ADDITIONAL INTERCONNECTION BETWEEN NORTHERN IRELAND AND REPUBLIC OF IRELAND

SELECTION OF PREFERRED OPTION

Study References:-

Northern Ireland Electricity	***TREN/2000/5.7100/Z/00-007***
ESB National Grid	***TREN/2000/5.7100/Z/00-008***

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Additional North South Interconnector
Selection of Preferred Option

This document records the case for Kingscourt Drumkee which was presented to the steering committee. It is a formal record of the rationale for selecting Drumkee Kingscourt as the proposed option for further interconnection.

JUSTIFICATION FOR FURTHER INTERCONNECTION

Since 2001, ESB National Grid and Northern Ireland Electricity have carried out joint studies investigating further interconnection.

In July 2004, ESB National Grid and Northern Ireland Electricity provided the two regulators, CER and NIAER, with a summary of the results from the joint studies.

Following consideration of this information and other aspects, the regulators in October 2004, recommended to the two Ministers responsible for energy that there is a sound economic and strategic case for a second interconnector based on expected fuel savings, the potential for increased competition, increased flexibility in the provision of ancillary services, improved security of supply and system stability. The two Ministers subsequently endorsed this recommendation of the regulators.

The two regulators asked ESB National Grid and Northern Ireland Electricity to identify a preferred interconnector option and to progress this project.

TECHNICAL BACKGROUND

The most significant limitation on power transfers over the existing interconnector is the risk of system separation. Although there are two 275 kV circuits between Louth and Tandragee, these are carried on the same structures (a double-circuit line). There is a range of credible contingencies which could cause the loss of the double circuit line leading to the separation of the two systems. Power transfers must be limited to a level where the generation/load imbalance resulting from the system separation can be managed by both systems.

To date, planned power transfers have been kept below the level for which a system separation is acceptable. The construction of an additional interconnector is required to increase transfer capability between the two systems. With an additional interconnector, the loss of the Louth - Tandragee 275 kV double circuit will leave the systems connected by the new interconnector and will no longer lead to system separation. Consequently, the transfer limit across the interconnector can be significantly increased permitting greater trade in electrical power.

BENEFITS OF ADDITIONAL INTERCONNECTION

Based on the justification for additional interconnection given above, the criteria for selection of the preferred option for additional interconnection are:

- The additional interconnector must result in significantly increased transfer capacity in both directions
- The additional interconnector must avoid situations where a single event could lead to system separation.

The level of transfer capacity which is available on the transmission system at a given point in time depends on a number of variables including generation dispatch, and the level and distribution of demand across the system. In addition, the level of transfer capacity that technical studies show on a future network depends on further assumptions about future load developments, future generation developments and future network reinforcements. Therefore transfer capacity cannot be defined as a single figure – the circumstances vary and levels of transfer capacity will also vary accordingly.

An additional benefit of further interconnection is that the existing 110kV interconnectors could be used more fully and the remedial action scheme in place could be switched out.

EVALUATION OF OPTIONS

In assessing the capacity benefits of the alternative interconnector options, a very large number of scenarios was evaluated, resulting in a large quantity of transfer capacity results for the different options and all the scenarios. The selection of the preferred interconnector option was made on the basis of all the scenario results and not just on a single figure.

Options considered were:

1. Multiple 110 kV interconnection (three new cross-border 110 kV lines as a single project)
2. Arva - Drumkee 275 kV
3. Louth - Tandragee 400 kV or 275 kV circuit 3
4. Coolkeeragh - Srananagh 275 kV
5. Drumkee Kingscourt

In making the decision on a north south interconnector, the possible locations of the proposed east-west interconnector were taken into account.

PREFERRED OPTION FOR ADDITIONAL INTERCONNECTION

A new Kingscourt - Drumkee circuit, connecting to a new transmission station in the vicinity of Kingscourt and looping into the Flagford - Louth 220 kV circuit, is the preferred option to provide additional interconnection. A single transformer will be located at the proposed Kingscourt station. This option is shown in Fig.1.

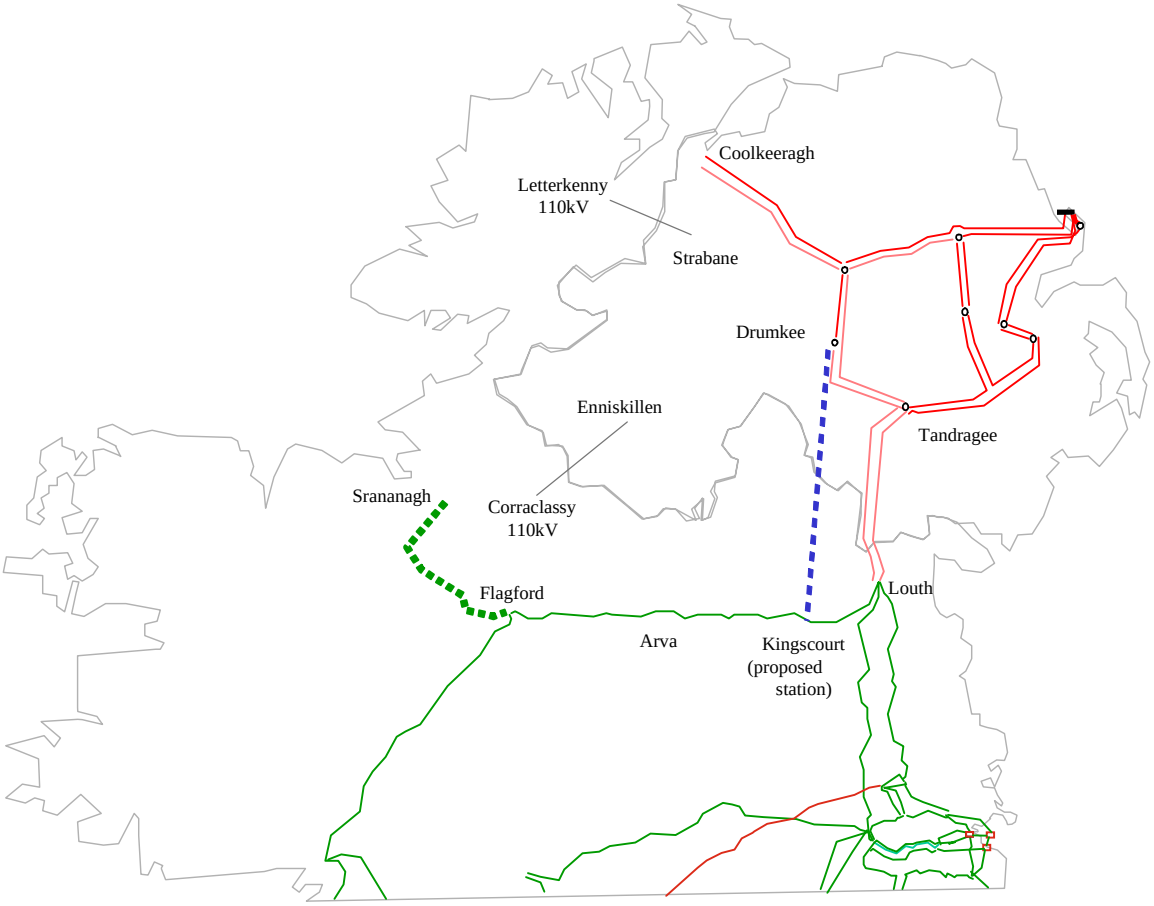

Figure 1. – Present 400/275/220 kV networks with proposed additional interconnector circuit and approximate location of new Kingscourt station.

This interconnector option satisfies both criteria for additional interconnection. It facilitates a significant increase in power transfer capability in both directions. It is robust in that a complete station outage at either Louth or Tandragee will not result in a system separation and the loss of all interconnector circuits.

The following table shows the transfer capabilities of the existing network and the transfer capabilities for the mid-country Kingscourt Drumkee interconnector development option. The transfer capabilities are quoted for power transfers between Dublin and Belfast and vice versa and are made on the basis that additional internal reinforcements are implemented. The existing transfer capability is limited by the system separation limit.

	Power to Republic of Ireland Belfast to Dublin			Power to Northern Ireland Dublin to Belfast		
	Winter Peak	Summer Peak	Summer Night Valley	Winter Peak	Summer Peak	Summer Night Valley
Existing	460	450	120	295	240	144
Mid Country Kingscourt Drumkee	727	770	>600	721	564	> 500

Consideration will be given during Phase 1[1] as to whether 275 kV or 400 kV construction should be used for the new interconnector – a recommendation will be developed by ESBNG and NIE. This recommendation will be based on balancing the long-term strategic view, integration with existing networks, accepted design standards, rating required, cost and environmental implications.

The Kingscourt – Drumkee option is consistent with the strategic development of the network. The proposed new station at Kingscourt also has the added benefit of providing additional flexibility in the further development of the transmission network between Dublin and the north east. Depending on construction and operating voltage it could facilitate the eventual extension of the 400 kV system to the north east and across the border. The site for the new station at Kingscourt will be sized to facilitate the expansion to a 400/220 kV station, if required. Provision of 400kV can be fully allowed for in the design of the new stations at Drumkee and Kingscourt, therefore minimising construction risks in extending stations.

Taking account of the uncertainties in the final scope, the estimated total project cost (i.e. the sum of costs on both sides of the border) is in the region of €100 - €150 million, for the interconnector only. This option is recommended as the preferred option, since it is the least cost option which satisfies the criteria for additional interconnection and it also provides a good platform for future growth.

[1] Phase 1 includes the work up to the submission of the planning application

ALTERNATIVE INTERCONNECTOR DEVELOPMENT OPTIONS

As reported above the other alternative options to the preferred option were identified as below:

1. Multiple 110 kV interconnection (three new cross-border 110 kV lines as a single project)
2. Arva - Drumkee 275 kV
3. Louth - Tandragee 400 kV or 275 kV circuit 3
4. Coolkeeragh - Srananagh 275 kV

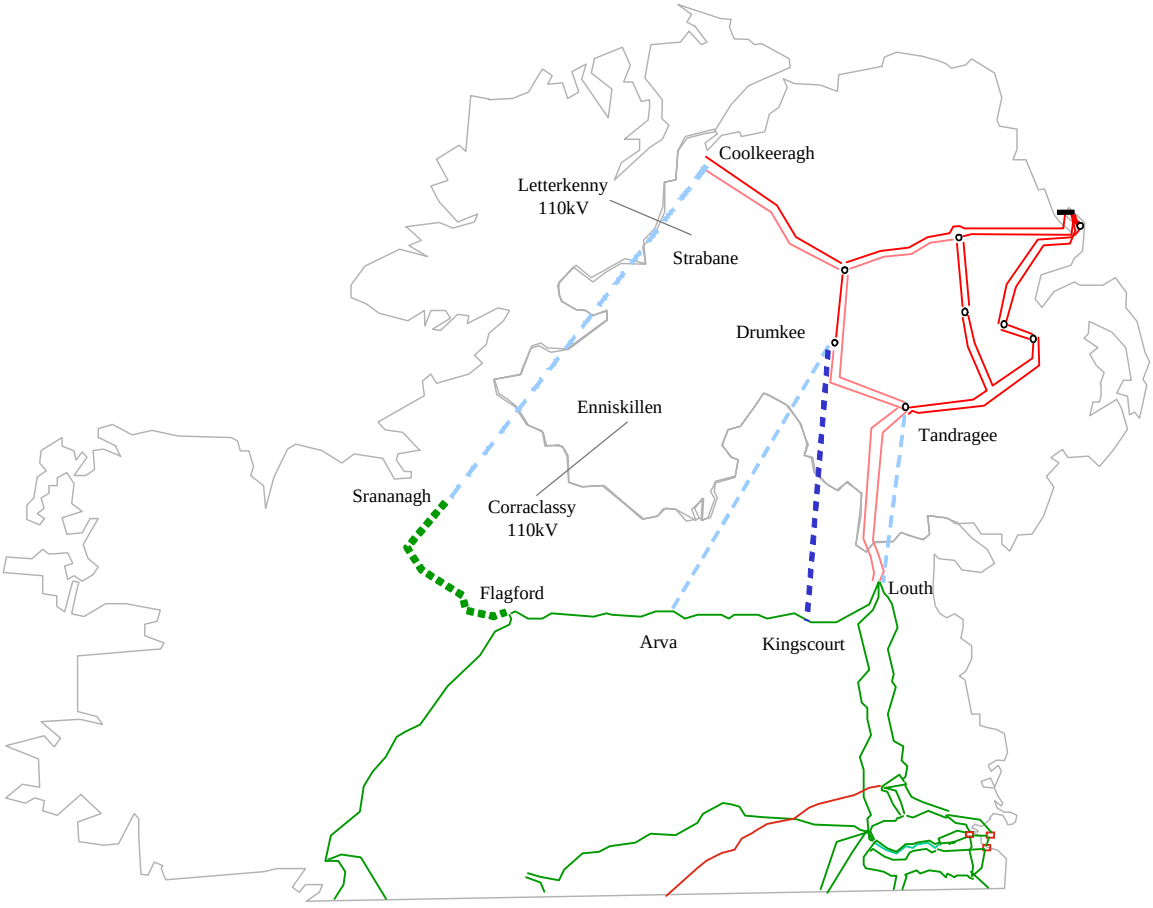

Figure 2. – Present 400/275/220 kV networks with possible options for new 400 kV or 275 kV north south interconnector circuit (shown as dotted blue lines, preferred option in dark blue).

Multiple Additional 110 kV interconnections

The construction of multiple additional 110 kV circuits will not increase the transfer capability in either direction. The loss of the Louth Tandragee 275kV double circuit would still result in system separation and so there is no increase in transfer capability. Therefore

this option is rejected on the basis that it does not comply with the first criterion for additional interconnection.

The 110kV interconnections on their own are not appropriate for facilitating large scale power transfers between the two systems. However, if one of the other projects considered here is implemented, it will eliminate the need for the system separation remedial action scheme. This increases the reliability of all 110kV interconnectors between Northern Ireland and the Republic of Ireland which makes it more likely that additional 110kV interconnection will be considered in the future as an option for local reinforcement.

Arva - Drumkee 275kV

An alternative to the preferred interconnection would be to terminate the interconnector close to the existing Arva 110 kV station. Arva is situated very close to the Flagford - Louth 220 kV circuit and there is sufficient space in Arva to accommodate a 220 kV busbar and a 275/220 kV transformer. Technical studies have indicated that this alternative would provide similar transfer capabilities to the preferred option. However, the Arva - Drumkee option is longer than the Kingscourt - Drumkee option (100 km v 82 km) and is consequently more expensive. In addition, the Arva - Drumkee option does not offer the synergy with future reinforcement of the Dublin - Louth corridor.

The Arva - Drumkee 275 kV option is rejected on the grounds that the additional expense does not provide any additional benefits compared to the Kingscourt - Drumkee option

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Louth - Tandragee 400 kV or 275 kV circuit 3

An alternative to the proposed interconnection would be for a new third circuit between Louth and Tandragee. This circuit would be shorter than Kingscourt - Drumkee.

The primary purpose of the proposed interconnector is to eliminate the risk of a system separation. A third Louth – Tandragee line would not fulfil this purpose as

- the routes of the existing and new circuits would be unacceptably close,
- the new circuit would have at least one crossing with the existing circuits
- the existing and new interconnectors would terminate in both Louth station and Tandragee station.

A risk analysis indicates that it would be unacceptable to have multiple interconnectors along the same corridor and terminating at the same transmission stations, as one incident could trip all the interconnectors. While this is a relatively unlikely event, there have been a number of such incidents in Ireland and elsewhere in the past few years, for example;

- A cable bushing explosion at Inchicore resulted in full station disconnection,
- A protection mal-operation in Tarbert resulted in disconnection signals being issued for all the 220kV circuits,
- A fire in Castlereagh 275 kV station required full disconnection of the 3 interbus transformers at the station,
- An ice storm close to Ballylumford resulted in three out of four 275kV lines being disconnected from the station,

- Lightning near Ballylumford, which disconnected most 275 kV circuits out of the station,
- Salt accretion at Kilroot resulted in full disconnection of the station,
- Operator error involving earthing resulted in full disconnection of Magherafelt 275kV substation & thus the double circuit 275kV to Coolkeeragh,
- The 2003 blackout in Sweden and Denmark caused by a single unlikely failure in one substation.

The Louth – Tandragee option is rejected on the basis that it does not comply with the second criterion for additional interconnection i.e. that the additional interconnector must avoid situations where a single event could lead to system separation.

It is estimated that Louth Tandragee 3 would cost approximately 20% less (approx €20-€30 million less) than the preferred option of Kingscourt- Drumkee.

Separate stations could be developed at both terminal points (Louth and Tandragee) to mitigate multiple failures at the terminal points. This proposal would cost approximately an additional €15 million, but would still not solve the possible line-related failures leading to a full loss of all interconnection.

Coolkeeragh - Srananagh 275 kV

The option of a 275 kV circuit from Coolkeeragh in Derry to the proposed Srananagh 220 kV station in Co. Sligo was considered. For power transfers in the south to north direction, the Coolkeeragh Srananagh interconnector would offer a transfer capacity that is significantly less than that achievable with the Kingscourt - Drumkee interconnector. In addition, this option is significantly longer (125 km compared with 82 km) and consequently more expensive than the preferred Kingscourt – Drumkee line option.

Consideration was given to whether there were any synergies between Coolkeeragh Srananagh and the possible future reinforcement of Donegal (such as by facilitating a 275/110 station in Donegal). NIE are considering a 275kV western loop to facilitate sustainable energy development. It was found that the considerable extra cost and inferior transfer capacity performance of Coolkeeragh Srananagh compared to the proposed option more than offset any possible synergies.

Coolkeeragh - Srananagh 275 kV is rejected on the basis that it does not comply with the first criterion for additional interconnection and that it is considerably more expensive than the preferred option.

CONCLUSION

Of the options considered, the preferred option is Kingscourt – Drumkee.

It is the least cost option which complies with the criteria for additional interconnection

- increase transfer capability significantly in both directions
- the additional interconnector must avoid situations where a single event could lead to system separation

REVIEWED

This document records the case for Kingscourt Drumkee which was presented to the steering committee prior to both companies proceeding to obtain internal approvals to progress the project.

It is a formal record of the rationale for selecting Drumkee Kingscourt as the proposed option for further interconnection.

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