2 INTRODUCTION

2.1 PREAMBLE

This Environmental Impact Statement (EIS) has been prepared in response to a request for Further Information from An Bord Pleanála dated 29th April 2013, in order to accompany a planning application by EirGrid to develop the Laois – Kilkenny Reinforcement Project. This project consists of the following 8 units (see Figure 2.1 for an illustration of the proposal and its component units and Section 2.4 for a more detailed Project Description):

- Unit 1: New 400/110kV GIS substation at Coolnabacky townland, Co. Laois.
- Unit 2: New connection to Coolnabacky from the existing Moneypoint-Dunstown 400kV line (c. 1.4km).
- Unit 3: New 110kV connection to Coolnabacky substation from the existing Athy-Portlaoise 110kV line.
- Unit 4: A new 110kV / 38kV / MV substation in Ballyragget, Co. Kilkenny.
- Unit 5: A new 110kV overhead line between Ballyragget and Coolnabacky (c. 26km).
- Unit 6: An Uprate of the existing Ballyragget-Kilkenny 110kV overhead line (c. 22km).
- Unit 7: A New Bay in the Existing Kilkenny 110kV station.
- Unit 8: Modifications to existing Athy-Portlaoise 110kV line.

The EIS has assessed all associated and ancillary site works both permanent and temporary and in making this assessment it should be noted that all distances are measured from the centre line of the overhead line and from the compound fence of the substations.

It should be noted that EirGrid as the Transmission System Operator (TSO) are responsible for obtaining planning consents. ESB as the asset owner are responsible for construction and maintenance of the development and for that reason documents relating to ESB are referenced in this EIS from time to time.

2.2 PURPOSE OF THIS EIS

This EIS sets out a description of the proposed development, an outline of the main alternatives studied by the developer (and an indication of the main reasons for this choice taking into account the effects on the environment), a description of the potential effects of the proposed development on the environment, a description of the data required to identify and forecasting methods used to assess the potential effects on the environment referred to above, a description of the measures envisaged to avoid, reduce and, where possible, remedy significant adverse effects on the environment and a description of the residual impacts, if any, together with a non-technical summary of this information. In addition, the Environmental Impact Statement addresses the concerns identified in the Stage 1 Lead Consultants Report (May 2011), which was carried out for the project and identified the most significant constraints within the study area, and in the Stage 2 Lead Consultants Report (February 2012), which considered the emerging preferred route corridor. The Environmental Impact Statement also addresses issues raised in submissions received during the scoping process (see below). Scoping was informal and is in accordance with the EU and EPA Guidance.

The assessment has considered, inter alia, cumulative impacts. Cumulative impact is defined by the EPA (2002) Guidelines on information to be contained in Environmental Impact Statements as 'The addition of many small impacts to create one larger, more significant, impact' and by the European Commission (1999) Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions as 'impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project'.

This EIS has considered extant planning permissions for dwellings and other developments with respect to the cumulative impact. Extant planning permissions were taken into account when determining the actual line route at design stage. Where relevant throughout this EIS, the impact of other proposed developments has been considered.

This EIS has been prepared in accordance with EU and Irish Legislation including the requirements of Annex IV of the EIA Directive and in accordance with Schedule 6 of the Planning and Development Regulations 2001 (as amended) and conforms to the relevant requirements as specified therein. Table 2.1 lists the requirements of Annex IV of the EIA Directive and identifies the sections of this EIS where they are addressed.

Requirement of Annex IV of the EIA Directive	**Section of this EIS where requirement is addressed**
1. A description of the project, including in particular: (a) a description of the physical characteristics of the whole project and the land-use requirements during the construction and operational phases;	Section 2
(b) a description of the main characteristics of the production processes, for instance, the nature and quantity of the materials used;	Section 2
(c) an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed project.	Sections 9, 10 and 12
2. An outline of the main alternatives studied by the developer and an indication of the main reasons for this choice, taking into account the environmental effects.	Section 4
3. A description of the aspects of the environment likely to be significantly affected by the proposed project, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the interrelationship between the above factors.	Sections 5 to 13
4. A description([1]) of the likely significant effects of the proposed project on the environment resulting from: (a) the existence of the project; (b) the use of natural resources; (c) the emission of pollutants, the creation of nuisances and the elimination of waste.	Sections 5 to 12
5. The description by the developer of the forecasting methods used to assess the effects on the environment referred to in point 4.	Section 2 and Sections 5 to 12
6. A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.	Sections 5 to 12 and Section 14
7. A non-technical summary of the information provided under headings 1 to 6.	Section 1
8. An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the developer in compiling the required information.	Section 2.2.2

Table 2.1 Annex IV of the EIA Directive Requirements and where they are addressed in this EIS

The EIS has also been undertaken having regard to the Environmental Protection Agency (EPA) Guidelines on information to be contained in Environmental Impact Statements (EPA 2002) and Advice Notes on Current Practice in preparation of Environmental Impact Statements (EPA 2003) and the European Commission documents “Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions”, “Guidance on EIA, EIS Review” (2001), “Guidance on EIA, Scoping” (2001) and “Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment” (2013).

[1] This description should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the project.

For completeness the Natura Impact Statement (NIS) that was originally submitted in January 2013 and that contains the findings of the assessment of the potential of the proposed development to affect the integrity of the Natura 2000 network is appended to this EIS. An Bord Pleanála as the competent authority will carry out this assessment.

The EIS addresses each of the topics specified by the EIA Directive and the provisions of Irish national law under the following section headings:

EIA Regulation Topics	EIS Section Headings
Project Description	Project Description
Alternatives Considered	Alternatives
Human Beings and Population	Human Beings and Population
Fauna and Flora	Ecology
Soil	Soils and Geology
Water	Water (Hydrology and Hydrogeology)
Air	Air and Climate / Noise
Climate	Air and Climate
Landscape	Landscape and Visual Impact
Material Assets	Material Assets (Utilities) Roads, Traffic and Transportation Waste Management Agricultural Impact Assessment
Cultural Heritage	Cultural Heritage
Interrelationship between the Above Factors	Addressed as it arises within the above sections and addressed in Interrelationships Between Environmental Factors

Table 2.2 EIA Regulations Topics as addressed by the EIS

Mitigation measures have been integrated into the project with a preference given to measures that avoid potential environmental effects over measures that reduce and remedy potential environmental effects.

2.2.1 EIS FORMAT

This EIS follows a grouped format structure. Using this structure the EIS is prepared in a framework which examines each environmental topic (as prescribed by the EIA Directive and Irish national regulations) in a separate section. These sections include reference to:

- The proposed development;
- The receiving environment;
- Likely significant impacts;
- Mitigation measures; and
- Residual impacts (where applicable).

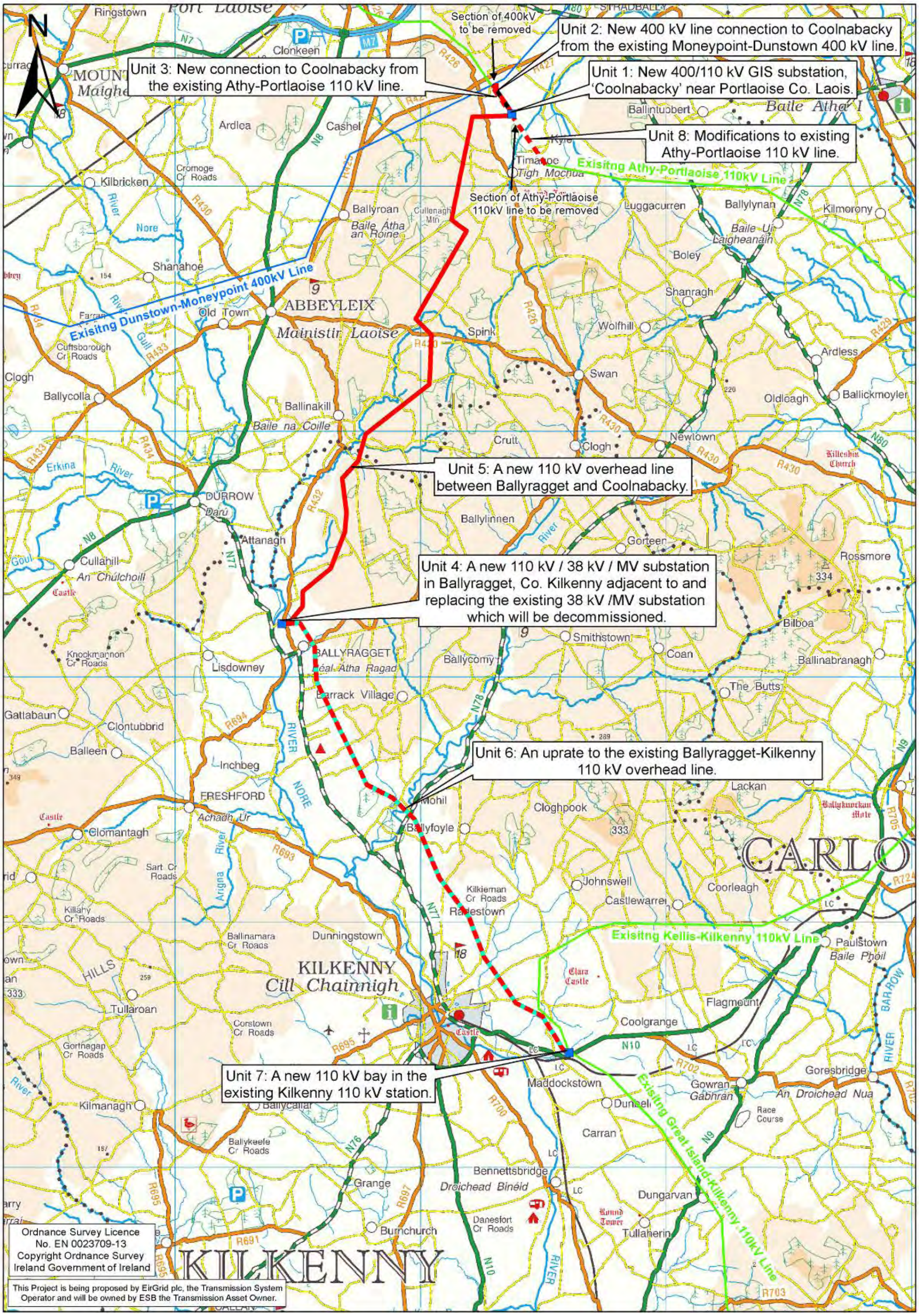


Figure 2.1 Layout of Project Units (as per planning report submitted in Jan 2013 – figure no: 8.1)

The study team commissioned to prepare this EIS is listed below:

Role	Personnel	Company
Lead Consultant	Shane McLoughney	ESBI
EIS Manager	Ciara Kellett/David L'Estrange	AOS Planning
Specialist Topics		
Human Beings and Population	Ciara Kellett	AOS Planning
Flora and Fauna	Dr. Patrick Crushell	Wetland Surveys Ireland
Soils, Geology and Hydrogeology	Dominica Baird Teri Hayes Brian Tiernan	AWN Consulting
Water and Hydrology	Dominica Baird Teri Hayes Brian Tiernan	AWN Consulting
Air Quality and Climate	Rose Walsh	ESBI
Noise and Vibration	Rose Walsh, Jarlath Doyle, Eugene McKeown, Paddy Kavanagh	ESBI
Landscape and Visual Impact	Conor Skehan	Environmental Impact Services
Waste Management	Rose Walsh	ESBI
Traffic	Stephen Reid	AECOM
Cultural Heritage	Miriam Carroll and Annette Quinn	Tobar Archaeological Services
Agricultural Impact Assessment	Pat Minnock	Minnock Agri-Enterprises
EMF	Bill Bailey	Exponent
Interactions & Cumulative Effects	All Consultants	

Table 2.3 Study Team Commissioned to Prepare this EIS

Separate reports are appended to this EIS or included elsewhere in the planning application to address topics including the following: Flood Risk Assessment and Appropriate Assessment. Some of these reports are also relevant in the consideration of the prescribed EIA topics so these are referred to in related sections of the EIS, as appropriate. For example, Section 10 Water (Hydrology and Hydrogeology) refers to the Flood Risk Assessment, and Section 8 Ecology refers to the Natura Impact Statement.

2.2.2 TECHNICAL DEFICIENCIES/LACK OF KNOW-HOW

The EIA Directive and Irish national regulations require that difficulties such as technical deficiencies, lack of information or knowledge encountered in compiling any specified information for the EIS be described.

Access was permitted to the vast majority of lands for the purposes of environmental surveys and design. For the small minority of lands where access was not permitted, this was overcome by viewing lands from nearby i.e. from public roads and adjacent lands where permission was granted, and aerial photograph and LiDar data. Assessments were carried out on the basis of available access and information, i.e. on the basis of conditions that could be reasonably viewed or inferred from aerial photography, published reports and direct observation during site visits (including observations of lands for which access was not granted but which were adjacent to lands for which access was granted).

2.3 A NOTE ON QUOTATIONS

Environmental Impact Statements by their nature contain statements about the proposed development, some of which are positive, and some less than positive. Selective quotation or quotations out of context can give a very misleading impression of the findings of the study. Therefore, the study team urge that quotations should, where reasonably possible, be taken from the conclusions of specialists' sections or from the non-technical summary and not selectively.

2.4 OUTLINE DESCRIPTION OF PROJECT

The proposed Laois-Kilkenny Reinforcement Project consists of the following inter-related units (as illustrated in Figure 2.1):

- Unit 1: New 400/110kV GIS substation at Coolnabacky townland, Co. Laois.
- Unit 2: New connection to Coolnabacky from the existing Moneypoint-Dunstown 400kV line (c. 1.4km).
- Unit 3: New 110kV connection to Coolnabacky substation from the existing Athy-Portlaoise 110kV line.
- Unit 4: A new 110kV / 38kV / MV substation in Ballyragget, Co. Kilkenny.
- Unit 5: A new 110kV overhead line between Ballyragget and Coolnabacky (c. 26km).
- Unit 6: An Uprate of the existing Ballyragget-Kilkenny 110kV overhead line (c. 22km).
- Unit 7: A New Bay in the Existing Kilkenny 110kV station.
- Unit 8: Modifications to existing Athy-Portlaoise 110kV line.

The locations of all structures (substation, OHL and UGC) referred to in this section are identified on 8 no. drawings (PE687-D261-026-001-001 to PE687-D261-026-008-001), which form part of Volume 1 - Statutory Particulars, submitted to An Bord Pleanála in January 2013 as part of the application for planning approval in respect of the Laois-Kilkenny Reinforcement Project.

The full extent of the development including indicative temporary works associated with the construction works are shown on the 17 drawings which are provided at the end of this section (PE687-D261-039-001-000 to PE687-D261-039-017-000).

2.4.1 UNIT 1 - NEW 400/110KV GIS SUBSTATION AT COOLNABACKY TOWNLAND, CO. LAOIS.'

This substation is proposed in a 6.7 hectare field in the townland of Coolnabacky near the village of Timahoe, Co. Laois. The substation development will consist of 2 no. steel framed buildings within a 117m x 98m plan area secured by a 2.6m high palisade fence. One of the buildings will house the 400 kV switchgear (electrical equipment) whilst the other building will house the 110 kV switchgear (electrical equipment). A 400 kV gantry and associated line equipment will be required to divert the 400 kV overhead lines into the 400 kV GIS building. The support gantry will be located outdoors behind the 400 kV building. The installation also includes 2 no. 400/110 kV, 500MVA transformers and allows for the accommodation of 2 no. shunt reactors. These will be positioned in bunded enclosures between the two steel-framed buildings. The enclosures will accommodate of 2 no. transformers (plan area 25m x 10m each) and allow for the accommodation of 2 no. shunt reactors (plan area 14m x 10m each). Both will be surrounded on three sides by fire walls approximately 10m high.

The 400 kV indoor station (building dimensions 64m x 15.3m x 12m) will be equipped with 8 bays (2 no. lines (Moneypoint & Dunstown), 2 no. transformers, 2 shunt reactors and 2 spare bays).

The 110 kV indoor station (building dimensions 50m x 11.5m x 12m) will also be equipped with 8 bays (3 no. lines (Athy, Portlaoise, Ballyragget), 2 no. transformers and 3 spare bays).

It is proposed to re-use excavated material on site in the form of berms. The berms will be approximately 11,000m^3 over a plan area of 5,000m^2.

It is proposed that 8 separate sedimentation/attenuation ponds (average area 110m^2) will be constructed on site. One group of 4 will be located northwest of the substation and 4 located to the east of the compound. Two of these ponds will be used temporarily to treat the runoff from the berm, with the remaining 6 used to treat surface water being discharged from the compound prior to entry into water courses.

The proposed access to the station will be via a modification to the existing road (that currently serves a farmstead with a dwelling and a disused sand/gravel quarry near the station site) in the townlands of Esker and Coolnabacky. The access road will be approximately 1.2km (total area = 0.865Ha) from the R426 (public road) to the substation compound gates (bringing the total development area for Coolnabacky 400/110 kV substation to 7.6 hectares). The modifications to the existing road will include:

- Moving the junction (at the public road) south by 25m with 160m of new access road to be created to accommodate this new junction.
- Expansion of an existing bend to accommodate turning circles of large vehicles.
- New section of road 250m through land owner's property to accommodate large vehicles.

Figure 2.2 shows the proposed site layout. Detailed drawings are contained in Volume 1 – Statutory Particulars submitted in January 2013 as part of the application accompanied by this EIS for planning approval.

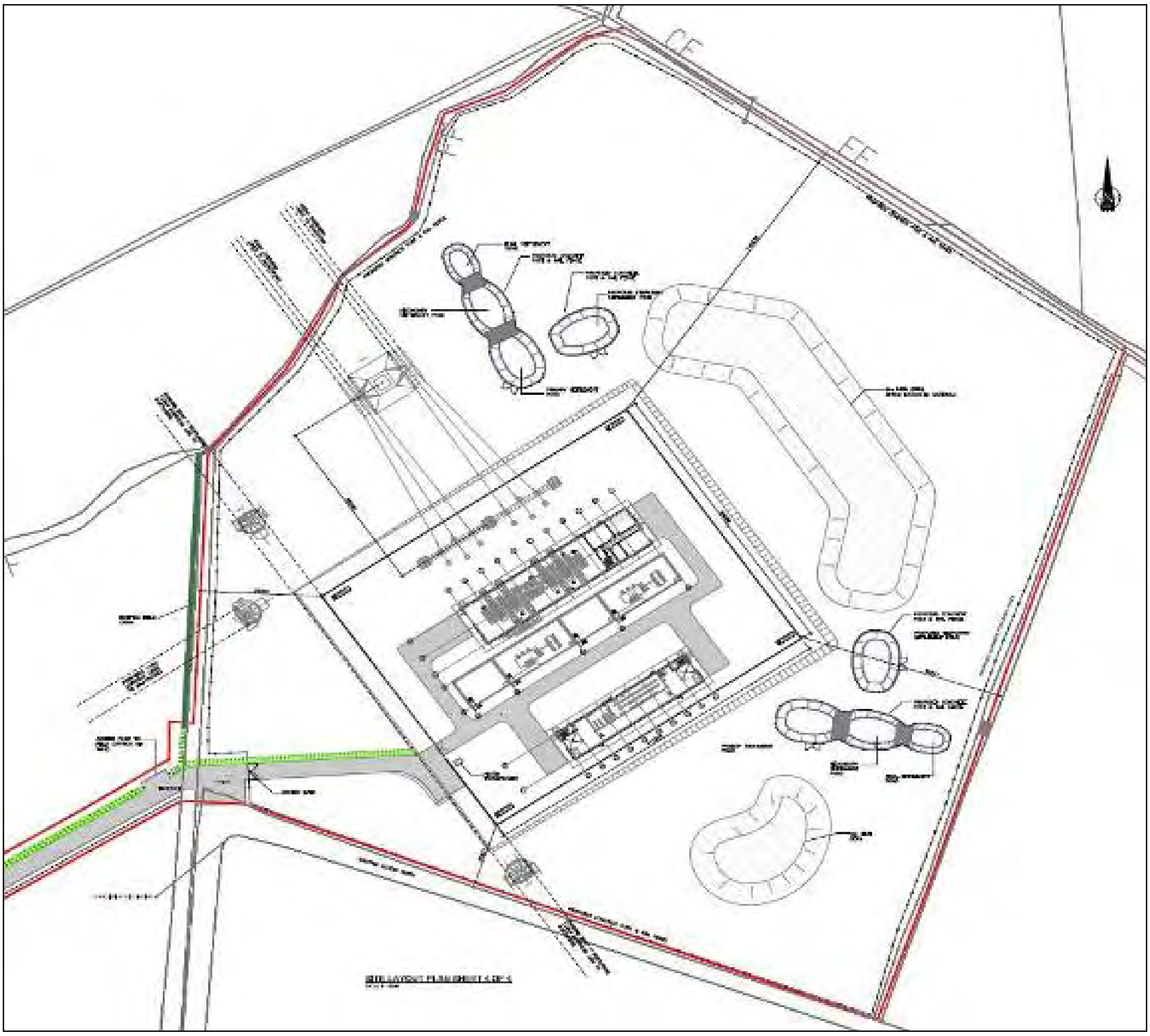


Figure 2.2 Site Layout of the Proposed Coolnabacky GIS Substation

2.4.2 UNIT 2 - NEW CONNECTION TO COOLNABACKY FROM THE EXISTING MONEYPOINT-DUNSTOWN 400KV LINE

The connection to the proposed Coolnabacky substation from the Moneypoint – Dunstown 400 kV line will be made by way of 400 kV overhead line. This will be achieved by 2 new single circuit spans (280m and 295m respectively) connecting to 1.2km of 400 kV double circuit line which brings the 400 kV circuits onto a support gantry in Coolnabacky 400/110 kV substation.

The proposal includes 2 new 400 kV single circuit angle masts (MDC2 & MDC8) within the alignment of the existing 400 kV line of heights 37.25m & 32.25m respectively, 2 new 400 kV double circuit angle masts (MDC3 & MDC7) both 55.5m in height and 3 new 400 kV intermediate masts (MDC4, MDC5 & MDC6) all 57.75m in height extending from the existing 400 kV line to the proposed substation. One of the existing 400 kV intermediate masts on the existing 400 kV line and approximately 150m of the existing 400 kV overhead line between the 2 connection points to the Moneypoint – Dunstown 400 kV line will be removed.

The line and structure positions were selected to minimise impact on the environment by paralleling an existing transmission line and avoiding locating support structures in hedges. This line route is also the shortest possible. This 'unit' is necessary to connect the existing 400 kV line into the new 400/110 kV substation.

The structure positions and associated temporary working areas are shown on drawing PE687-D261-039-001-000 which is provided at the end of this section.

Figure 2.3 Photomontage of the Proposed 400 kV OHL

(Note: Location is on the R427 looking south to the substation – existing 400 kV line is in the foreground)

2.4.3 UNIT 3 - NEW CONNECTION TO COOLNABACKY FROM THE EXISTING ATHY-PORTLAOISE 110KV LINE

The proposed Coolnabacky substation is situated beside the Athy – Portlaoise 110 kV line. It is proposed to replace intermediate polesets AP98 and AP99 with lattice steel line/cable interface masts approximately 21m in height (both these structures contained on the Coolnabacky site). These structures have a generally similar scale and character to the existing angle towers on this circuit. Short lengths of cable will connect the new line/cable interface masts AP98 (100m) and AP99 (190m) into the 110 kV building within the Coolnabacky compound.

Approximately 150m of existing overhead line will be removed between AP98 and AP99.

This 'unit' is necessary to connect the existing 110 kV line into the new 400/110 kV substation.

The structure positions and associated temporary working areas are shown on drawing PE687-D261-039-001-000 which is provided at the end of this section.

Figure 2.4 Photograph of a 110 kV Earthwire Line/Cable Interface Mast

2.4.4 Unit 4 - A new 110kV / 38kV / MV substation in Ballyragget, Co. Kilkenny

The new Ballyragget 110 kV / 38 kV / MV substation will be constructed adjacent to the existing 38 kV /MV substation in the townland of Moatpark near Ballyragget. The site area comprises approximately 1.5 hectares. The existing 38 kV / MV Ballyragget substation will ultimately be decommissioned and replaced.

This new substation will be in a compound of 61m x 70m plan area secured by a 2.6m high palisade fence. The substation compound will contain 1 no. 31.5MVA and 1 no. 5MVA transformer positioned in transformer bunds and 1 no. 200A Arc Suspension Coil between the substation buildings. 2 no. lightning masts 14m in height will also be placed in the compound.

The 110 kV electrical swtichgear equipment will be housed in a steel framed building (dimensions 50m x 11.5m by 12m high) designed for 6 no. Line Bays, 2 no. Transformer Bays, a coupler Bay and busbar.

The 38 kV and MV switchgear equipment will be housed in a block built building (dimensions 24.5m x 8m by 7m high). This building will be designed for 8 no. 38 kV Line Bays, 2 no. 38 kV/MV Transformer Bays, 1 no. 38 kV Sectionaliser Bay and 1 no. 38 kV Riser Bay along with 2 no. MV Transformer Bays, 10 no. MV Line Bays, 2 no. MV House Transformer Bays, 1 no. MV Sectionaliser Bay and 1 no. MV Riser Bay.

Access to the station will be via a new access road (60m long) from an existing gate to the substation field. The existing gate will be modified by removing sections of hedgerow, chainlink fence and a section of block wall to the left and right to allow the required sightlines to be achieved.

The foul water treatment on site will be via a septic tank and percolation area. The surface water treatment on site will be via soakaway areas.

On completion and energisation of the new Ballyragget substation the existing 38 kV substation will eventually be dismantled. Two of the 38 kV end masts in this substation will be retained with line-cable interfacing equipment being mounted on them.

Figure 2.5 shows a photomontage and the proposed site layout of the substation. Detailed drawings are contained in Volume 1 Statutory Particulars submitted with the application for planning approval. Figure 2.6 shows an aerial view of the wider context where the proposed substation will be located. The nearby Glanbia plant is a significant industrial feature in this area and provides a context for the proposed substation which is significantly smaller in scale.

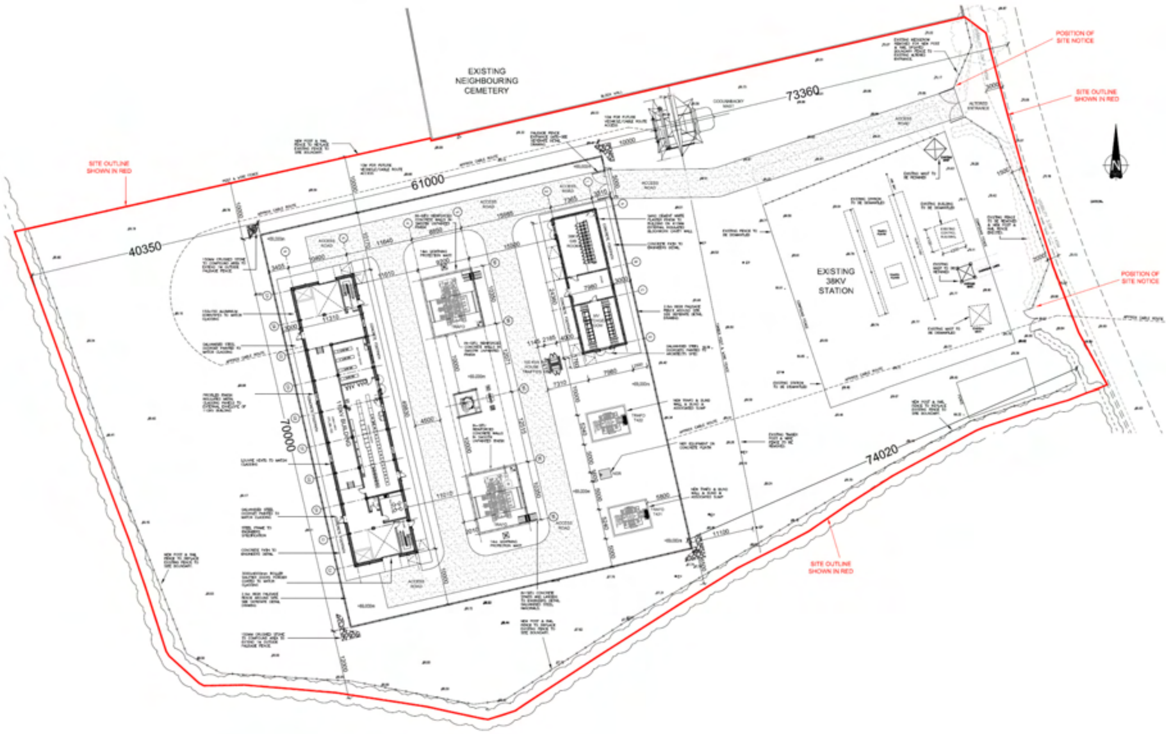


Figure 2.5 Photomontage and Site Layout of the Proposed Ballyragget 110 kV/38 kV/ MV substation

Figure 2.6 Aerial View of the Ballyragget Substation Location

(Note: The nearby Glanbia plant is a significant industrial feature in this area and provides a context for the proposed substation which is significantly smaller in scale.)

(Note: The approximate location of the proposed development is indicated in red)

2.4.5 UNIT 5 - - A NEW 110KV OVERHEAD LINE BETWEEN BALLYRAGGET AND COOLNABACKY

This 110 kV circuit will consist of 26km of overhead line and 2 short lengths of cable at Ballyragget and Coolnabacky substations. The overhead line will consist of 133 double wood polesets with height above ground level ranging from 13.7m to 21.7m and 17 lattice steel angle masts with height above ground level ranging from 18m to 24.5m supporting three electrical conductors and two earthwires.

Figure 2.7 Photograph of a 110 kV Earthwire Angle Mast

Figure 2.8 Photograph of a 110 kV Earthwire Poleset

The following is a description of the line route from Ballyragget to Coolnabacky (straight by straight). All straights were established taking into account the preceding and succeeding straights along with the constraints in the straights vicinity. This section can be read in conjunction with 17 aerial maps which are provided at the end of this section (PE687-D261-039-001-000 to PE687-D261-039-017-000) which detail the full development, including indicative temporary works and indicative access.

Ballyragget 110 kV Building- Angle Mast BC1
Approximately 160m of underground cable connects the Ballyragget 110 kV building to the line/cable interface mast on the Ballyragget substation site (BC1).

Angle Mast BC1-BC3
The overhead line runs in a south-northeast direction from BC1 for approximately 270m over arable land to BC3 crossing the R432 public road. This straight closely parallels an existing 38 kV line. One poleset is located along this straight.

Angle Mast BC3-BC7
The overhead line turns to run in a northeast direction from BC3 for approximately 777m over arable land to BC7. This straight closely parallels an existing 38 kV line. Three polesets are located along this straight.

Angle Mast BC7-BC10
The overhead line turns away from paralleling an existing 38 kV line due to the presence of a farmstead which causes the route to run in a northerly direction from BC7 for approximately 623m over arable land to BC10 crossing over a local public road. Two polesets are located along this straight.

Angle Mast BC10-BC18
To avoid housing the overhead line turns to run in a northeast direction from BC10 for approximately 1.4km over arable land to BC18. Seven polesets are located along this straight. This places the line route in the transition area between the lowlands and highlands of an area described as Zone A in Section 6 "Landscape and Visual Impact" of the Environmental Impact Statement – this area is considered to have the best absorption capacity for the proposed development both from low-lying and high vantage points, while keeping out of the Special Protection Area as defined by Kilkenny County Council.

The high absorption capacity arises from the existence between BC 27 and BC 39 of conditions that are very favourable for minimising visual effects – namely paralleling the treeline of established forestry and following a 'breakline' of concavity in the topography which ensures that the line will be minimally visible from the sensitive Scenic Route V19.

Angle Mast BC18-BC27
Again to avoid housing and get to suitable road crossings the overhead line turns to run in a north-northeast direction from BC18 for approximately 1.6km over arable land to BC27 crossing over two local public roads. Eight polesets are located along this straight.

Angle Mast BC27-BC32
The overhead line turns to run in a north direction to avoid a Scenic Amenity Area from BC27 for approximately 806m over arable land to BC32. Four polesets are located along this straight.

Angle Mast BC32-BC41
The overhead line turns to run in a north-northwest direction from BC32 for approximately 1.4km over arable land to BC41 crossing over a local access road whilst continuing to avoid a Scenic Amenity area and housing. Eight polesets are located along this straight.

Angle Mast BC41-BC46
The overhead line turns to run in a northeast direction from BC41 for approximately 952m over arable land to BC46 crossing an access road. This straight encroaches upon the Scenic Amenity area to avoid a cSAC and housing. Four polesets are located along this straight.

Angle Mast BC46-BC53
The overhead line turns to run in a north-northeast direction from BC46 for approximately 1.16km over arable land to BC53 crossing over three local public roads and crosses the county border from Co. Kilkenny to Co. Laois. The straight avoids a cSAC and several houses. Six polesets are located along this straight.

Angle Mast BC53-BC72
The overhead line turns to run in a northeast direction from BC53 for approximately 3.29km over mainly arable land with the exception of approximately 50m of commercial forestry to BC72 crossing 1 public road. The straight avoids a cSAC and a privately owned Heliport leading it to higher ground. Eighteen polesets are located along this straight.

Angle Mast BC72-BC85
The overhead line turns to run in a north direction from BC72 for approximately 2.03km over mainly arable land with the exception of approximately 800m of commercial forestry to BC85 crossing two local public roads and thereby avoiding crossing the higher ridgelines. Twelve polesets are located along this straight.

Angle Mast BC85-BC90
The overhead line turns to run in a northwest direction from BC85 for approximately 926m over arable land to BC90 crossing the R430 public road, a further local public road and a cSAC. This straight crosses the SAC over a road bridge in order to minimise impact on the cSAC. Four polesets are located along this straight.

Angle Mast BC90-BC112
The overhead line turns to run in a north-northeast direction from BC90 for approximately 4.13km over mainly arable land with the exception of approximately 940m of commercial forestry to BC112 crossing one local road. This straight has a low amount of constraints which allows for a long straight. Twenty one polesets are located along this straight.

Angle Mast BC112-BC117
The overhead line turns to run in a northwest direction from BC112 for approximately 770m over arable land to BC117 crossing a regional public road. This straight establishes a suitable road crossing point while avoiding housing associated views towards the Special Area of Development Control. Four polesets are located along this straight.

Angle Mast BC117-BC141
The overhead line turns to run in a north-northeast direction from BC117 for approximately 4.28km over mainly arable land with the exception of approximately 835m of commercial forestry to BC141 crossing two public roads. This straight has a low amount of constraints which allows for a long straight and is influenced by housing at road crossings. Twenty three polesets are located along this straight.

Angle Mast BC141-BC150
The overhead line turns to run in an east direction from BC141 for approximately 1.6km over arable land to BC150 (in the Coolnabacky substation site) crossing the R426 public road. This straight also has a low amount of constraints which allows for a long straight and is influenced by housing at road crossings. Eight polesets are located along this straight.

Angle Mast BC150-Coolnabacky 110 kV Building
Approximately 190m of underground cable connects the line/cable interface mast on the site (BC150) to the 110 kV building in the Coolnabacky compound.

2.4.6 Unit 6 - Uprate of the existing Ballyragget-Kilkenny 110kV OHL

This section will consist of the replacement of all the structures along the existing line with similar structures along the same alignment. The 110 kV circuit will consist of 21.9km of overhead line and 2 short lengths of cable at Ballyragget and Kilkenny substations.

The overhead line will consist of 90 double woodpole structures with height above ground level ranging from 13.7m to 21.7m and 14 lattice steel angle masts with height above ground level ranging from 13m to 24.5m supporting three electrical conductors. For approximately the first 1.73km out of Ballyragget and approximately the first 1.84km out of Kilkenny the structures will support three electrical conductors and two earthwires.

Figure 2.9 Photograph of a 110 kV Non-Earthwire Angle Mast

Figure 2.10 Photograph of a 110 kV Non-Earthwire Poleset

The following is a description of the line route from Ballyragget to Kilkenny (straight by straight). The majority of this line route does not deviate from the existing Ballyragget – Kilkenny alignment. This section can be read in conjunction with 17 aerial maps which are provided at the end of this section (PE687-D261-039-001-000 to PE687-D261-039-017-000) and which detail the full development including indicative temporary works and indicative access.

Ballyragget 110 kV Building-Angle Mast BK1

Approximately 215m of underground cable connects the Ballyragget 110 kV building to the line/cable interface mast (BK1) proposed in private lands across the R432 public road. Approximately 35m of the cable will be outside the ESB owned site. The end mast is located outside the compound as it would conflict with an existing telecoms mast and a 38 kV line if located within the compound.

Angle Mast BK1-BK4

The overhead line runs in an east direction from BK1 for approximately 580m over arable land to BK4 crossing over an abandoned railway line. Two polesets are located along this straight. This straight is first of two straights that do not follow the original alignment.

Angle Mast BK4-BK11

The overhead line turns clockwise to run in a southeast direction from BK4 for approximately 1.14km over arable land to BK11 crossing over a local public road and the R694 public road. Six polesets are located along this straight.

Angle Mast BK11-BK19

The overhead line turns clockwise to run in a south direction from BK11 for approximately 1.42km over arable land to BK19 crossing over a local public road. Seven polesets are located along this straight.

Angle Mast BK19-BK40
The overhead line turns anticlockwise to run in a south-southeast direction from BK19 for approximately 4.67km over arable land to BK40 crossing over four local public roads and two access roads. Twenty polesets are located along this straight.

Angle Mast BK40-BK46
The overhead line turns anticlockwise to run in a southeast direction from BK40 for approximately 1.21km over arable land to BK46. Five polesets are located along this straight.

Angle Mast BK46-BK51
The overhead line turns clockwise to run in a south-southeast direction from BK46 for approximately 1.23km over arable land to BK51 crossing over a local public road, the N78 public road, the Dinin River and an SAC at two locations. Four polesets are located along this straight.

Angle Mast BK51-BK62
The overhead line turns clockwise to run in a south-southeast direction from BK51 for approximately 2.62km over arable land to BK62 crossing one local public road. Ten polesets are located along this straight.

Angle Mast BK62-BK71
The overhead line turns anticlockwise to run in a southeast direction from BK62 for approximately 1.99km over arable land to BK71 crossing two local public roads and a local access road. Eight polesets are located along this straight.

Angle Mast BK71-BK79
The overhead line turns clockwise to run in a south-southeast direction from BK71 for approximately 1.72km over arable land to BK79. Seven polesets are located along this straight.

Angle Mast BK79-BK89
The overhead line turns anticlockwise to run in a south-southeast direction from BK79 for approximately 2.3km over arable land to BK89 crossing two local public roads. Nine polesets are located along this straight.

Angle Mast BK89-BK94
The overhead line turns anticlockwise to run in a southeast direction from BK89 for approximately 1.19km over arable land to BK94. Four polesets are located along this straight.

Angle Mast BK94-BK102
The overhead line turns clockwise to run in a south-southeast direction from BK94 for approximately 1.57km over arable land to BK102 crossing one local public road, one access road and the N10 public road. Seven polesets are located along this straight.

Angle Mast BK102-BK104
The overhead line turns clockwise to run in a southeast direction from BK102 for approximately 275m over arable land to BK104 in the Kilkenny substation site. One poleset is located along this straight. This straight is second of two straights that do not follow the original alignment.

Angle Mast BK104-Kilkenny 110 kV substation
Approximately 50m of underground cable connects the line/cable interface mast on the site (BK104) to the 110 kV equipment in the Kilkenny 110 kV substation compound.

2.4.7 UNIT 7 - A NEW BAY IN THE EXISTING KILKENNY 110KV STATION

Kilkenny 110 kV substation is located in the townland of Scart, Co. Kilkenny. The works consist of the installation of outdoor air insulated equipment including, circuit breaker, disconnects and instrument transformers mounted on concrete plinths along with the removal of the existing Ballyragget – Kilkenny 110 kV endmast.

Figure 2.11 Photograph of the Existing Kilkenny Substation

(Note: The approximate location of the proposed development is at the furthest bottom left corner of the compound indicated in red)

2.4.8 UNIT 8 - MODIFICATIONS TO EXISTING ATHY-PORTLAOISE 110KV LINE

The modification is the retrofitting of earthwire onto the existing Athy – Portlaoise 110 kV line from Coolnabacky towards Athy (AP98 to AP85) for 2.32km and from Coolnabacky towards Portlaoise (AP 99 to AP105) for 1.29km. The purpose of earthwire is to provide lightening protection and it is used by EirGrid in the following circumstances:

- Install earthwires on the entire length of all new station-to-station transmission lines;
- Where a new line (or lines) is required to connect a new station to an existing transmission line, install earthwire on the entire length of the new line section(s); and
- Where a new line is not required or where only a short section of new line is required to connect a new station to the existing transmission system, earthwire should be retrofitted, where feasible on the last two km of each existing line into the new station.

To achieve this all structures will be replaced by similar structures except for structure AP105 which is a poleset and will be replaced with a lattice steel angle mast; as such the existing alignment of the existing circuit will not alter. The overhead line in this unit will consist of 17 double wood polesets with height above ground level ranging from 13.7m to 21.7m and lattice steel angle masts with height above ground level ranging from 18m to 24.5m supporting three electrical conductors and two earthwires (2 of these lattice steel towers are already mentioned in Section 2.4.3).

This section can be read in conjunction with 17 aerial maps which are provided at the end of this section (PE687-D261-039-001-000 to PE687-D261-039-017-000) and which detail the full development including indicative temporary works and indicative access.

Angle Mast AP99-AP105
The overhead line runs in a northwest direction from AP99 for approximately 1.29km over arable land to AP105. Five polesets are located along this straight.

Angle Mast AP98-AP85
The overhead line runs in a southeast direction from AP98 for approximately 2.32km over arable land to AP85 crossing over one local public road. Twelve polesets are located along this straight.

2.5 TEMPORARY WORKS FOR CONSTRUCTION OF OVERHEAD LINES

The following is a description of the temporary works required for the construction of overhead lines. These works are shown on the 17 drawings which are provided at the end of this section (PE687-D261-039-001-000 to PE687-D261-039-017-000).

2.5.1 CONSTRUCTION MATERIAL STORAGE YARD

For the Laois – Kilkenny project, materials to be used for the construction of the overhead lines will come from the existing ESB storage yard at Kilteel, Co. Kildare by way of just-in-time deliveries.

2.5.2 STRINGING AREAS INCLUDING CROSSINGS OVER PUBLIC ROADS

Stringing of overhead lines refers to the installation of the phase carrying conductors and shieldwires on the supporting structures or towers. The conductor is kept clear of all obstacles along the straight by applying sufficient tension. Certain obstacles along a straight have to be guarded such as road/railway crossings and other transmission or distribution lines by way of temporary guard poles. Indicative stringing areas and guard pole areas are detailed on the 17 drawings which are provided at the end of this section (PE687-D261-039-001-000 to PE687-D261-039-017-000).

2.6 CONSTRUCTION METHODOLOGY

The purpose of this section is to outline and explain the construction techniques which will be used on the proposed Laois–Kilkenny Reinforcement Project. This section is intended to be used as an aid to understand the implications of the project on the environment. Plans and drawings of the proposed development are contained in Volume 1 Statutory Particulars submitted in January 2013 as part of the application for planning approval.

It should be noted that prior to commencement of works the contractor(s) will prepare a Construction and Environmental Management Plan (CEMP - see Section 2.11) which will include method statements and work programmes that show more detailed phasing of work; such details will reflect the proposal and mitigation as set out herein, and any condition attached to a grant of planning permission by An Bord Pleanála. The appointed contractor(s) will develop a series of detailed plans for the construction of the substations, the erection of the towers and polesets, the stringing of the line and the installation of the cables. These construction and environmental plans will detail access to structure sites, archaeological and ecological sensitive sites which have been identified in this EIS and will take account of third party requirements, mitigation measures outlined in the various sections (Sections 5.5, 6.5, 7.5, 8.5, 9.5, 10.5, 11.1.6, 11.2.3, 11.3, 11.4.3, 12.5, 12.75 and 14) of this EIS and site investigations carried out prior to construction. It should be noted that the construction methodology given in this EIS is indicative and based on ESB/EirGrid's long experience in similar electricity transmission infrastructure projects but does consider the particular characteristics of the receiving environment in respect of this proposed development. Any issues specific to this project, for example planning conditions attached to any approval An Bord Pleanála may decide to grant, will be incorporated fully into the appointed contractors' scopes of work and careful supervision and management will be carried out to ensure full compliance.

The CEMP produced by the contractor(s) will be agreed with the appropriate authorities. ESB Networks will employ a team to monitor the construction phase of the project and ensure works are being carried out in accordance with the agreed method statement, safety procedures, pollution control etc.

This section makes reference to drawings previously submitted in January 2013 as part of the application for planning approval.

2.6.1 SUBSTATION CONSTRUCTION

2.6.1.1 Coolnabacky 400/110 kV Substation

The proposed substation is located in a 6.7 hectare field in the townland of Coolnabacky near the village of Timahoe, Co. Laois. The substation installation will consist of, but not be limited to, the following elements:

- Site establishment and site compound;
- Station entrance from the public road network;
- Station access road;
- Site clearance, earthworks and Sustainable Drainage Systems (SuDS);
- Existing OHL enabling works;
- Predominantly stone surfaced compound area with security fencing;
- Compound circulation roads;
- 400 kV GIS building;
- 110 kV GIS building;
- Enclosed structure housing segregated electrical transformers;
- Miscellaneous outdoor electrical equipment, cabling and wiring with associated support structures and bases;
- Site services including surface water drainage, foul water drainage and water supply;
- Paving, fencing and external finishes; and
- Landscaping.

For the duration of the construction phase of the substation there will be temporary welfare facilities installed. A traffic management plan will be implemented. A waste management plan will also be implemented. These are discussed in more detail in the Material Assets section of this EIS (Section 11).

All works will be carried out in accordance with the building regulations and up-to-date design codes at the time of mobilisation. There are no construction activities planned which could be considered abnormal or complex in the context of civil and building construction projects. Some of the major construction elements and method of construction are outlined within this section.

2.6.1.1.1 Site Entrance & Access Road

The proposed access to the station will be via a modification to the existing private entrance (that currently serves a farmstead with dwelling and a disused sand/gravel quarry near the station site) in the townlands of Esker and Coolnabacky. The access road will be 1.2km (total area = 0.865Ha) from the R426 (public road) to the substation compound gates (bringing the total development area for Coolnabacky 400/110 kV substation to 7.6 hectares). The modifications to the existing private entrance will include:

- Moving the junction (at the public road) south by 25m with 160m of new access road to be created to accommodate this new junction;
- Expansion of an existing bend within the private road, to accommodate turning circles of large vehicles; and
- New section of access road totalling 250m through land owner's property to accommodate large vehicles.

The site entrance proposals from the public road network have been discussed and agreed with the relevant department of the local authority – Laois County Council. The construction of the entrance splay will be a standard method of road construction to the specification and requirements outlined by Laois County Council. The phasing and provision of the entrance splay will be agreed with Laois County Council prior to commencement to provide safe access to the construction site. Where relevant, layers of road build up at the entrance may be left exposed for various durations during the construction phase within the site area as per the contractor's requirement and programming of the works.

Similarly, construction of the station access road will commence at an early stage in the project to provide access for plant and materials to the field location of the station and where the bulk of the construction activity will take place. The site access road incorporates an element of an existing access track which will be utilised during the construction phase. The programming and finishing schedule for various sections of this access road will be decided by the contractor in agreement with the Council. Road drainage and drainage controls to any section of construction along this road will be accommodated in conjunction with this work in accordance with the Construction Industry Research and Information Association (CIRIA) guidance document C648 – Control of water pollution from linear construction projects. This will include the provision of the proposed road drainage swales and discharge points to local field drains. The route of the site access road is shown on drawings PE610-D002-002-001 to 004 and the associated road drainage is shown on drawings PE610-D002-004-001 to 003.

2.6.1.1.2 Site Clearance, Earthworks & Sustainable Drainage Systems (SuDS)

Prior to site clearance and earthworks for the construction of the substation, the Sustainable Drainage Systems (SuDS) elements that have been incorporated into the final drainage design proposals shown on drawings PE610-D002-004-005 will be installed. These proposals have been developed in accordance with CIRIA C697 – The SuDS Manual and through consultation with the relevant department of Laois County Council. The surface water drainage proposals are outlined in the Coolnabacky Drainage and Services Report PE687-F0261-R261-016. The SuDS controls proposed take account of the construction activities and reference additional temporary controls for this phase of the project. Furthermore the contractor will provide task specific controls where necessary in accordance with C532 – Water Pollution from Construction Sites. A Construction Environment Management Plan (CEMP – see Section 2.11) will also incorporated the Contractor's SuDS approach to earthworks. It is proposed that 8 separate settlement/attenuation ponds (average area 110m²) will be constructed on site. The 6 no. permanent ponds located in the northwest of the substation and to the east of the compound will be constructed in series separated only by checkdams. These ponds will treat surface water runoff from the construction area of the compound and be retained to serve the same function in the operational phase. Two of the proposed ponds will be used temporarily to treat runoff from material stockpiled on the site until the berms ultimately re-vegetate.

Figure 2.12 Typical settlement / attenuation pond

Site Clearance will involve the stripping of topsoil from construction areas. Earthworks on the site will include excavations to formation level for structural foundations and underground drainage, services and ducting. The site is relatively flat so no extensive cut and/ or fill operation is required for the construction of the substation as can be seen on the compound section drawings PE610-D002-003-009 and 010.

Excavated material will be stockpiled and stored in the berm areas indicated on the site layout plans. The berms volume will be approximately 11,000m^3 over a plan area of 5,000m^2.

It is expected that heavy plant including some or all of the following will be employed in the site clearance and earthworks phase of the project: excavator(s) of various sizes; dumper truck(s); bulldozer; roller(s) etc.

Figure 2.13 Typical plant employed in the site clearance and earthworks phase of the project

2.6.1.1.3 Compound Area, Fencing & Circulation

The station compound area, as distinct from the construction compound area, lies within a 117m x 98m plan area shown on drawing PE610-D002-003-001. Apart from the structures located within the compound and circulation routes the compound will be predominantly finished with stone surfacing on completion. Initially the topsoil material will be stripped from the compound area and stored within the dedicated berm areas of the site. This material may be double handled towards the end of the construction programme to landscape and spread evenly over the berms to aid re-vegetation of same.

As the bulk of the construction activity for the substation will take place within the compound area it is likely that the stone finished surfacing will be installed in the final stages of the construction programme.

The Compound area will be surrounded by a 2.6m high palisade security fence. This is likely to be one of the final elements installed so as to facilitate free movement of plant and materials throughout the site. The contractor will be responsible for temporary fencing off of the site and security measures such as temporary fencing to the construction area and contractor compound.

Circulation roads within the compound are likely to be co-ordinated with and programmed for, a similar time as the stone compound finish in the latter stages of the construction phase.

2.6.1.1.4 GIS Buildings

The two major elements in the construction of the substation in terms of resources, construction duration and visibility on the site are the two buildings which will house the Gas Insulated Switchgear (GIS). The plans, elevations and sections of these buildings are illustrated on drawings PE610-D002-003-002 to 008 and 011. The larger of the buildings (building dimensions 64m x 15.3m x 12m) will house the 400 kV electrical equipment whilst the smaller building (building dimensions 50m x 11.5m x 12m) will house the 110 kV electrical equipment.

The buildings are proposed to be steel framed construction on a concrete substructure and a mixture of cladding and masonry wall external finishing. The buildings that will house the electrical equipment will be typical of light industrial, warehousing, retail and agricultural buildings of the same scale.

The construction of each of the buildings will involve the following steps (approximate duration of activities are included in brackets following each activity):

- Excavation of foundations to formation level and dewatering of foundation excavations as necessary (1-2 weeks);
- Blinding will be placed in the excavation to bottom of foundation level to provide a smooth working surface (0.5-1 week);
- Side shutters erected for floor slab and/ or foundations. Ground floor slab and foundations may be constructed in combination or independently of each other. Most likely foundation types to be thickenings in slab at column locations or dedicated pad foundations to be confirmed at detailed design stage (1-2 weeks);
- Waterproofing membrane to base of foundations/ slab and side shutters (0.5-1 week);
- Steel reinforcement fixing to foundations/ floor slab including holding down bolts at column locations (1-3 weeks);

Figure 2.14 Steel reinforcement fixing to foundations/ floor slab

- Pouring of concrete for foundations and floor slab (0.5-3 weeks);
- Structural steel erection including bracing and gantry crane rail (3-7 weeks);

Figure 2.15 Structural steel erection including bracing and gantry crane rail

- Roof purlins and cladding rails (4-8 weeks);
- Roofing and cladding panels (5-10 weeks);

Figure 2.16 Roofing and cladding panels

- Masonry including external random rubble wall finish and internal blockwork (8-15 weeks);
- Internal floor slabs (3-6 weeks); and
- Building finishes (4-6 weeks).

The programme allowance quoted is purely indicative and is dependent on contractor resources and the contractor's proposed programme. The programming of the various activities can vary significantly between similar construction projects. In general the buildings may be substantially complete in approximately 6 months from the commencement of construction on these elements.

Additional plant required for the construction of the buildings will include some or all of the following (non-exhaustive list):

- Concrete Pump;
- Mobile crane for steel erection and cladding;
- Mobile Elevated Working Platforms (MEWPS) including cherrypickers/ boom lifts and scissor lifts;
- Loadall/ teleporter; and
- Various small plant.

Figure 2.17 Typical plant employed during building construction

As with the programming of construction activities and the use of plant machinery, personnel resources for the construction of the buildings will also be dependent on the main contractor. It is anticipated that the maximum number of operatives, tradesmen and site management would be 30 to 40 on site during the project with personnel levels more commonly in the range of 15 to 25. These figures are indicative of experience on similar construction projects while acknowledging that all projects have individual characteristics that influence staffing and resources.

2.6.1.1.5 Transformer Enclosure

The installation also includes enclosures for 2 no. 400/110 kV, 500 MVA transformers and 2 no. shunt reactors. These will be positioned in bunded enclosures between the two steel framed buildings and adjacent to the 400 kV GIS building. The enclosures will be plan area 25m x 10m each for transformers and plan area 14m x 10m each for shunt reactors. Both will be surrounded on three sides by fire walls approximately 10m high of reinforced concrete construction. There is no additional level of complexity in the construction of these bunds and walls due to the electrical equipment that they will house; the construction methodology is approached in the same manner as the building foundations in Section 2.6.1.1.4. Plans, sections and elevations of this enclosure can be referenced on drawing PE610-D002-003-012.

Figure 2.18 Typical walled enclosures for transformers and shunt reactors

2.6.1.1.6 Underground Services

The installation of ducting for electrical cables, communication cables, lighting etc. will be carried out within the compound area. These will involve the excavation of trenches and the laying of ducts. Similarly surface water drainage, foul water drainage and water supply pipes will require the excavation of trenches throughout the site as indicated on drawings PE610-D002-004-005 & 006. Care has been taken in the design to avoid the necessity for deep excavation; however elements such as the oil separator and foul holding tank may require temporary trench supports to be designed by the contractor. Temporary dewatering activities will also be used in the excavations if required.

Figure 2.19 Typical installation of drainage

2.6.1.1.7 Supports and bases for electrical equipment in compound

A 400 kV gantry and associated line equipment will be required to divert the 400 kV overhead lines into the 400 kV GIS building. The support gantries will be located outdoors behind the 400 kV building.

2.6.1.1.8 Electrical Installation Including Transformers

- Delivery and installation of 2 no. 400/110 kV transformers. These are large and the deliveries will be managed in accordance with regulations governing the movement of large loads. Further details in relation to these deliveries are in Section 11.2 ‘Traffic’.
- Delivery and installation of all other HV equipment.
- Wiring and cabling of HV equipment and protection and control cabinets.
- Commissioning of all newly installed equipment.

2.6.1.2 Ballyragget 110 kV / 38 kV / MV Substation

The new Ballyragget 110 kV/38 kV/MV substation will be constructed adjacent to the existing 38 kV/MV substation in the townland of Moatpark near Ballyragget. The site area is approx. 1.5 hectares. The existing 38 kV/MV Ballyragget substation will ultimately be decommissioned and removed. The substation installation will consist of, but not be limited to, the following elements:

- Site establishment and site compound;
- Station entrance from the public road network;
- Station access road;
- Site clearance, earthworks & Sustainable Drainage Systems (SuDS);
- Existing OHL enabling works;
- Predominantly stone surfaced compound area with security fencing;
- Compound circulation roads;
- 110 kV switchgear building;
- 38 kV and MV switchgear building;
- Bunded structure housing segregated electrical transformers;

- Miscellaneous outdoor electrical equipment, cabling and wiring with associated support structures and bases;
- Site services including surface water drainage, foul water drainage and water supply;
- Paving, fencing and external finishes;
- Landscaping; and
- Dismantling of existing 38 kV substation.

For the duration of the construction phase of the substation there will be temporary welfare facilities installed. A traffic management plan will be implemented. A waste management plan will also be implemented.

All works will be carried out in accordance with the building regulations and up-to-date design codes at the time of mobilisation. There are no construction activities planned which could be considered abnormal or complex in the context of civil and building construction projects. Some of the major construction elements, a brief description and method of construction are outlined within this section.

2.6.1.2.1 Site Entrance & Access Road

Access to the station will be via a new access road (60m long) from an existing gate to the substation field. The existing gate will be modified by removing sections of hedgerow, chainlink fence and a section of block wall to the left and right to allow the required sightlines to be achieved.

The site entrance proposals from the public road network have been discussed and agreed with the relevant department of the local authority – Kilkenny County Council. Where relevant, layers of road build up may be left exposed for various durations during the construction phase within the site area as per the contractor’s requirement and programming of the works.

Construction of the station access road will commence at an early stage in the project to provide access for plant and materials to the field location of the station and where the bulk of the construction activity will take place. The programming and finishing schedule for various sections of this access road will be decided by the contractor. Road drainage and drainage controls to any section of construction along this road will be accommodated in conjunction with this work in accordance with the Construction Industry Research and Information Association (CIRIA) guidance document C648 – Control of water pollution from linear construction projects. The route of the site access road is shown on drawing PE610-D003-002-003.

2.6.1.2.2 Site Clearance, Earthworks & Sustainable Drainage Systems (SuDS)

Prior to site clearance and earthworks for the construction of the substation, the Sustainable Drainage Systems (SuDS) elements that have been incorporated into the final drainage design proposals shown on drawing PE610-D003-004-001 will be installed. These proposals have been developed in accordance with CIRIA C697 – The SuDS Manual and through consultation with the relevant department of Kilkenny County Council. The surface water drainage proposals are outlined in the Ballyragget Drainage & Services Report PE687-F0261-R261-017. The contractor will provide task specific controls where necessary in accordance with C532 – Water Pollution from Construction Sites. The CEMP will also incorporate the Contractor’s SuDS approach to earthworks.

Site Clearance will involve the stripping of topsoil from construction areas. Earthworks on the site will include excavations to formation level for structural foundations and underground drainage, services and ducting. The site is relatively flat so no extensive cut and/ or fill operation is required for the construction of the substation as can be seen on the compound section drawings PE610-D003-003-007. Surplus excavated material will be removed from the site.

It is probable that heavy plant including some or all of the following will be employed in the site clearance and earthworks phase of the project: excavator(s) of various sizes; dumper truck(s); bulldozer; roller(s) etc.

2.6.1.2.3 Compound Area, Fencing and Circulation

The station compound area, as distinct from the construction compound area, lies within a 61m x 70m plan area shown on drawing PE610-D003-002-003. Apart from the structures located within the compound and circulation routes the compound will be predominantly finished with stone surfacing on completion. Initially the topsoil material will be stripped from the extent of the compound area and stored within the dedicated areas of the site. This material will be used for landscaping in the latter stages of the construction programme and surplus material will be removed from the site.

As the bulk of the construction activity for the substation will take place within the compound area it is likely that the stone finished surfacing will be installed in the final stages of the construction programme.

The compound area will be surrounded by a 2.6m high palisade security fence. This is likely to be one of the final elements installed so as to provide free movement of plant and materials throughout the site. The contractor will be responsible for temporary fencing off of the site and security measures such as temporary fencing to the construction area and contractor compound.

Circulation roads within the compound are likely to be co-ordinated with and programmed for a similar time as the stone compound finish in the latter stages of the construction phase.

2.6.1.2.4 GIS Buildings

The 110 kV electrical swtichgear equipment will be housed in a steel framed building (dimensions 50m x 11.5m by 12m high). The construction methodology for this building will be the same as that for the steel framed buildings in Coolnabacky as previously outlined.

The 38 kV and MV switchgear equipment will be housed in a block built building (dimensions 24.5m x 8m by 7m high). The foundations, and floor slabs (including a cable pit) for this building will involve the same construction methodology as followed for the steel framed buildings without the requirement for holding down bolts to accommodate steel. The blockwork walls, sand and cement render, roof truss arrangement and slate roofing will be similar to that common for commercial buildings of similar size and residential building construction.

2.6.1.2.5 Transformer Bunds and external structures

The substation compound will contain 1 no. 31.5MVA and 1 no. 5MVA transformer positioned in transformer bunds and 1 no. 200A Arc Suppression Coil between the substation buildings. These bunds are shown on drawing PE610-D003-003-001. 2 no. lightning masts 14m in height will also be placed in the compound.

2.6.1.2.6 Underground Services

The installation of ducting for electrical cables, communication cables, lighting etc. will be carried out within the compound area. These will involve the excavation of trenches and the laying of ducts.

Drainage and water supply proposals are outlined in the Ballyragget Drainage and Services Report PE687-F0261-R261-017. The foul water treatment on site will be via a septic tank and percolation area. The surface water treatment on site will be via soakaway areas. Surface water drainage, foul water drainage and water supply pipes will require the excavation of trenches throughout the site as indicated on drawings PE610-D003-004-001. Care has been taken in the design to avoid the necessity for deep excavation; however elements such as the oil separator, soakaway and septic tank may require temporary trench supports to be designed by the contractor. Temporary dewatering activities will also be used in the excavations if required.

2.6.1.2.7 Electrical Installation Including Transformers

- Delivery and installation of a 110/38 kV and a 38 kV/MV transformer. These are unusually large and the deliveries will be managed in accordance with regulations governing the movement of large loads.
- Delivery and installation of all other HV equipment.
- Wiring and cabling of HV equipment and protection and control cabinets.
- Commissioning of all newly installed equipment.

2.6.1.2.8 Dismantling of existing 38 kV station

On completion and energisation of the new Ballyragget substation the existing 38 kV substation will eventually be dismantled. Two of the 38 kV end masts in this substation will be retained with line-cable interfacing equipment being mounted on them. Minor demolition works will be carried out for the removal of a small control room building in the existing station. All waste will be disposed of to a licensed facility.

The exact programme of works will be proposed by the contractor prior to mobilisation to site. The following is a non-exhaustive list of the works to be carried out:

- Removal of electrical equipment;
- Dismantling the supporting steelwork;
- Removal of the control room building (4mx4mx3m); and
- Removal of chain link compound fence.

2.6.1.3 Changes to Kilkenny 110 kV Substation

The changes to the existing Kilkenny 110 kV substation consist of the installation of outdoor air insulated equipment including, circuit breaker, disconnects and instrument transformers mounted on concrete plinths.

The construction work will take place in two broad phases: (i) main construction and (ii) electrical construction (with the sequence of construction phases to be confirmed with ESB Networks and the contractor prior to construction commencement)

2.6.1.3.1 Main Construction

- 110 kV modification works, including AIS substation works as per drawings and structural steelwork erection.
- Extension to the busbar.
- Fencing.
- Completion works, full reinstatement of lands.

2.6.1.3.2 Electrical Installation

- Delivery and installation of all other HV equipment.
- Wiring and cabling of HV equipment and protection and control cabinets.
- Commissioning of all newly installed equipment.

A traffic management plan and a waste management plan will be implemented.

2.6.2 OVERHEAD LINE CONSTRUCTION

2.6.2.1 400 kV Overhead Line Construction

The connection to the proposed Coolnabacky substation from the Moneypoint – Dunstown 400 kV line will be made by way of 400 kV overhead line. This will be achieved by 2 new single circuit spans (280m and 295 m respectively) connecting to 1.2km of 400 kV double circuit line which brings the 400 kV circuits onto a support gantry in Coolnabacky 400/110 kV substation.

The proposal includes 2 new 400 kV single circuit angle masts (MDC2 & MDC8) within the alignment of the existing 400 kV line of heights 37.25m & 32.25m respectively; 2 new 400 kV double circuit angle masts (MDC3 & MDC7) both 55.5m in height and 3 new 400 kV intermediate masts (MDC4, MDC5 & MDC6) all 57.75m in height extending from the existing 400 kV line to the proposed substation. One of the existing 400 kV intermediate masts on the existing 400 kV line and approximately 150m of the existing 400 kV overhead line between the 2 connection points to the Moneypoint – Dunstown 400 kV line will be removed.

The line and structure positions were selected to minimise impact on the environment by paralleling an existing transmission line and avoiding locating support structures in hedges. This line route is also the shortest possible. This 'unit' is necessary to connect the existing 400 kV line into the new 400/110 kV substation.

The structures proposed can be identified using the Detail Description Schedule document (document number: PE687-F0261-R261-018-002) to establish the correct structure drawing. All relevant structure drawings are included in the planning application.

The construction techniques carried out will be in line with international best practice and full comply with all health and safety requirements. In general the construction phase can be broken down into the following parts:

- Verify that all planning and environmental conditions have been satisfied;
- Carryout pre-construction site investigations including access review and ground conditions;
- Delineation of any on-site working area (e.g., erection of temporary fencing);
- Setting out of tower foundations;
- Site preparation works including minor civil works such as removal of fences and erection of temporary fencing;
- Installation of tower foundations;
- Erection of tower; and
- Stringing of conductors and commissioning.

The proposed 400 kV line will consist of galvanised steel lattice towers of varying heights at intermediate and angle locations. The construction methodology will be similar to that used on existing 400 kV lines. Figure 2.20 shows the proposed intermediate towers.

Figure 2.20 400kV double circuit intermediate towers near Moneypoint generating station County Clare

The terrain is generally flat with favourable ground conditions. The proposed access routes have been considered by the environmental consultants.

2.6.2.1.1 Electrical Installation

The foundations will be excavated using a rubber tyre or tracked excavator. Depending on the location a wheeled or tracked dumper may deliver the ready-mix concrete to the excavation.

Figure 2.21 Typical Excavator and dumper used in OHL foundation installation

The standard ESB foundation practice is to have four individual footings for each tower leg. The tower will be set out and pegged prior to foundation excavation. In some cases this will require excavation of existing hedges and/or drains to allow clear pegging of each individual leg footing for excavation. All such hedges and/or drains are restored upon completion of foundation works. Excavations are set out specifically for the type of tower and the type of foundation required for each specific site. A larger footing may be required in the case of weak soils, pile foundations may be required in the case of deep bog and reduced footing size foundations may be required in the case of rock being encountered at shallow depths (in the case of deep bog, however, no deep bog is expected based on the soils and geology review).

All tower sites will be checked for underground services such as cables, water pipes etc. Consultation with the landowner will help to identify these. If field drains are encountered these will be diverted and all diversions identified to the landowner.

In areas of poor ground and high water table it may be necessary to use sheet piles supported by hydraulic frame(s) to prevent collapse of the sides and also to prevent the excavation becoming too large. In this case the requirement for a concrete pipe (which is normally used in tower foundations) is removed. During any dewatering activities a standard water filtration system will be utilised to control the amount of sediment in surface water runoff.

When each leg is excavated the formation levels (depths) are checked by the on-site engineer. Once the levels have been achieved the concrete pipes (if used) are lowered into position. Once in position and all water is pumped from the excavation, concrete is poured outside the concrete ring. When this concrete has set a paving slab is set within the concrete pipe to provide a stable base on which the tower stubs will rest.

A setting template (see Figure 2.22) is used to set and hold the tower stubs in position while the concrete is being poured and cured. Any water in the excavation is pumped out prior to any concrete being poured into the foundation. Concrete trucks will be brought as close as possible to the excavation to pour directly into the excavation. In the event of this not being possible concrete will be transported in 6T dumpers fitted with concrete chutes.

After this concrete pour the remaining part of the foundation, the shear block or neck is shuttered. Once the shuttering is complete the concrete may be poured and the foundation completed. The tower foundations are backfilled one leg at a time usually with the material already excavated. The backfill is placed and compacted in layers.

Once the tower base is completed and fully cured it is ready to receive the tower body. When the base construction crew leave site they will ensure to remove all surplus materials from the site including all unused excavated fill.

Figure 2.22 Photograph of setting template being prepared for final concreting

Foundation Size

The average foundation size for each tower leg used on the 400 kV transmission system is approximately 5.3m x 5.3m x 3.6m for single circuit angle tower, approximately 5.1m x 5.1m x 4m for double circuit angle tower and approximately 3.4m x 3.4m x 2.8m for double circuit intermediate tower.

Working Area

The average working area for construction of a 400 kV tower will extend 10 metres all around the footprint of the base of the tower.

Construction equipment required

- 4x4 vehicle
- Concrete vibrator
- Water pump
- Wheeled dumper or Track dumper (6 to 8 tons)
- Timber or other Shuttering boxes
- 360˚ tracked excavator (13 ton normally, 22 ton for rock breaker).
- Transit van
- Chains and other small tools
- Concrete delivered by supplier to closest convenient point (38 ton gross)

Duration of foundation works

The average duration of foundation works is as follows:

- Angle tower6 10 days
- Piled foundation 10 days
- Crew size 4 to 6 workers

2.6.2.1.2 Erection of tower body

The most common methods of constructing a transmission line of this nature are by using a "derrick pole" or a mobile crane. Both methodologies are outlined below.

Derrick Pole Methodology

The tower can be erected using a derrick / gin pole and tractor. The derrick pole is a very simple and straight forward way to build the tower where small sections of steel are lifted into place using the derrick and a winch. As illustrated the derrick consists of either a solid or lattice aluminium or steel pole which is held in position using guy ropes anchored to the ground. This methodology is available for use if required.

Figure 2.23 Derrick pole at tower base

Figure 2.24 Lower part of the tower head being dropped into position

Construction equipment required

- 4x4 vehicle
- Winch (see Figure 2.24 for details)
- Tractor and trailer
- 360˚ tracked excavator (13 ton normally)
- Derrick pole
- Teleporter
- Transit van
- Chains and other small tools

Duration of tower erection works

The average duration of tower building works is as follows:

- Angle tower 4 days
- Intermediate tower 3 days
- Crew size 7 workers

Mobile Crane Methodology
Mobile cranes can also be used to construct steel towers, however due to cost and access issues they are generally restricted to sites which provide optimal construction conditions. End towers in or close to the substations are good examples where use of a mobile crane can present advantages. Crane size and weight is generally dependent upon the properties of the tower in question with the tower erection procedure completed in various sections due to the weight of the differing components. Tower sections are assembled on the ground and lifted into place.

Figure 2.25 Tower erection by mobile crane

Construction equipment required
- 4x4 vehicle
- All terrain mobile crane
- Tractor and trailer
- Teleporter
- 360 degrees Excavator
- Transit van
- Chains and other small tools

Duration of tower erection works
The average duration of tower building works is as follows:

- Angle tower 4 days
- Intermediate tower 3 days
- Crew size 7 workers

2.6.2.2 110 kV Overhead Lines
There are three elements (or units) relating to 110 kV construction in the proposed development. The structures proposed can be identified using the Detail Description Schedule document (doc number: PE687-F0261-R261-018-002) to establish the correct structure drawing. All relevant structure drawings are included in the documentation submitted with the application for planning approval.

New connection to Coolnabacky from the existing Athy - Portlaoise 110 kV line
The proposed Coolnabacky substation is situated beside the Athy – Portlaoise 110 kV line. It is proposed to replace intermediate polesets AP98 and AP99 with lattice steel line/cable interface masts approximately 21m in height (both these structures contained on the Coolnabacky site). These structures

have a generally similar scale and character to the existing angle towers on this circuit. Short lengths of cable will connect the new line/cable interface masts AP98 (100m) and AP99 (190m) into the 110 kV building within the Coolnabacky compound.

Approximately 150m of existing overhead line will be removed between AP98 and AP99.

Ballyragget – Coolnabacky 110 kV Line
This 110 kV circuit will consist of 26km of overhead line and 2 short lengths of cable at Ballyragget and Coolnabacky substations. The overhead line will consist of 133 double wood polesets with height above ground level ranging from 13.7m to 21.7m and 17 lattice steel angle masts with height above ground level ranging from 18m to 24.5m supporting three electrical conductors and two earthwires.

Ballyragget – Kilkenny 110 kV Line Modification
This section will consist of the replacement of all the structures along the existing line with similar structures along the same alignment. The 110 kV circuit will consist of 21.9km of overhead line and 2 short lengths of cable at Ballyragget and Kilkenny substations.

The overhead line will consist of 90 double woodpole structures with height above ground level ranging from 13.7m to 21.7m and 14 lattice steel angle masts with height above ground level ranging from 13m to 24.5m supporting three electrical conductors. For approximately the first 1.73km out of Ballyragget and approximately the first 1.84km out of Kilkenny the structures will support three electrical conductors and two earthwires.

Athy - Portlaoise 110 kV Line Modification
The modification is the retrofitting of earthwire onto the existing Athy – Portlaoise 110 kV line from Coolnabacky towards Athy (AP98 to AP85) for 2.32km and from Coolnabacky towards Portlaoise (AP 99 to AP105) for 1.29km.

To achieve this all structures will be replaced by similar structures except for structure AP105 which is a poleset and will be replaced with a lattice steel angle mast. The overhead line in this unit will consist of 17 double wood polesets with height above ground level ranging from 13.7m to 21.7m and lattice steel angle masts with height above ground level ranging from 18m to 24.5m supporting three electrical conductors and two earthwires (2 of these lattice steel towers are already mentioned in Section 2.4.3).

2.6.2.2.1 110 kV Overhead Line Construction

The construction techniques carried out will be in line with international best practice and full comply with all health and safety requirements. In general the construction phase can be broken down into the following parts:-

- Verify that all planning and environmental conditions have been satisfied;
- Carry out pre-construction site surveys including access review and ground conditions, in order to confirm the pre-application appraisal of those conditions;
- Delineation of any on-site working area (e.g., erection of temporary fencing);
- Setting out of tower foundations and polesets;
- Site preparation works including minor civil works such as removal of fences and erection of temporary fencing;
- Where necessary, removal of hedges and trees;
- Installation of tower foundations;
- Erection of towers and polesets; and
- Stringing of conductors and commissioning.

The proposed 110 kV line will be constructed of double wood polesets at intermediate locations and galvanised steel lattice towers at angle positions. This style of construction is the standard type of construction used for 110 kV single circuit lines in Ireland. Figure 2.26 and Figure 2.27 below show the structure types to be used on this project. Double wood polesets are used for all straight line structures, angle towers are only used where the line changes direction.

Figure 2.26 Typical Wood poleset **Figure 2.27 Typical steel angle structure**

Prior to commencement of work the contractor(s) will prepare a Construction and Environmental Plan which will include method statements and work programmes providing for more detailed phasing of work. The plan will be based upon the detail, including mitigation measures contained in this EIS and any condition attached to a grant of planning permission by An Bord Pleanála. The appointed contractor(s) will develop a series of detailed plans for the erection of the tower and the stringing of the line. These Construction and Environmental Plans will detail access to structure sites, archaeological and ecological sensitive sites and will take account of third party requirements, mitigation measures outlined in the various sections of this EIS (Sections 5.5, 6.5, 7.5, 8.5, 9.5, 10.5, 11.1.6, 11.2.3, 11.3, 11.4.3, 12.5, 12.75 and 14) and site investigations carried out prior to construction. It should be noted that this construction methodology is indicative and based on ESB/EirGrid's long experience in similar transmission line projects. Any issues specific to this project, for example unique planning conditions, will be incorporated fully into the appointed contractors' scopes of work and careful supervision and management will be carried out to ensure full compliance.

The method statements produced by the contractor(s) will be agreed with the appropriate authorities. ESB will employ a team to monitor the construction phase of the project and ensure works are being carried out in accordance with the agreed method statement, safety procedures, pollution control etc. An access officer will be appointed by the contractor to liaise with the landowners along the line route and ensure that their requirements for entry are met so far as is possible.

2.6.2.2.2 Installation of 110 kV steel tower foundations

All structure locations will be checked for underground services such as cables, water pipes etc. Consultation with the landowner will help to confirm the location of these underground services. If field drains are encountered these will be diverted and all diversions identified to the landowner.

The tower will be set out and pegged prior to foundation excavation. This may require excavation of some existing ditches or drains to allow clear pegging of each individual leg footing for excavation. All such removals are restored upon completion of foundation works. Excavations are set out specifically for the type of tower and the type of foundation required for each specific site. It should be noted that pre-construction site investigations may show that ground conditions unsuitable to the standard foundations are present. In such a case, a modified, special foundation will be designed. A larger footing may be required in the case of weak soils, pile foundations may be required in the case of deep bog (although no deep bog is expected based on the soils and geology review) and reduced footing size foundations may be required in the case of rock being encountered at shallow depths.

The tower stubs (lower part of tower leg) will be concreted into the ground. For each leg of the tower (4 in total) a foundation is excavated using a tracked excavator and the formation levels (depths) checked by the on-site foreman. Each of the four corners of the tower will be separately anchored below ground in a block of concrete as per Figure 2.28 below. Any water in the excavation is pumped out prior to any concrete being poured into the foundation. Concrete trucks will be brought as close as possible to the excavation to pour directly into the excavation. In the event of this not being possible concrete will be transported in dumpers. In the event that the ground is very poor and wheel dumpers are not suitable to transport the concrete over the terrain, track dumpers may be used.

In areas of poor ground or high water table it may be necessary to use sheetpiles supported by hydraulic frame(s) to prevent collapse of the sides of the excavation and also to prevent the excavation becoming too large. During any dewatering activities a standard water filtration system will be utilised to control the amount of sediment in surface water runoff.

After this, the remaining part of the foundation, the concrete shear block or neck is formed using shuttering.

During each pour the concrete will be vibrated thoroughly using a vibrating poker. In the event that sheet piles have been used these are removed (pulled) at this stage. Care is taken not to damage the base members of the tower. The shear block formers are removed at this stage.

The tower foundations are backfilled one leg at a time with the excavated material. The backfill is placed and compacted in layers. All dimensions are checked following the backfilling process. If the excavated material is deemed unsuitable for backfilling imported fill material may be used also compacted in layers. When the base construction crew leave site they will ensure to remove all surplus materials from the site including all unused excavated fill.

Once the tower base is completed and fully set (usually after seven days) it is ready to receive the tower body which is normally constructed in an area near the foundation site ready to be lifted and bolted into place.

Figure 2.28 Photograph of steel tower base in open excavations

Foundation Size
The average foundation size for each tower leg used on the 110 kV transmission system is approximately 4m x 4m x 3.0m.

Working Area
The average working area for construction of a 110 kV tower will extend 10 metres all around the footprint of the base of the tower.

Construction equipment required

- 4x4 vehicle
- Concrete vibrator
- Water pump
- Wheeled dumper or Track dumper (6 to 8 tons)
- Timber or other Shuttering boxes
- 360˚ tracked excavator (13 ton normally, 22 ton for rock breaker).
- Transit van
- Chains and other small tools
- Concrete delivered by supplier to closest convenient point (38 ton gross)

Duration of foundation works

The average duration of foundation works is as follows:

- Angle tower 6 - 10 days
- Piled foundation 10 days
- Crew size 4 to 6 workers

Erection of tower body
The steel for the remainder of the tower is delivered to the site by lorry and various sections of the tower, depending on weight and method of construction of the tower, are pre-assembled on the ground beside the tower before lifting into position. The tower is normally built using a suitable crane.

Construction equipment required
- 4x4 vehicle
- Winch Tractor/Pole erector
- Tractor and trailer
- Crane
- Teleporter
- Transit van
- Chains and other small tools

Duration of tower erection works
The average duration of tower building works is as follows:

- Angle tower 4 days
- Crew size 7 workers

2.6.2.2.3 Replacing Existing Angle Masts

It is intended to replace most of the existing angle masts on the Ballyragget – Kilkenny and the Athy – Portlaoise 110 kV lines. In all except one case these angle masts will be constructed the site of the existing angle mast in the same manner as described above. Prior to construction the existing angle mast will be dismantled and removed, then the foundations removed and disposed of to a licensed facility.

2.6.2.2.4 Installation of Polesets

Delivery of material to site
The required poles will be collected from the storage yard and delivered as close as possible to the required location.

Pole base excavation and pole erection
- The excavation for each pole will be carried out using a wheeled or tracked excavator.
- Each of the two poles are lined up with the excavated holes and the machine operator then drives forward pushing the pole up until the pole is in an almost vertical position. The pole never passes through the point of balance in the vertical position.
- The pole is supported at all times and the holes manually backfilled to a minimum depth of 1.0m.
- After excavation and erection of the poleset a further excavation 0.8m deep is necessary. This is a linear excavation perpendicular to the line necessary to install wooden sleepers. These sleepers add additional stability to the poleset and are attached to the poleset using a u-bolt.
- The two installed poles are connected near the top by a steel crossarm from which three insulators are attached. The conductor is then attached to these insulators during the stringing process.
- As much of this overhead line is designed as an earthwire line an earthgrid is required on all polesets. This earthgrid is a section of earth conductor forming a loop underground around the installed poleset. It is connected to the shieldwire on the pole top by another section of earth conductor running along the length of the pole.
- In poor ground conditions staywires may be required at some poleset locations. These wires add stability to the pole and are supported by means of stayblocks. These stayblocks are made of concrete and are buried underground.

Working Area
The average working area for construction of a 110 kV poleset will extend 10 metres all around the footprint of the base of the poleset.

Construction equipment required

- 360˚ tracked excavator
- Winch Tractor/Pole erector
- Transit van
- Chains and other small tools

Duration of poleset installation works

The average duration of poleset installation works is as follows:

- Per poleset 1/2 days
- Crew size 3 workers

2.6.2.2.5 Replacing Existing Polesets

It is intended to replace all of the existing polesets on the Ballyragget – Kilkenny and some on the Athy – Portlaoise 110 kV lines. In most cases these polesets will be constructed next to the existing structure in the same manner as described above. Figure 2.29, Figure 2.30 and Figure 2.31 provide an illustration of 110 kV poleset replacement. The waste poles will be disposed of by a licensed contractor, at an authorised facility.

Figure 2.29 Details of 110 kV poleset replacement (i)

Figure 2.30 Details of 110 kV poleset replacement (ii)

Figure 2.31 Details of 110 kV poleset replacement (iii)

2.6.2.3 Stringing of overhead lines

Stringing of overhead lines refers to the installation of phase conductions and shieldwires on the transmission line supporting structures (poleset or towers). The conductor is kept clear of all obstacles along the straight by applying sufficient tension. Certain obstacles along a straight have to be guarded such as road/railway crossings and other transmission or distribution lines. See generic layout below.

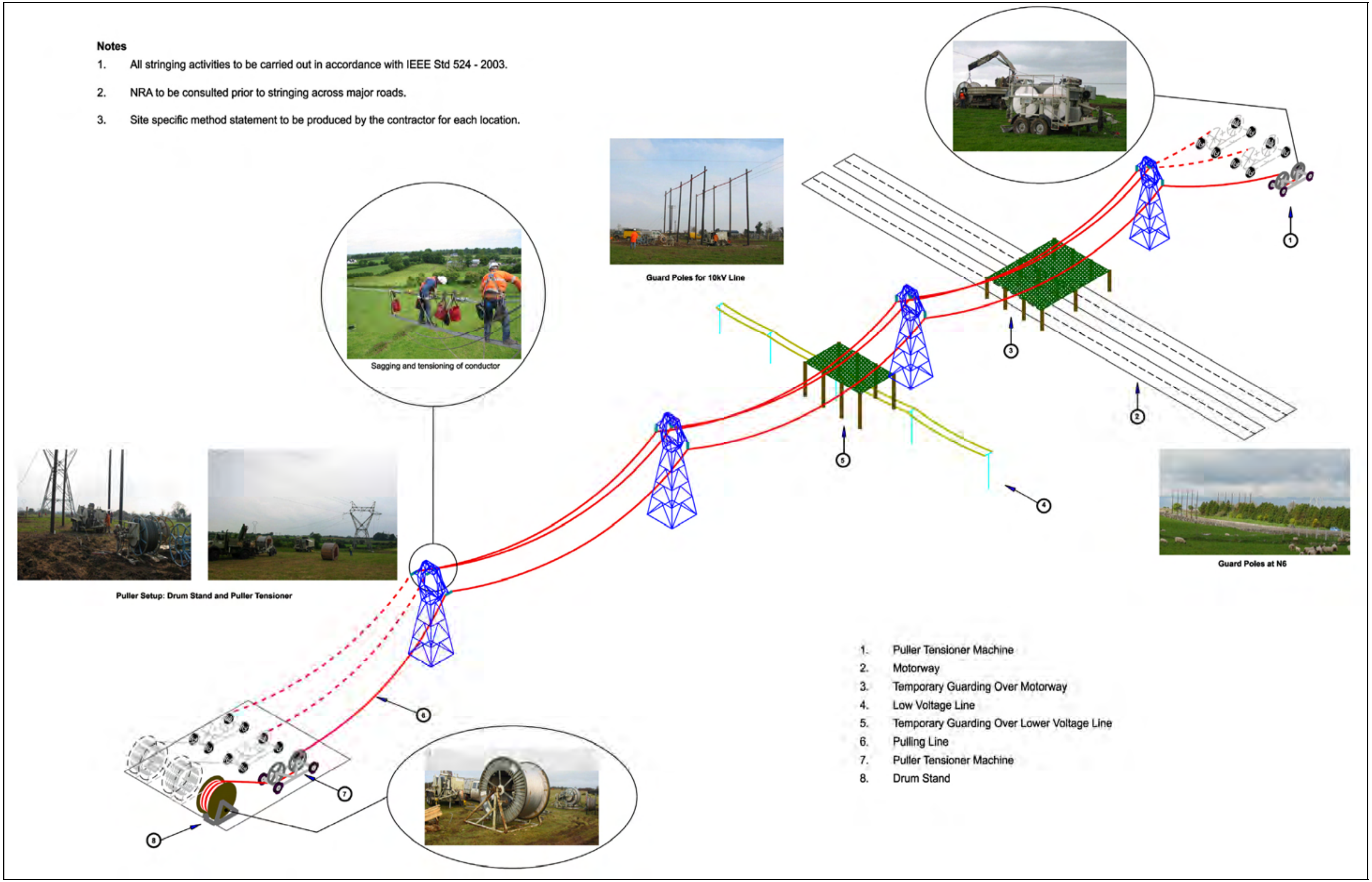


Figure 2.32 Generic tension stringing layout

This method involves the pulling of a light pilot line (nylon rope) which is normally carried by hand into the stringing wheels. This in turn is used to pull a heavier pilot line (Steel rope) which is subsequently used to pull in the conductors from the drum stands using specifically designed “puller – tensioner” machines, see photograph below. The main advantages with this method are (a) the conductor is protected from surface damage and (b) major obstacles such as road and rail crossings can be completed without the need for major disruption. The indicative temporary area utilised for the stringing equipment are generally 15m x 15m and are identified on the 17 drawings which are provided at the end of this section (PE687-D261-039-001-000 to PE687-D261-039-017-000)).

Figure 2.33 Puller – Tensioner machine

Once the conductor has been pulled into position, one end of the straight is terminated on the appropriate tension fittings and insulator assemblies. The free end of the straight is then placed in temporary clamps called “come-alongs” which take the conductor tension. The conductor is then cut from the puller-tensioner and the conductor is sagged using a chain hoist.

Figure 2.34 Typical stringing equipment

2.6.2.3.1 Construction equipment required

- 4x4 vehicles
- Puller - tensioner X 2 (see Figure 2.34 for details)
- Teleporter X 2
- Drum stands X 2
- Drum carriers X 2
- Stringing wheels
- Conductor drums
- Compressor & head
- Transit vans
- Chains and other small tools
- Conflict guardings (Guard poles at road crossings etc. – the indicative guard pole areas are identified on the 17 drawings which are provided at the end of this section (PE687-D261-039-001-000 to PE687-D261-039-017-000)).

2.6.2.3.2 Duration of stringing works

The average duration of stringing works is typically 1 week per straight. This figure is similar for all straights regardless of length as the most time consuming aspect is the movement and setup of stringing equipment. Stringing crews are typically quite large and could have as many as 15 workers.

2.6.2.4 Access Routes

In order to access individual structure sites, the contractors will be required to utilise the local public road network in the vicinity of the line. From here, access to the locations of the structures will have to be via existing tracks or road wherever possible.

Where necessary, access routes can be fenced/barriered off to keep disturbance to a minimum.

Maximum use will be made of both existing farm entrances and also farm tracks or roads. Access to structure locations will be carefully selected to avoid impact to the surrounding area. Careful and considered local consultation will be carried out with all affected landowners such that a minimum amount of disturbance will be caused.

Figure 2.35 Temporary Stone and Aluminium Panel tracks

Machinery and vehicle access for overhead line construction is assessed prior to entry. Where peat areas are encountered access is achieved using wide-tracked low ground pressure vehicles to minimise damage to ground and or combined with bog mats in sensitive areas. On occasion where very poor soft or boggy ground is encountered, a temporary access road or track may have to be constructed. Generally temporary roads are constructed using stone, however in certain sensitive situations aluminium road panels can be used. Stone road construction involves the excavation of the topsoil and storage of this to one side of the track. Geotextile reinforcement is then placed on the subsoil surface and approximately 200mm of stone placed on top and compacted to form the track. Alternatively in soft bog a stone or panel road as described above may not be appropriate and in this case timber sleepers can be used. Indicative access routes are identified on the 17 drawings which are provided at the end of this section (PE687-D261-039-001-000 to PE687-D261-039-017-000) and have been assessed and some localised mitigation measures have been identified by relevant experts. The final implementation details will be confirmed during on-site arrangements for access.

2.6.2.4.1 Construction equipment required

- 4x4 vehicle
- Wheeled dumper or Track dumper (6 to 8 tons)
- 360˚ tracked excavator (13 ton normally, 22 ton for rock breaker)
- Teleporter or other mobile aerial platform and lifting equipment.
- All terrain crane (depending on site)
- Transit van
- Chains and other small tools
- Road material delivered by supplier to closest convenient point (38 ton gross)
- Crew size: 3 workers

2.6.2.4.2 Duration of access route works

The duration of access road construction is typically very short with one day being the norm. For a very long road two working days may be required.

2.6.2.5 Traffic Management

Traffic Signs Manual issued by the Department of the Environment provides details of the traffic signs which may be used on roads in Ireland, including their layout and symbols, the circumstances in which each sign may be used and rules for positioning them. Chapter 8 of the 1996 Traffic Signs Manual will be used on this project.

2.6.3 INSTALLATION OF UNDERGROUND CABLE

All the connections into the 110 kV substations for the Laois – Kilkenny reinforcement project are by way of underground cable for short distances from a cable interface mast close to the 110 kV substations. The following is a synopsis of the proposed cable construction methodology for this project.

2.6.3.1 Extent of the Civil Works

High voltage underground cable is supplied in pre-ordered lengths of up 900m on large cable drums. A typical cable length on one drum would be in the order of 600m/750m. The cable may weigh anything from 7kg/m up to 50kg/m depending on the cable size required. When the cable is on the cable drum, the combined weight may be up to 20000kg.

2.6.3.2 Excavating the Trench

There are currently a number of different trench cross sections that may be installed depending on the voltage, type and size of the proposed cable circuit. One of the current standard trench cross sections is detailed in Figure 2.36 below.

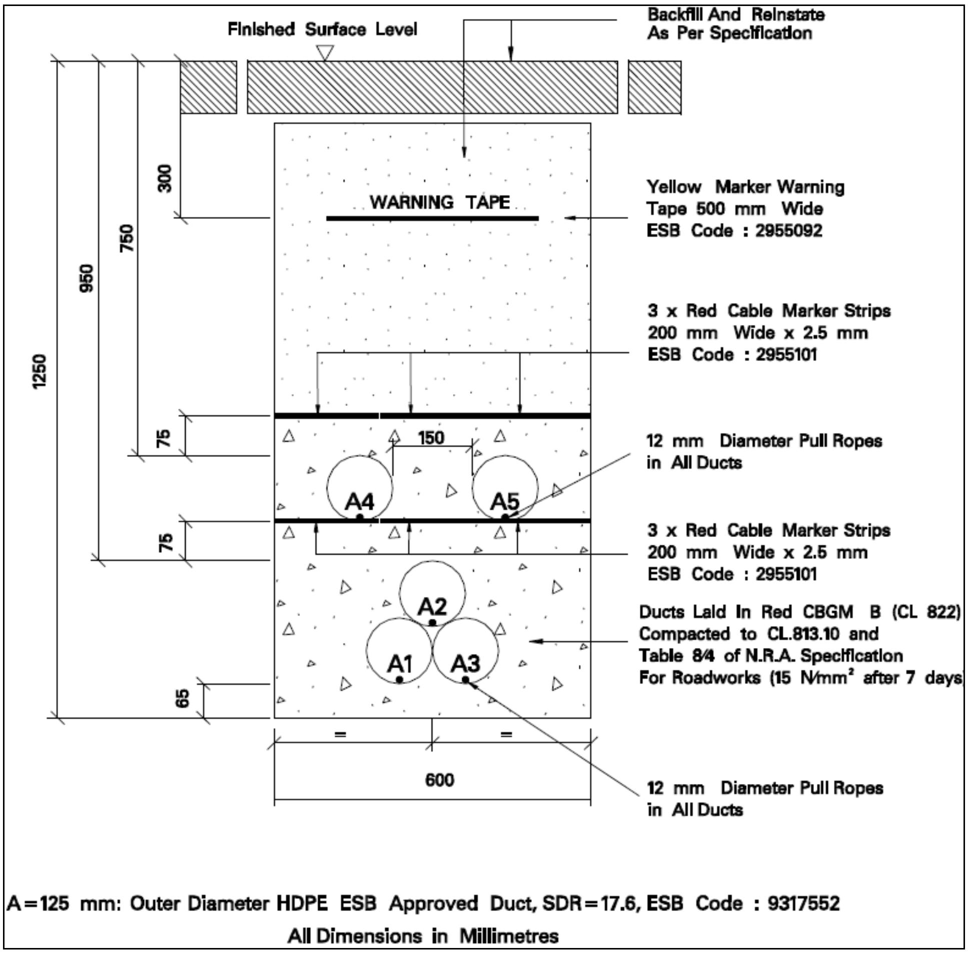


Figure 2.36 Trench Cross Section – 110 kV Single Circuit Trefoil 5 way duct formation

Typically the trench width is marked on the ground using standard line marking spray paint. The overall trench width will vary depending on the circuit or circuits to be installed. The typical width of the trench ranges from 600mm to 1250mm.

In roads, the two edges of the trench are then saw cut using a concrete saw. A rock breaker attached to an appropriate excavator then breaks the surface to a depth of approximately 150mm. The trench is then excavated to a depth of 1250mm by using a toothless bucket attached to the excavator machine. If underground services are present in the trench, excavation around these services will be hand dug. The spoil material is removed from site by a dumper or suitable lorry and is treated if required before being disposed of appropriately in a licensed facility. The bottom of the trench will be graded. Any water which gathers in the trench will be collected, treated appropriately on site before being disposed of in accordance with the conditions set out by the relevant authorities. The trench is the same dimension in green field sites except the sod and topsoil are placed so they can be recycled back into the trench.

Typical resources on site at any time are a crew of one excavator operator, a banks man and up to three other operatives. The crew will operate an excavator and hand-held motorised equipment. They will also require a large van, dumper truck and welfare facilities. The refuelling of all machinery will take place in the contractor's site compound / lay down located off site.

2.6.3.3 Installing HDPE Ducts in the Trench

Where the cable ducts are being installed in a trench in the public road, a 100mm thick bed of CBGM B (CL 822) will be laid along the section of open trench.

The three power cable ducts are then placed on the bed of CBGM B (CL 822) in the formation shown on the appropriate trench cross-section drawing. The ducts are then surrounded in CBGM B (CL 822) to a level 100mm above the top of the power cable ducts. The CBGM B (CL 822) is then compacted to CL 813.10 and Table 8/4 of the NRA Specification for road works (15N/mmsq after 7 days). A 12 mm rope is inserted into the ducts to facilitate cable pulling.

An as constructed record of the duct locations to the relevant specification is then surveyed by a qualified surveyor so that the location of the power cable can be identified at any time in the future.

A cable warning slab is then placed on top of the CBGM B (CL 822) with the communications ducts installed as shown on the appropriate trench cross-section.

The remainder of the trench is then backfilled as per the trench cross-section drawing. In public roads all trench work must comply with the 'Guidelines for Opening, Backfilling and Reinstatement of trenches in Public Roads' and any other conditions imposed on the contractor by the relevant road authority. In green fields the topsoil and sod will be used to backfill to the trench.

In roads, once the trench reinstatement has been completed, the appropriate resurfacing of the road is carried out as per agreement with the relevant local roads authority.

This completes the civil works on this section of the cable route and the following day a new section of road can be excavated and the ducting installed. The civil works proceed in this manner along the cable route until all ducting is installed.

2.6.3.4 Power Cable Installation

Once the underground cable ducts have been installed from the cable interface tower to the substation it is then necessary to carry out a test to ensure that they have been installed to the required standard. To do this the ducts are thoroughly cleaned, brushed and a propriety mandrel is pulled through the ducts a number of times. The contractor must provide signed proof that these tests were carried out successfully.

The three power cable drums are then brought to site on a suitable transporter. They are removed from the transporter by a crane and positioned in line at the rear of the joint bay/end of ducts. A cable winch attached to an appropriate vehicle is positioned at the next joint bay location/end of ducts. The power cable is then pulled through the ducting using a steel wire and the cable winch.

2.7 WORKING HOURS

Site development and building works will generally be carried out during normal working hours. In exceptional circumstances works may be required outside of these hours.

2.8 WASTE MANAGEMENT

All waste arising during the construction phase will be managed and disposed of in a way that ensures the provisions of the Waste Management Acts and regulations and any of the relevant Local Authorities Waste Management Plans. A Construction Waste Management Plan will be implemented to minimise waste and ensure correct handling and disposal of construction waste streams in accordance with the *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects, Department of the Environment, July 2006.*

2.9 REINSTATEMENT OF LAND

Once all works are complete, the access route and the construction areas around the overhead line structures will be restored to their original condition. Generally this work is carried out by a specialised agricultural contractor and is carried in accordance with the relevant IFA agreements and in consultation with the individual landowner.

A landscaping scheme for the Ballyragget and Coolnabacky substations forms part of the planning application which will be implemented towards the end of the construction phase.

2.10 COMMERCIAL FORESTRY AND HEDGING

2.10.1 COMMERCIAL FORESTRY

The proposed new Ballyragget – Coolnabacky line crosses commercial forestry. The normal corridor widths centred on the line to be left clear of trees for 110 kV lines is 61 metres.

2.10.2 HEDGES

Hedges need to be managed under powerlines. All trees should be outside their falling distance from any part of any overhead line support.

2.11 CONSTRUCTION ENVIRONMENT MANAGEMENT PLAN

For infrastructure projects of this nature it will be a requirement of the construction contract to prepare a Construction Environment Management Plan (CEMP). For similar projects where An Bord Pleanála has granted planning approval a condition has been attached in relation to preparing a CEMP. The wording in the condition is generally as follows[2]:

Prior to commencement of construction, a Construction Environment Management Plan (CEMP) shall be submitted to, and agreed in writing with, the planning authorities, following consultation with relevant statutory agencies. This plan shall incorporate the mitigation measures indicated in the EIS, and any others deemed necessary, and shall provide details of intended construction practice for the proposed development, including:

a. *location of the site and materials compound(s) including area(s) identified for the storage of construction refuse,*
b. *location of areas for construction site offices and staff facilities,*
c. *details of site security fencing and hoardings,*
d. *details of on-site car parking facilities for site workers during the course of construction,*
e. *details of the timing and routing of construction traffic to and from the construction site and associated directional signage, to include proposals to facilitate the delivery of abnormal loads to the site,*
f. *measures to obviate queuing of construction traffic on the adjoining road network,*

[2] An Bord Pleanála references PL08 .VA0012, PL25 & VA0013, PL06F.VA0014.

g. measures to prevent the spillage or deposit of clay, rubble or other debris on the public road network,
h. alternative arrangements to be put in place for pedestrians and vehicles in the case of the closure of any public road during the course of site development works,
i. details of appropriate mitigation measures for noise, dust and vibration, and monitoring of such levels,
j. containment of all construction-related fuel and oil within specially constructed bunds to ensure that fuel spillages are fully contained; such bunds shall be roofed to exclude rainwater,
k. disposal of construction/demolition waste and details of how it is proposed to manage excavated soil,
l. a water and sediment management plan, providing for means to ensure that surface water run-off is controlled such that no silt or other pollutants enter local water courses or drains,
m. details of a water quality monitoring and sampling plan.
n. if peat is encountered - a peat storage, handling and reinstatement management plan.
o. measures adopted during construction to prevent the spread of invasive species (such as Japanese Knotweed).

In the event that An Bord Pleanála grants approval for the proposed development, a CEMP will be prepared addressing these and any other issues specified by An Bord Pleanála for agreement with the planning authorities. As previously noted the CEMP will be a detailed expression of the proposal and mitigation measures set out in the EIS.

2.12 MAINTENANCE

The design life for all the units of the development is 50 to 60 years.

During this lifespan there will be on-going maintenance on the different units. The routine maintenance within the substations will be contained to the substation site and no environmental impacts are envisaged. The maintenance on the overhead lines will require access through third-party lands from time to time. The following section describes the expected maintenance requirements for the overhead lines over the lifetime of the project.

2.12.1 OVERHEAD LINES MAINTENANCE

2.12.1.1 Overhead line Patrolling

Helicopter patrols of overhead lines are carried out once a year. These patrols will be advertised in advance.

Foot patrols of overhead lines are carried out every 5 years. The landowners will be contacted in advance.

2.12.1.2 Towers

Tower Painting at approx. 35 to 40 years' service for all steel structures to get additional 15 to 20 years prevention of steel corrosion.

2.12.1.3 Woodpoles

Poleset replacement is generally due to rot or damage. Over a 50 year period is normal for approximately 25 % of the polesets to be replaced.

2.12.1.4 Insulator & earthwire hardware

It is estimated that 25 % earthwire hardware replacement, less than 5 % glass insulator replacement on the 400 kV line will be required after 30 years and less than 5 % composite insulator replacement on the 110 kV line will be required after 30 years.

2.12.1.5Foundation

No foundation maintenance work is generally required.

2.12.1.6Conductor

No conductor maintenance work is generally required.

2.13 DECOMMISSIONING

The expected lifespan of the development is in the region of 50 to 60 years. In the event that part of, or, the entire proposed infrastructure is to be decommissioned, all structures, equipment and material to be decommissioned will be removed and the land reinstated.

2.14 HEALTH & SAFETY

2.14.1DESIGN & CONSTRUCTION

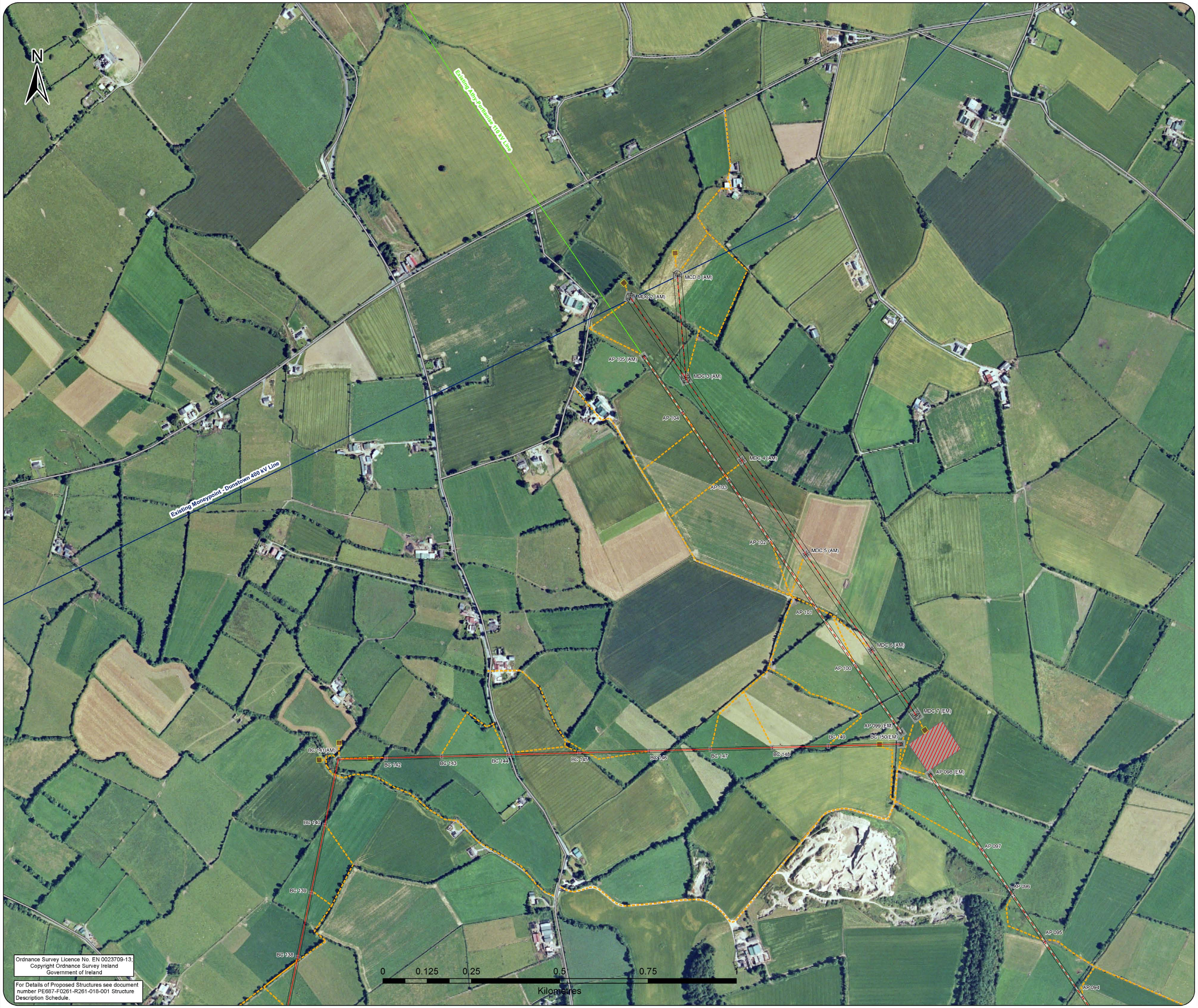
During the design and throughout the construction of the development EirGrid/ESB personnel, designers, project supervisors, contractors, and workers have been and will be required to comply with current Health and Safety legislation.

ESB have policies, procedures and systems, which will be in place, in the unlikely event of an accident or emergency incident occurring during the construction of the development.

2.14.2DEVELOPMENT LIFETIME

Safety is a core ESB Group value and is fundamental to ESB's commitment to operate in a socially responsible manner. ESB regard the health, safety and welfare of their workforce, contractors and the communities they serve as a priority.

For this type of development ESB have policies, procedures and systems in place, in the unlikely event of an accident or emergency incident occurring during the lifetime of the development.



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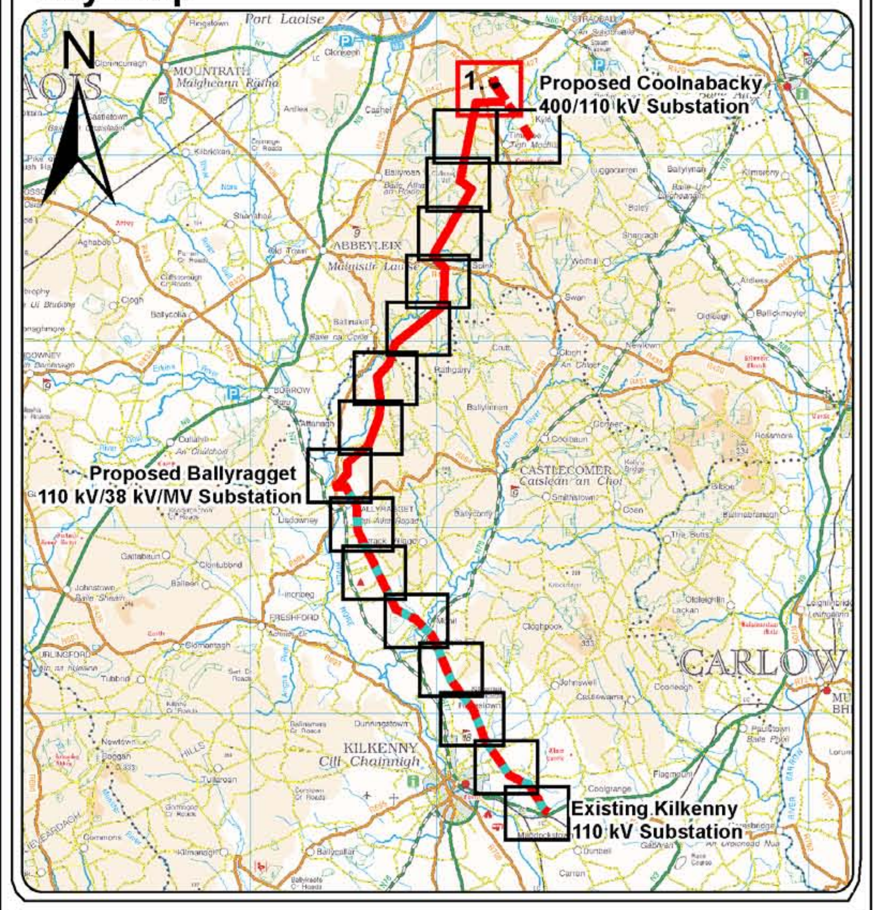
For Details of Proposed Structures see document number PE687-F0261-R261-018-001 Structure Description Schedule.

This Project is being proposed by EirGrid plc, the Transmission System Operator and will be owned by ESB the Transmission Asset Owner.

Legend (Symbols not to scale)

- 9 metres: Outer Conductor; Centreline of Proposed Ballyragget - Coolnabacky 110 kV line; Outer Conductor
- 9 metres: Outer Conductor; Centreline of Proposed Athy - Portlaoise 110 kV Line Uprate; Outer Conductor
- 22.8 metres: Outer Conductor; Centreline of Moneypoint - Dunstown - Coolnabacky 400 kV line; Outer Conductor
- Temporary Access Route (Indicative)
- Proposed Tower Location
- Proposed Poleset Location
- Temporary Working Area (Indicative) including Foundation Area
- Public Road
- Temporary Guarding Location (Indicative)
- Temporary Stringing Area (Indicative)
- Proposed Coolnabacky Substation

Key Map



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Drawing Title

Proposed Development

Project

Laois - Kilkenny Reinforcement Project

Production Unit **OHL High Voltage**

ESB International
ESB International, Stephen Court, 18–21 St. Stephen's Green, Dublin 2, Ireland **Tel:** +353 (0) 1 703 8000 **Fax:** +353 (0) 1 703 8088
Email: marketing@esbi.ie **Web:** www.esbi.ie
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Registered Office: as above **Registered in Ireland No.** 155249

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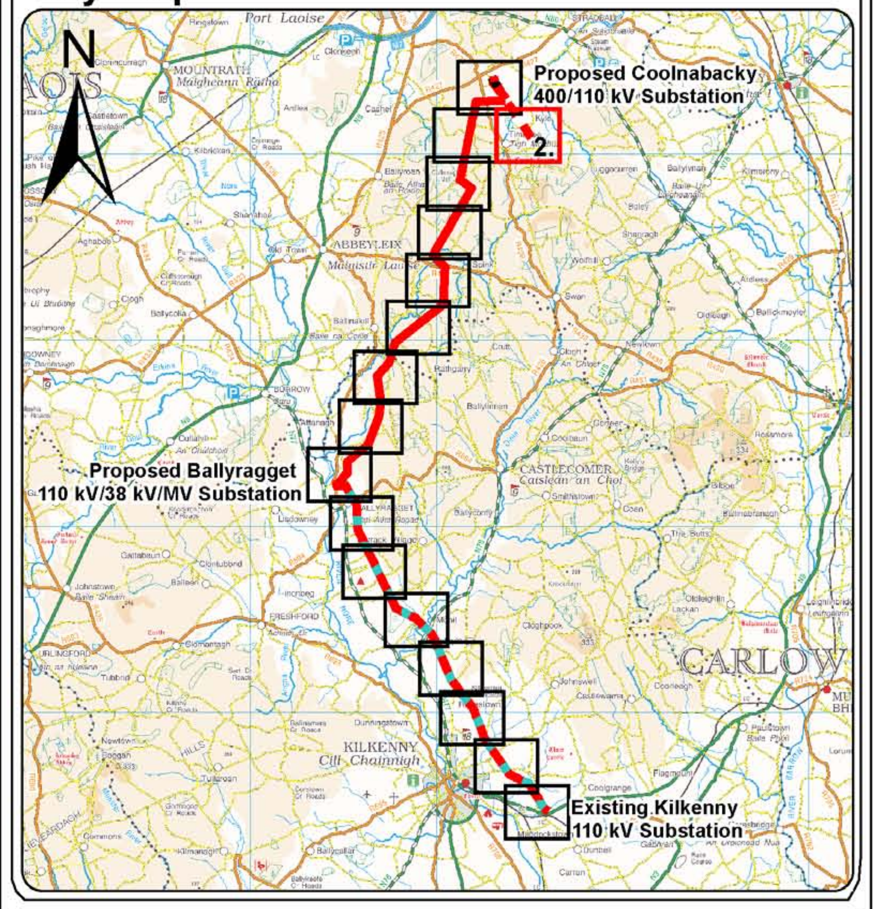

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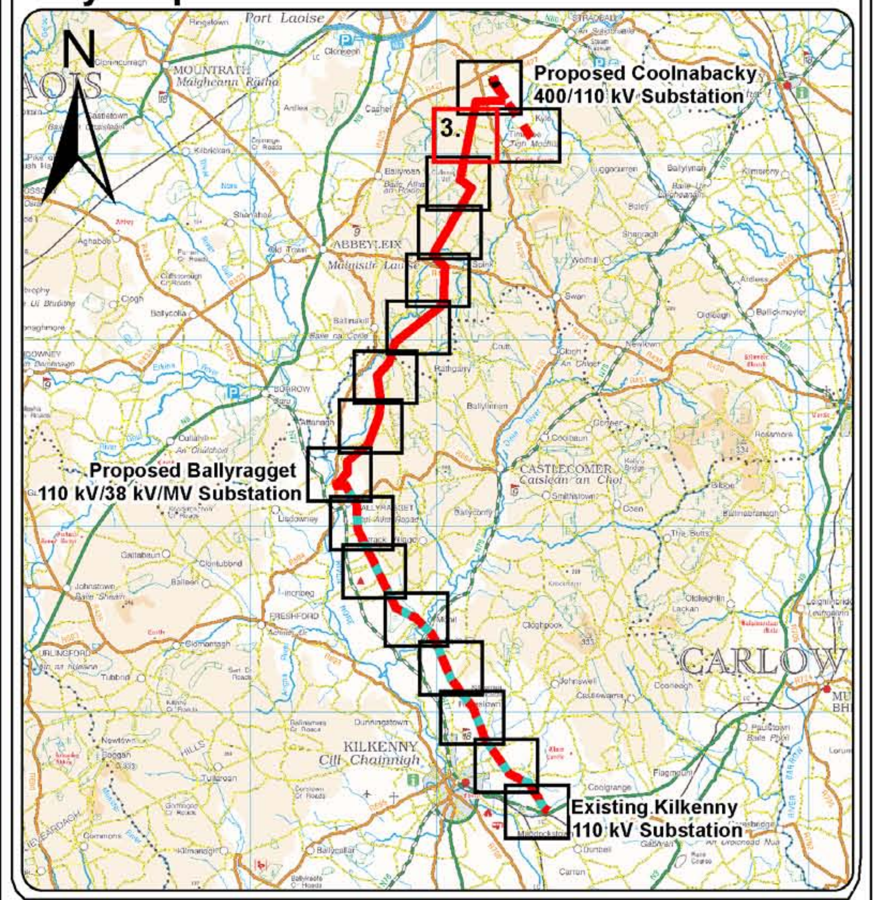

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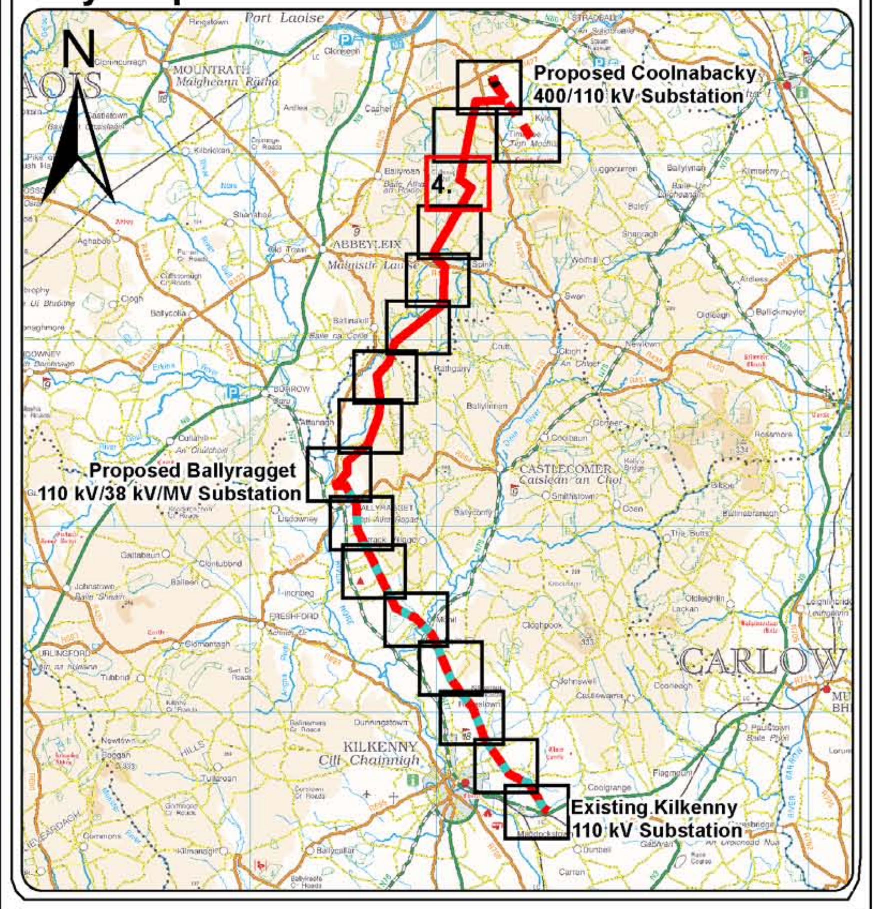

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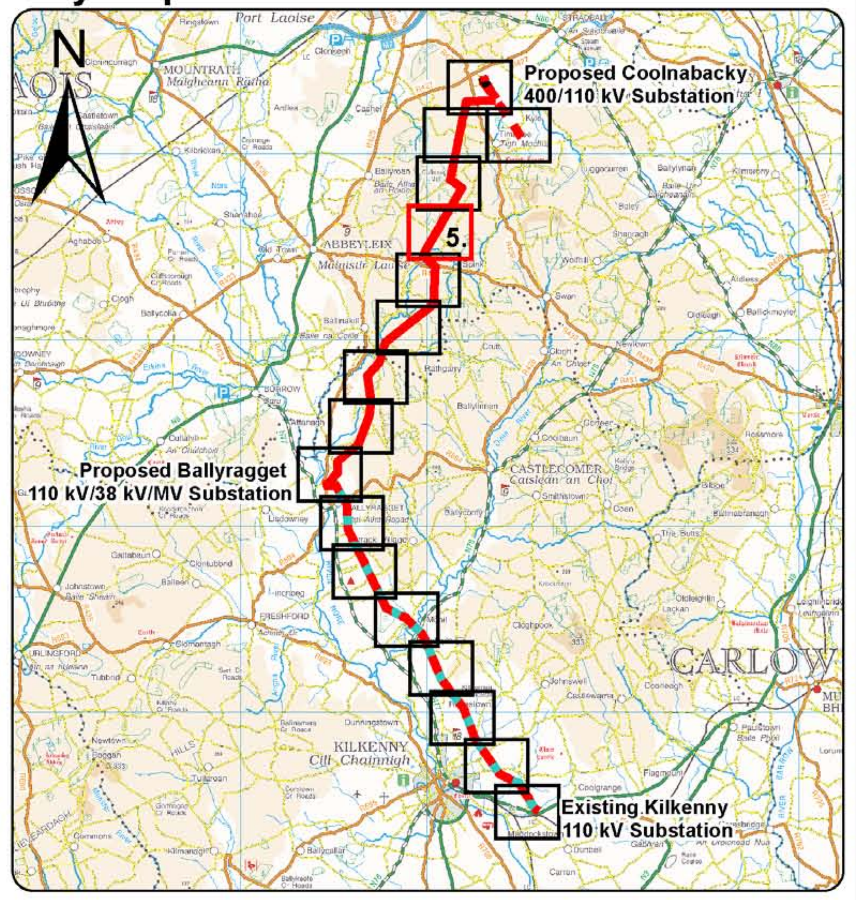

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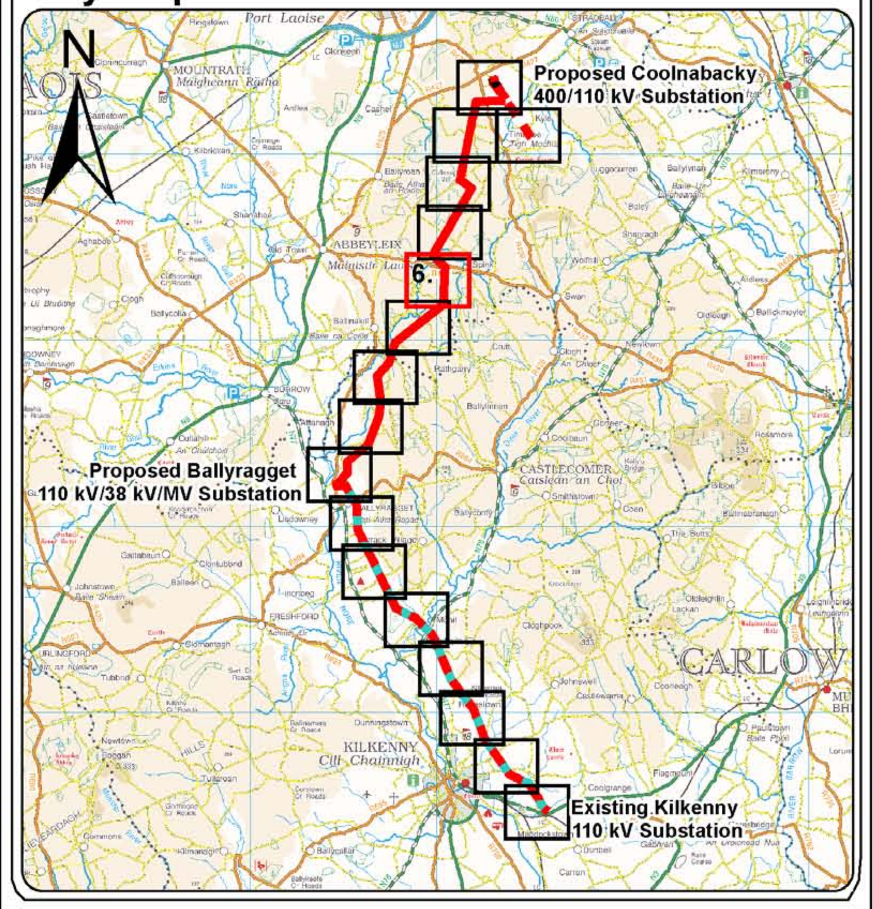

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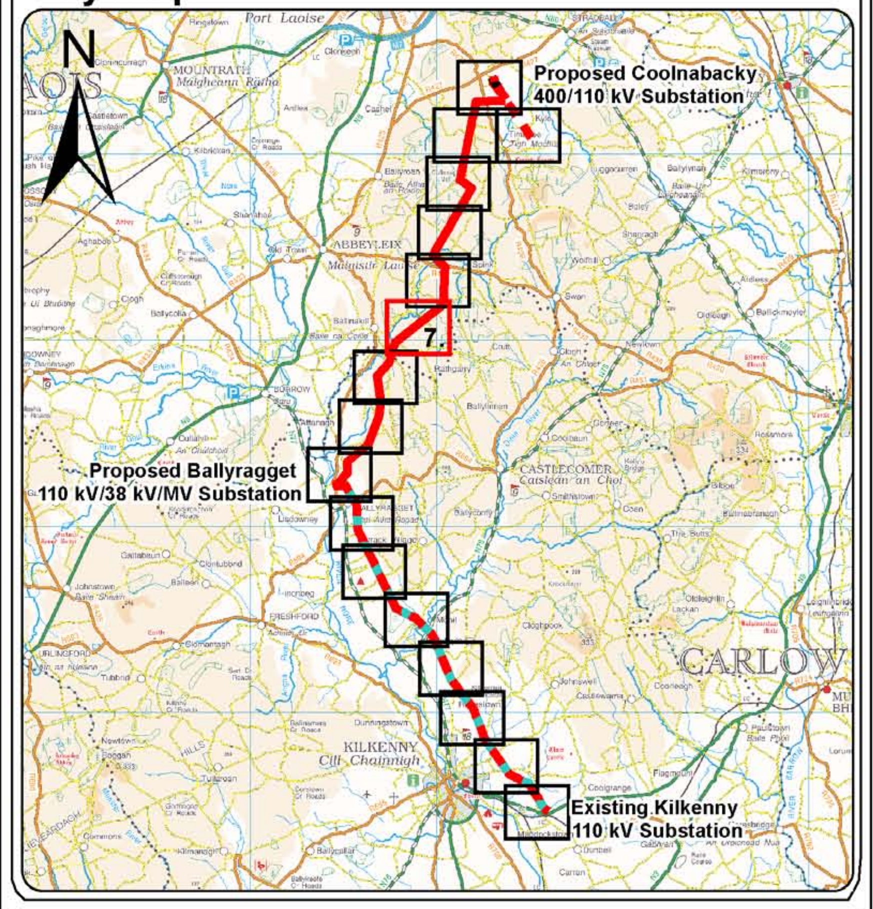

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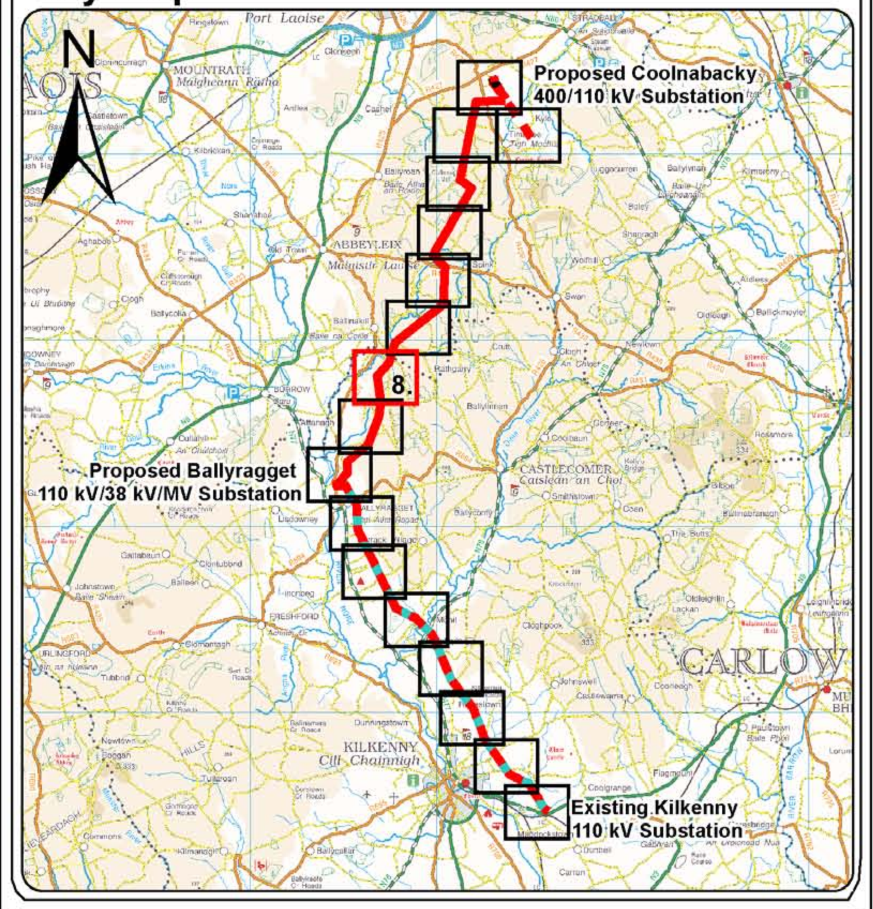

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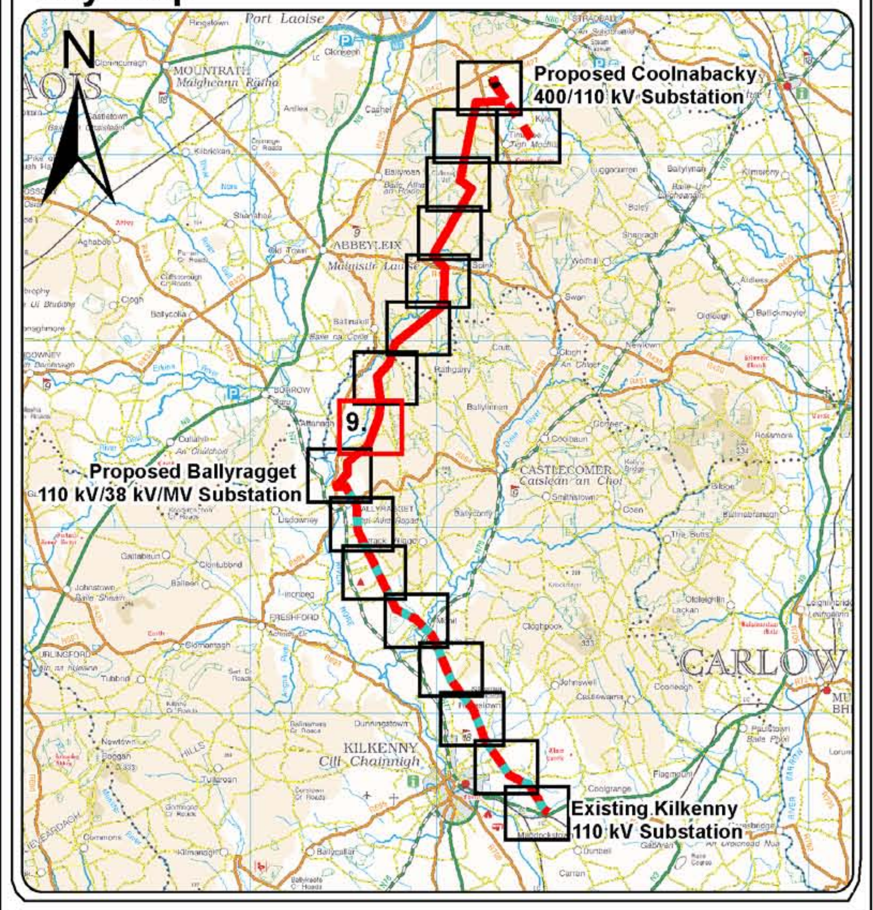

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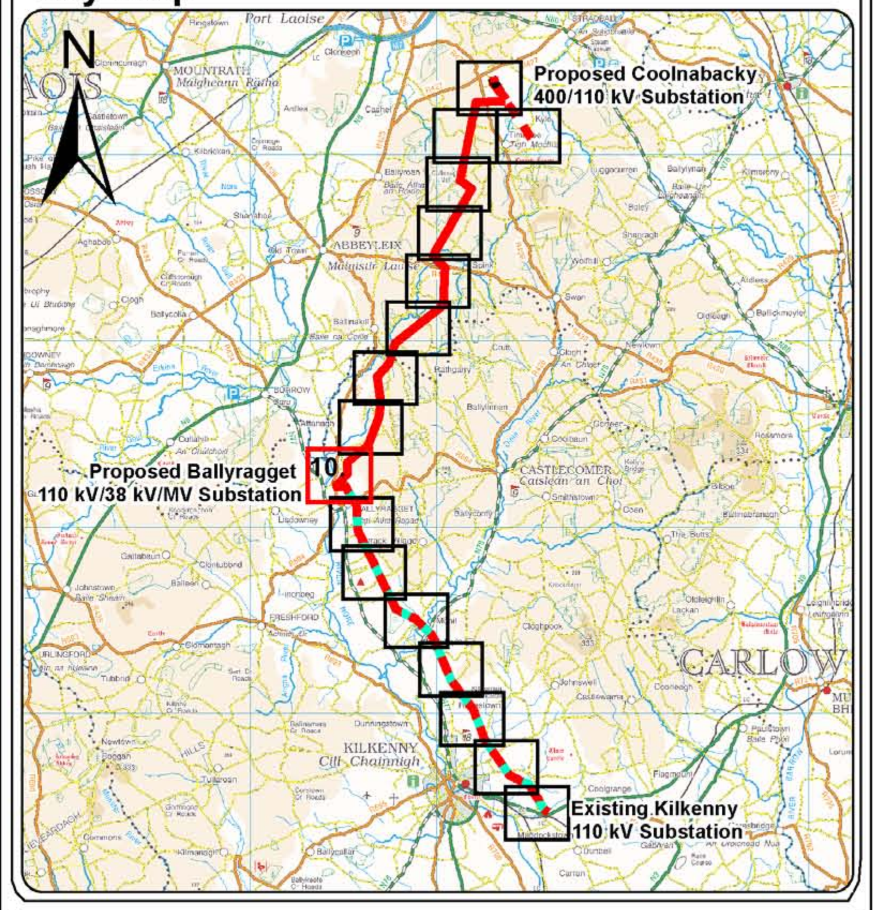

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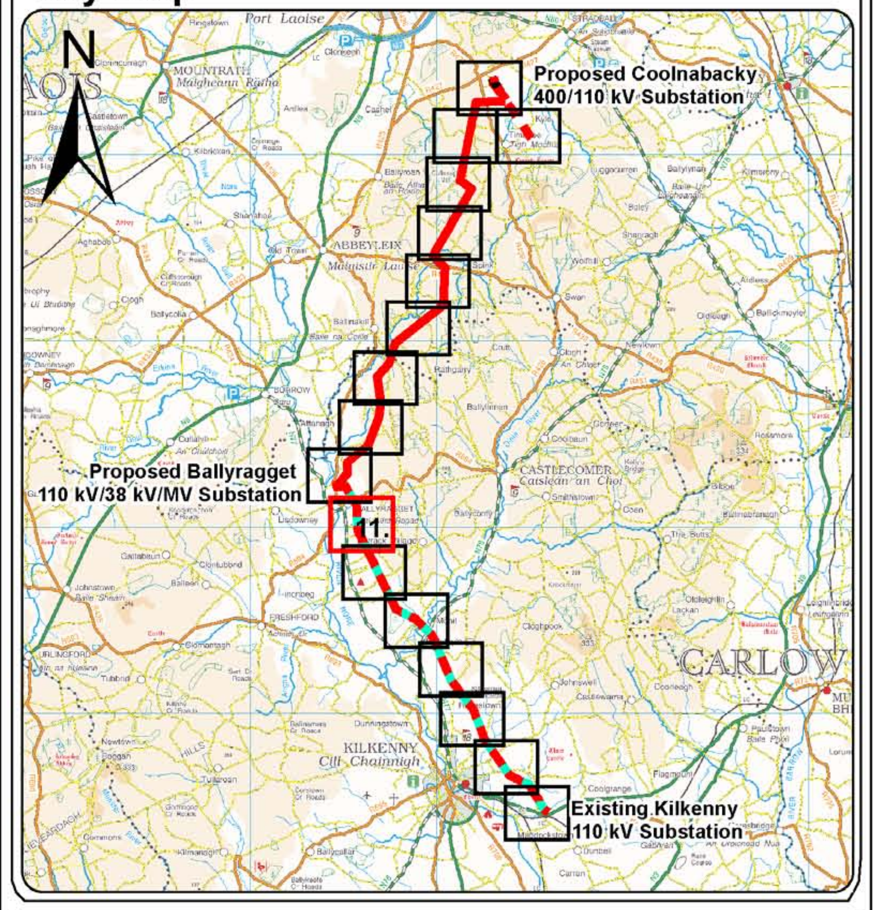

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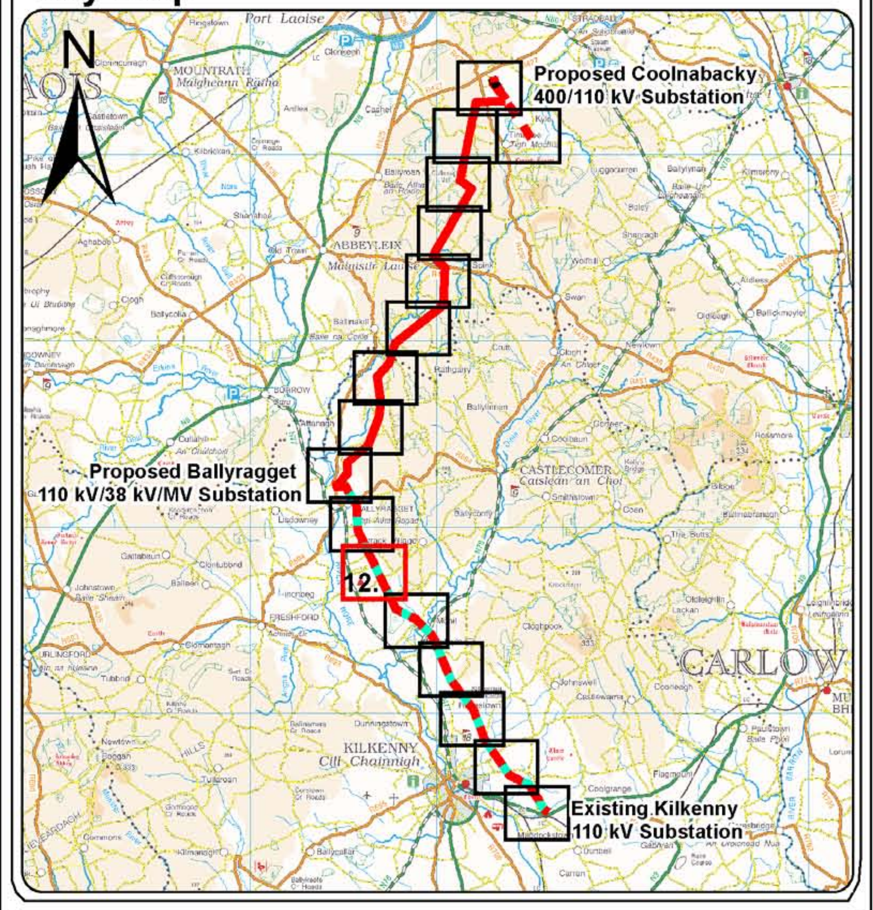

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Project

Laois - Kilkenny Reinforcement Project

Production Unit **OHL High Voltage**

ESB International

ESB International, Stephen Court, 18–21 St. Stephen's Green, Dublin 2, Ireland **Tel:** +353 (0) 1 703 8000 **Fax:** +353 (0) 1 703 8088
Email: marketing@esbi.ie **Web:** www.esbi.ie
ESB International is a trading name of ESBI Engineering & Facility Management Limited
Registered Office: as above **Registered in Ireland No.** 155249

Drawn	Produced	Verified	Approved	Approved date
EMcM	EMcM	SMcL	BD	July-2013

Client ref.	No. of sheets	Size	Scale
	12 of 17	A1	1 : 5,000

Drawing number Sheet Rev

PE687-D261-039-012-000

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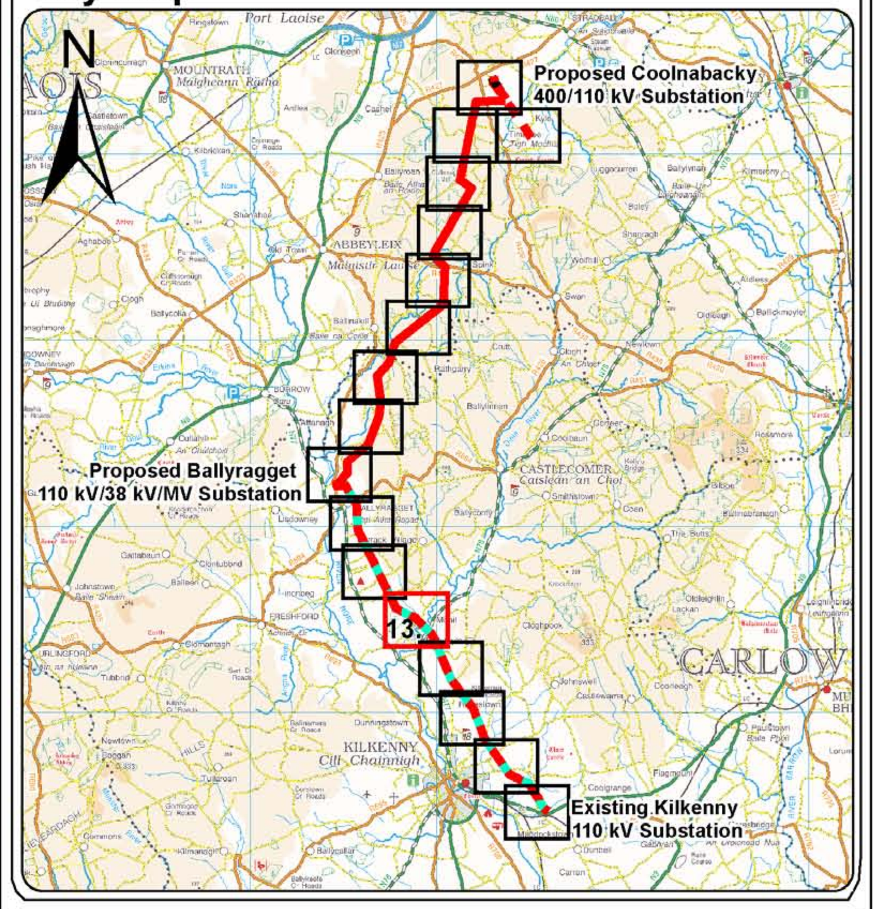
For Details of Proposed Structures see document number PE687-F0261-R261-018-001 Structure Description Schedule.

This Project is being proposed by EirGrid plc, the Transmission System Operator and will be owned by ESB the Transmission Asset Owner.

Legend (Symbols not to scale)

- 9 metres
- Outer Conductor
- Centreline of Proposed upgrade to the existing Ballyragget - Kilkenny 110 kV line
- Outer Conductor
- Temporary Access Route (Indicative)
- Proposed Tower Location
- Proposed Poleset Location
- Temporary Working Area (Indicative) including Foundation Area
- Public Road
- Temporary Guarding Location (Indicative)
- Temporary Stringing Area (Indicative)

Key Map



Client

EIRGRID

Rev.	Date	Revision Description	Drn	Pro	Ver	App

Drawing Title

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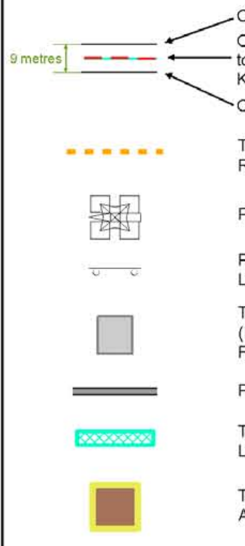
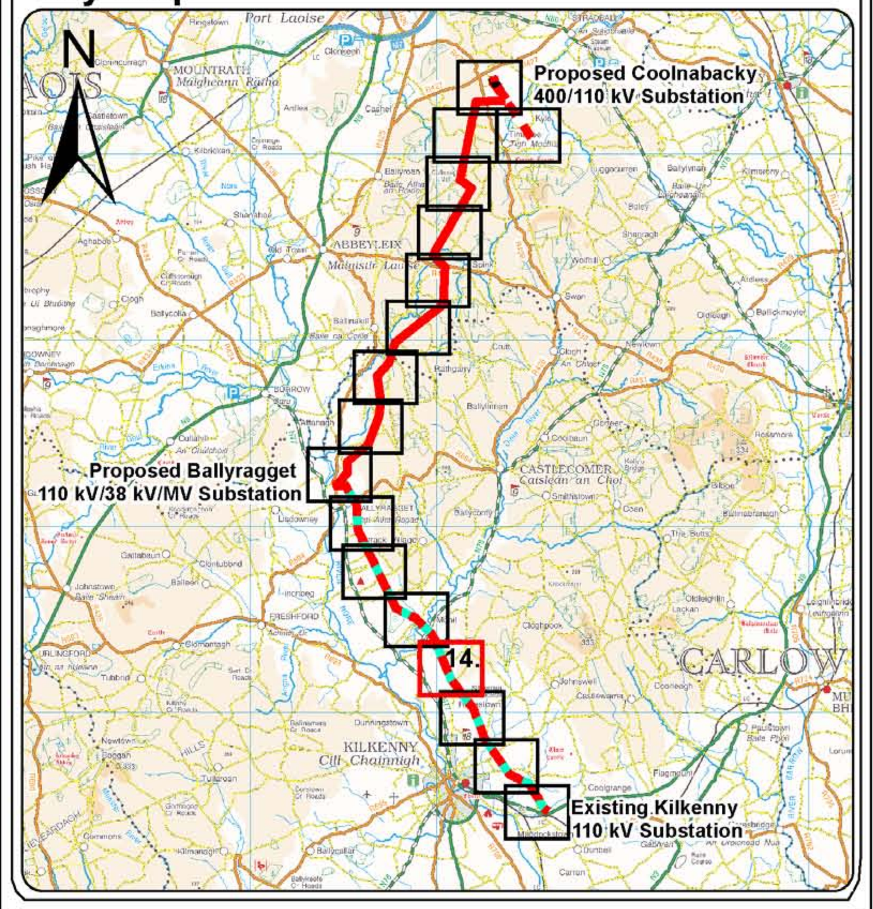


Key Map



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PE687-D261-039-014-000

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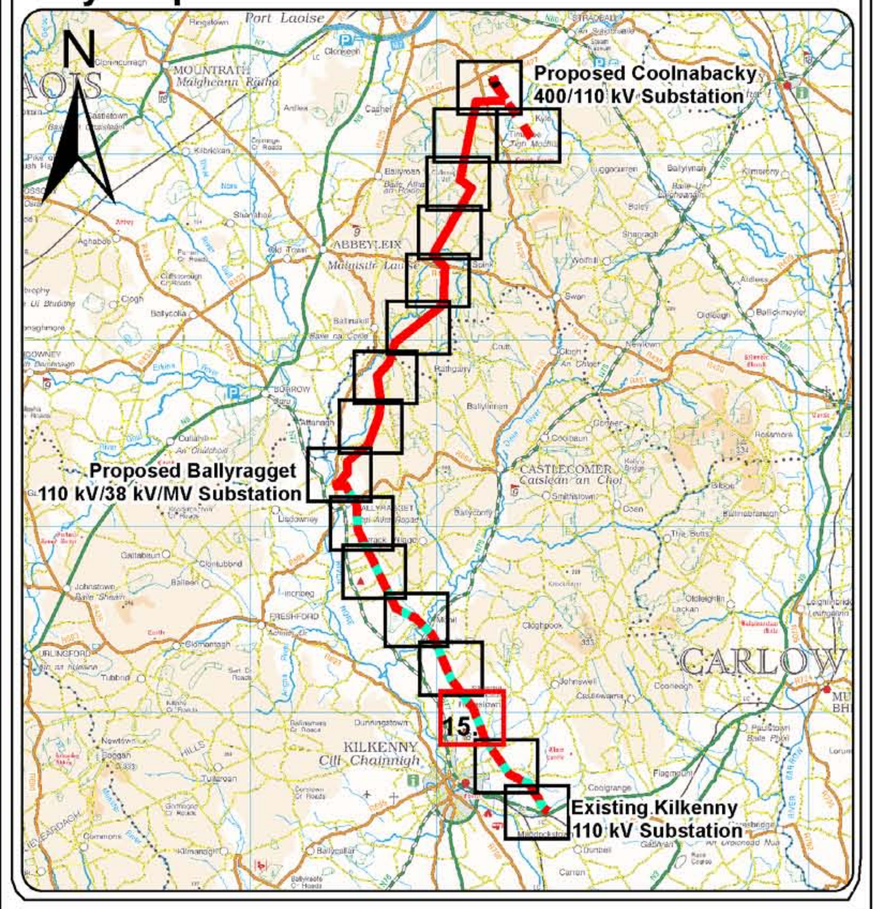

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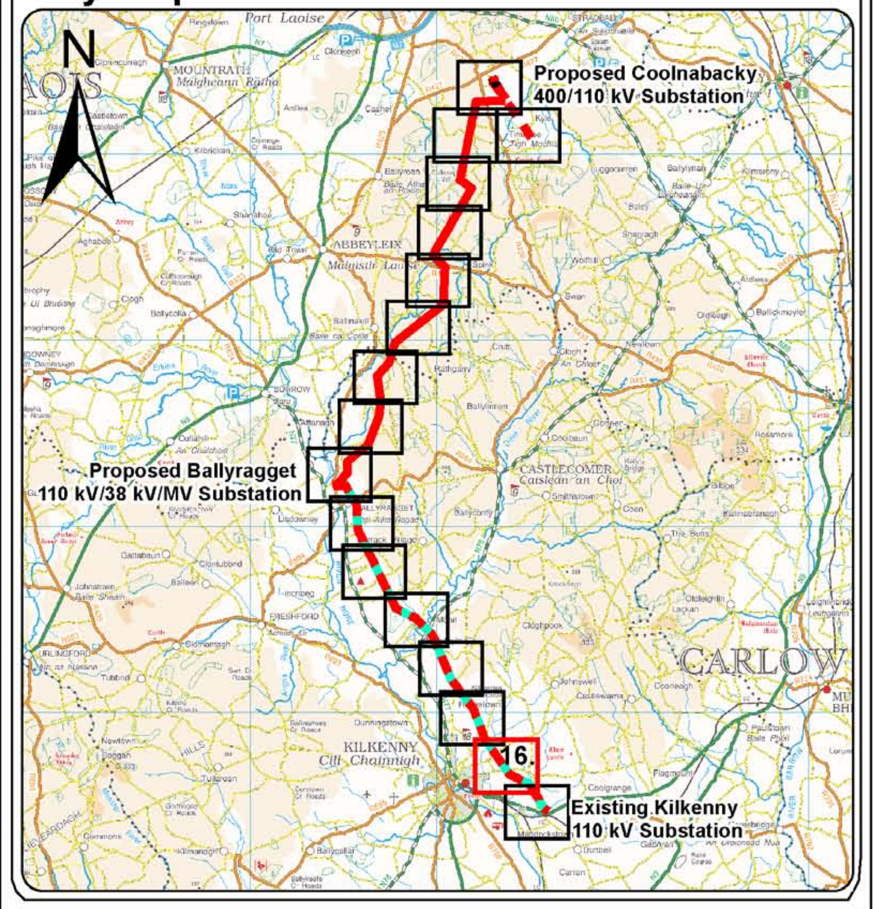

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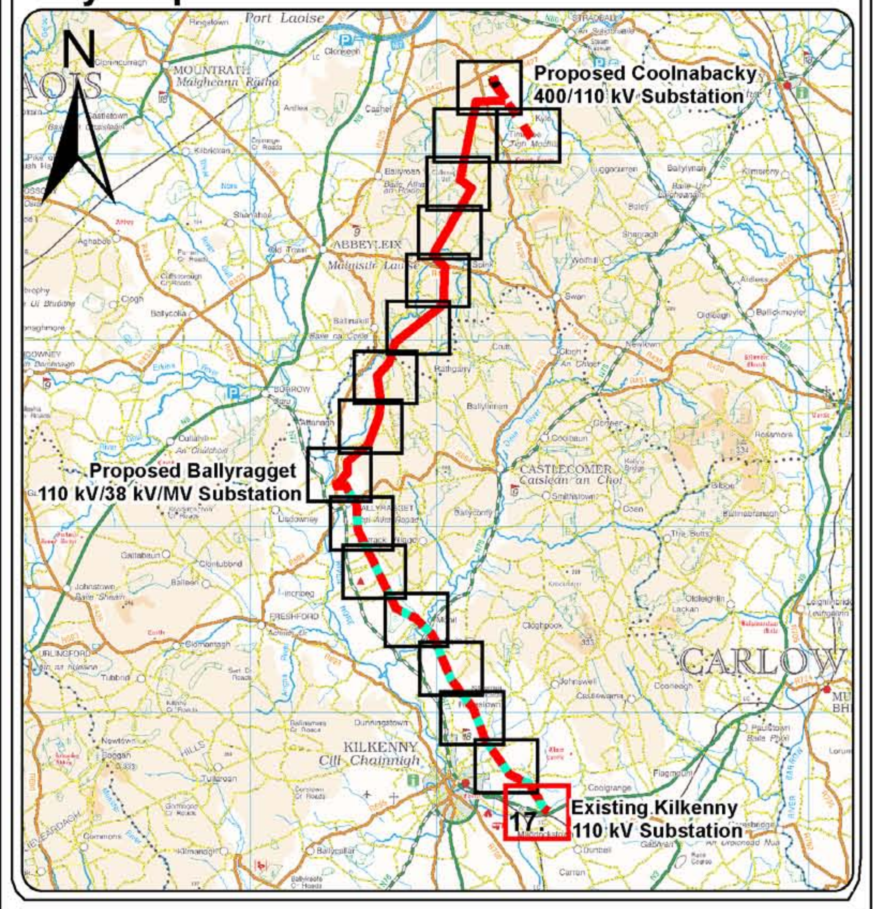

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