MINUTES OF THE MEETING OF

THE NETWORK OPTION ASSESSMENT COMMITTEE (the "NOA Committee" or the "Committee")

Held in

National Grid House, Warwick Technology Park, Warwick CV34 6DA On Tuesday 11th December 2018 at 10:00

Present: Duncan Burt (Chair)
Roisin Quinn
Audrey Ramsay for Richard Smith
Julian Leslie
Marcus Stewart

Apologies: Richard Smith

In attendance: Hannah Kirk-Wilson – Technical Secretary
Jingchao Deng – NOA 2018/19 Lead
James Greenhalgh – Electricity Customer Connections Manager
Iain Shepherd – NOA CBA South Lead
Tom Poffley – NOA CBA North Lead
Kelvin Lambert – NOA Lead
Jason Hicks – NOA CBA Lead
Mark Pearce – NOA CBA Technical Specialist
Kevin Tse – Pathfinding Project Lead – for minutes 6
Mostafa Nick – Pathfinding Project Lead – for minutes 6
James Whiteford – System Capability Manager – for minutes 10 onwards
Roddy Wilson – Transmission System Planning & Investment Manager, SHET – for minutes 7 & 8*
Malcolm Barnacle – Transmission Senior System Planning & Investment Engineer, SHET – for minutes 7 & 8*
Eric Leavy – Head of Transmission, SPT – for minutes 7 & 8*
David Adam – Transmission Networks Manager, SPT – for minutes 7 & 8*
Kirsten McIver – Senior Design Engineer, SPT – for minutes 7 & 8*
Mark Perry – System Design Manager, NGET TO – for minutes 7 to 10
Le Fu – NOA Lead, NGET TO – for minutes 7 to 10
Nicola Todd – NOA Lead, NGET TO – for minutes 7 to 10
Clothilde Cantegreil – Head of RIIO Electricity Transmission, Ofgem

*Joined by teleconference

1	**Welcome and apologies for absence**
	[This section is redacted due to its administrative nature]
2	**Meeting governance and process**
	[This section is redacted due to its administrative nature]
3	**Minutes of the NOA Committee meeting of 24 September 2018**
	[This section is redacted due to its administrative nature]

4	**Actions arising from previous NOA Committee meetings**
	[This section is redacted due to its administrative nature]
5	**Pathfinding projects**
	The following document, presented by Dr Pearce and distributed prior to the meeting was taken as read: • NOA Committee Briefing – Topic 7 & 9 Mr Burt invited Dr Pearce to provide an overview of how commercial solutions have been treated in the NOA this year. The following points were noted: • Commercial solutions were considered in 3 areas of the network. • Prices are based on historic contracts and assumed that a commercial solution is armed all year. • Optimal paths evaluated with and without commercial solutions. • There was no change to the south optimal path without commercial solutions. • For the North there was a small change to the optimal path. [This section is redacted due to its commercially sensitive nature]. Mr Burt invited comments from the Committee. • It was noted that there are also delivery risks with asset solutions as well as commercial. • Mr Leslie highlighted the complexity that needs to be addressed with multiple tripping schemes. • The Committee noted that all options should be treated equally. All options need a degree of engineering and have delivery risks. [This section is redacted due to its commercially sensitive nature]. The following document, presented by Mr. Tse and distributed prior to the meeting, was taken as read: • Topic 5 – Pathfinding project update Mr. Burt invited Mr. Tse and Mr Nick to provide an update on the progress of the Pathfinding projects. The following points were noted: • Mr Nick provided an update on the Thermal probabilistic analysis o A tool has been developed to facilitate the year-round boundary capability analysis. o This looks at a broader range of background conditions and highlights the magnitude and likelihood of events on the transmission network. o The tool developed estimates the likely power flow on individual transmission circuits or a group of circuits at a boundary level. o New boundary identified in the South which was used for analysis. o Where there is high variation in network flows due to network configuration and generation types, this type of analysis is required to understand boundary capability variation. o Aim is to use this technique for validation and support of the boundary analysis. o The Committee is supportive and interested in expanding use of this approach. **Action 10.1:** Mr Nick to come back to the April / May NOA Committee with plans

	of how the thermal probabilistic technique is to be incorporated into the NOA 2019/20 cycle.
	
	• High voltage
	  ○ Work is progressing in the Pennine region. The needs of 4x200Mvar reactive support are justified through the technical and economic analysis.
	  ○ Considering asset solutions the best combination of assets at the moment in 3 TO solutions and 1 DNO solution.
	  ○ [This section is redacted due to its commercially sensitive nature]
	  ○ A report on this will be published via the ENA Open Networks project Work stream 1 Product 1 by the end of the year.
	  ○ [This section is redacted due to its commercially sensitive nature]
	
	[This section is redacted due to its commercially sensitive nature]
	
	• **Action 9.2** – Work with Ofgem to develop the funding process to support DNO options for addressing transmission system needs.
	  ○ **Update** – There are ongoing discussions with Ofgem on funding routes with concerns on their side around which customers pick up the cost of any solution. This action remains open.

6	**Future Energy Scenarios data input**
	[This section is redacted due to its commercially sensitive nature]
7	**Scotland and the North of England**
	The following document, presented by Dr. Pearce and Mr. Hicks and distributed prior to the meeting, was taken as read: • NOA Committee Briefing – Topic 7 & 9 (Scotland and the North of England)
7.1	**Regional Results**
7.1.1	**Optimal path and narratives (including Commercial Solutions)**

	Mr. Burt invited Dr. Pearce to provide an update on the findings in Scotland and the North of England. The following points were noted:
	
	• Dr. Pearce provided an overview of the key changes in the process to last year. This includes the use of European scenarios to better model interconnector flows, variation of boundary flow dependant on interconnector behaviour, introduction of new power flow control devices and the introduction of commercial solutions.
	• Commercial solutions:
	  ○ Commercial solutions considered a 1GW solution.
	  ○ One considered for the North which defers one asset based solution.
	  ○ This asset is only required under one scenario if commercial solutions are not considered.
	  ○ Recommendation of the Committee was not to proceed with the Harker MSC.
	  ○ Mr Perry noted that commercial solutions cannot provide winter peak capability and expressed concerns on how commercial

	solutions are used in line with SQSS. o Mr Burt noted the ESO needs to provide clarity on how commercial solutions will be used and that it needs to be discussed at the SQSS Committee. o Mr Burt noted that the SQSS Committee needs to make a decision on the use of commercial solutions to provide network capability. Important for RIIO-2 and NOA cycle. o The only investment decision changed on the use of commercial solutions is the Harker MSC. If there is derogation required, it is for that scheme only and for the South and East any derogation would be on the basis until the asset investments are delivered. **Action 10.3:** ESO to define a policy for the use of multiple commercial solutions in any zone until this issue is reviewed and decision made via the SQSS Committee. Initial steer from the NOA Committee is that one major system per region is a starting point – Mr Harvey for May meeting. • Results Highlights: o 48 non-marginal options are non-optimal, 49 non-marginal options are optimal but not critical, 31 options are optimal and critical. o Mr Burt queried whether anyone had any queries on any non-marginal schemes. Mr Perry had some queries on the Power Flow control schemes. Mr Poffley provided an overview of the optimal paths for the North region. The following points were noted: • Aim of the north is to get power from Scotland to England as fast and as cheaply as possible due to the large build-up of renewable generation. • There are three changes to last year's proceed recommendations – MRUP, CPRE and NOR1. • Mersey Ring Uprate (MRUP) – this is not required as there are high flows on the other side of the network and there is a better option to uprate the network which is the use of power flow control. • Mr Adams queried whether there was risk associated with the new technologies. Mr Perry conformed they are happy with the technology and their use. **Action 10.4:** Mr Perry to provide an overview on the technology (power control device) and the deliverability of it to the NOA Committee in January. [Redacted due to its commercially sensitive nature] • CPRE is not recommended to proceed as there is another alternative new to the CBA which is preferable. The flows are also expected to be on the other side of the network so this provides limited benefit. • NOR1 – it is believed this is affected by the new power flow control devices [redacted due to its commercially sensitive nature]. The reconductoring can be delayed until there is a greater build-up of wind. • Mr Perry queried why reconductoring was chosen over a power flow control device on the Lackenby – Norton 400kV circuit. **Action 10.6:** ESO (Dr Pearce / Mr Hicks) to respond to NGET TO on the reasoning for a change between LNRE as opposed to LNPC – January
7.1.2	**Non-marginal options / recommendations**

	Dr. Pearce summarised the options that were recommended to proceed in NOA 2017/18 for Scotland and the North of England region and highlighted the key changes for this year. The following points were noted: • Two additional landing points in the North of England are considered for Eastern HVDC Links. • Power flow control device options are considered between Harker and Stella West. • A circuit intertrip is considered between Harker and Stella West. • A number of new asset-based options are considered.
7.3	**Marginal options / recommendations**
7.3.1	**HSRE**
	Mr. Burt invited Mr Hicks to provide an overview of the marginal option for discussion. The following points were noted: • HSRE is only required in Steady Progression • Its requirement is based on the late closure of nuclear plants • Would need to believe that steady progression or similar conditions is >12% likely to occur. • Mr Stewart contacted EDF with regard to the nuclear closures. [Redacted due to its commercially sensitive nature]. • Mr Leslie queried whether this could be brought forward to deliver more benefit whilst the nuclear plants are open. • On the balance of evidence the Committee is minded to not proceed but to review in January **Action 10.7:** NGET TO (Mr Perry) to look at possibility of accelerating the delivery of HSRE including consideration of outages – for January.
7.3.2	**CS01**
	Mr. Burt invited Mr Hicks to provide an overview of the marginal option for discussion. The following points were noted: • Commercial solution is only critical in Two Degrees. • The ESO is incurring spend on the B6 boundary now to manage the network. • [Redacted due to its commercially sensitive nature] • Mr Harvey noted that the delivery for 2020 is challenging and depending on the complexity of the scheme could take longer. The Committee considered the evidence and on the balance of that CS01 is recommended to **PROCEED.**
7.4	**Sensitive Options**
7.4.1	**Eastern Links**
	Mr. Burt invited Mr Hicks to provide an overview of the Eastern Links for discussion. The following points were noted: • A similar approach has been adopted for the NOA as for the SWW, that is that only one Eastern Link can originate or terminate in any location. • Two 2 GW links are recommended (Torness to Hawthorn Pit (E2DC) and Peterhead to Drax (E4D3)). • There is significant benefit to accelerate the links. [Redacted due to its commercially sensitive nature]

	• The links are highly sensitive to timings. [Redacted due to its commercially sensitive nature]. Delivery of onshore works at Hawthorn Pit are also required to be on time. • Mr Perry noted that these points should be covered by the SWW analysis. • Ms Quinn noted that we are putting a lot of HVDC links on the network and queried what is the limit of the number of links. **Action 10.8:** Mr Leslie to bring work on fault levels to the May meeting for discussion and also a view of what number of HVDC links the network can accommodate. • The Committee **NOTE** that this will be considered through the SWW and that longer links should be considered.
7.4.2	**OENO**
	Mr. Burt invited Mr Hicks to provide an overview of the marginal option for discussion. The following points were noted: • This is a central Yorkshire reinforcement and so is sensitive from a stakeholder perspective. • It is required to provide capability on B8 once E2DC is commissioned. • [Redacted due to its commercially sensitive nature]. • Mr Burt also queried whether this was the right option and whether there were other options which are better. • Mr Perry queried when it was required. Mr Hicks noted that is tied with E2DC. It needs to be delivered at the same time. The Committee support the decision to **PROCEED**, but note that work needs to be done by the TO to ensure this is the best options and to try and mitigate consenting risk.
7.4.3	**EHRE**
	Mr. Burt invited Mr Hicks to provide an overview of the marginal option for discussion. The following points were noted: • This is required on its EISD on in all four scenarios and helps reduce constraints on B6. • Construction outages could cause significant constraint costs – [Redacted due to its commercially sensitive nature] • Mr Poffley queried whether 2 years of outages were required as there is significant benefit if it could be delivered earlier with shorter outages. • Mr Burt queried whether SPT could look at outages. Mr Adams noted that there were some things that could be done but due to the length of the circuits it would have minimal impact. The Committee recommends to delay the option and **HOLD** to deliver after an Eastern Link.
7.4.4.	**ECU2 / ECUP**
	Mr. Burt invited Mr Hicks to provide an overview of the marginal option for discussion. The following points were noted: • This option is also sensitive to the consideration of the impact of construction outages. • Mr Hicks noted that the ESO will come back in January with details on outage assessment on ECU2 and ECUP versus ECU4.

7.4.5	**Notional Reinforcements**
	Mr. Burt invited Mr Hicks to provide an overview of the marginal option for discussion. The following points were noted: • NR01 and NR20 are both triggered on their earliest dates in all scenarios. • This represents a 2GW reinforcement across B4, B5, B6, B7, B7a and B8. • The expectation is that TOs will bring forward further reinforcement options for the next cycle.
7.5	**Key Messages**
	• Discussion is required at the SQSS Committee on the use of commercial solutions and network compliance. • This year there is the use of new technology in the form of power flow devices. • Consideration of construction outages can be necessary for some options to ensure the right course of action is recommended. • There needs to be confidence in the delivery of Eastern links and associated onshore works.
8	**East Coast Strategic Wider Work**
	The following document, presented by Mr Vincent and distributed prior to the meeting, was taken as read: • Topic 8 – East Coast SWW update Mr. Burt invited Mr Vincent to provide an overview and the following points were noted: • This year NOA has reinforced the need to build additional network capacity between Scotland and England. • SWW is considering 58 combinations of options. • CBA paused during NOA but is now recommencing and due to complete by the end of January. • [Redacted due to its commercially sensitive nature]. **Action 10.9:** TOs to update ESO on project progress and when large capital expenditure is expected for Eastern links – May.
	AOB
	Mr Adams queried whether the NOA was picking up the security requirements for the network as well as the economics. Particularly for South to North flows. Mr Burt noted that it does.
9	**The England and Wales region exc North**
	The following document, presented by Dr. Pearce and Mr. Hicks and distributed prior to the meeting, was taken as read: • NOA Committee Briefing – Topic 7 & 9 (England and Wales Region)
9.1	**Regional updates – The South**
9.1.1	**Optimal path and analysis**
	Mr. Burt invited Dr. Pearce to provide an update on the findings in the England and Wales region. The following points were noted: • The commercial solution C25 is required in all scenarios and is not displacing any assets, it is required on top to manage constraints. • For the south, the same reinforcements are required across all scenarios.

	Timings are based around when the last of them is required and how they can be fitted in ahead of that. • Ideally would like to have KLRE and FLR2 in the same year. Currently this is not possible with the outages as submitted and so FLR2 is delayed to 2025. **Action 10.10:** Ms. Ramsay to review what is possible for outages and whether FLR2 and KLRE could be delivered in the same outage window. • There are several notional reinforcements in the optimal path suggesting that additional reinforcements are required for this region. • Mr Perry queried whether the power flow control is an option for other scenarios due to lower outage requirements to deliver it rather than or ahead and in addition to FLR2. **Action 10.11:** ESO (Dr Pearce) to look into whether a power flow device could be used as an interim measure for FLR2 – January • There are two changes to last year's recommendations. These are TKRE and WYTI. • TKRE does not provide any benefit once a new overhead line is delivered. This is a year after it is delivered so it is not economic for the benefit of this scheme for a year. [Redacted due to its commercially sensitive nature]
9.2	**Sensitive Options – Commercial options**
9.2.1	**Commercial options CS25 and CS21**
	Mr. Burt invited Mr Hicks to provide an overview of the marginal option for discussion. The following points were noted: • Assumption of a 1GW commercial scheme. • CS25 critical in all scenarios, CS21 optimal but not critical. • Recommended to proceed with CS25 and hold CS21. • Dr. Fu queried whether the same assumptions on cost of the scheme are appropriate for this area of the network as for Scotland due to potentially a lower number of participants. • Ms Ramsay confirmed that it is reasonable to make these assumptions and that there are likely to be a sufficient number of parties. **Action 10.12:** ESO (Dr. Pearce) to consider whether a shorter lifetime for a commercial solution is more beneficial and whether this should only be used if a 40 year one is not beneficial is the best approach – view on materiality for January.
9.2.2	**SCN1**
	Mr. Burt invited Mr Hicks to provide an overview of the marginal option for discussion. The following points were noted: • This is similar to a reinforcement SCN2 which was recommend to proceed last year. SCN2 was not submitted this year having been ruled out as unviable. • Mr Burt queried whether this would be SWW. Mr Perry confirmed that NGET would be submitting a SWW for this scheme.
9.2.3	**BTNO**
	Mr. Burt invited Mr Hicks to provide an overview of the marginal option for discussion. The following points were noted:

	• This was a marginal decision last year [Redacted due to its commercially sensitive nature] • This year it is required in all scenarios. Driven mainly by LE1 boundary due to increased generation in East Anglia. • Mr Stewart talked through the pack circulated to the committee titled "FES 2018 assumptions for offshore wind" and the following points were noted: o There are more opportunities for offshore wind. These include: ▪ Sector deal for offshore wind from government of 30GW by 2030 and 50GW by 2050. ▪ Lower costs of offshore wind, strike prices much lower between £57.50 - £74.75 in last CfD round. ▪ Technological improvements being able to deliver larger capability turbines. o FES 2018 figures are more in line with 2016 based on the recent developments supporting the industry. • The Committee **NOTED** that this is a nominal proceed. [Redacted due to its commercially sensitive nature]
9.2.4	**KLRE**
	Mr. Burt invited Mr Hicks to provide an overview of the marginal option for discussion. The following points were noted: • This scheme requires two outage windows and which clash with FLR2. This is proceed and very costly to delay [Redacted due to its commercially sensitive nature] • The Committee support a proceed with minimal levels of outages.
9.2.5	**Notional reinforcements**
	Mr. Burt invited Mr Hicks to provide an overview of the marginal option for discussion. The following points were noted: • NR18 is a 4GW notional reinforcement for boundary SC1. Required for TD and SP in 2031. • It is expected that another reinforcement is to be submitted into the process for next year. • The Committee supports the notion. **Action 10.14:** NGET to define where the notional reinforcement NR18 is for SC1 – for January.
9.3	**Regional updates – The West**
	The following document, presented by Dr. Pearce and Mr. Hicks and distributed prior to the meeting, was taken as read: • NOA Committee Briefing – Topic 7 & 9 (Wales and West Region) Mr. Burt invited Dr. Pearce to provide an update on the findings in the England and Wales region. The following points were noted: • Reinforcements are linked to Wylfa. One criticial reinforcement which is marginal. • Mr Stewart noted that there was speculation in the press yesterday (10/12/18) that Wylfa were going to pull out.
9.3.1	**PTC1**
	Mr. Burt invited Mr Hicks to provide an overview of the marginal option for discussion. The following points were noted: • This option is only critical in Consumer Renewables. This previously has

	been only available post other reinforcements, but following discussions with the TO it is possible to deliver it ahead of the other reinforcements. • [Redacted due to its commercially sensitive nature]
9.4	**Key Messages**
	• East Anglia reinforcements highly dependent on the increase in offshore wind. • Notional reinforcements driven by large interconnector flows and offshore wind.
10	**South Coast options assessment update**
	The following document, presented by Mr. Whiteford and distributed prior to the meeting, was taken as read: • Topic 11 – South Coast options assessment update Mr Burt invited Mr Whiteford to present the paper circulated to the committee. The following points were noted: • The aim is to use the SWW as a vehicle to understand and articulate the problem in the south east to clearly define issues. • NGET to focus on alternative options to the one submitted option for the south coast. • The ESO to focus on reduced build options and smart grid solutions. • Mr Leslie noted that there are customers with potential projects which could be of benefit and also understanding the capabilities for the DNOs in that area.
11	**NOA for Interconnectors**
	The following document, presented by Mr. Vincent and distributed prior to the meeting, was taken as read: • Topic 10 – NOA for Interconnectors Mr Burt invited Mr Vincent to provide an update on the NOA for IC analysis. The following points were noted: • The analysis takes the output of the NOA analysis to optimise interconnections levels. • 8 interconnecting countries are investigated. • New for this year are consideration of other interconnector benefits, that a range of level of interconnection will be provided.
12	**Overview of actions**
	[This section is redacted due to its administrative nature]
13	**Date of next meeting**
	9th January 2019 at 10am
14	**Any other business**
	None
15	**Feedback and review**
	[This section is redacted due to its administrative nature]

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Chairman

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Date