increase, the local transmission network is likely to come under increased stress.

The level of demand in the Northwest area of Ireland is forecast to be less than the generation, so the excess generation must be exported out of the area. This puts additional stress on the circuits including the existing Flagford – Sligo 110 kV line.

Additional transmission network capacity will help ensure that continued economic growth in the area can be supported, including facilitating regional load growth.

The identified need requires additional transmission capacity to strengthen the network in the Northwest area of Ireland in order to export excess generation out of the region when needed.

Capital Project (CP) 0982 is a proposed electricity development that will help to meet this network need identified in the Northwest area of Ireland. The location of the CP0982 Flagford – Sligo Capacity Needs Project is illustrated in Figure 1.1.

Reinforcing the transmission system in the Northwest area of Ireland will enable the further integration of renewable generation in the Northern and Western Region of the country ensuring the continued economic growth of the region while also supporting efforts to meet the Government's renewable electricity target for 2030.

The need for this Project has been published in EirGrid's Shaping Our Electricity Future (SOEF) roadmap which supports the Government's 80% renewable electricity target by 2030.

Figure 1.1: Location of CP0982 Flagford – Sligo Capacity Needs Project

Source: EirGrid

1.2.1 Northern and Western Regional Context

The Strategic Framework for Grid Development in the Northern & Western Region (EirGrid, 2024)[1] identifies that the Northern and Western Region (NWR) "*is characterised by a strong existing and potential renewable energy (primarily wind) resource, with many requests for further connection.*" This level of electricity generation is greater than the capacity of the existing network in the NWR, resulting in local constraints related to power transfer needs. Therefore, the *"Reinforcement of the regional grid infrastructure network is mainly required to connect the forecasted significant level of renewable generation, with benefits for regional economic and social development including creating transmission capacity for increased demand."*

The Framework lists a number of proposed key strategic grid infrastructure projects located in the NWR, including the 'Flagford – Sligo Capacity Needs' Project. The projects described in this Framework *"…will enable the transmission network to accommodate more diverse power flows.*" The Framework notes that the proposed Project will help to resolve the network need in the Northern and Western Region.

[1] Strategic Framework for Grid Development in the Northern & Western Region (EirGrid, 2024)

1.3 Overview of EirGrid's Framework for Grid Development

The proposed Project is being developed in accordance with EirGrid's Framework for Grid Development and is currently in Step 3, as presented in Figure 1.2.

Figure 1.2: EirGrid's Framework for Grid Development

Source: EirGrid

In Step 2, EirGrid performed a technology overview where technologies were explored, and possible options were identified. The aim of Step 3 is to identify the Best Performing (Technology) Option (BPO) from the options identified in Step 2. Step 3 includes the following tasks:

- Task 1 – Further develop the options brought forward from Step 2 and perform a **Multi-Criteria Assessment (MCA)** of the options to identify an Emerging Best Performing (Technology) Option (EBPO).
- Task 2 – **Consultation** with the public and engagement with stakeholders on the EBPO.
- Task 3 – **Assess feedback** from the public consultation and stakeholder engagement and carry out further assessment to identify the Best Performing Option (BPO).
- Task 4 – **Review the MCA** to incorporate the feedback from the consultation process.
- Task 5 – **Other considerations** including any new information that is not covered by the criteria in the MCA will be reviewed at this stage.

This report informs Task 1 as described above. Further details on Task 2 to Task 5 are included in Chapter 8 *Next Steps*.

The two solution options identified in Step 2 to resolve the Project identified need, are listed below and further described in Chapter 2 of this report. Figure 1.3 and Figure 1.4 show an illustrative map of Option 1 and Option 2 respectively.

- Option 1: Voltage upgrade to 220 kV of the existing Flagford – Sligo 110 kV overhead line.
- Option 2: Thermal uprate of the existing Flagford – Sligo 110 kV overhead line plus a new Flagford – Srananagh 220 kV underground cable (UGC).

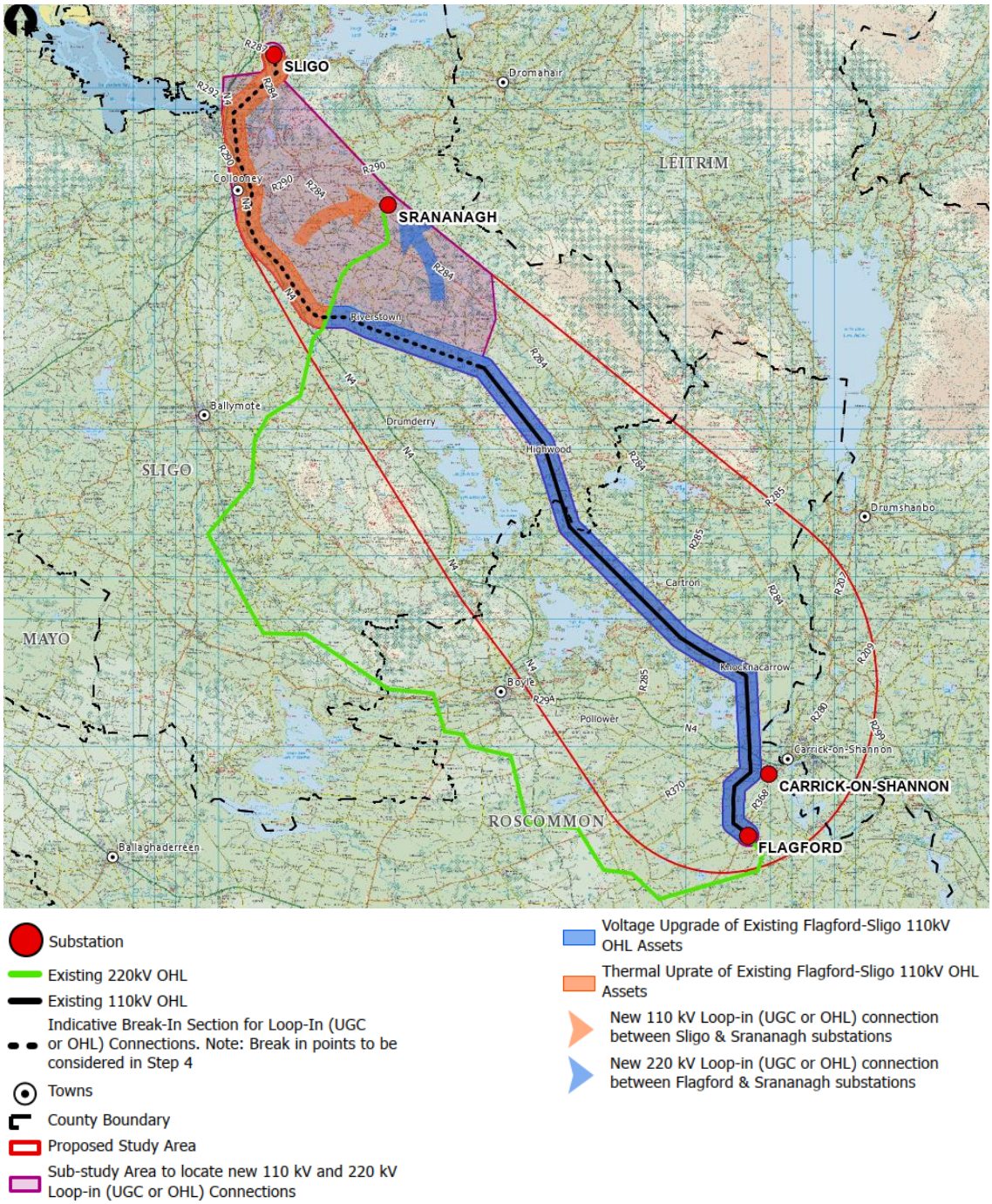
The study area for the two technology options is presented in Section 2.2 of this report.

Chapter 3 of this report presents the criteria used in the MCA undertaken on the technology options.

The MCA undertaken for each of the technology options is presented in Chapter 4 and 5 of this report respectively. Following the MCA, the Emerging Best Performing Option (EBPO) is presented and described in Chapter 6.

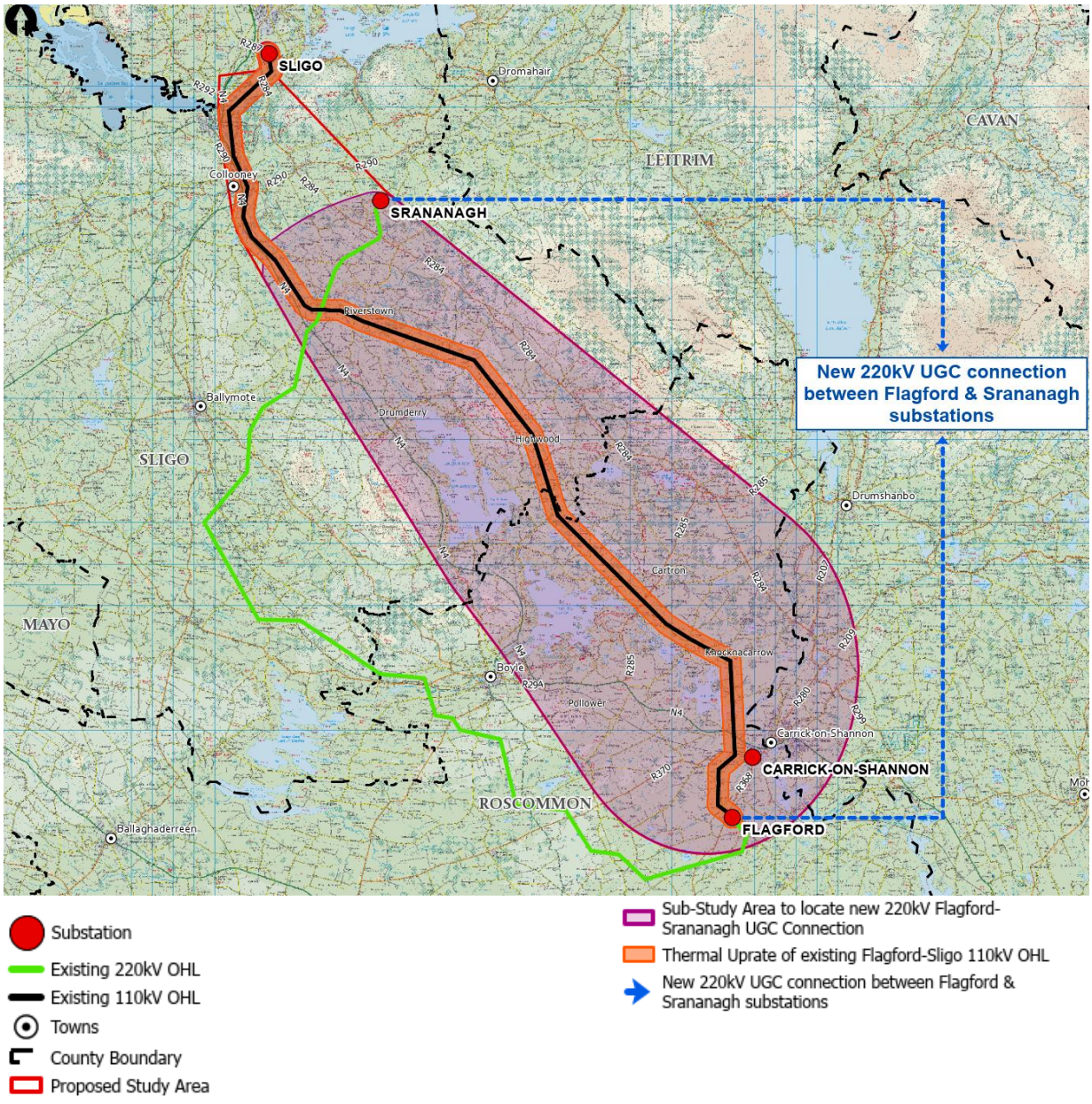
Chapter 7 provides a description of the EBPO, and Chapter 8 describes the Next Steps in the development of the Project.

Figure 1.3: Illustrative Map showing Option 1



Source: Mott MacDonald (Drawing Reference 229101216-MMD-00-GIS-0019, provided in Appendix A)

Figure 1.4: Illustrative Map showing Option 2



Source: Mott MacDonald (Drawing Reference 2291012160MMD-00-GIS-0020, provided in Appendix A)

2 The Project

2.1 Existing Flagford – Sligo 110 kV Line

The existing Flagford – Sligo 110 kV line extends from the Flagford 220 kV substation in the townland of Culleenatreen or Flagford in County Roscommon to the Sligo 110 kV substation in the townland of Tullynagracken South in County Sligo, a distance of approximately 50.8km.

This line is currently supported by intermediate wooden polesets and steel lattice towers at angle locations, which are due for replacement due to their age and condition. ESB Networks conducted a Line Condition Assessment (LCA) in 2023 and a Transmission Line Assessment Report (TLAR) in 2024. These reports indicate that approximately 70% of the wooden polesets and 40% of the steel structures along the existing Flagford – Sligo 110 kV OHL require replacement.

CP0982 aims to also facilitate this need for refurbishment/replacement works on the existing Flagford – Sligo 110 kV OHL along with the regional network reinforcement needs in the Northwest as detailed in Section 1.2.

Details of the existing Flagford – Sligo 110 kV line are provided in Table 2.1.

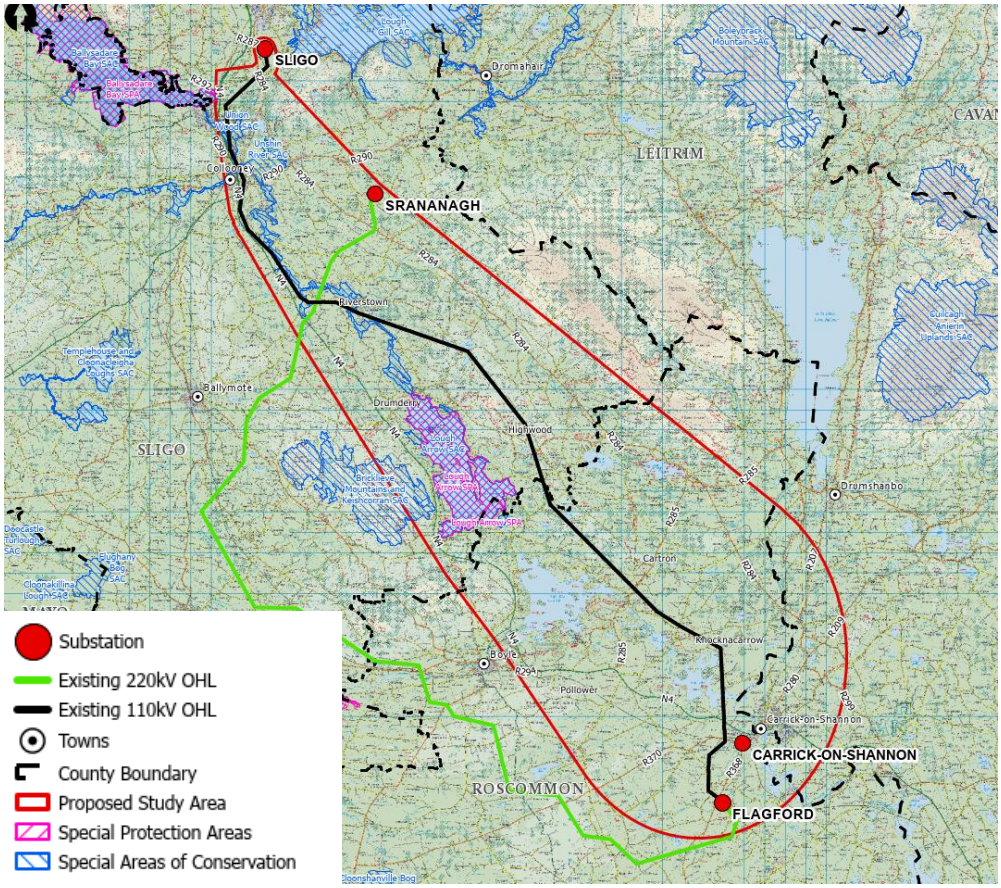
Table 2.1: Existing Flagford – Sligo 110 kV Line Dimensions

Existing Flagford – Sligo 110 kV Line	Dimensions
Line Voltage	110 kV
Total Length of Line	50.8km
Existing Conductor	200mm^2 Aluminium-Conductor Steel-Reinforced (ACSR) (Wolf)
Total Number of Structures	277
Total Number of Wooden Polesets	251
Total Number of Steel Towers	26
Line Construction Type	Single Circuit Wooden Poleset Structures Steel Lattice Strain Structures

2.2 Project Study Area

Figure 2.1 presents the Step 3 project study area.

Figure 2.1: CP0982 Flagford – Sligo Capacity Needs Project Study Area



Source: Mott MacDonald (Drawing Reference 229101216-MMD-00-GIS-0001, provided in Appendix A)

The study area contains the substation nodes necessary for the development of the Project namely the Sligo, Srananagh and Flagford substations, and the existing Flagford – Sligo 110kV line.

To the north, the study area is bound by mountainous terrain and characterised by bogs which naturally delineate the study area boundary as this landscape would be challenging for potential cable routes.

To the south and west, the study area is bound by the N4. Expanding the study area further south would lead to increased interaction with town centres, which would subsequently lead to a more extensive cable route, requiring additional justification for the proposed study area. The outer boundaries of the study area encompass the N4 to the south and west, and the regional road R284 to the north and east. Flagford substation is located in the south of the study area.

Several waterbodies are within the study area, such as Lough Key, Lough Eidin (also known as Drumharlow Lake), Lough Arrow, River Shannon, River Kilukin, River Boyle and River Unshin. The following European sites are located within the study area: the Unshin River Special Area of Conservation (SAC) (site code 00198), the Lough Arrow SAC site code (001673), the Bricklieve Mountains and Keishcorran SAC (site code 001656), the Lough Arrow Special Protection Area (SPA) (site code 004050) and the Ballysadare Bay SPA (site code 004129).

The study area lies within the counties of Sligo, Leitrim and Roscommon in the province of Connacht and is predominantly rural/agricultural in nature. The main settlements within, or near the study area include Carrick-on-Shannon, Collooney, Ballygawley, Ballisodare, Riverstown, Boyle, Leitrim and Sligo.

2.3 Technology Options under Consideration

Two potential solution options have been brought forward from Step 2 for further consideration:

- Option 1: Voltage upgrade to 220 kV of the existing Flagford – Sligo 110 kV overhead line.
- Option 2: Thermal uprate of the existing Flagford – Sligo 110 kV overhead line plus a new Flagford – Srananagh 220 kV UGC.

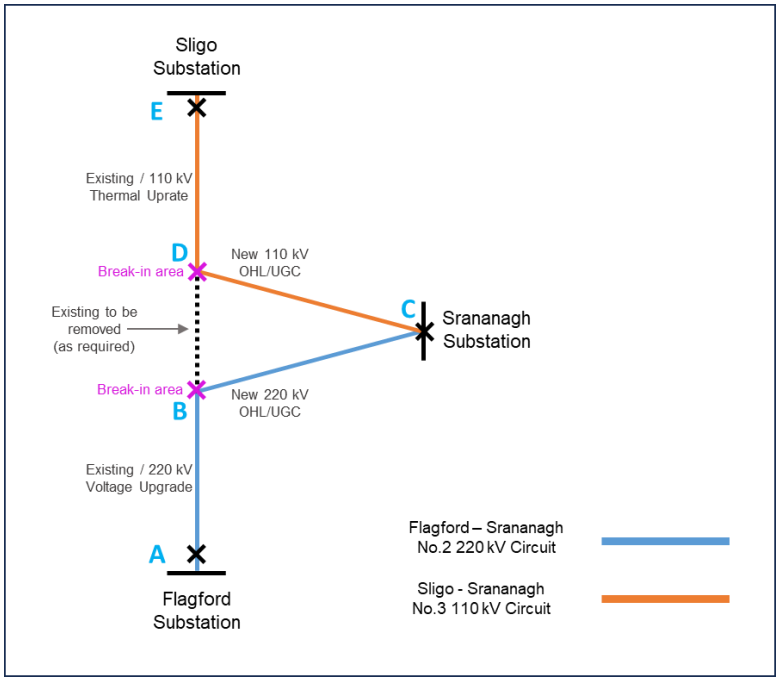
These are presented in more detail in Sections 2.3.1 and 2.3.2 respectively.

2.3.1 Option 1: Voltage Upgrade to 220 kV

Option 1 will include a voltage upgrade from 110 kV to 220 kV on a section of the existing Flagford – Sligo 110 kV OHL. This voltage upgrade will require new structures, and new conductors (wires) to replace the existing OHL.

Currently the Flagford – Sligo OHL is 110 kV and does not connect to Srananagh substation, which is an important node in the electricity grid. Two new sections of OHL or UGC (loop-in sections) will be required to connect the Flagford – Sligo OHL into Srananagh, as depicted in the Option 1 line diagram in Figure 2.2. The symbols used in Figure 2.2 are explained in the following paragraphs.

Figure 2.2: Line Diagram of Option 1: Voltage Upgrade to 220 kV



Voltage Upgrade of 110 kV OHL to 220 kV OHL:

Points A to B: Voltage Upgrade of Existing 110 kV to 220 kV

Points B to C: New 220 kV connection to Srananagh (OHL or UGC)

110 kV OHL:

Points D to E: Existing 110 kV OHL to remain, refurbish & thermal uprate.

Points D to C: New 110 kV connection to Srananagh (OHL or UGC)

Source: Mott MacDonald

The section of the existing Flagford – Sligo OHL to be upgraded to 220 kV extends from Flagford substation (A) to a break-in area (B) on the OHL from where a new 220 kV circuit loop-in section will connect to Srananagh substation (C). The new 220 kV circuit loop-in (B to C) could be either new 220 kV OHL or new 220 kV UGC. This will result in the new Flagford –

Srananagh No.2 220 kV circuit. The structures along the upgraded section of the existing OHL (A to B) and the new loop in section (B to C, if OHL) could be either traditional 220 kV lattice towers or new composite poles (Refer to Figure 2.3).

The existing OHL from the break-in area (D) to Sligo Substation (E) will undergo refurbishment and thermal uprate, and will remain operational at 110 kV. The towers/polesets and conductors will be replaced. It will be a 'like for like' replacement i.e. towers will be replaced with towers of the same type, and wooden polesets will be replaced with wooden polesets. A new 110 kV loop-in section will extend from break-in area (D) to Srananagh substation (C). The new 110 kV circuit loop-in (D to C) could be either new 110 kV OHL or new 110 kV UGC. This will result in the new Sligo – Srananagh No.3 110 kV circuit.

The section of the existing OHL between the two break-in areas (between B and D) will be removed.

Figure 2.3: Lattice Tower (left) and a Photomontage showing Composite Poles (right)

Source: Mott MacDonald

Note: The final design of the composite poles may vary.

Option 1 has been assessed for two scenarios:

- Scenario 1:
  - For the 220 kV circuit from Flagford to Srananagh substations this scenario proposes composite poles for intermediate locations and conventional steel lattice structures for angle locations; and
  - For the 110 kV circuit from Srananagh to Sligo substations this scenario proposes like for like replacement for the existing line i.e. wooden polesets for intermediate locations and conventional steel lattice structures for angle locations.
- Scenario 2:
  - For the 220 kV circuit from Flagford to Srananagh substations this scenario proposes conventional steel lattice structures at all structure locations; and

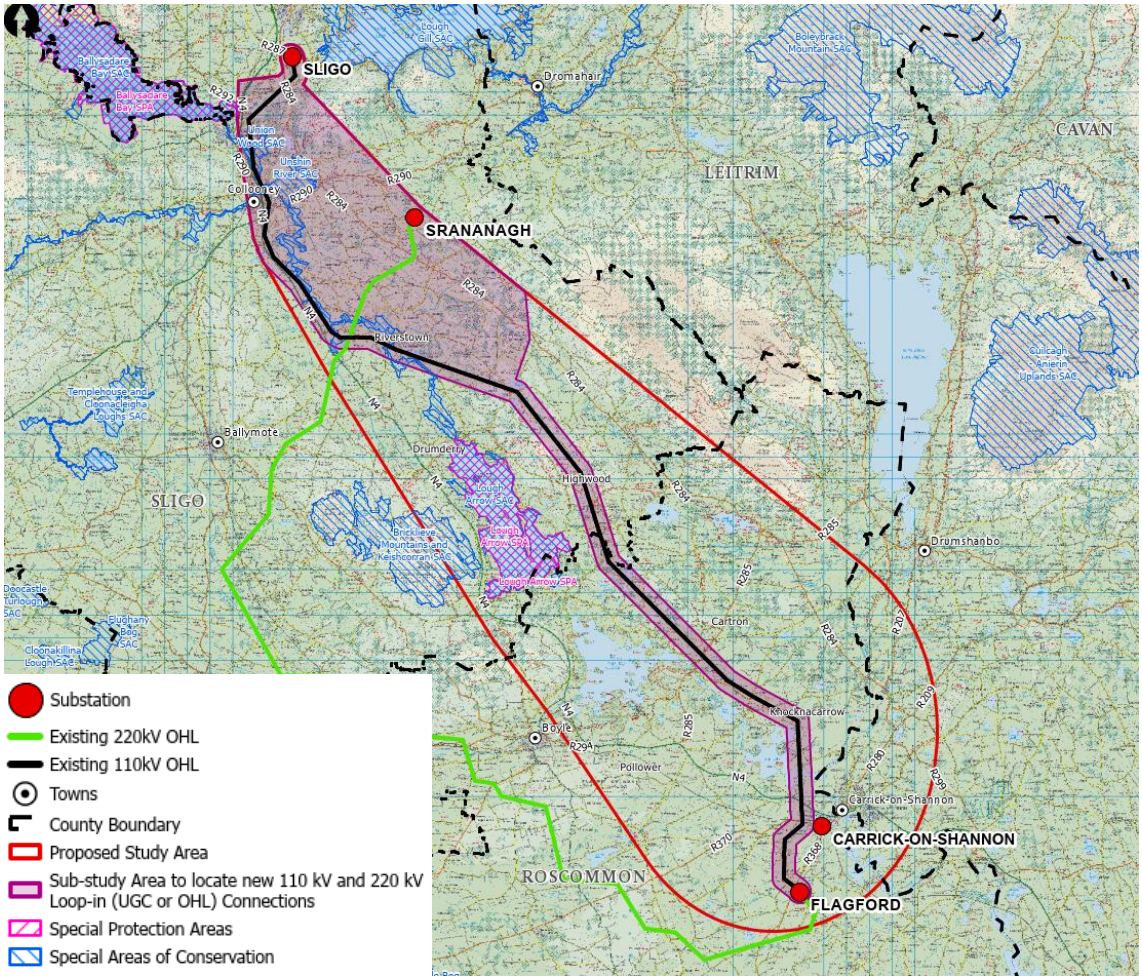
– For the 110 kV circuit from Srananagh to Sligo substations this scenario proposes like for like replacement for the existing line i.e. wooden polesets for intermediate locations and conventional steel lattice structures for angle locations.

The corridor options for the loop-in sections (overhead lines or underground cables) and route options within these corridors will be developed in Step 4, should Option 1 be selected as the BPO. The distance from the existing Flagford – Sligo OHL to Srananagh substation is approximately 6km. However the new loop-in sections may be longer depending on where they connect to the existing OHL and how they are routed to avoid constraints.

There will be works within the Flagford, Sligo and Srananagh substations, within the existing ESB property boundaries.

The sub-study area for Option 1 is presented in Figure 2.4 and included in Appendix A. The sub-study area includes a 1km wide corridor that encompasses the existing Flagford – Sligo 110 kV OHL, up to the break-in area for the 220 kV loop-in section, and then expands to a broader area that includes Sligo and Srananagh substations. The Option 1 sub-study is sufficient to accommodate loop-in option corridors in Step 4 of the Project, should Option 1 be selected as the BPO.

Figure 2.4: Option 1 Sub-Study Area



Source: Mott MacDonald (Drawing Reference 229101216-MMD-00-GIS-0017, provided in Appendix A)

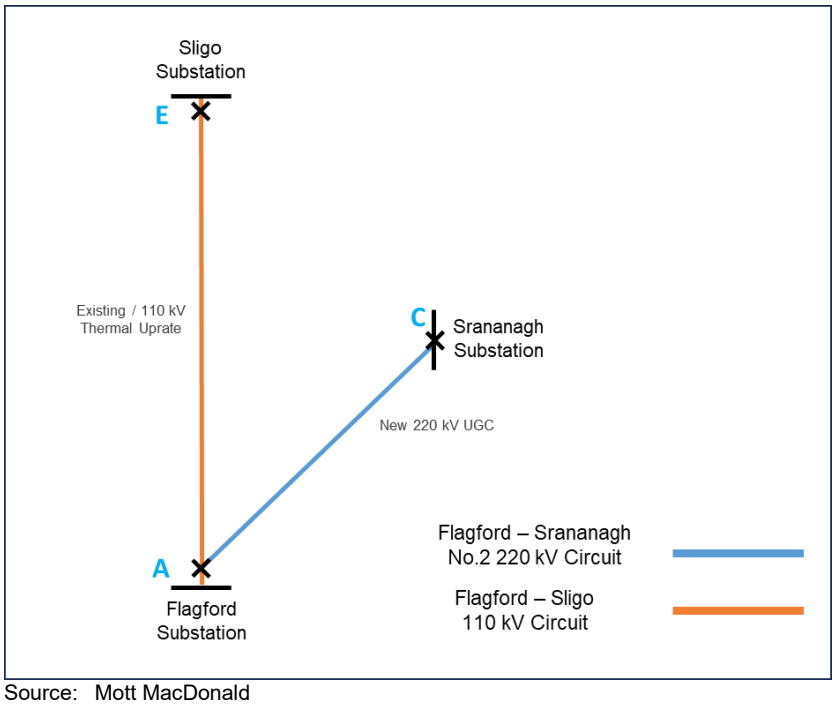
2.3.2 Option 2: Thermal Uprate and 220 kV Underground Cable

Option 2 will include a thermal uprate to the existing Flagford – Sligo 110 kV OHL. This would involve replacing the existing conductor so that the circuit can operate at a higher rating (thermal uprate). This would involve the replacement of approximately 40% of the steel angle masts and 70% of the intermediate wooden polesets along the existing Flagford – Sligo 110 kV OHL. Option 2 also proposes to construct a new 220 kV UGC circuit from Flagford substation to Srananagh substation. The corridor options for the UGC will be developed at Step 4, should Option 2 be selected as the BPO.

There will be works within the Flagford, Sligo and Srananagh substations, within the existing ESB property boundaries.

Option 2 is presented as a line diagram in Figure 2.5.

Figure 2.5: Line Diagram of Option 2: Thermal Uprate and 220 kV UGC



110 kV Circuit:

Points A to E: Thermal uprate & refurbish existing 110 kV OHL.

220 kV Circuit:

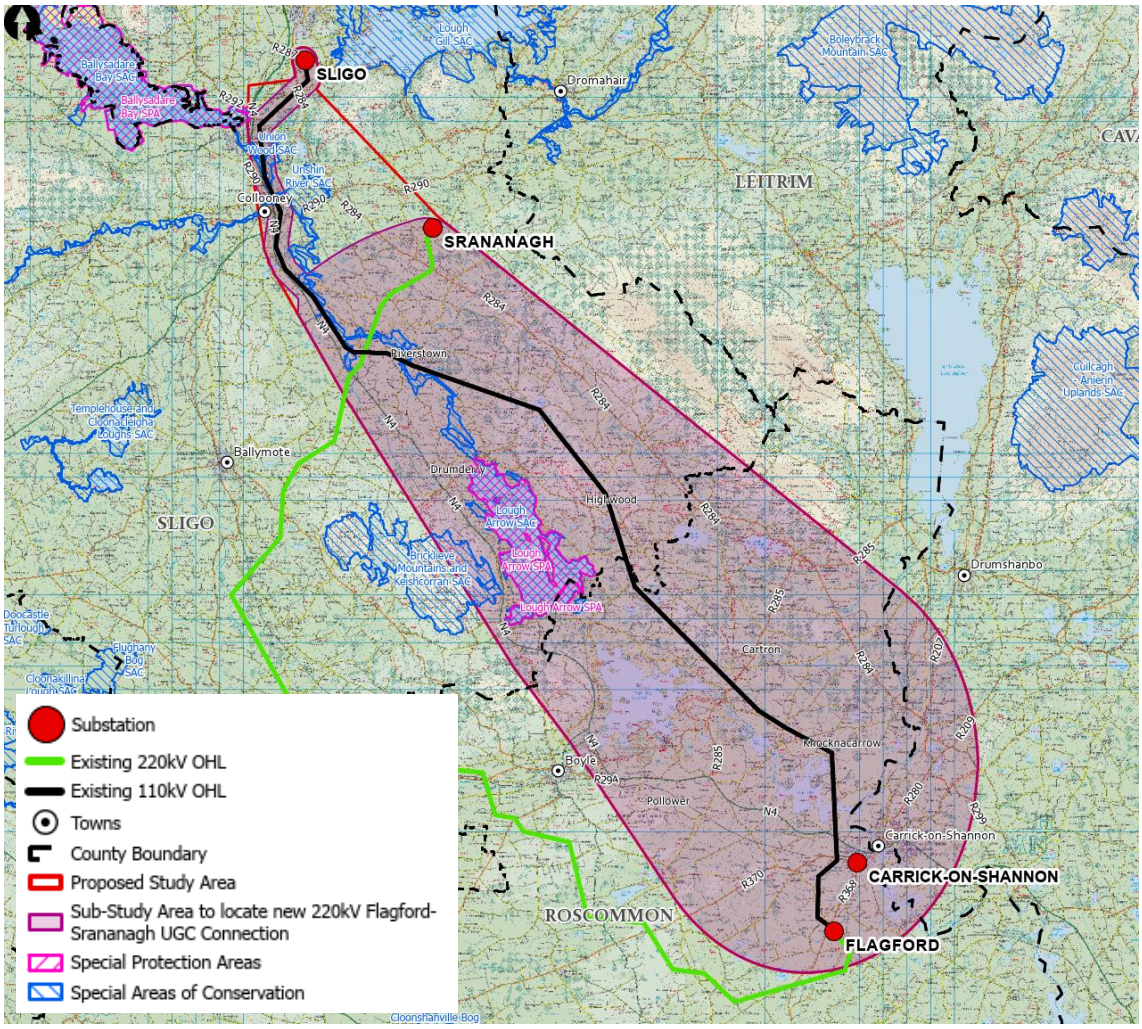
Points A to C: New 220 kV UGC.

Source: Mott MacDonald

The sub-study area for Option 2 is presented in Figure 2.6 and included in Appendix A. The sub-study area encompasses Flagford and Srananagh substations to allow for the identification of 220 kV UGC corridors, and route options within these corridors, connecting Flagford substation to Srananagh substation in Step 4, should Option 2 be selected as the BPO. North of Srananagh substation the sub-study area reverts to a 1km wide corridor that encompasses the existing Flagford – Sligo 110 kV OHL.

The corridor options and route options within these corridors for the 220 kV UGC connection between Flagford and Srananagh substations will be developed in Step 4, should Option 2 be selected as the BPO.

Figure 2.6: Option 2 Sub-Study Area



Source: Mott MacDonald (Drawing Reference 229101216-MMD-00-GIS-0018, provided in Appendix A)

3 Methodology

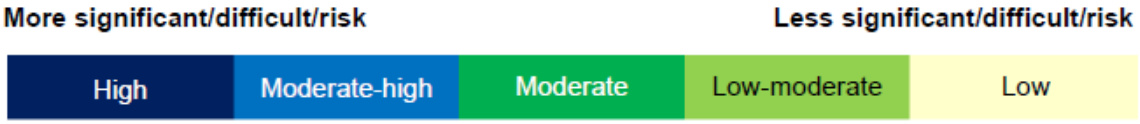
3.1 Multi-Criteria Assessment

Evaluations have been carried out on the two technology options as defined in Sections 2.3.1 and 2.3.2 using the following criteria: Technical, Economic, Deliverability, Environment, and Socio-economic.

The criteria have been further broken down into sub-criteria and a multi-criteria evaluation matrix has been used to identify the emerging best performing technology option.

The assessment of each sub-criteria is presented along with a ranking from “more significant” / “more difficult” / “more risk” to “less significant” / “less difficult” / “less risk”. The following scale has been used to illustrate the performance ranking.

Figure 3.1: Performance Ranking



The MCA at Step 3 is based on the technology appropriate to each option, and the identified constraints in the study area as relevant to the consideration of the appropriate technology.

Further detail on the criteria is provided in Sections 3.1.1 to 3.1.5.

3.1.1 Technical

The following technical sub-criteria have been used in the MCA.

Technical Sub-Criteria	Description
Safety Standard Compliance	● This sub-criterion examines the option compliance with all relevant safety standards such as those from the European Committee for Electrotechnical Standardisation (CENELEC). ● Compliance with all relevant IEC and CENELEC standards will be required for the materials necessary to carry out the proposed works of both scenarios. ● Existing and new OHL structures will be designed to comply with the National Annex for Ireland (EN 50341-3-11) based on EN 50341-1[2]. ● The UGC technology will comply with EirGrid’s UGC functional specification.[3] ● The OHL technology will comply with EirGrid’s OHL functional specification.[4]
Expansion / Extendibility	● This sub-criterion assesses the power carrying capability of each technology and the ease with which each technology can be expanded. ● An increase in the thermal capacity of the circuit can achieve an increase in the power carrying capability. This is generally achieved by uprating the conductor to a higher capacity one. ● For UGC, increasing the thermal rating may be difficult to achieve in the future due to the diameter of ducting and crossing of obstacles.

[2] BS EN 50341-1:2021, Overhead electrical lines exceeding AC 1 kV, European Standard, December 2012

[3] 110/220/400 kV Underground Cable Functional Specification, CDS-GFS-00-001-R1, EirGrid, 21/05/2021

[4] 110/220/400 kV Overhead Line Functional Specification, LDS-EFS-00-001-R0, EirGrid, 14/07/2017

Technical Sub-Criteria	Description
	Crossing of obstacles such as bridges, culverts, watercourses, transmission gas mains, drainage pipes or other cables can require UGC to be buried deeper, impacting its thermal rating. There also may be difficulties in accommodating larger diameter ducting or additional cables in the UGC corridors, limiting the extendibility of the UGC technology. Changing the thermal capacity of the UGC may lead to reactive power compensation requirements (i.e. installation of shunt reactors and harmonic filters on each remote end of the circuit) or existing reactive power compensation equipment becoming redundant. This may require the resizing and installation of new reactors. ● In the event that another connection along the circuit is required, this can be achieved by constructing another substation which could be connected to the circuit. This is a very common way to expand the transmission network and is normally technically feasible. ● OHL technology is considered less challenging in terms of expansion of the transmission network due to the flexibility in incorporating new substations with little or no impact to existing infrastructure. For UGC, technology expansion of the transmission network is more challenging.
Repeatability	● Consideration is given to the repeatability of the technology used within the Irish Transmission System. ● Conventional OHL structures, i.e. steel lattice structures and wooden polesets, are already widely in use and in operation on the Irish transmission system. Considering system integration, operation, and maintenance there are no limits envisaged with regards to the repeatability of using steel lattice structures on the Irish transmission system. ● While an OHL option is very repeatable, a fully or partially underground cable option is less repeatable as there may be harmonic filter and reactive compensation requirements that are bespoke for each option. The length of cable circuit that can be integrated in certain parts of the network may also be limited. ● The use of composite poles at suspension locations for the 220 kV corridor (Scenario 1) is a new and innovative solution. Composite poles are a relatively new technology; however composite poles are currently used on electricity grids globally. It is acknowledged that composite poleset technology has yet to be installed in the Irish Transmission System, however this is not considered a risk, considering that 220 kV Composite polesets have gone under rigorous testing by EirGrid and ESBN. This testing enabled personnel to gain familiarity with methods of installation of this new asset and did not identify any major risks in its use.
Technical Operational Risk	● Consideration is given to the risk of operating different technologies on the transmission system. ● Overhead lines supported by lattice towers and wooden polesets are seen as a tried and tested technology. ● UGC is also considered a tried and tested technology, however consideration must be given to the length of the UGC corridor, especially in areas where the network is relatively weak, such as the Northwest Region. Reactive power compensation will be required to keep voltage levels within acceptable margins. Additionally, large capacitance can be associated with UGC which may cause amplification of harmonics due to resonances on the network and change the harmonic impedance profile of the network in an unfavourable manner. A harmonic filter device may be required to mitigate harmonic distortion. The additional installation of reactive power compensation and harmonic filter devices increases the technical operational risk of these methods
Compliance with EirGrid Security and Planning Standards	● The technology option will comply with the network reliability and security standards defined in the Transmission System Security and

Technical Sub-Criteria	Description
	Planning Standards (TSSPS)[5] and the Operation Security Standards (OSS)[6]. All options investigated will meet the minimum technical requirements set out in the above standards. Options which extend or enhance technical performance margins beyond minimum acceptable levels are favoured over others.
Reliability performance	• The reliability of transmission infrastructure is associated with two categories or type of outages, namely unplanned outages and planned outages. • Each technology or type of equipment is associated with faults (unplanned outages) that routinely occur. These can be represented as average failure rates usually expressed as unplanned outages/100km/year. • This sub-criterion also takes account of the mean time to repair. This is the time taken to return the equipment to service after a fault has occurred. The assessment is based on transmission performance statistics or industry standard reliability data. • This sub-criterion assesses the typical time the options would be unavailable for during planned outages. Planned outages are normally associated with annual routine maintenance and will be based on typical outage durations taken from maintenance policies. • The reliability for each option will be based on a combination of the above type of outages. The reliability of the station equipment associated with the options is assumed to be the same for all options and is therefore not included in this analysis.
Headroom	• This sub-criterion assesses the ability of each option to accommodate increases in renewable generation in the Northwest region. • Each option is compared relative to the others to determine the increase in renewable generation that can be accommodated in the Northwest without further network reinforcements being required. The limit for each option can be found by increasing renewable generation in the Northwest until a TSSPS limit is reached. • The headroom for each option is the difference between the renewable generation that can be accommodated by the network with that option included and the renewable generation that can be accommodated by the network with no option included.

3.1.2 Economic

The sub-criteria used to assess the economic performance are listed below:

Economic Sub-Criterion	Description
Implementation Costs	• Consideration is given to project implementation costs. These are the costs associated with the procurement, installation and commissioning of the grid development. • Each option is evaluated for kilometre length and used to estimate the cost of each option. These costs are indicative and used only for the purposes of comparison between options. The costs do not represent the total project costs. • To aid the economic evaluation Transmission Standard Development Costs (TSDC), a cost estimate tool for various transmission system technologies, has been used, to enable comparison between different technology options.

[5] EirGrid, Transmission System Security and Planning Standard, 2016 (http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Transmission-System-Security-and-Planning-Standards-TSSPS-Final-May-2016.pdf

[6] EirGrid, Operational Security Standards, 2011 (http://www.eirgridgroup.com/site-files/library/EirGrid/Operating-Security-Standards-December-2011.pdf)

Economic Sub-Criterion	Description
Life-cycle cost	● Life-cycle costs refer to the costs incurred over the useful life of the option and include the on-going cost of ensuring that it remains viable for the evaluation period. This sub-criterion includes: – Operation and Maintenance costs – Replacement costs
Cost to Single Electricity Market (SEM)	● This sub-criterion will take account of the impact of the cost to the electricity market for the periods where the reinforcement option is not available. The technologies and equipment associated with the different options have different performance and reliability characteristics. This cost is calculated as a combination of the benefit in production cost saving (project benefit) and reliability performance of the option. ● Production cost saving benefit in relation to transmission system and its operations, expressed as savings in generation costs due to enhanced transmission capability.
Robustness test, sensitivity analysis	● This sub-criterion considers sensitivity analysis, namely the option's sensitivity to changes in the reference parameters (i.e. implementation cost, and benefits).

3.1.3 Deliverability

The following sub-criteria have been used to assess the deliverability performance of options:

Deliverability Sub-Criteria	Description
Implementation Timelines	● Consideration is given to the relative length of time from the beginning of the construction phase until energisation, circuit lengths, as well as any seasonal and local constraints that may impact implementation. ● The critical path of the construction programme is the installation of the technology. As such, options with the same technology will have similar implementation timelines. The following installation rates are applied: – 325m per week for installation of new UGC. Assume works sequenced to allow multiple crews working in parallel. – 1km per week for installation of OHL. Assume that works can be completed in parallel with multiple crews. – 1.5km per week for removal of existing OHL. Assume that works can be completed in parallel with multiple crews.
Project Plan Flexibility	● The assessment reviews the flexibility to identify the OHL and UGC corridors. ● Making use of the existing Flagford – Sligo 110 kV route presents advantages from a planning and environmental perspective but reduces the level of flexibility to identify a route. ● New build sections of OHL and UGC will provide certain levels of flexibility to identify corridors within the respective sub-study areas of the options in Step 4.
Dependence on other Projects	● Consideration is given to the extent a corridor may be impacted by other transmission infrastructure projects in the area, such as CP1233 Donegal-Srananagh project.
Risk of Untried Construction Technology	● Consideration is given to the frequency of utilisation within the Irish Transmission System. ● UGC technology in 110 & 220 kV levels and OHL technology with the use of traditional steel lattice towers and wooden polesets are considered tried and tested. ● Composite poles are a relatively new technology; however it is currently used on electricity grids globally. It is acknowledged that composite technology has yet to be installed in the Irish Transmission System, however this is not considered a risk, considering that that 220 kV composite polesets have gone under rigorous testing by EirGrid and ESBN. This testing enabled personnel to gain familiarity with methods of

Deliverability Sub-Criteria	Description
	installation of this new asset and did not identify any major risks in its use.
Supply Chain Constraints	● The assessment reviews the possible supply chain constraints for the OHL and UGC infrastructure. ● Conventional steel lattice structures, wooden polesets and UGC are extensively used worldwide. ● The equipment required for the substation works has been used extensively and as such, considered to be standard. ● Several manufacturers of composite poles have been identified thus far, however a new market research study would be beneficial to identify any market entrants at the time of tender release.
Permits and Wayleaves	● Consideration is given to the potential use of the existing Flagford – Sligo 110 kV corridor, as far as practically possible, reducing the requirements of permits easements and/or wayleaves. ● The assessment considers potential negotiation with landowners to develop new wayleave and/or new easements for the new build sections.
Water Impact During Construction	● Consideration is given to water crossings to ensure compliance with the Water Framework Directive (WFD).
Air Quality Impact during Construction	● The assessment reviews the potential air quality impacts arising from the construction works.
Traffic and Noise Impact during Construction	● Consideration is given to potential construction phase traffic and noise impacts associated with the technology options.
Design Complexity	● Consideration is given to obstacles or crossings encountered. The following constraints are considered in the assessment: – Crossings such as utilities, High Voltage (HV) OHL crossings, waterbodies, railway and road crossings, etc – Location of OHL structures within designated sites – Proximity to existing dwellings

3.1.4 Environment

The following environmental sub-criteria have been used in the environmental performance of options:

Environmental Sub-Criteria	Description
Land Use and Land Use Planning	● Existing and proposed land use zoning is reviewed. This includes land use zoning and relevant development policies and objectives as per the relevant County Development Plans. ● Existing land use as per the Tailte Éireann Land Cover Map 2023 and historic OS mapping. ● New OHL and UGC may impact on future land use, particularly with respect to forestation and bog rehabilitation. For any new sections of UGC, the width of the road and its ability to accommodate the required width of the cable trench, joint bays, and passing bays is considered in relation to the potential requirement of third party lands. ● There is a proposed N4 Carrick-on-Shannon Bypass currently being developed by Leitrim County Council and Transport Infrastructure Ireland. A preferred corridor has been confirmed and this is currently in Phase 3 (design and evaluation).
Land, Soils and Hydrogeology	● Existing ground conditions, including geological and hydrogeological features as determined from publicly available mapping are reviewed. ● Proximity to geological heritage sites, karst features, quarries and landslide events as determined from publicly available mapping are reviewed.

Environmental Sub-Criteria	Description
	● Consideration is given to particular soil types and structures, for example peat and alluvium deposits, karst features and proximity to quarries that may present construction challenges, which in turn may result in additional resource usage and the potential for increased pollution risk and nuisance effects. ● Consideration is given to the risk of pollution to groundwater during construction works, and the potential connectivity to European sites associated with excavation of foundations for OHL structures, and trenching and excavation of joint bays for UGC.
Water Resources	● Existing hydrological features, as determined from publicly available mapping including surface water features and their WFD status, drinking water rivers/lakes, and Public Supply Protection Areas are reviewed. ● For existing OHL and any new sections of OHL (loop-in options), the evaluation is made taking account of the scale of excavation associated with 110 kV and 220 kV OHL structures, and associated works. ● For UGC, the evaluation considers that where the cables cannot be accommodated by existing bridges, water crossings will be facilitated by either open cut trenching, HDD or cable bridges as appropriate.
Climate, including Flood Risk	● The assessment takes account of Catchment Flood Risk Assessment and Management (CFRAM) mapping, publicly available flood extents mapping and records of past flood events. ● The assessment considers the potential effects on surface water as a result of OHL and UGC technology. Effects are predominantly limited to the construction phase for both technologies. ● For the existing OHL the evaluation is made taking account of the anticipated proximity of polesets / steel towers to watercourses. ● The assessment considers the vulnerability of the proposed technology to flooding. At this stage of project development, equipment vulnerable to flooding should avoid areas of known fluvial flood risk, groundwater flood risk and / or known flood plains. ● The further development of the design in next stage of the project development will have regard to the EirGrid's functional specification CDS-GFS-00-001-R1[8] on cable routing through any area likely to flood (areas classified in 1 in 100 year fluvial and pluvial events). A desktop assessment of the ground conditions will be carried out during the next stage of the project development to avoid these areas where feasible during cable routing, as appropriate.
Biodiversity	● Designated Sites of International Importance such as Special Areas of Conservation (SAC), Special Protection Areas (SPAs), Ramsar Sites and Shellfish Waters are reviewed. ● Sites of National Importance such as (Proposed) Natural Heritage Areas and other sites/features of ecological importance are also reviewed. ● Consideration is given to policies and objectives relating to biodiversity within the relevant development plans. The evaluation of technology options has been undertaken with regard to EirGrid's Ecology Guidelines for Electricity Transmission Projects[9]. ● The need for vegetation removal/clearance should be minimised as far as practicable. For any new sections of UGC, narrow tree lined roads should be avoided if possible due to the risk of causing root damage necessitating their permanent removal for safety reasons.
Cultural Heritage	● The assessment reviews the Sites and Monuments Record (SMR), Record of Monuments and Places (RMP) and Zones of Notification (ZoN), Local Planning Authority's Record of Protected Structures (RPS), Architectural Conservation Areas (ACAs) and the National Inventory of Architectural Heritage (NIAH). Walls and gates that may form part of a protected demesne and garden are also considered.

[8] 110/220/400 kV Underground Cable Functional Specification – CDS-GFS-00-001-R1 – EirGrid, May 2021

[9] Ecology-Guidelines-for-Electricity-Transmission-Projects.pdf (eirgrid.ie)

Environmental Sub-Criteria	Description
	● Consideration is given to policies and objectives relating to cultural heritage within the relevant development plans. ● EirGrid have produced a number of Evidence Based Environmental Studies (EBES) of direct and indirect relevance to Cultural Heritage – Archaeology and Architectural (EBES 2: Cultural Heritage[10], EBES 9: Settlement & Land Use[11] and EBES 10: Landscape & Visual[12]) alongside the guidance document, Cultural Heritage Guidelines for Electricity Transmission Projects: A Standard Approach to Archaeological, Architectural and Cultural Heritage Impact Assessment of High Voltage Transmission Projects[13]. This guidance document provides a standardised approach for cultural heritage (including archaeological heritage and architectural heritage) impact assessment in the planning, design, construction, and operation of high voltage (110 kV, 220 kV and 400 kV) electricity transmission projects undertaken by EirGrid and is based on published national and international best practice guidance and legal obligations in relation to the identification, protection and avoidance of heritage assets. These guidelines are supported by the Code of Practice agreed between EirGrid and the then Department of Environment, Heritage and Local Government in 2009, which outlines a commitment to avoid archaeology where possible in projects undertaken by EirGrid. ● Additionally, EirGrid's Grid Implementation Plan 2023-2028[14] includes two cultural heritage policies. ● In line with the EirGrid Cultural Heritage Guidelines[13], the potential impacts to buried archaeology are considered.
Roads and Traffic	● Potential technical obstructions associated with the options under consideration are addressed in Section 3.1.3. ● For the existing OHL and new sections of OHL, this sub-criterion considers potential impacts due to construction traffic and the proximity of the OHL to the existing road network. ● To minimise adverse impacts from any new sections of UGC on receptors, where possible, UGC should avoid: – Known and planned settlements, residential areas, and commercial centres. – Joint bays at access points for residential developments and sensitive receptors. – Full road closures that may necessitate night-time. Consideration should also be given to the availability of diversions if full road closures are envisaged. ● Engagement with roads authorities will be undertaken if needed at Step 4.
Designated Landscapes, Protected Views and Scenic Routes	● The designated landscapes, protected views and scenic routes as per the county development plans are reviewed in the context of the technology options. ● The county development plans' policies and objectives are also reviewed with regards to electricity transmission infrastructure. ● Given the nature of the above ground structures in Option 1 (and the possible new sections of OHL), consideration of elevation and slope, scenic routes, protected views and landscape character areas are relevant to the evaluation of the option. ● Given that the Option 2 entails replacement of existing structures along the existing Flagford – Sligo OHL on a like for like basis, and the

[10] EirGrid Evidence Based Environmental Studies Study 2 Cultural Heritage (EirGrid, 2015)

[11] EirGrid Evidence Based Environmental Studies Study 9 Settlement and Land Use (EirGrid, 2015)

[12] EirGrid Evidence Based Environmental Studies Study 10 Landscape and Visual (EirGrid, 2016)

[13] Cultural Heritage Guidelines for Electricity Transmission Projects: A Standard Approach to Archaeological, Architectural and Cultural Heritage Impact Assessment of High Voltage Transmission Projects (EirGrid, 2015)

[14] Grid Implementation Plan 2023-2028 (EirGrid, 2024)

Environmental Sub-Criteria	Description
	installation of a new 220 kV UGC, the consideration of designated landscapes, protected views and scenic routes is unlikely to be relevant however it is included here for consistency with Option 1.
Aviation and Telecommunications	• Wireless services such as radars, radio communications, TV, flight paths, etc are reviewed. • Airports and airport public safety zones in vicinity are reviewed. • The previous Sligo County Development Plan (2017-2023) stated that in 2011, Sligo Airport ceased to operate a regional service and it currently serves as the Northwest base of the Irish Coast Guard Search & Rescue Helicopter. • At this stage of the project development, no potential for aviation related risks and telecommunications interference has been identified and it is therefore not included in the MCA presented in Chapters 4 and 5.

3.1.5 Socio-economic

The following sub-criteria have been used to assess the socio-economic performance of the technology options:

Socio-economic Sub-Criteria	Description
Settlements and Communities	• The sub-criterion reviews the proximity of options to settlements and communities including CSO settlements. • The potential for requirement of third party lands is also considered. • Where possible, concentrations of population should be avoided in order to reduce actual and perceived effects.
Visitors and Commuters	• Transient and infrequent visitors and commuters in the study area are considered.
Amenities, Recreation and Tourism	• The evaluation considers the technology options in relation to to amenities, recreation (e.g., fishing, sports) and tourism (including potential views to and from) resources within the study area.
Nuisance and Disturbance	• Consideration of potential noise and air quality (dust) impacts associated with the technology options are considered. • Consideration of nuisance arising from potential traffic diversions and road closures associated with the technology options are considered. • The likely duration of the construction phase for the technology options is considered in the context of the potential nuisance and disturbance.
Visual Effects	• While Section 3.1.4 considers protected views and landscapes, under this sub-criterion consideration is given to potential visual impacts and opportunities for visual screening in a broader sense. • For Option 1, the assessment considers the potential visual effects associated with the voltage upgrade of the existing OHL for Scenarios 1 and 2. It also considers the potential visual effects of new OHL (loop-in options). • Given that Option 2 entails replacement of existing structures along the existing Flagford – Sligo OHL on like for like basis, and the installation of a new 220 kV UGC, the consideration of visual effects is unlikely to be relevant however it is included here for consistency with Option 1.
Humans and Human Health	• Electric and magnetic fields (EMFs) are produced when current flows, and occur anywhere that electricity is generated, transmitted, or used. Apart from power lines, this includes electrical appliances and wiring in our homes and businesses. The EMFs from electricity are at the extremely low frequency end of the electro-magnetic spectrum.The consensus from health and regulatory authorities is that extremely low frequency EMFs do not present a health risk.[15]

[15] Electric and Magnetic Fields (EMFs) (EirGrid) (accessed January 2025)

Socio-economic Sub-Criteria	Description
	• EirGrid operates the transmission grid to stringent safety recommendations including relating to EMFs. EirGrid requires all transmission networks to operate in line with the existing public exposure guidelines from the International Commission for Non-Ionizing Radiation Protection (ICNIRP). More information is available in the EirGrid publication 'Your guide to understanding electric and magnetic fields (EMFs) (2024)[16] and on the EirGrid website[17]. • Compliance with ICNIRP Guidelines, the European Union Recommendation 1999/519/EC, and Health and Safety Standards, such as CENELEC, will be implemented regardless of the location or technology type proposed. • Consideration is given to potential for the Project to cause stress and anxiety. This may result from aspects relating to proximity to the Project, as well as the potential for temporary nuisance and disturbance related to factors such as traffic, disruption to commuters, construction phase noise and dust. EirGrid will always seek to locate new electricity infrastructure as far from existing dwellings and community buildings as is practicably possible.

3.2 Information Gathering

At this stage in the development of the Project, options are considered at a high level only, based on publicly available information in advance of consultations with stakeholders and the public. The information and data sources set out in Table 3.1 have been considered in the preparation of this report.

Table 3.1: Data Sources used to inform this Report

Source	Date	Data Contents
Geological Survey of Ireland (GSI) database (https://www.gsi.ie/en–ie/data–and–maps accessed October 2024)	2024	• Bedrock Geology • Karst Landforms • Karst Traced Underground Connections • Active and Historic Quarries and Pits • Teagasc Soils • Quarry Directory (2014) • Groundwater Wells and Springs • Landslide Susceptibility and Landslide Extent Locations • Geological Heritage • Groundwater Resources • Groundwater Vulnerability • Public Source Protection Areas
Tailte Éireann	Various	• National Land Cover Map 2023 • Various editions of historic maps for recorded cultural heritage sites and historic land use
Environmental Protection Agency (EPA) database (https://gis.epa.ie/EPAMaps/ accessed October 2024)	2024	• SIS National Soils • Subsoils • River Network • WFD Status 2016-2021 • Licenced Activities
ESBN	2022	• 110 kV OHL

[16] Your guide to understanding electric and magnetic fields (EMFs) (EirGrid, 2024)

[17] How the Grid Works (EirGrid) (accessed January 2025)

Source	Date	Data Contents
		● 110 kV UGC ● 220 kV OHL ● 220 kV UGC ● 400 kV OHL ● 400 kV UGC ● MV/LV OHL/UGC
Open Street Data Map	2024	● Bridges ● Road and Rail Network ● Landscape / Visual ● Settlements and Communities ● Amenities and Facilities ● Humans and Human Health
Google Street Mapping	2024	● Land use ● Landscape / Visual ● Settlements and Communities ● Amenities and Facilities ● Humans and Human Health
OPW Flood Mapping (https://www.floodinfo.ie/map/floodmaps/ accessed October 2024)	2024	● Flood Mapping ● Historic Flood Events
MyPlan.ie web map portal (https://www.myplan.ie/, accessed October 2024)	2024	● Land use and zoning ● Planning Applications
Sligo County Development Plan 2017-2023	2017	● Sligo Airport operations
Sligo County Development Plan 2024-2030	2024	● Land use and zoning ● Plans, policies and designations ● Record of Protected Structures ● Landscape Characterisation Map
Roscommon County Development Plan 2022-2028	2022	● Land use and zoning ● Landscape Characterisation Map ● Various policies appropriate to the options under consideration. ● Record of Protected Structures ● Strategic Flood Risk Assessment
Leitrim County Development Plan 2023-2029	2023	● Land use and zoning ● Landscape Characterisation Map ● Various policies appropriate to the options under consideration. ● Record of Protected Structures ● Strategic Flood Risk Assessment
European Site Documentation including detailed Mapping in relation to Conservation Objectives (NPWS)	2024	● Ecological Sites ● Conservation status, objectives, mapping
NPWS Site Synopses and, Natura Standard Data Forms	2024	● Site information, species and habitats information
National Biodiversity Data Centre (http://maps.biodiversityireland.ie accessed October 2024)	2024	● Species data
Rare and Protected Species Data supplied by NPWS	2024	● Rare and protected species data
National Survey of Native Woodland	2003-2008	● Distribution and classification of native woodland

Source	Date	Data Contents
Ancient and Long-Established Woodlands	2012	● Distribution of ancient woodland
Margaritifera Sensitive Areas Map	2017	● Mapping of freshwater pearl mussel sensitive areas
Irish Semi Natural Grassland Survey	2013-2015	● Distribution and classification of semi-natural grasslands
Otter Survey of Ireland	1982; 2004-2005; 2010-2011	● Distribution of otter
Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP)	2024	● Recorded cultural heritage sites
National Inventory of Architectural Heritage	2024	● Recorded cultural heritage sites
Central Statistics Office (CSO) (www.cso.ie)	2022	● Census 2022 ● Demographics ● Settlements
Public Participation Network (www.gov.ie)	2024	● Communities
Fáilte Ireland (www.failteireland.ie accessed October 2024)	2024	● Tourism and Amenity
An Bord Pleanála (https://www.pleanala.ie/en-ie/Map-search accessed October 2024)	2024	● Planning Applications

4 Multi-Criteria Assessment of Option 1: Voltage Upgrade to 220 kV

4.1 Introduction

This section provides an assessment of Option 1, against the criteria as described in Chapter 3. It is noted that the corridors / routes for the loop-in sections (OHL or UGC) will not be prepared until Step 4, should Option 1 be selected as the BPO.

4.2 Assessment of Option 1: Voltage Upgrade to 220 kV

4.2.1 Technical

Scenario	Commentary	Performance (significance / difficulty / risk)
Scenario 1	The technical performance is scored as low risk due to 220 kV technology being widely used within the Irish transmission system in compliance with safety and security and planning standards, well known ways to increase thermal capacity of the circuit and a low operational and reliability risk, with an approximate total annual unavailability of 3 days. Risks associated with the expansion/extendibility, of the OHL circuit are not considered significant due to well-known ways of increasing the power carrying capacity of OHLs. Additionally, risks associated with compliance with security and planning standards are not considered significant, since the inclusion of Scenario 1 leads to a more robust transmission system in the area. On the contrary, Scenario 1 accommodates a slightly lower amount of renewable energy in the Northwest area compared to Option 2, thus a slightly increased headroom risk. No major risks were identified on the use of composite pole technology during the rigorous testing performed by ESB Networks and EirGrid, therefore the technical operational risk of this scenario is deemed low. Increased risks/difficulties exist in increasing the power carrying capacity of UGC circuits, which will be captured in the Step 4 assessment of possible loop-in options, if Option 1 is selected as the BPO.	
Scenario 2	The technical performance is scored as low risk due to 220 kV technology being widely used within the Irish transmission system in compliance with safety and security and planning standards, well known ways to increase thermal capacity of the circuit and a low operational and reliability risk, with an approximate total annual unavailability of 3 days. Additionally, risks associated with compliance with security and planning standards are not considered significant, since the inclusion of Scenario 2 leads to a more robust transmission system in the area. On the contrary, Scenario 2 accommodates a slightly lower amount of renewable energy in the Northwest area compared to Option 2, thus a slightly increased headroom risk. Increased risks/difficulties exist in increasing the power carrying capacity of UGC circuits, which will be captured in the Step 4 assessment of possible loop-in options, if Option 1 is selected as the BPO.	

4.2.2 Economic

Scenario	Commentary	Performance (significance / difficulty / risk)
Scenario 1	The implementation cost of the Flagford – Srananagh No.2 220 kV circuit with composite poles will vary from approx. €40m to €65m. These costs include the voltage upgrade of the existing Flagford – Sligo 110 kV OHL assets, the new-build loop-in 220 kV section to Srananagh (either OHL or UGC as this will be assessed in Step 4, if Option 1 is selected as the BPO) and the removal of existing Flagford – Sligo 110 kV OHL assets required to facilitate this option. The implementation cost of the Sligo – Srananagh No.3 110 kV circuit will vary from approx. €7m to €14m. These costs include the thermal uprate of existing Flagford – Sligo 110 kV OHL assets and the new-build loop-in 110 kV section to Srananagh. Considering all of the above, the implementation cost for Option 1 Scenario 1 is estimated to be between €47m and €79m (incl. 15% contingency). Including the life-cycle costs of this option the total cost of Scenario 1 is estimated to vary between approximately €58m to €90m. It is also estimated that the annual saving from the SEM of Scenario 1 will be approx. €28m. Considering the implementation, life cycle costs and the annual savings from the SEM, the economic performance of Scenario 1 scores moderate.	
Scenario 2	The implementation cost of the Flagford – Srananagh No.2 220 kV circuit with steel lattice towers will vary from approx. €34m to €58m. These costs include the voltage upgrade of the existing Flagford – Sligo 110 kV OHL assets, the new-build loop-in 220 kV section to Srananagh and the removal of existing Flagford – Sligo 110 kV OHL assets required to facilitate this option. The implementation cost of the Sligo – Srananagh No.3 110 kV circuit will vary from approx. €7m and €14m. These costs include the thermal uprate of existing Flagford – Sligo 110 kV OHL assets and the new-build loop-in 110 kV section to Srananagh. Considering all of the above, the implementation costs for Option 1 Scenario 2 is estimated to be between €41m and €72m (incl. 15% contingency). Including the life cycle costs of this scenario, the total cost is estimated to vary between approximately €52m to €83m. It is also estimated that the annual saving from the SEM of Scenario 2 will be approximately €28m. Considering the implementation, life cycle costs and the annual savings from the SEM, the economic performance of Scenario 2 scores moderate.	

4.2.3 Deliverability

Scenario	Commentary	Performance (significance / difficulty / risk)
Scenario 1	A moderate scoring has been assigned to Scenario 1. The use of composite poles at suspension locations is a new and innovative technology within the Irish transmission grid compared to traditional OHL infrastructure proposed by Scenario 2, however this technology is currently installed on electricity grids internationally. Additionally, ESB Networks and EirGrid conducted rigorous testing on the composite polesets and no major risks were identified, therefore this is not considered a differentiator between the two scenarios. The risk/difficulty of Scenario 1 is increased due to project implementation timelines which are dependent on planned outages and construction programme, including dismantling a section of the existing 110 kV OHL and installing the new composite pole OHL structures. It is estimated that construction of Scenario 1 will take between approx. 41 to 52 months. The risk of dependence on other projects and permits and wayleaves has been deemed low due to the use of the existing Flagford – Sligo 110 kV OHL corridor, as far as practically possible, which reduces the project plan flexibility of this Scenario. It is anticipated that the deliverability performance of the loop-in corridors will be dependent on whether the circuit will be OHL or UGC. New permits and	

Scenario	Commentary	Performance (significance / difficulty / risk)
	wayleaves will be required for the new-built loop-in sections, which could also affect the project implementation timelines. UGC circuits typically have a higher risk of design complexity due to the cable routing, compared to OHL. These will be assessed at Step 4, if Option 1 is selected as the BPO.	
Scenario 2	A moderate scoring has been assigned to Scenario 2 due to the use of conventional steel lattice structures having a low risk of untried technology and supply chain constraints, since these structures are extensively used worldwide. Increased timelines due to planned outages and construction programme, including dismantling a section of the existing 110 kV OHL and installing the new 220 kV OHL, increases the risk/difficulty to moderate. It is estimated that construction of Scenario 2 will take between approx. 41 to 52 months. Additionally, the risk of dependence on other projects and permits and wayleaves has been deemed low due to the use of the existing Flagford – Sligo 110 kV OHL corridor, as far as practically possible, however that use reduces the project plan flexibility of this Scenario. It is anticipated that the deliverability performance of the loop-in corridors will be dependent on whether the circuit will be OHL or UGC. New permits and wayleaves will be required for the new-built loop-in sections, which could also affect the project implementation timelines. UGC circuits typically have a higher risk of design complexity due to the cable routing, compared to OHL. These will be assessed at Step 4, if Option 1 is selected as the BPO.	

4.2.4 Environment

Scenario	Commentary	Performance (significance / difficulty / risk)
Scenario 1	A moderate risk is assigned for environmental performance. The key drivers for this evaluation are listed below. The existing Flagford – Sligo 110 kV OHL crosses the River Unshin Special Area of Conservation (site code 001898) at eight separate locations. Works will be required within the designated site. The intersections of the existing OHL with the River Unshin SAC are likely within the sections of the OHL where the line would be dismantled, or where thermal uprate works will occur (i.e. like for like replacement of structures). The existing Flagford – Sligo 110 kV OHL crosses EPA watercourses where there is a potential hydrological connection to internationally and nationally designated sites. Effects on surface water would predominantly occur during the construction phase, associated primarily with access tracks to the works areas, excavation of new structures' foundations where required and use of concrete for foundations, where required. Potential effects to surface water resources may be mitigated through careful siting of composite polesets and access routes and by using appropriate and standard mitigation measures during the construction phase. There are risks associated with the new sections of 110 kV and 220 kV circuits (loop in sections), particularly in relation to a possible new UGC which may need to cross the River Unshin and the River Unshin SAC. Horizontal Directional Drilling (HDD) may be needed to cross the River Unshin SAC (site code 001898). This would likely require works within, or in close proximity to the SAC. HDD is a mitigation technique used where in-stream works are not feasible and therefore, direct impacts to the SAC can be avoided. It requires a sufficient hardstanding laydown and works area accessible by the required machinery in close proximity to the proposed river crossing. Given the European designated sites within the wider study area, consideration will need to be given to the carrying out of Wintering Bird and Breeding Hen Harrier/ wader surveys in the context of possible sections of new OHL, and replacement of the existing wooden polesets with composite poles that may be significantly taller and wider.	

Scenario	Commentary	Performance (significance / difficulty / risk)
	Consideration will be required of works areas and access routes in relation to sensitive non-designated habitats including bog, semi natural woodland, fen and less improved grassland. The existing Flagford – Sligo 110 kV OHL crosses four scenic routes and both 'Normal Rural Landscape' and 'Sensitive Rural Landscape' characterisations, as per the Sligo County Development Plan (SCDP). The existing OHL also passes through landscape characterisations of 'Very High Value and Exceptional Value' as per the Roscommon County Development Plan (RCDP). This is considered in the context of the replacement of wooden polesets with composite poles that may be significantly taller and wider. Landscape character, scenic landscapes and protected views will be considered in the context of the potential for new OHL loop-in options, if selected in Step 4, The following towns and villages in the study area: Riverstown, Sooey, Ballygawley could potentially be affected by the new sections of 110 kV and 220 kV circuit if Option 1 is selected as the BPO. The routing of UGC loop-in sections will consider constraints in these towns and villages, for example schools, churches, businesses, community centres, cemeteries and graveyards. There are known archaeological sites currently intersecting with the existing Flagford – Sligo 110 kV OHL. Six existing structures along the OHL currently lie within the ZoNs of SMR sites. For any works carried out within a ZoN, a Section 12(3) Notification application must be submitted to the National Monuments Service (NMS) and be approved before any works can take place. For such works archaeological mitigation may also be required following consultation with the NMS, and this must be carried out under a licence, as per Section 26 of the National Monuments Act 1930 (as amended). Archaeological mitigation may also be needed at discrete locations where works are to be carried out in areas that have not been previously disturbed. The existing Flagford – Sligo 110 kV OHL lies at the western boundary of the Markree Demesne, as identified from the OS 6-inch mapping. The Markree Demesne includes Markree Castle and associated features (NIAH Reg No. 32402620) within the townlands of Cloonmacduff, Ballygrania, Markree Demesne, Clooneenroe, Cooperhill or Gobbadagh. The works proposed along this section of the OHL would be thermal uprate works (like for like replacement of existing structures). Any sections of new OHL (loop-in options) in the vicinity of the demesne would require further assessment to determine potential effects on the demesne including the consideration of views to and from the associated built heritage features. At this stage, no decision has been made on the use of roads for UGC. This will be decided at Step 4 having regard to the MCA and in consultation with the local authorities and TII. There are possibilities of road closures and traffic diversions along key commuter routes, particularly if new sections of UGC (loop-in options) following the local road network are proposed in Step 4.	
Scenario 2	A moderate risk is assigned for environmental performance. The key drivers for this evaluation are listed below. The existing Flagford – Sligo 110 kV OHL crosses the Unshin River Special Area of Conservation (site code 001898) at eight separate locations. Works will be required within the designated site. The intersections of the existing OHL with the River Unshin SAC occur within the sections of the OHL where the line would be dismantled, or where thermal uprate works will occur (i.e. like for like replacement of structures. The existing Flagford – Sligo 110 kV OHL crosses EPA watercourses where there is a potential hydrological connection to internationally and nationally designated sites. Effects on surface water would predominantly occur during the construction phase, associated primarily with access tracks to the works areas, excavation of new structures' foundations where required and use of concrete for foundations, where required. Potential effects to surface water resources may be mitigated through careful siting of composite polesets and	

Scenario	Commentary	Performance (significance / difficulty / risk)
	access routes and by using appropriate and standard mitigation measures during the construction phase. There are risks associated with the new sections of 110 kV and 220 kV circuits (loop-in sections), particularly in relation to a possible new UGC which may need to cross the River Unshin and the River Unshin SAC. Horizontal Directional Drilling (HDD) may be needed to cross the River Unshin SAC (site code 001898). This would likely require works within, or in close proximity to the SAC. HDD is a mitigation technique used where in-stream works are not feasible and therefore, direct impacts to the SAC can be avoided. It requires a sufficient hardstanding laydown and works area accessible by the required machinery in close proximity to the proposed river crossing. Given the European designated sites within the wider study area, consideration will need to be given to the carrying out of Wintering Bird and Breeding Hen Harrier/ wader surveys in the context of possible sections of new OHL, and replacement of the existing wooden polesets with steel lattice towers along the existing OHL. Consideration will be required of works areas and access routes in relation to sensitive non-designated habitats including bog, semi natural woodland, fen and less improved grassland. The existing Flagford – Sligo 110 kV OHL crosses four scenic routes and both 'Normal Rural Landscape' and 'Sensitive Rural Landscape' characterisations, as per the SCDP. The existing OHL also passes through landscape characterisations of 'Very High Value and Exceptional Value' as per the RCDP. This is considered in the context of the replacement of wooden polesets with composite poles that may be significantly taller and wider. Landscape character, scenic landscapes and protected views will be considered in the context of the potential for new OHL loop-in options, if selected in Step 4, The following towns and villages in the study area: Riverstown, Sooey, Ballygawley could be potentially affected by the new sections of 110 kV and 220 kV circuit if Option 1 is selected as the BPO. The routing of UGC loop-in sections would be determined by constraints in these towns and villages, for example schools, churches, businesses, community centres, cemeteries and graveyards. There are known archaeological sites currently intersecting with the existing Flagford – Sligo 110 kV OHL. Six existing structures along the OHL currently lie within the ZoNs of SMR sites. For any works carried out within a ZoN, a Section 12(3) Notification application must be submitted to the National Monuments Service (NMS) and be approved before any works can take place. For such works archaeological mitigation may also be required following consultation with the NMS, and this must be carried out under a licence, as per Section 26 of the National Monuments Act 1930 (as amended). Archaeological mitigation may also be needed at discrete locations where works are to be carried out in areas that have not been previously disturbed. The existing Flagford – Sligo 110 kV OHL lies at the western boundary of the Markree Demesne, as identified from the OS 6-inch mapping. The Markree Demesne includes Markree Castle and associated features (NIAH Reg No. 32402620) (within the townlands of Cloonmacduff, Ballygrania, Markree Demesne, Clooneenroe, Cooperhill or Gobbadagh). The works proposed along this section of the OHL would be thermal uprate works (like for like replacement of existing structures). Any sections of new OHL (loop-in options) in the vicinity of the demesne would require further assessment to determine potential effects on the demesne including the consideration of views to and from the associated built heritage features. At this stage, no decision has been made on the use of roads for UGC. This will be decided at Step 4 having regard to the MCA and in consultation with the local authorities and TII. There are possibilities of road closures and traffic diversions along key commuter routes, particularly if new sections of UGC (loop-in options) following the local road network are proposed in Step 4.	

Scenario	Commentary	Performance (significance / difficulty / risk)
	In comparison with Scenario 1, a larger area of land is required for the works and maintenance areas (potentially requiring greater vegetation clearance), and there will be requirement for additional excavations and concrete pours due to the two additional contact points with the ground associated with lattice structures. In addition, the industrial form of the steel lattice towers may have an influence on future land uses.	

4.2.5 Socio-economic

Scenario	Commentary	Performance (significance / difficulty / risk)
Scenario 1	A moderate risk is assigned for socio-economic performance. The key drivers for this evaluation are listed below. The composite polesets are significantly taller and wider than the wooden polesets, with resultant potential visual impacts. However, the composite pole design has a strong family resemblance to the existing wooden polesets and appear less industrial than the steel lattice towers, thus can be considered favourable to steel lattice towers proposed in Scenario 2. However, the replacement of wooden polesets with composite poles would result in permanent visual effects. The existing OHL is in the vicinity of several amenities, recreation and tourist facilities such as Lough Bo Equestrian Centre, Ardagh Self-catering Accommodation and Suites, Tara Marina, which may be indirectly impacted by the replacement of the existing wooden polesets with the larger composite poles. The existing Flagford – Sligo 110 kV OHL lies at the western boundary of the Markree Demesne, as identified from the OS 6-inch mapping. Markree Demesne and Castle (within the townlands of Cloonmacduff, Ballygrania, Markree Demesne, Clooneenroe, Cooperhill or Gobbadagh) is a tourist destination and local amenity facility. The works proposed along this section of the OHL would be thermal uprate works (like for like replacement of existing structures). Any proposed OHL loop-in options in the vicinity of the demesne could result in potential effects on the demesne/estate including the consideration of views to and from the castle and associated developments. Any new sections of OHL (loop-in options) would result in permanent visual effects. The significance of the visual effects will depend on their location, which will be determined in Step 4 if Option 1 is selected as the BPO. The Sligo County Development Plan 2024-2030 identifies that Riverstown has a regionally significant cultural role. Any new OHL or UGC circuits crossing Riverstown could result in nuisance and disturbance in Riverstown and other amenities in the wider vicinity. The significance of the nuisance and disturbance will depend on the location, which will be determined in Step 4 if Option 1 is selected as the BPO.	
Scenario 2	A moderate-high risk is assigned for socio-economic performance. The key drivers for this evaluation are listed below. The steel lattice towers are significantly taller and wider than the wooden polesets. Furthermore, steel lattice towers appear more industrial than the composite pole design which has a strong family resemblance to the existing wooden polesets, thus steel lattice towers can be considered less favourable than the composite polesets proposed in Scenario 1. The replacement of wooden polesets with steel lattice towers would result in permanent visual effects. The existing OHL is in the vicinity of several amenities, recreation and tourist facilities such as Lough Bo Equestrian Centre, Ardagh Self-catering Accommodation and Suites, Tara Marina. There is a distinct step up in terms of presence and community acceptance from double pole 110 kV structures to the proposed 220 kV steel lattice	

Scenario	Commentary	Performance (significance / difficulty / risk)
	structures, and there is potential for stress and anxiety in relation to this change. The existing Flagford – Sligo 110 kV OHL lies at the western boundary of the Markree Demesne, as identified from the OS 6-inch mapping. Markree Demesne and Castle is a tourist destination and local amenity facility. The works proposed along this section of the OHL would be thermal uprate works (like for like replacement of existing structures). Any proposed OHL loop-in options in the vicinity of the demesne could result in potential effects on the demesne/estate including the consideration of views to and from the castle and associated developments. Any new sections of OHL (loop-in options) would result in permanent visual effects. The significance of the visual effects will depend on their location, which will be determined in Step 4 if Option 1 is selected as the BPO. The Sligo County Development Plan 2024-2030 identifies that Riverstown has a regionally significant cultural role. Any new OHL or UGC circuits crossing Riverstown could result in nuisance and disturbance in Riverstown and other amenities in the wider vicinity. The significance of the nuisance and disturbance will depend on the location, which will be determined in Step 4 if Option 1 is selected as the BPO.	

4.2.6 Summary MCA

Table 4.1 presents MCA summary for Scenario 1 and Scenario 2 of Option 1.

Table 4.1: Option 1: Voltage Upgrade to 220 kV Technology MCA Summary

Option 1	Technical	Economic	Deliverability	Environment	Socio-economic
Scenario 1					
Scenario 2					

Both scenarios score a low technical risk, due to the extensive use of OHL technology in the Irish Transmission system. It is noted that composite poles have not yet been used in the Irish Transmission system, however it is currently installed on electricity grids internationally. Additionally, composite polesets have undergone rigorous testing by EirGrid and ESBN, where no major risks were identified. Both scenarios have a similar risk of expansion / extendibility, headroom, reliability and compliance with EirGrid security and planning standards.

Economically, both scenarios have been assessed as moderate risk, with Scenario 2 being slightly favourable, due to lower implementation costs of the steel lattice structure technology compared to composite poles.

In terms of deliverability, both scenarios score very similarly in terms of implementation timelines, permits and wayleaves and construction related criteria because of the use of the existing Flagford – Sligo 110 kV OHL corridor, as far as practically possible, and the fact that both are OHL technologies. The risk of untried technology of Scenario 1 is not considered a differentiator due to the fact that composite technology has been installed on electricity grids internationally and testing performed by EirGrid and ESBN did not identify any major risks. Therefore, both scenarios score moderate for deliverability performance.

Scenario 1 and Scenario 2 both score moderate for environmental performance. Given the European designated sites within the wider study area, consideration will need to be given to the carrying out of Wintering Bird and Breeding Hen Harrier Surveys for both Scenarios 1 and 2 in the context of replacement of the existing wooden polesets with either composite poles or steel lattice towers sections and new OHL sections (loop in options). Both scenarios 1 and 2 will use the existing Flagford – Sligo 110 kV OHL corridor, as far as practically possible, and both

will require greater areas of disturbance than historically required at structure locations, particularly for the section undergoing voltage upgrade works.

Notwithstanding that Scenario 1 and Scenario 2 score equally for environmental performance, Scenario 2 will require a greater area of disturbance at structure locations when compared with that for Scenario 1. This is due to the greater footprint of the steel lattice towers and the fact that they require four foundations as opposed to two for the composite poles. In addition, the greater industrial presence of the steel lattice towers would result in a potentially greater effect on landscape character, protected views and scenic routes for Scenario 2.

Scenario 1 is preferable to Scenario 2 on socio-economic performance. The key differentiator is the more industrial visual presence of steel lattice towers as replacements for wooden polesets along the length of the existing OHL, and the resultant effects on residents/communities, visitors, commuters, recreation and tourism.

5 Multi-Criteria Assessment of Option 2: Thermal Uprate and 220 kV UGC

5.1 Introduction

This section provides an assessment of Option 2, against the criteria as described in Chapter 3. It is noted that the corridor options for the 220 kV UGC connection between Flagford and Srananagh substations will not be developed until Step 4, should Option 2 be selected as the BPO. All potential solutions are considered in this assessment.

5.2 Assessment of Option 2: Thermal Uprate and 220 kV UGC

5.2.1 Technical

Option	Commentary	Performance (significance / difficulty / risk)
Option 2	A moderate technical performance risk was assigned to Option 2. This was influenced by an increased risk of further expansion / extendibility of the UGC technology due to the limitations referenced in Section 3.1.1. Additionally, an increased reliability risk is associated with Option 2, compared to Option 1 with an expected Total Annual Unavailability of the Option for approx. 6 to 9 days. Furthermore, an increased repeatability risk is associated with Option 2, compared to Option 1, due to the bespoke nature of the cable system design and integration into the network. Additionally, the risk of harmonic distortion and the potential need for harmonic filters and the definite need for additional reactive compensation equipment associated with Option 2 due to an extensive length of UGC circuit increases the technical operational risk and risk of compliance with security and planning standards.	

5.2.2 Economic

Option	Commentary	Performance (significance / difficulty / risk)
Option 2	Construction works associated with the thermal uprate of the existing Flagford – Sligo 110 kV OHL are estimated at approximately €17m (incl. 15% contingency). To accurately assess the economic performance of Option 2, construction works associated with the new Flagford – Srananagh No.2 220 kV UGC circuit should also be considered. Considering the distance between Flagford & Srananagh substations a typical length of such a UGC circuit would range from approx. 43 to 49km. The approximate implementation cost of such a circuit, would range from €74m to €78m. Considering the above, the approximate implementation cost of Option 2 would vary between €91m and €95m, assuming a typical range of a new 220 kV Flagford – Srananagh No.2 UGC Circuit, between 43 and 49km. Life cycle costs have also been considered and accounted for in the economic performance of Option 2. Another consideration is the 40-year lifespan of Option 2's UGC which is 10 years less than the 50-year lifespan of Option 1's OHL. As a result, significant investment would be required after 40 years to replace the cable & associated infrastructure and extend the lifespan of the Option 2 cable. While it would then have a lifespan beyond the 50-year	

Option	Commentary	Performance (significance / difficulty / risk)
	lifespan of the Option 1 OHL, Option 2's economic performance suffers in the regard. It is also estimated that the annual saving from the SEM will be approximately €29m, therefore both options have the same performance on Cost to SEM.	

5.2.3 Deliverability

Option	Commentary	Performance (significance / difficulty / risk)
Option 2	A moderate risk was assigned for deliverability performance for Option 2 as the use of the existing Flagford – Sligo OHL corridor decreases the level of project plan flexibility. The implementation timelines of the thermal uprate of the existing Flagford – Sligo 110 kV OHL are deemed low risk, however the risk increases for the implementation timelines of the Flagford – Srananagh No.2 220 kV UGC circuit, based on a typical circuit length that would vary between 43 and 49km, to connect the two substations. For such a circuit length, the implementation timelines would vary from approximately 33 to 38 months. A higher risk was assessed for the design complexity of the Flagford – Srananagh 220 kV No.2 UGC circuit. Design complexity will be reassessed at Step 4, once cable corridors have been identified, should Option 2 be selected as the BPO.	

5.2.4 Environment

Option	Commentary	Performance (significance / difficulty / risk)
Option 2	A moderate risk is assigned for environmental performance. The key drivers for this evaluation are listed below. The existing OHL corridor crosses the River Unshin SAC (site code 001898) at eight separate locations, and works will be required within the designated site. In addition to direct effects on the SAC, consideration will be required for works areas and access routes in relation to sensitive non-designated habitats including bog, semi natural woodland, fen and less improved grassland. At the location of six existing structures along the OHL, the structure is located within the ZoN for SMR sites. For any works carried out within a ZoN a Section 12(3) Notification application must be submitted to the National Monuments Service (NMS) and be approved before any works can take place. For such works archaeological mitigation may also be required, following consultation with the NMS, and this must be carried out under a licence, as per Section 26 of the National Monuments Act 1930 (as amended). The 220 kV UGC will likely cross rivers and streams within the sub-study area. The rivers within the sub-study area are hydrologically connected to European sites. Horizontal Directional Drilling (HDD) may be needed to cross the River Unshin SAC (site code 001898). This would likely require works within, or in close proximity to the SAC. HDD is a mitigation technique used where in-stream works are not feasible and therefore, direct impacts to the SAC can be avoided. It requires a sufficient hardstanding laydown and works area accessible by the required machinery in close proximity to the proposed river crossing. There are large areas of peat within the sub-study area, which will be unavoidable for any UGC route. Construction works within peat areas may necessitate extensive civil works to ensure stability and these works may result in additional resource usage and potential for increased pollution risk and nuisance effects. There are also areas prone to flooding near Carrick-on-Shannon and Leitrim village.	

Option	Commentary	Performance (significance / difficulty / risk)
	Corridors for the 220 kV UGC will be developed at Step 4, should Option 2 be selected as the BPO. At this stage, no decision has been made on the use of roads for UGC. This will be decided at Step 4 having regard to the MCA and in consultation with the local authorities and TII. Any potential UGC within the road network may require road closures and traffic diversions resulting in disruption on key commuter routes during the construction phase. The regional roads R284, R280, and R368 may facilitate single lane operation during the construction phase, however, partial/full road closures will be required due to the width of some local roads and the existing terrain in the study area. Any in-road routes will be discussed with the relevant roads authorities in Step 4, should Option 2 be selected as the BPO.	

5.2.5 Socio-economic

Option	Commentary	Performance (significance / difficulty / risk)
Option 2	A moderate risk is assigned for socio-economic performance. The key drivers for this evaluation are listed below. At this stage, no decision has been made on the use of roads for UGC. This will be decided at Step 4 having regard to the MCA and in consultation with the local authorities and TII should Option 2 be selected as the BPO. If the proposed UGC options follow the local road network, partial/full road closures will be required due to the width of some local roads in the area and the existing terrain in the study area. For in-road sections, the regional roads R284, R280, and R368 may facilitate single lane operation during the construction phase, however this would result in delays and disruption to commuters between significant CSO settlements in the study area (Carrick-on-Shannon, Leitrim Village) for an estimated construction phase of approximately 33 to 38 months. The 220 kV UGC may need to pass through CSO settlements within the study area like Carrick-on-Shannon and Leitrim Village, as well as Ballyfarnon, Keadew West, if avoidance is not possible. This would result in nuisance and disturbance to communities within these settlements. The need to avoid constraints (for example utilities, watercourse crossings) may necessitate off-road sections of cable routing requiring third party lands. This will be assessed in Step 4, if Option 2 is selected as the BPO.	

5.2.6 Summary MCA

Table 5.1 presents MCA summary for Option 2.

Table 5.1: Option 2: Thermal Uprate and 220 kV UGC Technology MCA Summary

	Technical	Economic	Deliverability	Environment	Socio-economic
Option 2					

Option 2 scored moderate for technical performance. There is a low risk with respect to headroom and safety standard compliance with both the OHL and UGC technologies being widely used in the Irish Transmission System. An increased risk of further expansion / extendibility of the thermally uprated Flagford – Sligo 110 kV OHL as well as a moderate risk of expansion / extendibility, reliability and repeatability of UGC technology for the Flagford – Srananagh No.2 220 kV UGC circuit were assessed. Additionally, the length of UGC circuit of Option 2 will lead to an increased risk of harmonic distortion thus the potential need for harmonic filter devices. This length of UGC will also lead to a definite need for reactive power

compensation devices. This increases the technical operational risk and the risk of compliance with EirGrid security and planning standards of Option 2.

Additionally, Option 2 scored high for economic performance, due to the approximate implementation cost of the Flagford – Srananagh No.2 220 kV circuit. With a typical circuit length of between approximately 43 and 49km, the implementation cost of this option would vary between €91m and €95m. Considering the life cycle costs of this option and the 40-year lifespan of UGC, Option 2's economic performance suffers in that regard. The cost to SEM is similar to Option 1 (€1m difference between the two Options).

Option 2 scored moderate on deliverability performance since there is a reduced level of project plan flexibility due to the use of the existing Flagford – Sligo 110 kV OHL corridor for the thermal uprate. Additionally, a high risk was associated with the design complexity of a 220 kV UGC circuit to connect Flagford and Srananagh substations.

Option 2 scored moderate for environmental performance. The existing Flagford – Sligo 110 kV OHL crosses the River Unshin SAC at eight separate locations and works will be required within the designated site. The 220 kV UGC will likely cross rivers and streams within the sub-study area which are hydrologically connected to European sites. Horizontal Directional Drilling (HDD) may be needed to cross the River Unshin SAC (site code 001898), depending on the routing of the 220 kV UGC, to be developed at Step 4, should Option 2 be selected as the BPO.

The existing Flagford – Sligo 110 kV OHL corridor intersects with the ZoNs of SMR sites at six locations. For any works carried out within a ZoN, a Section 12(3) Notification application must be submitted to the National Monuments Service (NMS) and be approved before any works can take place. For such works archaeological mitigation may be required, following consultation with the NMS, and this must be carried out under a licence, as per Section 26 of the National Monuments Act 1930 (as amended).

Any UGC option within the road network may result in disruption on key commuter routes during the construction phase. For any UGC option within the road network, consultation with the relevant roads' authorities will be carried out at Step 4, should Option 2 be selected as the BPO.

Option 2 scored moderate for socio-economic performance. The key drivers are the potential for nuisance and disruption to communities within the key settlements of Carrick-on-Shannon and Leitrim Village, as well as Ballyfarnon and Keadew West, if avoidance is not possible. This would result in nuisance and disruption to communities within these settlements.

6 Emerging Best Performing Technology Option

Table 6.1 presents an MCA summary for Option 1 and Option 2.

Table 6.1: Technology Options MCA Summary

Options	Technical	Economic	Deliverability	Environment	Socio-economic
Option 1					
Scenario 1					
Scenario 2					
Option 2					
Thermal Uprate and 220 kV UGC					

In a comparison of Scenario 1 and Scenario 2 (Option 1), both scenarios score equally for technical, economic, deliverability and environmental performance.

Under socio-economic, Scenario 1 is favourable. The key differentiator is the more industrial visual presence of steel lattice towers proposed in Scenario 2 to replace wooden polesets along the section of the existing overhead line for voltage upgrade, and the resultant effects on residents/communities, visitors, commuters and recreation and tourism.

On balance, Scenario 1 is the preferred scenario of Option 1.

In a comparison of Option 1 Scenario 1 with Option 2, both score moderate for deliverability, environmental and socio-economic performance.

Option 1 Scenario 1 is preferable to Option 2 for technical performance due to the increased risk of expansion/extendibility, technical operational risk, reliability and compliance with EirGrid security and planning standards associated with Option 2.

Option 1 Scenario 1 is favourable under economic performance due to the increased implementation costs of UGC technology compared to OHL and the longer linear length of UGC that would be required for Option 2.

Therefore on balance Option 1 Scenario 1 is the emerging best performing technology option.

7 Conclusion

The CP0982 Flagford – Sligo Capacity Needs is a proposed electricity development that will help to meet the network need identified in the Northwest area of Ireland.

The Project is described in the Strategic Framework for Grid Development in the Northern & Western Region (EirGrid, 2024)[18]. The Framework identifies that the Northern and Western Region (NWR) "*is characterised by a strong existing and potential renewable energy (primarily wind) resource, with many requests for further connection*". The Framework notes that the proposed Project will help to resolve the network need in the Northern and Western Region.

The purpose of Step 3 is to identify the Best Performing Technology Option. The following two technology options were brought forward from Step 2 for further consideration:

- Option 1: Voltage upgrade to 220 kV of the existing Flagford – Sligo 110 kV OHL
  - Scenario 1: use of composite poles for intermediate locations and conventional steel lattice structures for angle locations for the 220 kV circuit from Flagford to Srananagh substations.
  - Scenario 2: use of conventional steel lattice structures at all structure locations for the 220 kV circuit from Flagford to Srananagh substations.
- Option 2: Thermal uprate of the existing Flagford – Sligo 110 kV OHL plus a new Flagford – Srananagh 220 kV UGC.

These options have been assessed against five criteria: technical performance, economic performance, deliverability performance, environmental performance, and socio-economic performance.

Based on the multi-criteria assessment, Option 1 Scenario 1 is the emerging best performing technology option. Option 1 Scenario 1 involves a voltage upgrade to 220 kV of the existing Flagford – Sligo 110 kV OHL using composite poles for intermediate locations and conventional steel lattice structures for angle locations for the 220 kV circuit from Flagford to Srananagh substations.

For the 110 kV circuit from Srananagh to Sligo substations this scenario proposes like for like replacement for the existing line i.e. wooden polesets for intermediate locations and conventional steel lattice structures for angle locations.

Option 1 Scenario 1 also includes new sections of OHL or UGC (loop-in sections) to connect the existing Flagford – Sligo OHL into Srananagh substation. An evaluation of loop-in OHL and UGC corridors will be undertaken in Step 4, if Option 1 Scenario 1 is selected as the BPO.

[18] Strategic Framework for Grid Development in the Northern & Western Region (EirGrid, 2024)

8 Next Steps

As described in Section 1.3, during Step 3 the shortlisted options brought forward from Step 2 will be assessed using an MCA to identify an EBPO. This will be task 1 under Step 3 of EirGrid's Framework for Grid Development.

The next steps in Step 3 are discussed below.

Task 2 – Consultation

The Step 3 assessment process provides for public participation and stakeholder engagement during the decision-making process.

To arrive at the BPO for the Project and conclude the Step 3 process there are three remaining activities that need to be completed after the consultation period has closed. These three activities and their outcomes will inform the decision-making process. A short description of each activity is provided below.

Task 3 – Assess feedback

The feedback received during the consultation period will be considered and analysed to review and refine the MCA. This review will be based on the responses received during the consultation period. The feedback will inform the selection of the BPO.

Task 4 – Review the MCA

The review will incorporate the feedback and other new information received that concerns the criteria assessed in the MCA. A clear description of the new information received will be provided. If the review results in a change to the previous assessment a justification will be outlined.

Task 5 – Other considerations

Following the confirmation of best performing technology option, consideration will be given to overhead line and underground cable options (assuming technical viability) in Step 4. From the start of this process, EirGrid will engage with the Roads Sector (TII and Local Councils) to ensure that potential impacts of high voltage transmission underground cable circuits on public roads and associated stakeholders' concerns are identified, considered in project optioneering and mitigated where an in-roads option is chosen. Where a road may also be a planned corridor for future public transport services or utility infrastructure, additional specific requirements will be considered and addressed through consultation.

TII and local authorities have previously highlighted concerns around the impacts of high voltage transmission underground cable circuits installed in public roads in terms of road asset integrity, performance and roads operations, traffic safety and disruption as well as associated costs and liabilities. Regional and local roads are recognised as offering potential for high voltage transmission underground cable circuits, where shown to be feasible, provided arrangements for traffic accommodation (including temporary diversion arrangements) are suitable, the characteristics of road structures, ground conditions, drainage systems and other services are addressed, and the road reinstatement provisions are appropriate. Further survey, assessment, design, and consultation will be undertaken before any new circuit is confirmed.

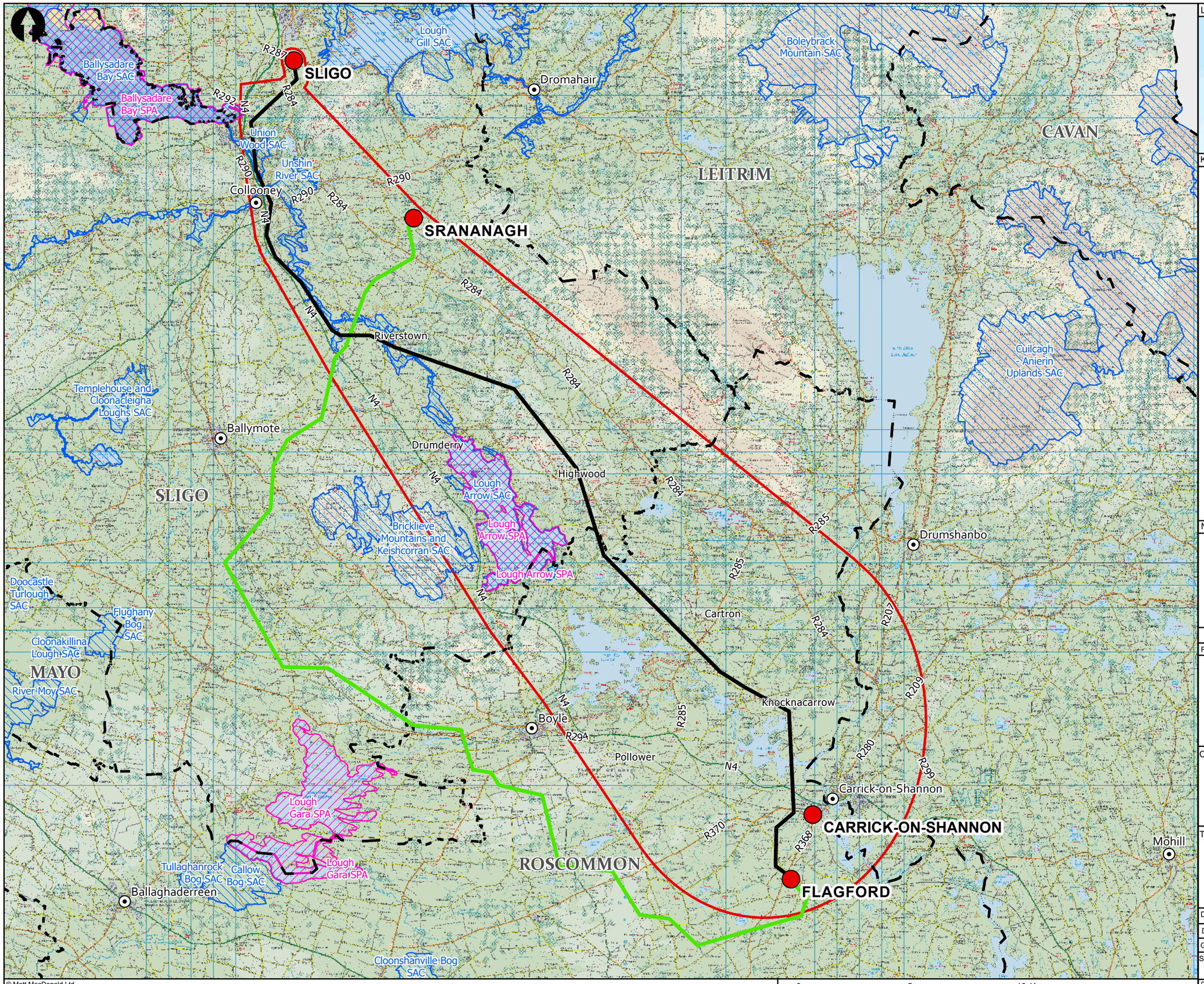
In some cases, information emerges that is not covered by the criteria in the MCA. In such cases the information will be considered outside the MCA and may influence the identification of

the BPO for the Project. A clear description of the new information received and a justification for any changes made to the original assessment will be provided.

In other cases, the MCA may result in an outcome with equal performance of options and other measures may have to be used to distinguish between the options. These measures may relate to technical and/or operational issues of the transmission system, strategic decisions in terms of the developments of the Irish transmission system in a timely manner and any risks that these items may impose to the transmission system. A clear description of the factors influencing the decision will be provided.

Appendices

A. Mapping



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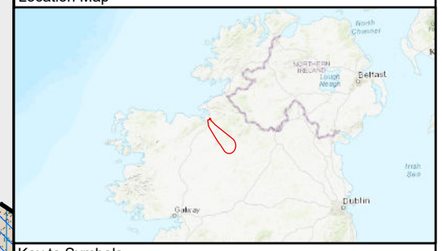

Key to Symbols

- Substation
- Existing 220kV OHL
- Existing 110kV OHL
- Towns
- County Boundary
- Proposed Study Area
- Special Protection Areas
- Special Areas of Conservation

Notes

Service Layer Credits: World Topographic Map: Esri, HERE, Garmin, FAO, NOAA, USGS

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09	10/02/2025	CC	Study Area	CC	PF

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Client

EirGrid

Title

CP0982 Flagford - Sligo Capacity Needs

Study Area

Designed	C Carvalho		Eng Check	A Farantatos	
Drawn	C Carvalho		Coordination	P Foley	
GIS Check	C Carvalho		Approved	P Foley	

Scale at A3	Status	Rev	Security
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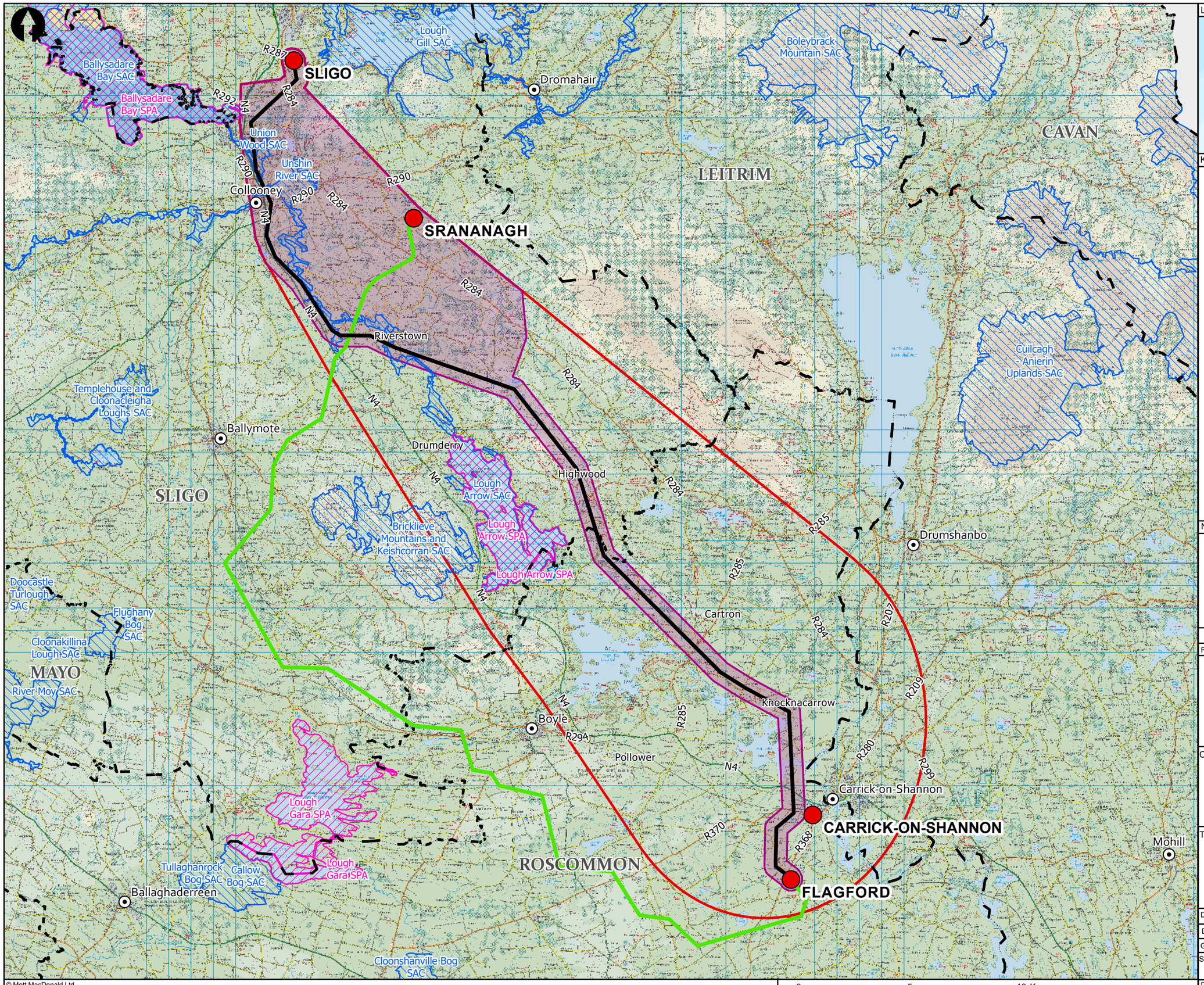

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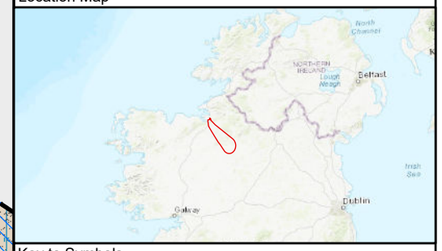

Key to Symbols

- Substation
- Existing 220kV OHL
- Existing 110kV OHL
- Towns
- County Boundary
- Proposed Study Area
- Sub-study Area to locate new 110 kV and 220 kV Loop-in (UGC or OHL) Connections
- Special Protection Areas
- Special Areas of Conservation

Notes

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CP0982 Flagford - Sligo Capacity Needs

Sub-Study Area Option 1 - Voltage Upgrade to 220kV

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Drawn	C Carvalho		Coordination	P Foley	
GIS Check	C Carvalho		Approved	P Foley	

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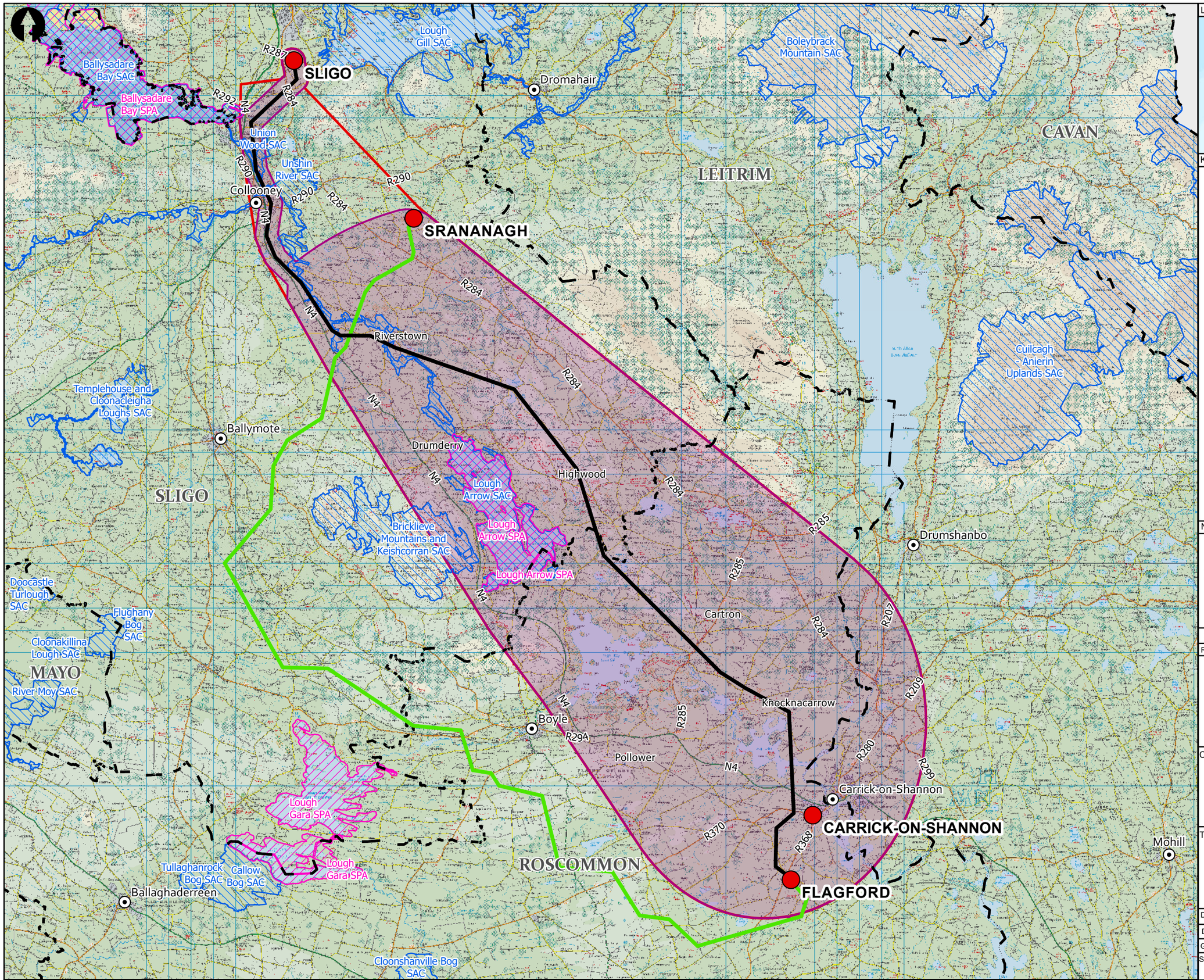
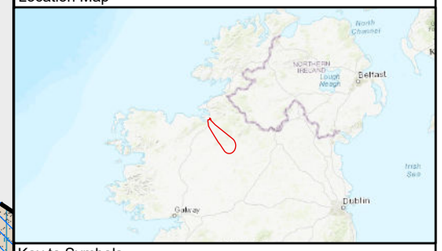


Location Map



Key to Symbols

- Substation
- Existing 220kV OHL
- Existing 110kV OHL
- Towns
- County Boundary
- Proposed Study Area
- Sub-Study Area to locate new 220kV Flagford-Sranangh UGC Connection
- Special Protection Areas
- Special Areas of Conservation

Notes

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CP0982 Flagford - Sligo Capacity Needs

Sub-Study Area Option 2 - Thermal Uprate and New 220kV UGC

Designed	C Carvalho		Eng Check	A Farantatos	
Drawn	C Carvalho		Coordination	P Foley	
GIS Check	C Carvalho		Approved	P Foley	

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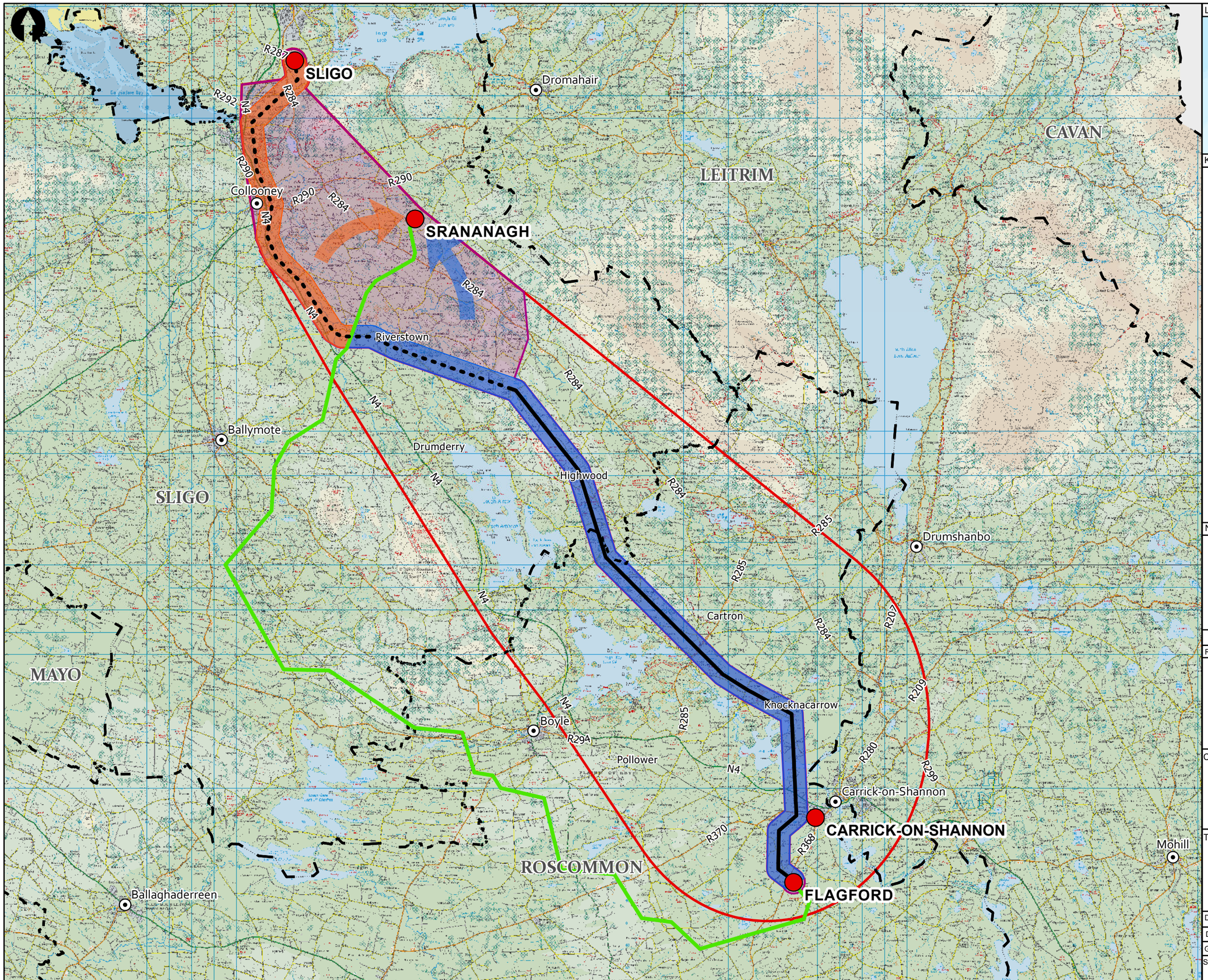
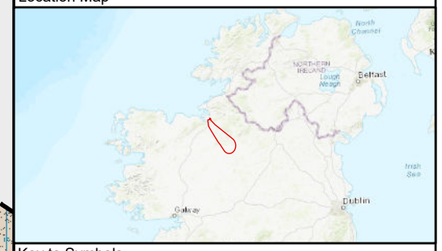


Location Map



Key to Symbols

- Substation
- Existing 220kV OHL
- Existing 110kV OHL
- Indicative Break-In Section for Loop-In (UGC or OHL) Connections. Note: Break in points to be considered in Step 4
- Towns
- County Boundary
- Proposed Study Area
- Sub-study Area to locate new 110 kV and 220 kV Loop-in (UGC or OHL) Connections
- Voltage Upgrade of Existing Flagford-Sligo 110kV OHL Assets
- Thermal Uprate of Existing Flagford-Sligo 110kV OHL Assets
- New 110 kV Loop-in (UGC or OHL) connection between Sligo & Srananagh substations
- New 220 kV Loop-in (UGC or OHL) connection between Flagford & Srananagh substations

Notes

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CP0982 Flagford - Sligo Capacity Needs

Option 1 - Voltage Upgrade to 220 kV

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Drawn	C Carvalho		Coordination	P Foley	
GIS Check	C Carvalho		Approved	P Foley	

Scale at A3	Status	Rev	Security
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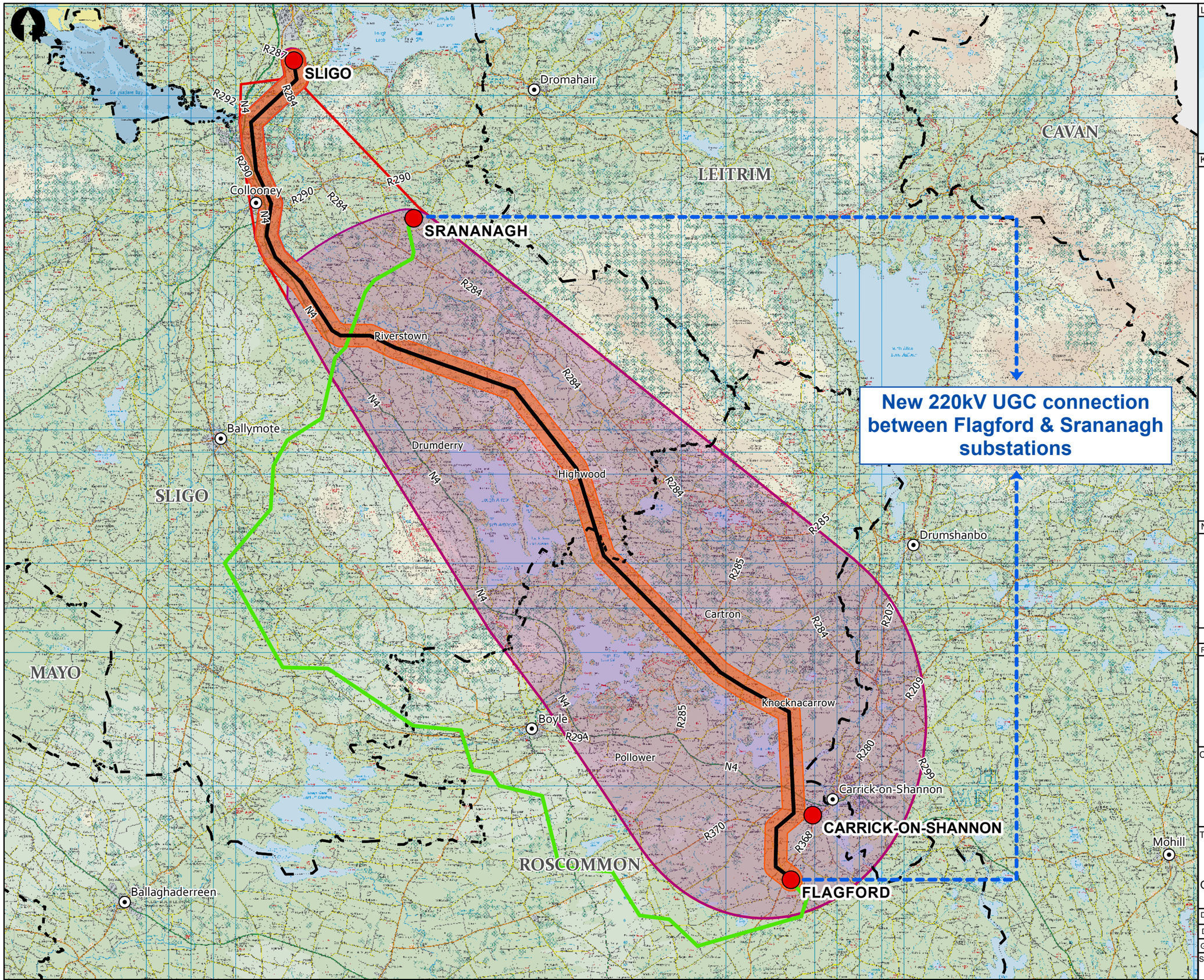
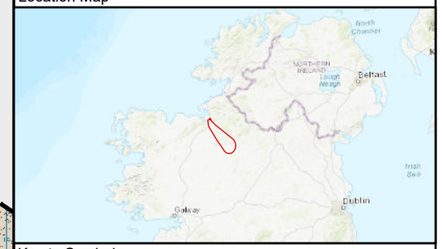


Location Map



Key to Symbols

- Substation
- Existing 220kV OHL
- Existing 110kV OHL
- Towns
- County Boundary
- Proposed Study Area
- Sub-Study Area to locate new 220kV Flagford-Srananagh UGC Connection
- Thermal Uprate of existing Flagford-Sligo 110kV OHL
- New 220kV UGC connection between Flagford & Srananagh substations

Notes

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CP0982 Flagford - Sligo Capacity Needs

Option 2 - Thermal Uprate and new 220kV UGC

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Drawn	C Carvalho		Coordination	P Foley	
GIS Check	C Carvalho		Approved	P Foley	

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