Capital Project 966

Substation Feasibility Assessment - Dunstown 400kV Connection

321084AE-REP-008 | B

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EirGrid

CP966

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Contents

Figures

Executive Summary

Jacobs was requested to prepare a set of substation feasibility reports for EirGrid CP966 project, which is a proposed development that will help transfer electricity to the east of the country and distribute it within the network in Meath, Kildare and Dublin. The project will help meet the growing demand for electricity in the east. This growth is due to increased economic activity and the planned connection of new data centres in the region. It will therefore require significant substation changes at Dunstown and Woodland to accommodate these system upgrades.

The report content and format are suitable to support EirGrid's network development process, in step 3. The options to be investigated by Jacobs are as follows:

- Woodland 220kV AIS C-Type Extension
- Woodland 220kV Connection
- Woodland 400kV Connection
- Woodland 400kV Ring configuration
- Dunstown 220kV AIS C-Type Extension
- Dunstown 220kV Connection
- Dunstown 400kV Connection

Specialists were sent, during the month of November 2019, to visit each of the substation sites to investigate the current infrastructure and what would be needed for the proposed substation connections and modifications. Further to this, sets of drawings have produced for the reports to give an indicative view of how each of the above substation modifications will look and have been referenced throughout all the reports.

This technical report examines the options for 400kV connections at Dunstown substation and highlights these findings by describing technical, environmental, deliverability, and economic factors. Throughout each of the reports, the design methodology and construction approach, and their costs have been detailed.

The following three options were considered:

i. 400kV Under Ground Cable (UGC), 1 cable per phase

ii. 400kV UGC, 2 cables per phase

iii. 400kV Over Head Line (OHL) or uprated 220kV line from Maynooth

The 400kV connection options at Dunstown substation are all technically feasible and require the extension of the substation boundary fence.

No major planning works involving land acquisition are anticipated to be required for all the three options considered. Earthworks and civil works will also be required for the extension as well as for a new road accessway for the delivery of the shunt reactors for UGC 2 cables per phase option.

The requirement for shunt reactors associated with options (i) and (ii) is a significant differentiator compared with option (iii) which represents a 'standard' solution.

1. Introduction

1.1 What is Capital Project 966?

Capital Project 966 is a proposed development that will help transfer electricity to the east of the country and distribute it within the network in Meath, Kildare and Dublin.

The project will help meet the growing demand for electricity in the east. This growth is due to increased economic activity and the planned connection of new data centers in the region.

A significant number of Ireland's electricity generators are located in the south and south west. This is where many wind farms and some modern, conventional generators are located. This power needs to be transported to where it is needed.

The power is mainly transported cross-country on the two existing 400 kV lines from the Moneypoint station in Clare to the Dunstown substation in Kildare and Woodland substation in Meath. Transporting large amounts of electricity on these 400 kV lines could cause problems that would affect the security of electricity supply throughout Ireland, particularly if one of the lines is lost unexpectedly.

To solve this emerging issue, we need to strengthen the electricity network between Dunstown and Woodland to avoid capacity and voltage problems.

Capital Project 966 aims to strengthen the transmission network between Dunstown and Woodland substations. and suggests a number of technical solutions to do so.

1.2 Framework for grid development explained

EirGrid follow a six-step approach when they develop and implement the best performing solution option to any identified transmission network problem. This six-step approach is described in the document 'Have Your Say' published on EirGrid's website [1]. The six steps are shown on a high-level in Figure 1. Each step has a distinct purpose with defined deliverables and represents a lifecycle of a development from conception through to implementation and energisation.

[1] http://www.eirgridgroup.com/the-grid/have-your-say/

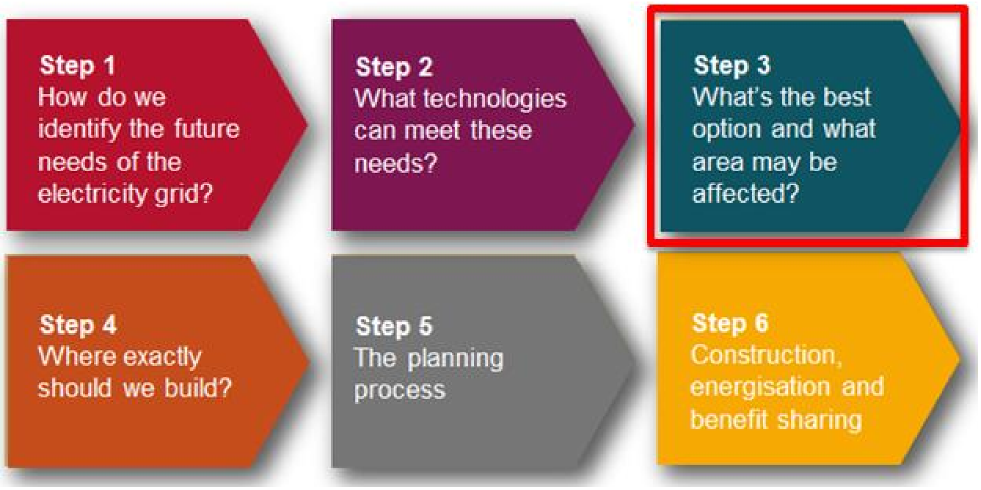

Figure 1 - EirGrid's Six-Step Framework for Grid Development

Capital Project 966 is in Step 3 of the above process. The aim of Step 3 is to identify a best performing solution option to the need identified. There are four remaining technical viable options to be investigated in Step 3. All options create a connection between Woodland and Dunstown substations and have common reinforcements associated in relation to voltage support devices and 110 kV uprates. The main four options are:

- Up-voltage existing 220 kV circuits to 400 kV to create new Dunstown – Woodland 400 kV overhead line (OHL);
- A new 400 kV overhead line;
- A new 220 kV underground cable,
- A new 400 kV underground cable.

Common reinforcements to all four options (outcome of Step 2, may change in Step 3):

- Uprating of the Bracklone – Portlaoise 110 kV overhead line
- Dynamic reactive support device in greater Dublin area rated at approximately ±250 Mvar

These options will be evaluated against five criteria: technical, economic, environmental, deliverability and socio-economic and each criteria incorporates a number of sub-criteria. It shall be noted that the overall assessment is carried out by EirGrid, but certain aspects are investigated and assessed by various consultants and their assessment will feed into the overall assessment.

1.3 Aim and context of this report

EirGrid (the Client) has engaged Jacobs to assess the required substation modifications at Woodland and Dunstown to accommodate these network changes specified by EirGrid. This report is aimed at presenting the findings of this investigation regarding a 400kV bay for cable and overhead line options at Dunstown. The findings will feed into EirGrid's overall evaluation of the four remaining options.

1.4 Description of criteria used to assess the options

This report uses the following criteria to assess each substation option:

- Technical

As part of technical feasibility assessment, substation layouts were developed in accordance with relevant EirGrid design standards to indicate a proposed solution. Constructability and health and safety implications for operation and maintenance activities through the achievement of appropriate electrical clearances have been considered.

- Environmental

As part of environmental feasibility, only the impact arising from any extension to the existing substation boundary has been identified and examined. For a broader environmental assessment, please refer to report 321084AE-REP-002 – Environmental Feasibility Report.

- Deliverability

As part of deliverability assessment, existing access roadways and operational/maintenance assessments were made to ensure that the solution can be safely constructed, maintained and operated.

- Economic

An approximate bill of quantities and cost estimate has been produced for each option.

- Socio-economic

As part of the social feasibility, a socio-economic assessment has been included as part of this report for the substation works only. For a broader social impact assessment, please refer to the report 321084AE-REP-003 – CP966 Social Impact Assessment Report.

1.5 Scale used to assess each criteria

The effect on each criteria parameter is presented along a range from “more significant”/”more difficult”/“more risk” to “less significant”/”less difficult”/“less risk”. The following scale is used to illustrate each criteria parameter:

In the text this scale is quantified by text for example mid-level/moderate (Dark Green), low-moderate (Green), low (Cream), high-moderate (Blue) or high (Dark Blue).

1.6 Relationship to other technical documents

Parallel to this report, Cable Feasibility, Environmental and a Social Impact studies are being prepared to investigate the impact of proposed solutions on the study area.

Please read in conjunction with the following reports;

- 321084AE-REP-001 – Cable Route Feasibility Report
- 321084AE-REP-002 – Environmental Feasibility Report
- 321084AE-REP-003 – Social Impact Report

2. The Project

2.1 Site description

Dunstown 400/220kV AIS substation is an existing substation located in County Kildare and is surrounded by farmland and is in a rural area. Aerial views of the area and substation are shown in Figure 2 and Figure 3 respectively. Further to this, Figure 4 shows the extent of land ownership held by Transmission Assets Owner (TAO).

The substation presently contains both 400kV and 220kV equipment in a double busbar arrangement with 2 x 400/220kV transformer bays, 5 x 220kV line bays and 1 x 400kV line bay.

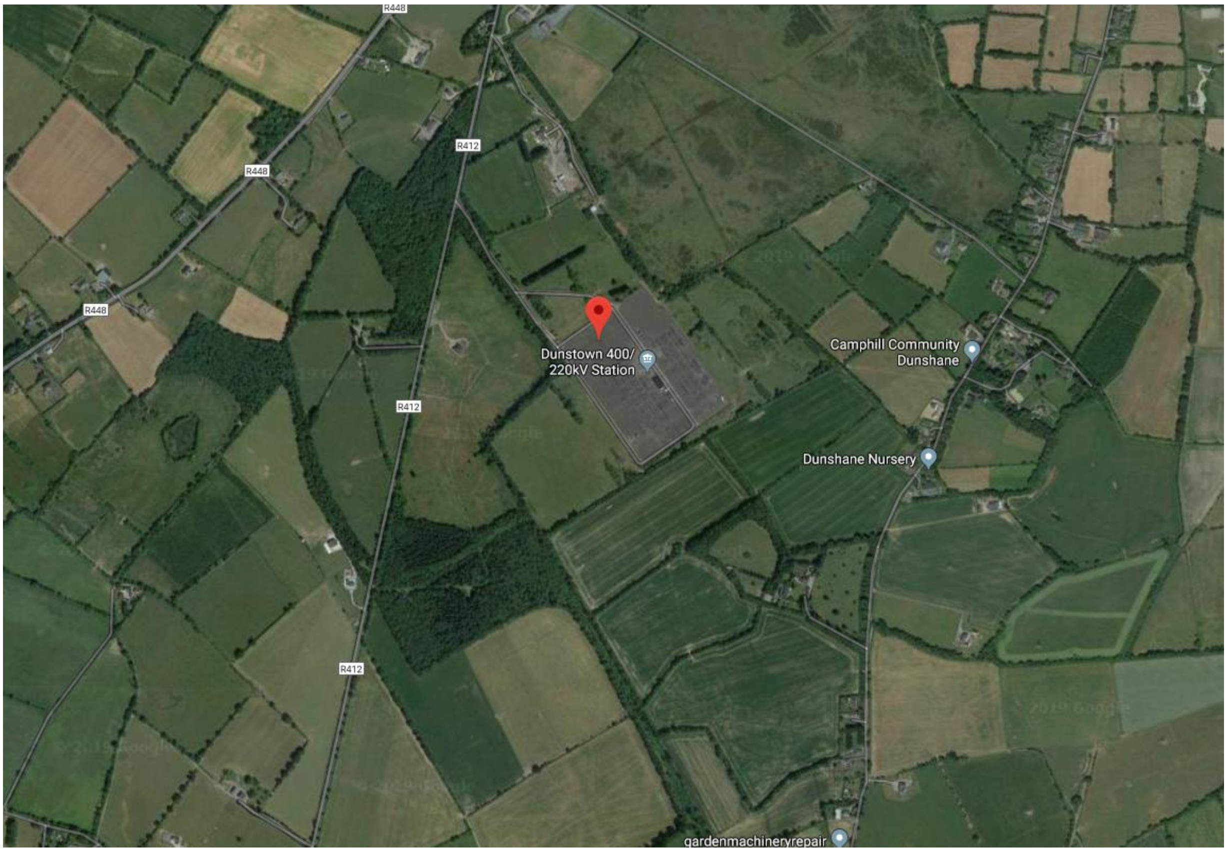

Figure 2 – Aerial View of Dunstown Substation (From Google Earth)

Figure 3 - Location of 400kV Connection (From Google Earth)

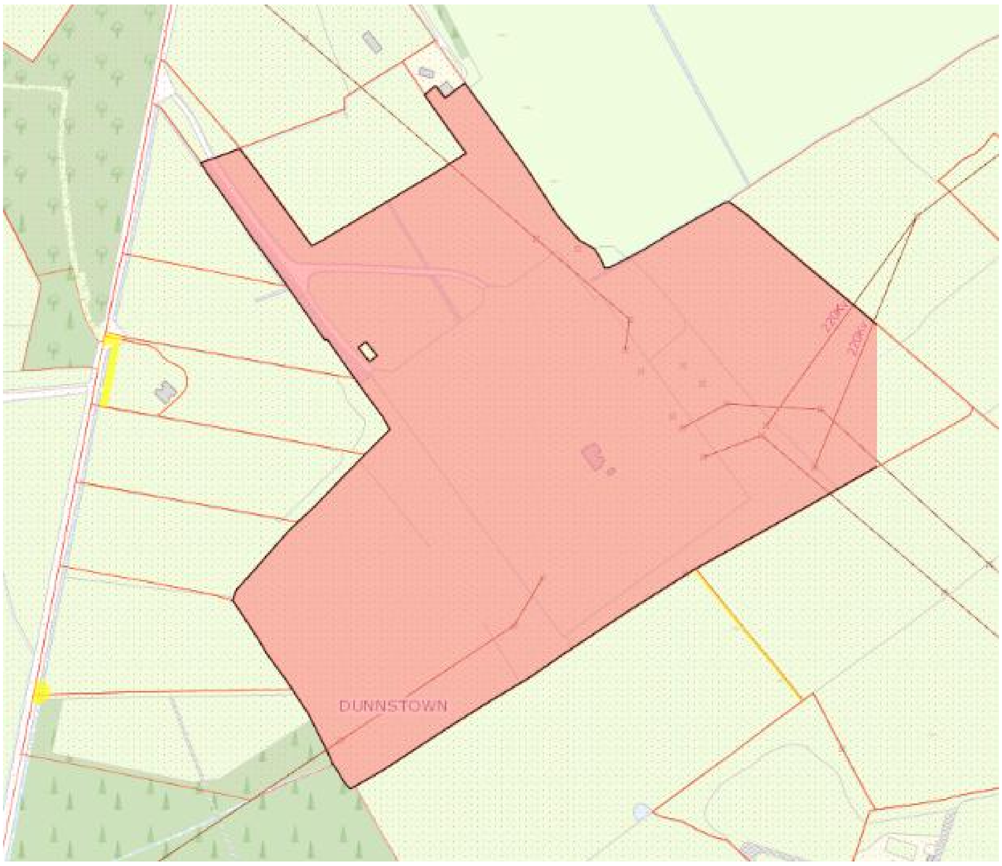

Figure 4 - Extent of Land Ownership Boundary

2.2 Objective

This report will provide a feasibility assessment of an option to utilise a spare 400kV bay for the CP966 connection with Dunstown Substation. This will cover the following three options:

(i) 400kV Under Ground Cable (UGC), 1 cable per phase

(ii) 400kV UGC, 2 cables per phase

(iii) 400kV Over Head Line (OHL)

2.3 Technical

2.3.1 Project Requirements

A new 400kV connection option utilises standard substation design parameters in determining the scope and extent of the substation extension works. These standard parameters ensure a safe and effective design. The 400kV line bay is based on the existing line bay designs at Dunstown substation.

Refer to Figure 5 for a single line diagram for a schematic representation of proposed extension works to the existing substation. Existing substation is indicated in black, new works are indicated in red. For all three options a typical feeder connection bay and all other required equipment will be connected at Dunstown substation for the CP966 connection. This will be at the existing spare bay E4 connected to busbar sections A2/B2 as highlighted previously in Figure 3. For substation layout arrangement of the proposed works, see the drawings listed below and in Appendix A:

(i) 321084AE-LAY-004 (UGC, 1 cable/phase)

(ii) 321084AE-LAY-005 (UGC, 2 cables/phase)

(iii) 321084AE-LAY-006 (OHL)

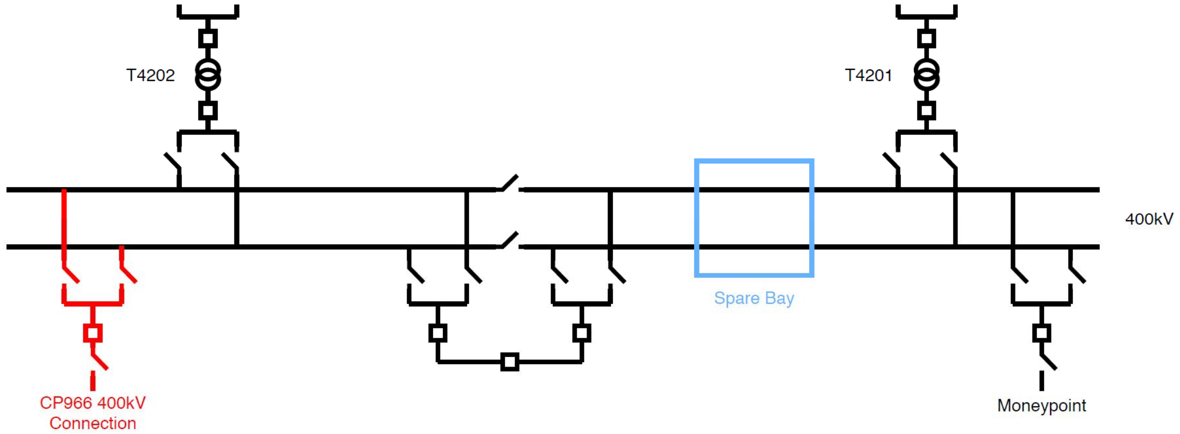

Figure 5 - New Dunstown 400kV Line Connection Bay

EirGrid have indicated that reactive compensation will be required at each substation with underground cable options in order to offset reactive power due to the capacitive nature of UGC's once energised, where the 1 cable per phase option needs 280MVAr and the 2 cables per phase needs 630MVAr. It should be noted that the compensation requirements for the cable options are extremely high and push the limits of reactor technology for the 2 cables per phase. Based on initial manufacturer feedback, we would currently understand that the maximum size of Shunt Reactor available on the market would be approximately 300MVAr.

Additional space is therefore needed to accommodate the equipment to do this. The OHL option does not need this compensation. The following equipment and their footprints are considered.

- 1 x 300MVar 400kV shunt reactor for 1 cable per phase (see drawing 321084AE-LAY-004), and
- 630MVAr reactors cannot be built due to technical limitations therefore 2 banked 300MVar 400kV shunt reactors for 2 cables per phase are needed (see drawing 321084AE-LAY-005).

It should be emphasised that it is the requirement for reactive compensation (or not) that is the most significant difference between the different 400kV connection options being considered, without the need for the shunt reactors the extent of substation works required would be very similar between all three options.

2.3.2 Other Requirements

All 400kV connection options reutilise an existing spare bay, therefore existing protection panels/or allocated space for the spare bay in the control building will be used. An assessment of the existing LVAC and DC systems should also be undertaken to confirm adequate capacity, especially if cable options are considered.

2.3.3 Technical Feasibility

As per Section 1.5, the following scale is used to assess the technical feasibility of this option. The scale assigned to each option is primarily driven by the implications associated with the need to accommodate the non-standard reactive compensation. For UGC option (i), the reactive compensation is possible with a single shunt reactor and can therefore meet the requirements of the project. This has therefore been given a moderate-low risk (Green). On the other hand, UGC option (ii) requires two, which is already technically challenging, and falls short on the reactive power requirements (630MVAr) therefore has been assigned a moderate-high rating (Blue). Lastly, since there is no requirement for compensation, the OHL option (iii) has been assigned low risk (Cream).

More significant/difficult/risk — Less significant/difficult/risk

400kV Connection Options	Technical Feasibility
(i) UGC, 1c/phase	
(ii) UGC, 2c/phase	
(iii) OHL	

2.4 Site Modifications

Options (i) and (iii), will not require any major substation perimeter fence extensions to accommodate the new 400kV connection as shown by drawings 321084AE-LAY-004 and 321084AE-LAY-006 in Appendix A, respectively. Option (ii) (drawing 321084AE-LAY-005) will require a small extension of the substation perimeter fence by 7.5 meters to accommodate additional cable sealing ends which will be located on the existing access road. The existing access road will also require a similar diversion. Presently, a temporary contractor access road is shown on the drawing for other project works at the Dunstown substation. A possible alternative may be to reutilise this temporary road for a permanent road if option (ii) is selected.

Options (i) and (ii) also sterilise the space immediately adjacent to the new connection bay, as the shunt reactors are mounted perpendicular, and may encroach on any future lines adjacent to this circuit. This is shown in drawings 321084AE-LAY-004 and 321084AE-LAY-005, respectively. This should be considered for any future 400kV busbar expansion plans. This is especially true for option (ii) as it utilises the space for two shunt reactors.

Figure 3 highlights the location of the proposed site extension work and Figure 4 shows the extent of the land ownership boundary of the substation. All three options are within the land ownership boundary of the substation, so no land acquisition is foreseen.

2.5 Environmental Constraints

2.5.1 Biodiversity

There are no designated sites in the vicinity of Dunstown substation, however an extension to the substation footprint to facilitate works would have potential temporary and definite permanent impacts on some aspects of biodiversity.

Potential impacts during construction include:

§ Temporary loss of terrestrial habitat within the footprint of the Project to facilitate access roads and construction compounds;

§ Disturbance, and temporary displacement of birds, mammals, amphibians, fish and other aquatic species in habitats within or in close proximity to the Project footprint;

§ Impacts on aquatic species in local watercourse as a result of silty water runoff and other contaminants from the construction site; and

§ Temporary loss of foraging habitat for mammals such as badger and bat.

Options (i) and (ii) would have no effects on biodiversity as they are contained wholly within the footprint of the existing substation. Option (iii) would have a low impact, as a result of a small loss of grassland habitat as a result of the 7.5m extension. There is a hedgerow in the field to the southwest of the substation where the proposed extension would be, but it is over 50m from the substation fence line. As a result it would not be affected. There are no ditches or more significant watercourses in the vicinity.

2.5.2 Soils and Water Impacts

The subsoils around Dunstown substation are varied including Marl Shell to the east and carboniferous limestone till surrounding the remainder of the site. There is also a large area of lake sediments to the west. There is one geological heritage site within 2.5km; Liffey_050, although it is outside the Substation Study Area boundary.

No effects on groundwater are anticipated during construction or operation.

There are no surface water features in close proximity of the proposed extension site; the nearest drainage ditch is on the other side of the substation. The increased area of hard standing would be minimal in comparison to the existing substation.

Options (i) and (ii) are entirely within the existing substation and so there would be a neutral effect on soils and water; the proposed extension (Option (iii)) is small and not close to surface water features. As a result, the effects on soil and water from all options are expected to be neutral.

2.5.3 Impact on Land Use (forestry, farmland, bogs/peats, horticulture, roads)

The lands immediately surrounding Dunstown are predominantly agricultural pastures with an area of arable agricultural land to the south, woodland scrub to the west and natural grasslands to the north east. There is no forestry or peat/bogs present. The Regional R412 road is about 250m to the west of the site running north to south.

Options (i) and (ii) are entirely within the existing substation; the proposed extension (Option (iii)) would be entirely within ESB owned land. As a result, there would be a neutral effect on land use for all options.

2.5.4 Landscape & Visual

The substation is within the Eastern Transition LCA which is a medium sensitivity LCA and is highly compatible with major powerlines infrastructure. There are no protected views or prospects within 2km of the Dunstown substation. No residential properties would have views of the proposed works; which would be set alongside the existing substation, back from the local road network and otherwise well screened by trees and hedgerows in along local and access roads.

As a result, the overall assessment would be a neutral effect on landscape and views for all options.

2.5.5 Cultural Heritage

There are six small, roughly rectangular earthworks classified by NMS on or close to the existing substation site to the south and immediate south west of the site; there are three enclosures noted by NMS in the field to the south west of the substation; and there are further six enclosures noted by NMS, three of which are on the access road to the substation and the other three are in the field adjacent to the access from the public highway. There is none within the field proposed for the extension. There is one NIAH site, Dunstown Cottage, which is approximately 600m from the proposed extension site. There may also be a risk of unrecorded or undiscovered heritage assets, including unknown archaeology, within this area.

Whilst there is potential for archaeological assets in the area of the proposed extension this is considered to be unlikely. None of the NMS sites are in the area proposed for the extension. There is no potential for other direct effects on heritage assets. The effects would be neutral for all options.

2.5.6 Assessment of 400kV Connection into Dunstown

More significant/difficult/risk — Less significant/difficult/risk

Table 2.1 Constraints Risk Assessment

Constraint	Option (i) UGC, 1c/phase	Option (ii) UGC, 2c/phase	Option (iii) OHL
Biodiversity			
Soil & Water			
Land Use			

Constraint	Option (i) UGC, 1c/phase	Option (ii) UGC, 2c/phase	Option (iii) OHL
Landscape & Visual			
Cultural Heritage			
Environmental Summary			

Only biodiversity would be potentially affected and only under Option (iii), by the proposed extension. However the effects would be low and as such the overall assessment of effects on the environment is that it would be neutral for all options.

2.6 Social Constraints

2.6.1 Amenity

The substation lies within a small area (SA2017-087018005). This has a small population of 360 people; almost all of whom live in a house or bungalow. The majority of people consider their health to be Good or Very Good.

In terms of amenity effects, these occur when there are two or more significant 'nuisance' effects on communities. These nuisance effects are generally taken to be visual impacts, traffic, noise and air quality. They are most likely to combine to create an amenity effect during the construction phase of any project.

The substation is largely distant from local properties and set back from the main road; as a result, there are unlikely to be amenity effects during construction. There are no properties in close proximity to the proposed extension.

During operation, there would be no traffic or air quality issues associated with the new equipment. There may be noise issues from the equipment but as it will be located to the south west of the existing substation and away from residential properties, it is unlikely to present a significant impact.

As such, the impacts on amenity are considered to be neutral for all options.

2.6.2 Economy

The majority of people in the area are in employment, students, looking after a home or family or retired. The percentage of people unemployed is very low. Industry in the area is largely Commerce or Professional Services. It is not likely there would be a significant benefit from construction work or local expenditure as a result of this project. During operation there would be no significant effects on land use or existing commercial premises; no significant effects on local industry and commerce are expected. This would be the case for all options.

The lands immediately surrounding Dunstown are predominantly agricultural pastures with an area of arable agricultural land to the south, woodland scrub to the west and natural grasslands to the north east. There is no forestry or peat/bogs present. There would be no effect on land use form Options (i) and (ii) and no significant effect on land use from Option (iii), as stated in Section 2.5.3, therefore there would be no significant effect on the local economy as a result of changes to land use.

There are no tourist sites nearby and the local roads are not likely to be used by tourists en route to attractions as there are none near the substation.

As such the impacts on economy are likely to be neutral for all options.

2.6.3 Traffic & transport

The Regional R412 road is about 250m to the west of the site running north to south. The majority of people in the area travel to school or work by car and take less than 45 minutes to get to school or work, indicating relatively local schools and places of employment. The substation is accessed from the R412 via a bespoke access track. This means that construction traffic delivering materials and workers to the site for the proposed works are unlikely to have a significant effect on local road users.

As such the effects on traffic and transport are expected to be neutral for all options.

2.6.4 Utilities

There are unlikely to be any significant issues relating to utilities within the footprint of the substation, aside from managing the existing substation layout. Options (i) and (ii) are wholly within the existing substation; the land in which the proposed extension would be constructed is already owned by ESB and so it is expected that any third-party utilities in this area would be already known.

As such the effects on utilities are expected to be neutral for all options.

2.6.5 Assessment of Social Impacts

More significant/difficult/risk Less significant/difficult/risk

Table 2.2 Constraints Risk

Constraint	Option (i) UGC, 1c/phase	Option (ii) UGC, 2c/phase	Option (iii) OHL
Amenity & Health			
Economy			
Traffic & Transport			
Utilities			
Social Summary			

None of the options is likely to generate social impacts.

2.7 Deliverability

2.7.1 Construction

New earthworks, foundations and cable troughs may be required for the new 400kV connection.

For UGC options (i) and (ii), shunt reactors are included for reactive compensation. For both options, it is anticipated that existing access roadways can be utilised for the delivery of the shunt reactor. For option (ii), the existing access roadway will need to be diverted to allow for the additional cable sealing ends. For the OHL option (iii), a new landing gantry will be required. No additional access roads requirements are expected.

2.7.2 Outage requirements

The majority of the construction and earthworks for the new bay can be done as an offline build without the need for outages, the exception to this being the works in proximity to the existing busbars which would require appropriate busbar outages. In addition to these construction outages, outages would be required on each of the busbars and an appropriate circuit to enable commissioning of the busbar protection. Such outages are standard for this type of construction work and no unusual outage requirements have been identified.

Horizontal safety distances have been maintained with the adjacent bay, so outages on the adjacent circuits may not be required.

It should be noted that current proposals envisage the re-use of existing pantograph disconnectors. If the condition of these is assessed as being unsuitable for re-use, then additional busbar proximity outages would be required for the removal of the existing pantograph disconnectors and the installation of new.

2.7.3 Deliverability Feasibility

As per Section 1.5, the following scale is used to assess the deliverability feasibility of this option. No significant issues are identified between the options, although the need for shunt reactors requires additional works for both UGC options. This explains the given moderate-low impact rating (Green) and moderate rating (Dark Green) for (i) and (ii), respectively.

More significant/difficult/risk | Less significant/difficult/risk

400kV Connection Options	Deliverability Feasibility
(i) UGC, 1c/phase	
(ii) UGC, 2c/phase	
(iii) OHL	

2.8 Economic

The following assumptions have been made for the cost feasibility assessment:

- The costs have been developed based on standard connection bay equipment conformations using information from the TAO and includes the electrical plant items/works and associated civil works.
- The shunt reactor costs are based on budget estimates provided by Siemens and are for the units only. Additional quantities of materials for the connection to substation have been included in evaluation.
- The works associated with planning and extension of the substation perimeter fence have not been included.

Note: costing assumes feeder connections are lines however from a substation perspective, cable options will be priced the same as it is assumed the cable sealing end costs are associated with the HV cable option as a whole.

2.8.1 UGC – 1 cable per phase option

Item No.	TAO Cost Ref.	Item Description	TSDC Rate Gross €	Quantity	Gross Cost Estimate Amount €
1	S400-9	New 400kV AIS Line Bay in existing 400kV AIS Double Busbar Outdoor Station (Strung / Tubular Busbar)	€ 1,710,000	1	€ 1,710,000

This cost may differ slightly due to the need for double the cable sealing ends for the extra conductors.

Siemens	New 300 MVAr 400kV 3ph 50Hz Shunt Reactor (SH RX)	-	1	€2,700,000

Due to the non-standard application of reactive compensation, there are no standard pricing methodologies for the arrangements shown in drawings 321084AE-LAY-004 therefore, for comparison, a list of quantities is shown below.

Item No.	Item Name	Quantity
Electrical		
1	Bus Bar	96m
2	Bus Support (BS)	1
3	Post Insulator (PI)	3
4	Surge Arrestor (SA)	3

Civils		
	Foundations	8
	Reactor Bund Wall	1

2.8.2 UGC – 2 cables per phase option

Item No.	TAO Cost Ref.	Item Description	TSDC Rate Gross €	Quantity	Gross Cost Estimate Amount €
1	S400-9	New 400kV AIS Line Bay in existing 400kV AIS Double Busbar Outdoor Station (Strung / Tubular Busbar)	€ 1,710,000	1	€ 1,710,000

This cost may differ slightly due to the need for double the cable sealing ends for the extra conductors.

Siemens	New 300 MVAr 400kV 3ph 50Hz Shunt Reactor (SH RX)	-	2	€ 5,400,000

Due to the non-standard application of reactive compensation, there are no standard pricing methodologies for the arrangements shown in drawings 321084AE-LAY-005. therefore, for comparison, a list of quantities is shown below.

Item No.	Item Name	Quantity
Electrical		
1	Bus Bar	298m
2	Bus Support (BS)	2
3	Post Insulator (PI)	14
4	Surge Arrestor (SA)	6
Civils		
	Foundations	24

	Reactor Bund Wall	2

2.8.3 OHL Option

Item No.	TAO Cost Ref.	Item Description	TSDC Rate Gross €	Quantity	Gross Cost Estimate Amount €
1	S400-9	New 400kV AIS Line Bay in existing 400kV AIS Double Busbar Outdoor Station (Strung / Tubular Busbar)	€ 1,710,000	1	€ 1,710,000

2.8.4 Economic Feasibility

As per Section 1.5, the following scale is used to assess the economic feasibility of this option. The scale assigned to each option is primarily driven by the cost of the shunt reactors and the indicative list of quantities derived from drawings 321084AE-LAY-004 and 321084AE-LAY-005 which are a very significant proportion of the overall costs. Since UGC option (i) requires a single shunt reactor the economic impact has been assigned moderate-high (Blue). On the other hand, the UGC option (ii) requires two and therefore doubles the materials quantities further impacting the costs. For this reason, the option has been given a high economic impact (Dark Blue). Lastly, the OHL option (iii) has been given a low economic impact rating (Cream) due to no compensation requirements.

More significant/difficult/risk — Less significant/difficult/risk

400kV Connection Options	Economic Feasibility
(i) UGC, 1c/phase	
(i) UGC, 2c/phase	
(ii) OHL	

3. Conclusion

The 400kV connection options at Dunstown substation are all technically feasible and do not require major extension of the substation boundary fence.

No major planning works involving land acquisition are anticipated to be required for all the three options considered. Earthworks and civil works will also be required for the extension as well as for the diverted access roadway for option (ii). The requirement for shunt reactors associated with options (i) and (ii) is a significant differentiator compared with option (iii) which represents a 'standard' solution.

400kV Connection Options	Technical Feasibility	Environmental Feasibility	Social Feasibility	Deliverability Feasibility	Economic Feasibility	Combined Performance
(i) UGC, 1c/phase						
(ii) UGC, 2c/phase						
(iii) OHL						

Appendix A. Drawings

321084AE-LAY-004 - Dunstown 400kV 1 Cable per Phase RevA

321084AE-LAY-005 - Dunstown 400kV 2 Cables per Phase RevA

321084AE-LAY-006 - Dunstown 400kV OHL RevA