NIE and ESB National Grid

Drumkee - Kingscourt 275kV Feasibility Study (South of Border)

ESBI Report No. PE687-R141-001-001-001.doc

Electrical Power Systems, ESBI Engineering Ltd

Stephen Court 18/21 St Stephen's Green Dublin 2 Ireland
Telephone+353-1-703 8000 Fax+353-1-661 6600
www.esbi.ie

DATE **05/12/05**

ESB INTERNATIONAL

ESB INTERNATIONAL

ESBI File Ref:	*PE687-F141*
Client:	ESB National Grid
Project Title:	Drumkee - Kingscourt 275kV Line
Report Title:	Drumkee - Kingscourt 275kV Feasibility Study (South of Border)
ESBI Report No.:	PE687-R141-001-001-001.doc
Rev. No.:	1
Volume *1* ***of*** *1*	

APPROVED: **C.Boylan** ***TITLE:***	***DATE:*** **05/12/05**

EXECUTIVE SUMMARY

A Joint ESB National Grid (ESB) / Northern Ireland Electricity (NIE) steering committee requested that a feasibility study of potential 275kV Interconnection be carried out in February 2003. This report assessed the feasibility of a new 275kV line between Arva 110kV station and Drumkee 275kV Station.

Following further joint ESBNG/NIE planning studies a further much briefer feasibility assessment be made of two further options as follows

(a) A new Louth-Tandragee 3 275kV circuit with system security measures in Louth and Tandragee Stations.
(b) A new 275kV circuit from Drumkee 275kV Station to a new 275/220kV station looped into the Flagford – Louth 220kV line in the vicinity of Kingscourt.

This report studies (b) above south of the Republic of Ireland/Northern Ireland border. There is also a companion report produced by NIE which studies (b) north of the border.

The scope of the project was agreed at the outset led to the production of Desktop studies which detailed all physical and environmental constraints that might hinder a route corridor. Typical constraints included Ecological sites & Special Protected Areas, Archaeological & Heritage Sites, Scenic & Tourist Roads, along with all developments & Infrastructure.

Constraint maps were created for both sides of the border and based on a co-operative effort with Northern Ireland Electricity, natural route corridors began to emerge and became very apparent. From this effort, it was possible to identify the border crossing point which is referenced in this report. Potential route corridors were limited on the Northern side of the border. The potential route corridors were developed during the desktop survey. Very limited site survey was carried out. However aerial photography flown in 2003/2004 was acquired from the Irish Ordnance Survey.

The on site investigation was very limited and consisted of very basic ‘drive through’ surveys. The potential route corridors were selected based on achieving a fine balance between Environmental, Technical and Economic criteria. A sample of road crossings were inspected to assess if adequate clearances exist at present. Some road crossings could accommodate a route corridor of at least 200m, however

routeing possibilities in many areas will be very limited by ribbon development. Some areas are considered to be under particular threat from unrelenting development.

For the Drumkee – Kingscourt 275kV Line proposal a 275kV Line route is feasible south of the border, however there are a number of key areas where future ribbon development may render some route options no longer feasible. There will be considerable detailed route selection work required due to the drumlin nature of the landscape and a very high prevalence of ribbon development in some areas. Level sites on good ground for a 220/275kV substation are not prevalent, however some possible sites were identified which would require considerable civil works.

It is recommended that considerable further work be carried out on the Drumkee – Kingscourt 275kV Project option south of the border in order to allow assessment to a similar level as that carried out for the Arva – Drumkee 275kV project option. An overall comparison can then be carried out of the two options.

CONTENTS

1.0 INTRODUCTION

Following discussions involving ESBNG, NIE and ESBI the following Scope of Work was agreed

The Scope of Work is defined to include:-

- Constraints map
- Desktop study
- Very limited field study
- Cost estimate for above including ESBI and NIE cost estimates both separate and combined to give total project cost. Cost estimates in euro and to be in a similar format to those provided for the recent Arva-Drumkee feasibility study.
- Separate reports each side of the border to be in a similar format to those provided for the recent Arva-Drumkee feasibility study.

Report Objective

- The objective of this report is to assess the feasibility of obtaining an overhead line 275kV route between the Kingscourt area and a crossing point into Northern Ireland.
- Initial assessment of possible 275/220kV Station sites in the vicinity of Kingscourt.
- Overhead line routes will be selected based on achieving a fine balance between Environmental, Engineering and Economic criteria.
- This report was not researched to the same level as the Arva-Drumkee report due to time constraints.

2.0 STUDY AREA

2.1 Introduction

The first task associated with the project was the defining of the study area. The study area is situated between Flagford – Louth 220kV Line, and the proposed border crossing point which was developed in close consultation with Northern Ireland Electricity and the constraint desktop studies undertaken by both sides of the border in mapping the physical and environmental parameters of the study area.

A new 275/220kV substation is proposed to loop into the Flagford – Louth 220kV Line with a 275/220kV transformer providing a takeoff for the new 275kV Line to Drumkee.

2.2 Makeup of study area

The study area is bounded to the west by Monaghan Town, Special Protection Areas at Dromore Lakes (between Ballybay and Rockcorry), Lough Sillian(Near Shercock) and Bailieborough, and to the East by the Northern Irish Border, Inishkeen and Ardee. It is bordered to the south by the Flagford – Louth 220kV Line and to the north by the border.

The study area encompasses approximately 700 km^2 covering mainly county Monaghan and a little of County Cavan.

The typical landscape throughout this study area will feature a drumlin landscape of varying density. The land is of varying agricultural quality with pasture being the main use. There are areas of peat, mixed quality land and marsh scattered throughout the extent of the study area but for the most part will be easily overcome.

Hedgerows are well established, although prevalence towards cutting the hedges throughout Monaghan to allow for easier viewing into fields and R.E.P.S(Rural Environmental Protection Scheme) etc. is evident.

The study area includes, existing infrastructure including major roads N2 and N53, several Regional roads R162, R165, R178, R 179, R180, R181, R183 and numerous third class roads. It also includes overhead transmission lines such as Flagford-Louth 220kV, Louth – Lisdrum 110kV Line, Louth-Meath Hill 110kV Line and Louth Shankill 110kV Line as well as 38kV and lower voltage lines.

2.3 Conclusion

It was concluded that the study area of 700 km^2 would be sufficient in size to accommodate possible overhead line route options from Kingscourt area to the border crossing point.

3.0 CONSTRAINTS MAP

3.1 Introduction

With the limits of the study area defined, constraints need to be added so as to avoid routing the line in inappropriate areas. The capturing of constraints on to a single map is a very difficult task given the magnitude of this project. Some constraints were obvious while others were more difficult to quantify. The associated sections of this chapter give a more detailed account of the constraints.

Coloured 1:50,000 Ordnance Survey maps were used for the production of the constraints map. The map-sheets used from 'Ordnance Survey Ireland' (Os*i)* were, 28, 35 & 36, See Appendix

The constraints included;

- Land zoning, towns and rural dwellings
- Electrical Infrastructure
- General Infrastructure
- Designated Ecological Sites
- Archaeological & Heritage sites
- Quarries, Mines and Airstrips

3.2 Landzoning, Towns and Rural Dwellings

The route corridor avoided large towns or clustered areas of settlement. In compiling the constraints map and carrying out the onsite investigations, relevant County Development Plans were consulted as to the extents and uses of land zoning around towns in the different counties. Routing was preferable outside these zones thus avoiding or reducing considerably, future conflict.

Scattered rural dwellings were to be avoided, keeping the proposed corridors approximately 50-75 meters away from any existing dwellings. Generally along the major arterial routes once off housing would generally be discouraged by The County Councils. Instead developments along the minor roads are less restricted by the County Councils. As a result the minor roads are more congested with once off housing developments, and building in the areas affecting the proposed route corridor will be inevitable.

3.3 Existing Transmission Lines and Substations

In the Republic of Ireland 110kV line crossings are to be made at or near 90 degrees. There are several transmission lines in the study area are as follows: Flagford-Louth 220kV, Louth – Lisdrum 110kV Line, Louth-Meath Hill 110kV Line and Louth Shankill 110kV Line.

3.4 General Infrastructure

Other infrastructure to be highlighted included major roads e.g. N2, N53 etc., again these need at or near 90 degree crossings where possible.

3.5 Designated Ecological Sites

Designated Areas for Flora and Fauna

In the Republic of Ireland, such areas are formally designated, or proposed for designation, under EU Directives or national legislation, such as the Wildlife Act, 1976. They are administered by The Department of Environment, Heritage and Local Government (National Parks and Wildlife). The following is a summary of their main implications,

Proposed candidate Special Area of Conservation (pcSAC)

This is a statutory designation which has legal basis in the EU Habitats Directive (92/43/EEC) as transposed into Irish law through the European Communities (Natural Habitats) Regulations, 1997 (S.I. 94 of 1997). The main implication of this designation is that any project likely to have a significant adverse impact on the integrity of the pcSAC may only be carried out for "imperative reasons of overriding public interest, including those of a social or economic nature". Where a pcSAC includes a "Priority Habitat" or a "Priority Species", as indicated in Annex I and Annex IV of the Directive, then "the only considerations which may be raised are those relating to human health or public safety or, further to an opinion from the Commission, to other imperative reasons of overriding public interest".

Designated Special Protection Area (SPA)

This is a statutory designation, which has legal basis in the EU Wild Birds Directive (79/409/EEC) as transposed into Irish law through the European Communities (Conservation of Wild Birds) Regulations, (various dates). Most (though not all) of these sites are wetlands or coastal areas, which have significant concentrations of birds. The implications of this designation are similar to the pcSAC but there is a provision in the statutory regulations to prevent "pollution or deterioration of habitats or any disturbance whatsoever" affecting the birds which use a SPA.

Proposed Natural Heritage Area (pNHA)

This is presently a non-statutory designation which replaced the previous designation, Area of Scientific Interest (ASI), about 1994. It will become a statutory designation when the Wildlife (Amendment) Bill, 2000 becomes law. Most local

authority development plans include an objective to protect pNHAs within their jurisdiction so this gives the designation some legal status under the Planning and Development Act, 2000. An application for planning permission for any development, which may have impacts on a pNHA, will be referred by the planning authority to the Department of Environment, Heritage and Local Government (D.o.E.H.& L.G.) for comment.

Statutory Nature Reserve (SNR)

This is a statutory designation which can cover either state or private land which is of scientific interest. Reserves are designated under the Wildlife Act, 1976. There is an obligation to manage the land in accordance with the objectives for which it was designated. Most nature reserves are in state ownership and are managed by the National Parks and Wildlife Service. Any state agency which is involved in activities that may affect a reserve is required to consult with D.o.E.H.& L.G. and to take all practical steps to avoid or minimise any damage.

Ecological areas of interest were highlighted from Department of Environment, Heritage and Local Government. These include NHAs (Natural Heritage Areas), SPAs (Special Protection Areas) and pcSACs (proposed candidate Special Areas of Conservation). These areas should be avoided as crossing them would normally be contrary to a future Planning Permission acquirement.

3.6 Archaeological & Heritage Sites

In the Republic of Ireland, archaeological heritage sites are administered by the Department of the Environment, Heritage and Local Government, (D.o.E.H.L.G.). The most recent boundaries of these designated areas were obtained from the departments' web site.

These include protected buildings, heritage sites including; Megalithic Monuments Earthworks, Ringforts and other types of enclosures, Ecclesiastical remains, crosses, holy wells and burial grounds, Stone fortresses, castles, tower, houses, bawns and forts etc.

For this study most archaeological sites are not considered a major constraint due to the high degree of flexibility in locating overhead line structures, however some such as the site of the battle of Clontibret cover extensive areas.

3.7 Quarries, Mines and Airstrips

Most quarries were already marked up from the Ordnance Survey mapping and were highlighted for the constraints study to be avoided. Whilst during the very limited on site investigation one previously unmarked quarry was found. There was no evidence to date, from the councils or from onsite scrutiny that there were any mines or airstrips within the study area.

3.8 Conclusion

Constraint maps were created for both sides of the border and based on a co-operative effort with Northern Ireland Electricity, low environmentally sensitive corridors were identified.

Using the above constraints plotted onto 1:50,000 map of the study area, a provisional initial 275kV overhead line could be routed and studied within the corridors.

The ideal general direction from Kingscourt to Drumkee will travel in a north-south direction avoiding these constraints. This enabled corridors to be marked up onto the map.

4.0 ROUTE OPTIONS

4.1 Introduction

The constraints map completed in the office was the foundation for on site assessing of suitable corridors. Conclusions from the desktop study were briefly assessed on site in a general way.

4.2 ESB Route from Kingscourt to Border

4.2.1 Station Sites in the vicinity of Kingscourt

A layout drawing was produced of the possible new Kingscourt station. As there is a possibility that the Kingscourt - Drumkee will be specified for future 400kV operation the layout was designed to be capable of accommodating the following (including future requirements)

1xSingle 220kV busbar

4x220kV Line bays

1x220kV Transformer bay

1X220kV Sectionaliser bay

1x400/220kV transformer

1xSingle 400kV Busbar

1x400kV Transformer bay

1x400kV Coupler bay

2x400kV Line bays

The initial site size based on the above requirements is 180mx148m.

A brief roadside survey was carried out to assess the possibilities of locating such a station site under or immediately adjacent to the Flagford – Louth 220kV line between where it crosses the N2 and a point approximately 5km to the west of Kingscourt. There is not a propensity of level sites with good ground due to the drumlin nature of the landscape nonetheless a no. of possible sites were identified as shown in the appendices.

It should be noted that any site of this size in this area will require some amount of leveling. The final selection of station sites will depend on a combination of site availability, site conditions and overhead line routeing possibilities.

4.2.2 Border Crossing Point

The border crossing point was agreed by creating constraint maps for both sides of the border and based on a co-operative effort with Northern Ireland Electricity, the border crossing point was located in the vicinity of Mulyard, East of Clontribret. Care must be taken on the southern side of the border to avoid the site of the battle of Clontibret. To the north of this crossing routing becomes difficult due to the very dense drumlins and one off housing.

4.2.3 Overview of Routes

Three possible route corridors were identified from the desktop study as follows

West Corridor – Shown in Red

Central Corridor – Shown in Purple

East Corridor – Shown in Blue

There are also two sub-routes connecting these main corridors. Other sub-routes may also be possible. The routes were chosen to avoid designated and urban areas followed by a review of aerial photography. A very brief site review took place.

4.2.4 Northern part of Study Area (Border to Castleblaney/Ballybay area)

The red route and Blue Route cross this area. Restrictions in the area are as follows

(a) Avoid Mullyash Mountains to the East
(b) Assess Crossing of the N2 for Red Route
(c) Avoid villages/towns of Clontibret, Castleblayney and Ballybay
(d) Avoid SAC Areas around Castleblayney and southwest of Ballybay
(e) Avoid ribbon development and one off housing.

Blue Route

There is a pinch point on the Blue route between the SAC to the East of Castleblayney and the border, in particular Lough Ross. On site investigations of this area gave only one route through this area with minimum clearance to one off housing and requiring crossing of high points on Drumlins. There is a high rate of one off housing construction in the area and the route would be visible from the lakes in the SPA. It is therefore anticipated that this route will not be viable from both visual amenity and house clearances. Consequently further research on this route was very limited.

Red Route

A reasonably good crossing of the N2 was found at Annyalla which allows good access to the Border crossing point. There is extensive ribbon development on the roads emanating from Castleblayney and careful routing is required in order to cross these roads while not developing adverse views. The Louth – Lisdrum 110kV line must be crossed in this area. A suitable route can be found through the extensive ribbon development down to the take off point for the Purple Route.

4.2.5 Middle part of Study Area (Castleblaney/Ballybay area to Carrickmacross/Shercock Area)

The red route, Blue Route, Purple Route and the purple subroute cross this area. Restrictions in the area are as follows

(a) Avoid SAC Areas around Castleblayney
(b) Assess Crossing of the N2 for Purple Subroute
(c) Avoid villages/towns of Shercock and Carrickmacross
(d) Avoid SAC Areas and Lakes around Shantonagh, Shercock and Castleblayney
(e) Avoid Lough Egish
(f) Avoid ribbon development and one off housing.

Blue Route

As discussed earlier, research on this route was very limited. From Lough Ross to the crossing of the Louth – Lisdrum 110kV Line the area is characterized by dense drumlins and small lakes. From here the line travels south to the east of Carrickmacross to the R178 through an area with good routeing possibilities but

forced about 5km East of Carrickmacross by development. Interestingly there is a route into Louth station apparent on the maps, though not confirmed on site, from this point traveling along the northern side of the R178 for approximately 5km. No assessment is made of the access into Louth Station. In addition to the Louth – Lisdrum 110kV Line this route would also cross the Louth – Shankill 110kV Line.

Red Route

This route needs to be carefully selected in the vicinity of the purple route takeoff point due to ribbon development and drumlin peaks. The route proceeds south from the purple route takeoff point towards a crossing of the Louth – Shankill 110kv line where routeing opportunities are limited by ribbon development and small lakes. The area between Shandonagh and Lough Egish is particularly limited. The route proceeds south from here threading through drumlins and avoiding ribbon development, crossing the R178 to the take off point of the red subroute.

Purple Route

This route proceeds south east from the take off point from the red route. After crossing the R181 the route enters an area of relatively sparse population and good routing possibilities until it approaches the R180 out of Carrickmacross. Although the drumlin density reduces the route options tighten up around Carrickmacross due to ribbon development.

Purple Sub-route

This route connects the purple route and the blue route. Routing in this area could be difficult due to drumlin and road density. Further work is necessary here to assess the combination effect of the Louth – Shankill 110kV line, Louth – Lisdrum 110kV Line and this route option in close proximity. However this route option is feasible.

4.2.6 Southern part of Study Area (Carrickmacross/Shercock Area to Flagford – Louth 220kV line)

The red route, blue route, purple route and the red sub-route cross this area. Restrictions in the area are as follows

(a) Assess Crossing of the N2 for blue route

(b) Avoid villages/towns of Kingscourt and Carrickmacross

(c) Avoid amenity areas and lakes around Kingscourt and Carrickmacross

(d) Avoid ribbon development and one off housing.

Blue Route

South of the R178 the line route is forced east by development hear Carrickmacross, a school, village of Aghafad. South of this area the line enters an area of relatively low population and road density including the crossings of the Louth – Meath Hill 110kV line, the River Glyde and the N2. Following the crossing of the N2 the route would be dominated by the station site selection.

Red Route

This route travels south to the west of Kingscourt and generally has reasonable routing options although further examination of the R162 and R165 road crossings is recommended. Again this route will be heavily influenced by the choice of station site.

Purple Route and Red Sub-route

There are route options for these route options although they are very restricted due to lakes, quarries and ribbon development as they thread between Kingscourt and Carrickmacross. The routes travel close to Meath Hill 110kV Station and the Louth-Meath Hill 110kV Line and the proposed Gorman – Meath Hill 110kV Line. Initial observations suggest that the line is likely to be forced west of Meath Hill 110kV Station.

4.3 Assumptions / Caveats of Route corridor

This section details the assumptions, comments and caveats associated with the aforementioned route corridors.

General Assumptions / Comments

- No survey took place of the proposed corridor nor was it walked. Only a very brief drive by survey of a sample of road crossings to check as to the feasibility of the corridor along with ensuring adequate clearances from existing developments.
- It is assumed no additional quarries, mines, airstrips, landfill sites will come on stream. Existing quarries will not extend beyond present geographical limits.
- The Route has not been agreed with the Planning authorities, Public bodies or landowners at this stage.

Planning permission for Substations

- Planning permission with EIS will be required for a new Kingscourt 220/275kV station and any short 220kV overhead line loop ins.

Protection of route corridor

- The corridor varies in width from 2 - 3 kilometers in some locations to pinch points of approx 100m elsewhere.
- It is assumed that the route corridor will not be further encroached by development including, ribbon housing development, transmission lines, roads etc.
- No additional areas are added to the NHA's, SAC's listings.
- No additional archaeological sites/monuments are added to listings.
- Urban commercial/residential zones are not expanded beyond present limits in towns e.g. Castlebleyney, Carrickmacross, Kingscourt etc.
- Additional scenic viewing points, scenic drives etc are not added by County Councils.
- Dismantled railways are not refurbished and used commercially again on or near the proposed route corridor.

Electrical Infrastructure

- Crossings of existing transmission lines were not investigated
- Conflicts with existing distribution network including 38kV, 10kV and LV have not been investigated or quantified
- Conflicts with existing communication lines including Eircom have not been investigated or quantified.
- No future transmission/networks lines are built in the corridor area.

4.4 Conclusion

This feasibility study identifies possible overhead line route options from Kingscourt to proposed border crossing. The approximate length of the route options is 45 kilometers. This route is dependent on a number assumptions as listed above in section 4.3.

There are 3 possible route corridors with 2 sub-route options. Routeing for all the options is very difficult in extensive areas. On balance a combination of route options is most likely with a substation site to the east of Kingscourt along the Flagford – Louth 220kV Line. This however will not be confirmed until a station site is fixed.

Of concern is the extent and spread of ribbon development that may impact on the route corridor chosen for this project especially around urban areas. Also the rapid growth of houses in the country side in the route corridor area will in time restrict the corridor chosen at this time.

The L8 pylons used in Northern Ireland are typically 35-45m in height and given that the terrain is mostly undulating drumlins of varying heights it should help break up short and medium impact. The negative side of this type of landscape is due to the loose scattering of drumlins which make it virtually impossible to reduce the number of angle towers and bends without compromising visual impact by moving onto higher ground.

5.0 COSTINGS

5.1 Introduction

This section provides the budgetary estimates of the project. The costs are split between station, overhead line and cable works. The costs are subject to a number of caveats as detailed below.

5.2 Caveats

The caveats associated with this project are divided into various categories as detailed below:

Financial

- All costs are preliminary and gross based on Unscoped Estimates
- The costs assume February 2004 construction rates. Some costs especially those related to steel prices are likely to have escalated considerably since then.

Technical

- The costs are unscoped, i.e. the scope of the project has not been defined.
- The costs only assumed a nominal amount of difficult foundations for transmission line structures.
- The costs assume standard materials will be used for construction, i.e. no special camouflaged conductor, no cold formed steel on towers, no camouflage painting of towers.

Third Parties

- The costs assumed only nominal difficulty from wayleaves, with Easement purchasing at most road crossings.
- The costs assume no financial burden associated with organized objection groups.

Construction

- The costs assume zero delay during construction phase.
- The costs assume no new archaeological site impacting upon the development will be discovered during construction,

5.3 Conclusion

From Table 1 it can be seen that the approximate cost of construction for the single circuit 275kV Line to the border is €47,560,000.

Table 1 Budgetary Estimates for Drumkee - Kingscourt 275kV Line

		Single circuit 275kV Lattice tower
		Total €
Overhead Line	45km in Republic.	35,100,000
Station	Kingscourt	12,460,000
Total (Lines & Stations)		47,560,000

Produced by: ESBI
Date: February 2005.

Assumptions / Notes:

All costs are preliminary and gross based on Unscoped Estimates
It is assumed that there are no excessive costs arising from the planning process, planning conditions or foundations
Overhead Line costs include allowances for wayleave compensation
A rate of €1.43 to £stg is assumed
Costs based on February 2004 costs as per Arva - Drumkee report
Costs north of the border have not been agreed with NIE

6.0 RECOMMENDATIONS

If a transmission line connection is required between Kingscourt and Drumkee 275kV station it is recommended that a detailed route assessment be undertaken based upon the potential route corridors as detailed in this report. The line route is approximately 45 kilometres.

It is recommended the line should be constructed using standard lattice steel towers.

It is recommended that detailed site investigation towards developing this study up to the standard of the Arva – Drumkee 275kV study be carried out to aid comparison between the options.

It is recommended that further work on potential Kingscourt 220kV site locations be carried out.

7.0 CONCLUSION

This feasibility report concludes that after investigating the requirement of additional transmission interconnecting route corridors between Northern and Republic of Ireland, that potential route corridors are currently available as detailed in this report and shown on the attached maps.

Indicative costs were provided on the same basis as that used for the previous Arva – Tyrone 275kV study.

These route corridors can accommodate an overhead line from a new 220/275kV station site in the vicinity of Kingscourt to a border crossing point.

The route corridor will remain under threat from expanding infrastructural development and one off housing. The corridor varies in width from 2 – 3 kilometers in some locations to a reduced width of approximately 100m at various pinch points.

APPENDIX

- **North-/South Interconnector – Route Options Map**