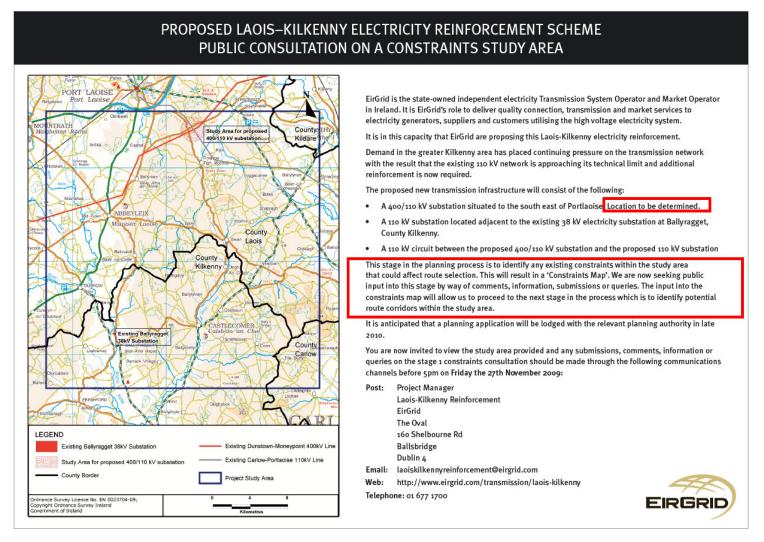
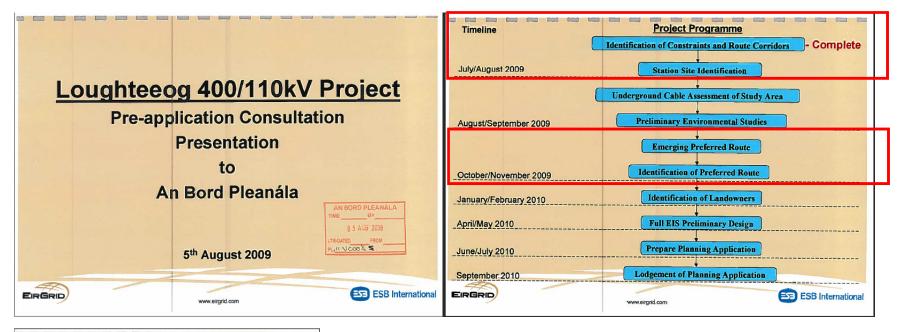
[Ref. 001] - Week commencing 26th October 2009, Semi-State developer, Eirgrid placed the first public notice for the project in local newspapers:



 $\frac{\text{http://www.eirgridlaoiskilkenny.ie/media/pdf/21\%20The\%20Final\%20Planning\%20Application\%20(Jan\%202013)/Vol\%202\%20Planning/Stage\%201\%20Applendices/Appendix\%20F-1\%20Newspaper\%20Notice\%201\%20-\%20Oct\%202009.pdf}$

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[Ref. 002] – Extracts from EirGrid presentation at ABP preconsultation meeting 05th August 2009. (this information was not published by ABP)



An Bord Pleanála Advice Required

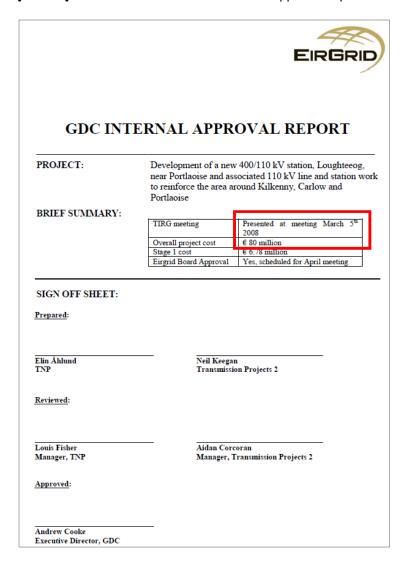
- · Direction is sought on whether this project is deemed to fall under the remit of the Strategic Infrastructure Act:
- · Advice on the procedural requirements for the application if it is deemed to be Strategic:
- · Advice regarding the scoping of the EIS;
- Are there any specific stakeholders to be considered (other than statutory bodies)

ESB International

See also Annex 2 - Drawing no PE687-D261-002-001-001 "preliminary Route Selection" for map also presented at this meeting.

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[Ref 003] - Extract from EirGrid GDC Internal Approval Report dated 05.03.2008



Loughteeog GDC Internal Approval report

The need for the project will be in accordance with the Transmission Planning Criteria and will be reviewed at critical stages of the project

Route/Site Acquisition;

Risk:

That a site for a substation in the required location or a route for the overhead line is impossible to achieve.

Mitigation

EirGrid will at the earliest possible stage identify and procure a substation site. Routing for the overhead lines will be carried out in accordance with standard routing criteria. If a route is completely blocked other alternatives including undergrounding will have to be considered.

Primary consultant pulls out of project

Risk: The primary engineering consultant pulls out of the project

Mitigation:

EirGrid will have available alternative consultants from a framework panel who will be able to complete the work.

7.2 Development Risks

7.2.1 Stations

The location for a new 400 kV station is dictated by the proximity to where the existing Dunstown-Woodland 400 kV and Carlow-Portlaoise 110 kV dissect each other. The area has a reasonable amount of ribbon development in place as it is adjacent to a crossroads and is in close proximity to the town of Portlaoise. There are a number of planning applications in the area that are before the planning authority awaiting decision.

A new 400 kV GIS station with reduced site area increases the number of potential sites and options for procurement as opposed to the AIS type. The area has two existing transmission lines in place (Dunstown–Woodland 400 kV and Carlow–Portlaoise 110 kV lines) and the introduction of a new station and its associated loop ins is likely to generate a degree of individual and organised resistance.

Acquisition of a suitable 400 kV station site is a prerequisite to proceed with the development. There is sufficient area adjacent to Ballyragget 38kV station to construct a new 110 kV station on lands in the ownership of ESB.

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[Ref 003] continued

Loughteeog GDC Internal Approval report

2 Justification

There are three network problems in the Kilkenny and Carlow area which will be outside Transmission Planning Criteria (planning standards) in the coming years resulting in unacceptable supply to customers. These are as follows:

- a) From October 2010 there will be unacceptable voltages at the Kilkenny 110 kV station following an outage of the Kilkenny Kellis 110 kV line. This is the case even with the approved capacitor installed in Kilkenny 110 kV station (2 x 15 MVAr).
- b) Load forecasts show that by summer 2019, over 80 MW of distribution load will be lost during the combined maintenance trip outage of the Kellis Kilkenny 110 kV line and the Great Island Kilkenny 110 kV line. If Kilmurry station is progressed by the DSO as planned; with Kilkenny connected into the Great Island Kilkenny line, this load level will occur from summer 2011, based on the demand growth used in the Transmission Forecast Statement 2007 2013. which is 3.8%.
- c) From March 2010, during the maintenance outage of either of the Carlow -Kellis 1 or 2 110 kV lines, the subsequent loss of the other will result in voltage step violations at the Carlow, Pollaphuca and Stratford 110 kV stations.

In addition from October 2013, voltages at Kilteel, Newbridge, Baroda, Monread, Portlaoise, Cushaling, Blake and Thornsberry will start to fall below minimum levels for a variety of outage conditions.

3 Transmission reinforcement options considered

Several alternative transmission reinforcements were considered to solve the identified violations described in the above section 2, Justification. The alternatives are presented below:

- 1. New 400/110 kV station, Loughteeog, and associated 110 kV line
- 2. New 220/110 kV station located in Kilkenny
- Second Kellis Kilkenny 110 kV line and looping of existing Maynooth Turlough Hill 220 kV line into new Pullaphuca 220 kV station.

The following sections provide for each option a brief description, a commentary on their technical performance and a comparison of costs.

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Loughteeog GDC Internal Approval report

5 Other issues considered

5.1 Feasibilities Reports carried out

Three high level feasibility reports have been carried out by our consultants ESBI, regarding the proposed development and potential alternatives. As the investigation has evolved over a number of years the two reports contain a number of potential reinforcements, some of which are not relevant to the identified network problems mentioned in section 2, Justification and some which have been used as potential alternatives to solve the problems. The three reports are listed below and a short description of each is given.

- Abbeyleix proposed Station Site Feasibility, EirGrid, dated 27th April 2006.
 - This report is a desktop study for possible 400/110 kV sites in the vicinity of the Dunstown Moneypoint 400 kV line near Abbeyleix, Co. Laois. Different layouts of the station were also investigated. Costs were not provided.
- High level Feasibility Study for Kilkenny Area Reinforcement, ESBI, PE867-R160-009-001-000, dated 8th May 2006.
 - This report investigates different 110 kV options to reinforce the area around Kilkenny and Cahir 110 kV stations.
 - Potential route corridors were developed during a desktop study and then verified with on-site investigations. The potential corridors were selected based on achieving a balance between environmental, technical and economic criteria
 - Breakdown of costs for each individual option was also given. In addition, costs were also provided for the proposed new Abbeyleix $400/110\ kV$ station.
- Portlaoise 400 kV station and associated 220 kV and 110 kV lines, PE 687-R224-001-001-000, dated 24th January 2008.
 - This report determines the feasibility of a new 400 kV station near Portlaoise. The new station should facilitate looping of both the existing Dunstown Moneypoint 400 kV line and the Carlow Portlaoise 110 kV line. The scope included the feasibility of a new 110 kV line route between the new 400 kV station and ballyragget 38 kV station.
 - Potential route corridors were developed during a desktop study and then verified with on-site investigations. The potential corridors were selected based on achieving a balance between environmental, technical and economic criteria.
 - Site assessment for the 400 kV station was also undertaken for potential sites. A number of potential sites were identified, but further investigations will be needed to define suitability and availability.

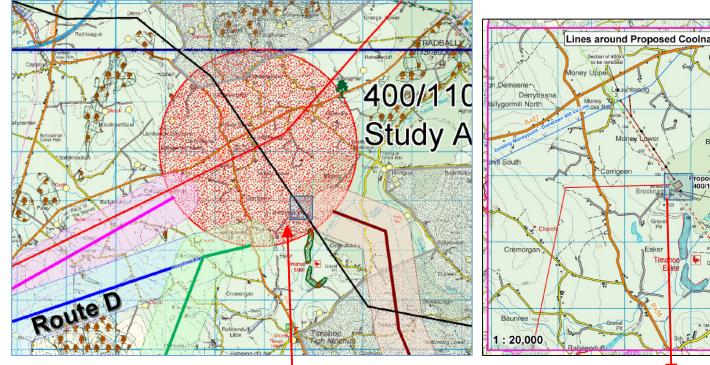
Breakdown of costs for each individual option was also given.

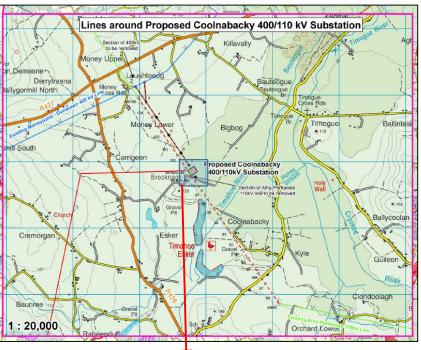
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[Ref 004] - Comparison between original preliminary route map, left (prior to any public notice) and final substation location, right.

Extract from Map 1 (see Annex 2 for original)	Extract from Map 2 – Final confirmed Laois substation location
Original map to ABP and Laois County Council prior to any public notice. Date: 21.07.2009 Title: Loughteeog 400/110kV project, Preliminary Route selection	Link to original: EirGrid drawing no PE687-D261-021-003-002 Date: Dec 2012 Title – Laois-Kilkenny Reinforcement Project Overview with Structures

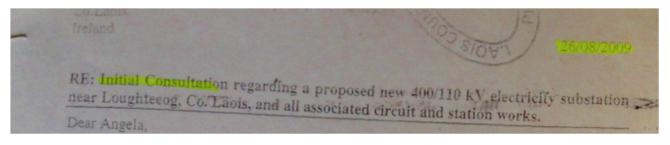




Extract from Map 2 = Final location of Laois substation. Emphasis added by us for this comparison to highlight location of Coolnabacky substation-see blue square.

Extract from Map 1 = Transferred to original pre-consultation map to demonstrate convergence of pre-defined routes on this site prior to all consultations.

[Ref 005] – Extracts from ESBI letter dated 26.08.2009 to Laois County Council on behalf of EirGrid seeking comments on preliminary routes:



This proposed project involves construction of a new 400/110kV station near Loughteeog, near Portlaoise, County Laois and a new 110kV transmission circuit (overhead line or underground cable). The new station will be looped into the existing Dunstown-Moneypoint 400kV overhead line and the existing Carlow-Portlaoise 110kV overhead line (future Athy-Portlaoise 110kV overhead line when the Athy substation and loop-in is complete). In addition, a new 110kV circuit will be constructed to connect the new 400/110kV station to a new 110kV station located adjacent to the existing Ballyragget 38 kV electricity substation.

The second attached A3 map (ref. PE687-D261-002-003-000), is a 'Preliminary Route Selection Map' and shows preliminary potential route corridors for both overhead line and underground cable options.

The study area is defined as the broad geographical area within which the potential alternative route corridors are located. It is approximately 735km² in area (26km x 28km). A route corridor is defined as a corridor approximately 600m wide within which the electricity transmission circuit could be located.

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[Ref 006] – Extracts from EirGrid report dated 18th October 2009 *"Investigating the Impact of HVdc Schemes in the Irish Transmission Network"* <a href="http://www.pleanala.ie/misc/PCI/PCI1/DAF2/2.0%20Missing%20Information/3.0%20Requested%20Reference%20Docs/7.0%20TransGrid%20Solutions%20Inc%20(2009)%20Investigating%20the%20Impact%20of%20HVDC%20Schemes.pdf

EirGrid plo Investigating the Impact of HVdc Schemes in the Irish Transmission Network Final Report

Executive Summary

EirGrid.NIE/SONI are currently faced with the challenge of expanding and modifying the meshed Irish AC network in order to accommodate increasing demand for electricity, connection of large amounts of renewable generation, and facilitating greater cross-border power transfers between Northern Ireland and the Republic of Ireland while still maintaining security of supply. As part of a solution to the challenge, EirGrid/NIE/SONI are investigating the feasibility or otherwise of using HVdc schemes to develop the transmission system of the Republic of Ireland and Northern Ireland.

The purpose of this study is to investigate the impact of HVdc schemes in the Irish Network and to compare these HVdc schemes to equivalent AC solutions for various scenarios. Four scenarios were investigated to compare various AC and HVdc schemes, including:

- 1) Scenario 1 North-West Wind
 - This scenario investigated the connection of 480 MW of wind in the north-west Mayo region via transmission from Bellacorick to Flagford. The study compared a 220 kV AC line to a voltage source converter (VSC) HVdo system.
- 2) Scenario 2/3 North-South Interconnector
 - This scenario compared a 400 kV AC line, a three-terminal line-commutated converter (LCC) HVdc system and a three-terminal voltage source converter (VSC) HVdc system, to connect Northern Ireland to the Republic of Ireland with terminals at Turleenan, mid Cavan and Woodland. This line is referred to as the North-South Interconnector.
- Scenario 4 Drawing Power out of the Cork Region
 This scenario compared 400 kV AC transmission to two voltage source converter (VSC) HVdc schemes in order to draw power out of the congested area near Cork.
- 4) Scenario 5 System Expansion in Northern Ireland

This scenario performed a very high level stability investigation into the potential feasibility to connect a five-terminal voltage source converter (VSC) HVdc system in Northern Ireland. The equivalent AC solution would be a five-terminal double circuit 275 kV AC line; however this scenario did not directly compare the AC option to the HVdc option.

The study aims at providing technical comparisons between HVdc and AC solutions. Simulation cases considered year 2020 base cases prepared by the EirGrid/NIE/SONI team.

Steady state contingency analysis, short circuit analysis, transient stability analysis, harmonic frequency scans and subsynchronous resonance (SSR) screening were performed to derive a basis for comparison of the technical performance of the AC and HVdo transmission solutions.

Please note that for clarity of explanation throughout this report, an HVdc bipole is referred to as an HVdc system that can continue to operate with one of the two poles being out of service, a monopole cannot. A bipolar HVdc system can continue to transmit power (up to the rating of the remaining pole) with one pole out of service. This report does not necessarily mean that bipole refers to two conductors and monopole to one conductor, which is a widely-used definition. Specifically confusion can arise as to the definition of a monopolar VSC system; despite the fact that it requires two conductors it cannot operate with one of those conductors out-of-service, unless it has been designed to operate as a bipole.

During the loss of one HVdc pole, the possibility of allowing a current flow through ground (or sea ground) is not always considered due to environmental constraints. Therefore, more often considered is the possibility of using the so-called metallic return, which is the use of the other HVdc conductor as a return path for the current in case of a loss of one valve group at a substation, thus, allowing half or even more than half of rated power, under that condition. A third conductor to be used as a spare is less often found due to economic reasons but could also be implemented. All of these possibilities are normally considered in the feasibility phase of the project studies and the technical, economic and environmental results are combined towards the adoption of the final configuration of the project.

TRANSGRID

R1116.03.04, Page 7 Oct-18, 2009 © TransGrid Solutions Inc. 2009 EirGrid plo Investigating the Impact of HVdc Schemes in the Irish Transmission Network Final Report

Study Tools and Models

5.1. PSSE

The primary study tool for this project is the PSSE loadflow and stability software package which is an industry standard worldwide. PSSE was used to perform the steady state, short circuit and transient stability analysis as described in upcoming Section 8 on Study Methodology.

5.1.1. Republic of Ireland and Northern Ireland Transmission Networks

5.1.1.1. Power Flow Models

Wind power generation is growing rapidly both in the Republic of Ireland (RoI) and Northern Ireland (NI). RoI's target is to reach 40% of Ireland's gross electricity from renewable resources by 2020. Conventional generation is also growing to meet the growing demand. For the purposes of this study it was decided to use the year 2020 base cases to ensure adequacy of the proposed transmission solutions at the high wind generation conditions.

During the course of this study, the East-West HVdc Interconnector was at the tender evaluation stage. It was not known at that time whether the link would use LCC or VSC technology. To consider the more difficult scenario this link was modeled as a conventional LCC based HVdc link. The contract has since been awarded and the East-West HVdc interconnector will use VSC technology.

Table 5.1 shows the list of power flow cases that were studied for each scenario.

Detailed generator dispatches for each power flow can be found in Appendices A-6, B-6, C-6 and D-2.

Table 5.1. PSS/E Power flow cases: Year 2020

Case	Description	

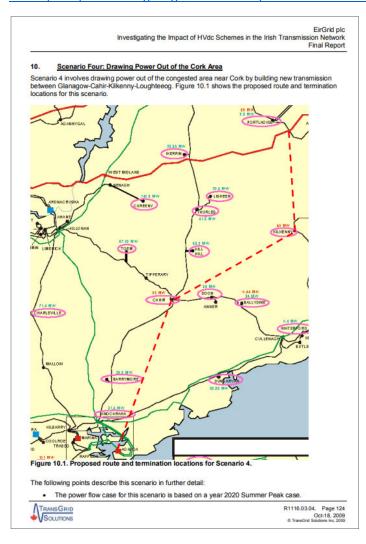
Scenario 4 4.1 Summer Peak Max wind in southwest 500 MW export to Wales 425 MW export to Scotland (75 MW of static reserve maintained) Turlough Hill pumping at full capacity (if necessary) Thermal generation maximized in Cork region except Marina and Aghada OCGT, generation elsewhere dispatched according to merit order and security of supply/power quality requirements Scenario 5 5.1 Based on power flow case 2.1

5.2 • Based on power flow case 2.4

5.1.1.2. Dynamic Models

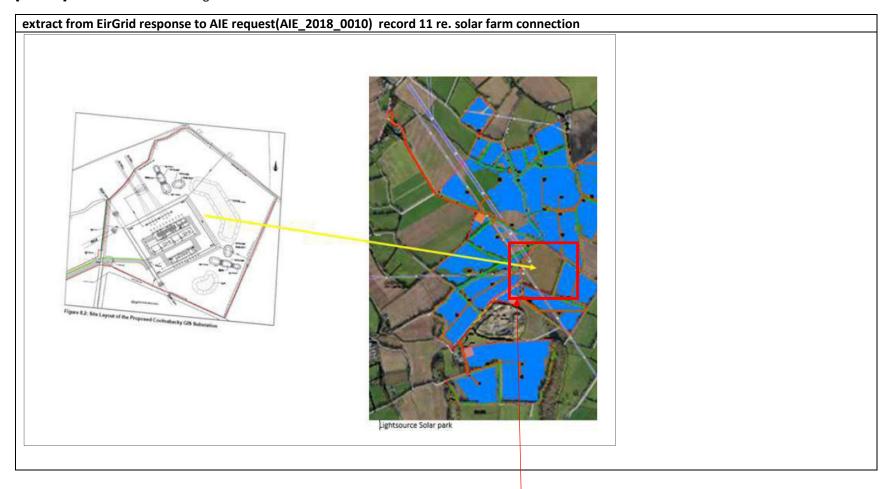
Dynamic models representing the year 2020 base cases used in the study were provided for the RoI and NI transmission network, including wind farm dynamic models and user-written models.

[Ref 006]continued – Extracts from EirGrid report dated 18th October 2009 "Investigating the Impact of HVdc Schemes in the Irish Transmission Network" <a href="http://www.pleanala.ie/misc/PCI/PCI1/DAF2/2.0%20Missing%20Information/3.0%20Requested%20Reference%20Docs/7.0%20TransGrid%20Solutions%20Inc%20(2009)%20Investigating%20the%20Impact%20of%20HVDC%20Schemes.pdf



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[Ref 007] – Solar farm surrounding Laois Substation



Red box above shows location of Laois-Kilkenny reinforcement project – Coolnabacky substation

Blue areas show intended solar farm

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[Ref 008] – extracts from EirGrid in response to AIE request (AIE_2018_0010) re. solar farm connection

Among other things, AIE_2018_0010, was a request for:

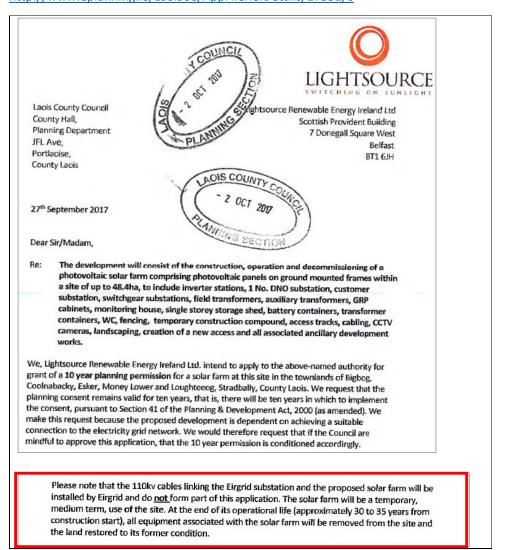
"A copy of all documents concerning the grid connection between the proposed massive Lightsource solar farm in Laois and the proposed Laois-Kilkenny reinforcement project in Co. laois." Including the initial correspondence with the developer indicating a grid connection, the documents showing the different connection options considered and correspondence with the developer discussing connection options.

Response included the following records:

14.	Type of Record: pdf document Title: Construction Designs from customer, commercially sensitive info Dated: 31/03/2014	Refuse	Article 9(1)(c) of the AIE Regulations Article 9(2)(c) of the AIE Regulations	Commercially sensitive information, third party requested to withhold this information In determining to Refuse release of this record, I have had regard to Article 10(3) of the AIE Regulations: and Article 10(4) of the AIE Regulations
31.	Type of Record: email Title: Internal Confirmation of project being connected to Coolnabacky Dated: 18/05/2018	Refuse	Article 9(1)(c) of the AIE Regulations	The release of information could be detrimental to the commercial interests of an individual or company and the protection of this information has been provided for in national or Community law to protect a legitimate economic interest In determining to Refuse release of this record, I have had regard to Article 10(3) of the AIE Regulations and Article 10(4) of the AIE Regulations

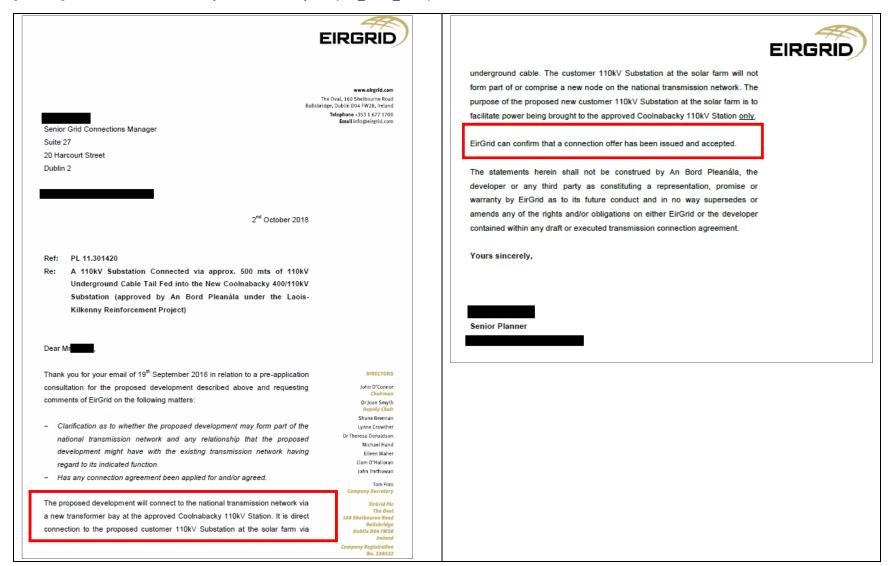
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[Ref 009] – extracts from Loughteogue Solar Farm planning application (Planning reference 17532 Laois County Council - http://www.eplanning.ie/LaoisCC/AppFileRefDetails/17532/0



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[Ref 010] - extract from EirGrid response to AIE request (AIE_2018_0010) record 17 re. solar farm connection



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