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## Greater Gabbard Ex-post Assessment



London, 26<sup>th</sup> May 2013

*ofgem* E-Serve

On behalf of Ofgem E-Serve



25 pages

approved :

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## EXECUTIVE SUMMARY

Greater Gabbard offshore wind farm is a 504 MW offshore wind farm comprising 140 x 3.6 MW wind turbines developed by Greater Gabbard Offshore Winds Ltd (GGOWL). GGOWL is owned 50/50 by Scottish and Southern Energy (SSE) and RWE npower renewables (RWE). The wind turbine generators (WTGs) were supplied by Siemens with the remainder of the project being constructed by Fluor under a Balance of Plant (BOP) contract.

DNV KEMA Ltd has been commissioned to investigate the extent of the cost differences between the Indicative Transfer Value (ITV) and the developer's proposed Final Transfer Value (FTV) for the transmission assets associated with the wind farm. DNV KEMA has concentrated on the following two areas;

1. Variations orders incurred since the ITV
2. 33 kV circuit breakers incorrectly proposed to be allocated to the transmission equipment

DNV KEMA has reviewed the variation orders related to the transmission equipment raised during the course of the project. We maintain that variations to a total value of [REDACTED] should not be allowed. We maintain that these costs represent costs which either;

- Were incurred on equipment which was not principally intended for the benefit of the OFTO, or;
- should have been included within the original BOP contract and where the raising of a variation order could not be seen as an economic and efficient form of procurement.

The current cost template assumes that the 28 circuit breakers on the generator side are transmission assets. DNV KEMA understands that Ofgem has deemed that these should be regarded as generator costs and should not be allocated to the FTV. DNV KEMA estimates the value of this equipment (including associated cabling, engineering, installation and commissioning) to be [REDACTED]. This value was estimated based on generic typical values derived by consultants working for DNV KEMA from experience of working on comparable projects.

In addition to these specific items, DNV KEMA was requested to look at those costs which may have resulted from project delays. DNV KEMA has looked at the reasons for the delays to the Greater Gabbard project schedule during construction. This occurred due to a variety of reasons. For the purposes of this report, and with no evidence to contradict this view, DNV

KEMA takes the position that the project delays were caused by the results of actions or failures to act by the BOP contractor or sub-contractors or suppliers employed by the BOP contractor. DNV KEMA maintains that any additional costs incurred by development or construction of the transmission assets as a direct result of a project delay, cannot be allocated to the FTV. However in practice the total incurred costs of the transmission assets was lower than the cost quoted in the FTV. For this reason, other than the specific costs mentioned above which, we have no recommendations for any other costs which should be disallowed.



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# 1 INTRODUCTION

## 1.1 Aims and objectives

DNV KEMA Ltd<sup>1</sup> has been retained by Ofgem to investigate the costs incurred during the development of the transmission assets of Greater Gabbard offshore wind farm. Specifically DNV KEMA was asked to investigate whether the costs quoted in the proposed Final Transfer Value (FTV) are in line with the Indicative Transfer Value (ITV). Also DNV KEMA should take a position as to whether these costs can be regarded as having been *economically and efficiently incurred*.

Specifically DNV KEMA was asked to look at the following items:

1. Variations orders incurred since the ITV
2. Estimate the value of 28 x 33 kV circuit breakers incorrectly proposed to be allocated to the transmission equipment

In addition DNV KEMA was asked to take a position as to whether any costs resulting from project delays could be allowed as part of the FTV.

## 1.2 Greater Gabbard offshore wind farm

Greater Gabbard is a 504MW offshore wind farm off the east coast of England comprising 140 x 3.6 MW wind turbines. It was developed by Greater Gabbard Offshore Winds Ltd (GGOWL).

GGOWL was originally set up by Fluor and Airticity, but is now owned 50/50 by Scottish and Southern Energy (SSE) and RWE npower renewables (RWE).

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<sup>1</sup> In February 2012 Det Norske Veritas (DNV) acquired a majority stake in 'KEMA B.V.'. 'KEMA B.V.' has since been renamed 'DNV KEMA Energy and Sustainability' (DNV KEMA). DNV KEMA's UK entity (KEMA Ltd.) was renamed 'DNV KEMA Ltd.'.



- December 2003 - GGOWL was incorporated at Companies House<sup>2</sup>
- January 2008 - GGOWL was as 50/50 joint venture between Airticity and Fluor
- January 2008 - SSE acquired Airticity<sup>3</sup>
- May 2008 - Fluor sold its 50% share to SSE<sup>4</sup>
- November 2008 - SSE sold 50% share to RWE<sup>5</sup>

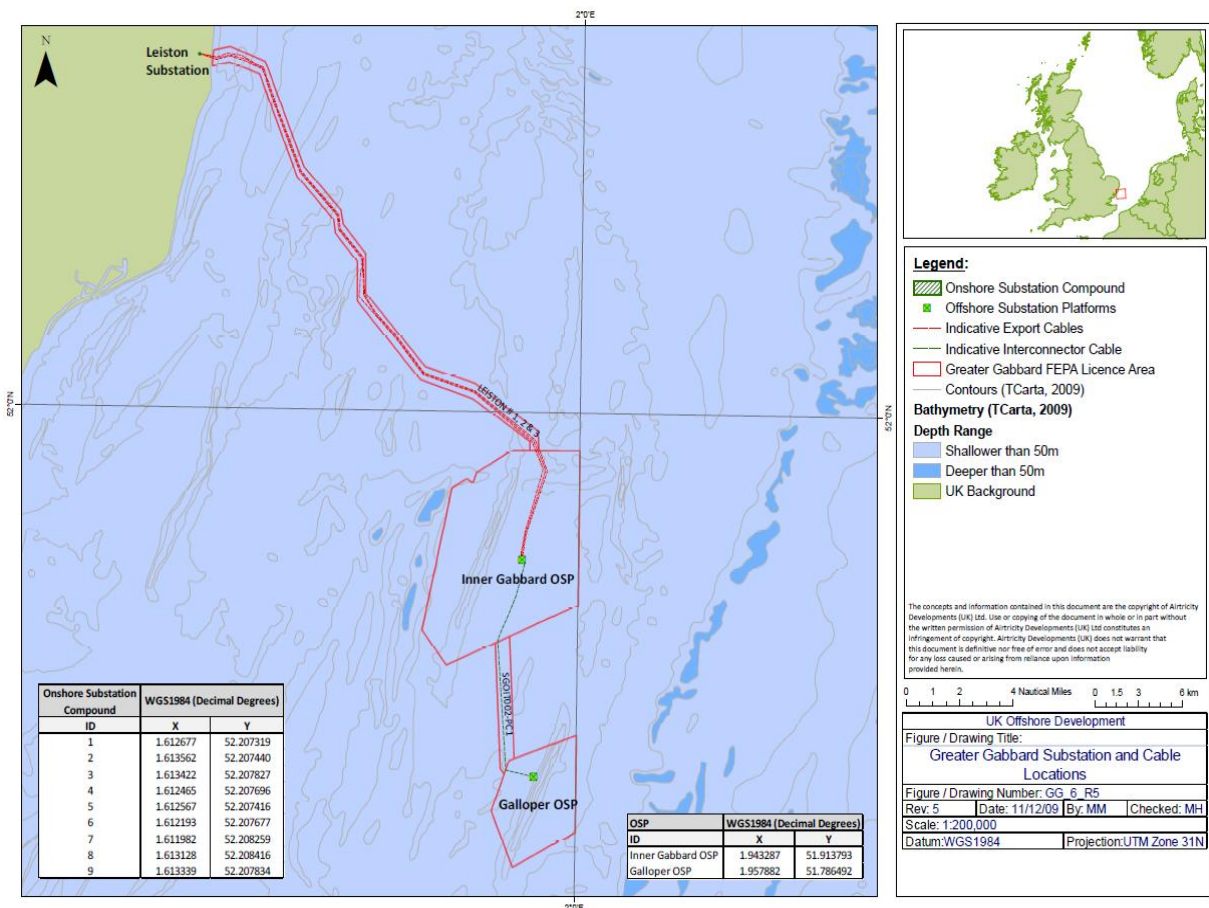


Figure 1: Location of Greater Gabbard Wind Farm<sup>6</sup>

The wind turbine generators (WTGs) were supplied by Siemens with the remainder of the project being constructed by Fluor under a Balance of Plant (BOP) contract<sup>7</sup>. The contract

<sup>2</sup> <http://wck2.companieshouse.gov.uk/01e5d3d95c9aee18403dd6c4385f9dc7/compdetails>

<sup>3</sup> 'Scottish & Southern in £1bn wind power deal', Financial Times, 4<sup>th</sup> January 2008

<sup>4</sup> 'SSE in £308m wind farm deal with RWE', Financial Times, 4<sup>th</sup> November 2008

<sup>5</sup> <http://www.power-technology.com/projects/greatergabbardoffsho/>

<sup>6</sup> 'Greater Gabbard Site Location', Greater Gabbard Offshore Winds Ltd, April 2008

scope included, “*inter alia, works required to commission transition pieces, transformers, switchgear, inter-array cabling, the met mast, two offshore substation platforms, onshore substation work at Leiston, and export cables from the offshore substation platform(s) to the onshore substation works.*”<sup>8</sup>

Table 1 details the sub-contractors contracted by Fluor to perform various functions

**Table 1: Fluor sub-contractors**

<b>Activity</b>	<b>Sub-contractor</b>
Onshore substation, OSPs and grid compliance	Siemens T&D
Final electrical design	Fluor / Siemens T&D
Final structural design	Fluor / Rambol
OSP topsides	Heerema / McNulty
OSP jackets	Burntisland Fabricators
132 kV cables	Prysmian
Onshore cable	Balfour Beatty
Contracts and regulatory	Denton Wilde Sapte LLP

**1.3 Transmission Assets**

The transmission assets connect to Greater Gabbard Wind Farm at the two Offshore Substation Platforms (OSPs), Galloper and Inner Gabbard. The two platforms are connected to each other by a 132 kV interconnector. The Greater Gabbard Transmission Assets are connected to the onshore substation by three 800mm<sup>2</sup> 132 kV subsea cables, (referred to as the three export circuits). Onshore, the subsea cable enters a transition jointing pit, where the subsea cable ends and the onshore 132 kV underground cabling begins. The 132 kV underground cable terminates at the Greater Gabbard 132 kV Substation in Leiston near Sizewell.

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<sup>7</sup> Balance of Plant Contract, Greater Gabbard Offshore Winds Ltd and Fluor Ltd, dated 14 April 2008

<sup>8</sup> ‘Summary of key issues in Balance of Plant Contract dated 14 April 2008 made between Greater Gabbard Offshore Winds Limited and Fluor Limited (the “Contract”)

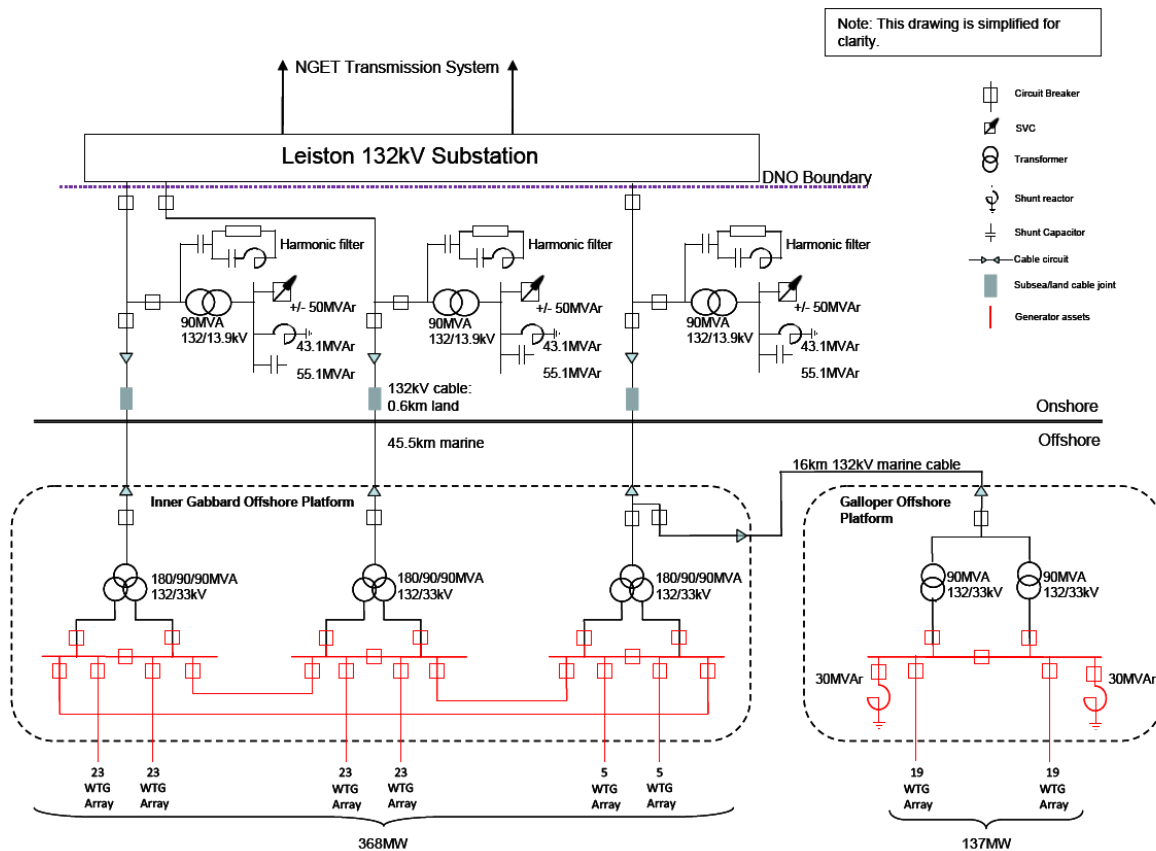


Figure 2: GGOWL Transmission equipment - Simplified Single Line Diagram<sup>9</sup>

The transmission assets were installed in 2 phases. These are defined in the following way.

### Phase 1 Infrastructure Works: works needed to export the first 167 MW

- Inner Gabbard OSP (IG-OSP)
- Onshore substation works at Leiston for the connection of one circuit to NGET
- 1 x export cable from IG-OSP to Leiston substation, including reactive compensation
- SCADA required to operate this equipment
- Other associated works

This phase involved the installation of the following equipment:

- GGOWL onshore compound civil infrastructure and ancillary systems: control building; internal and external fences; internal and external roads; LV switchboard

<sup>9</sup> 'Information Memorandum Greater Gabbard Offshore Transmission Assets', RBC Capital Markets, September 2009

- IG-OSP structure & jacket: water storage and bunkering systems, switchgear & transformer rooms; accommodation modules; ancillary systems

In addition, the equipment making up 'Module 3', which included a complete set of equipment required to connect one transmission cable from IG-OSP to Leiston substation. Module 3 included the following items:

- Onshore and submarine cables
- IG-OSP: High Voltage Gas-Insulated Switchgear (HIS) unit; 180MVA 132/33 kV transformer; earthing/auxiliary transformer
- GGOWL compound onshore: HIS unit, Static Var Compensator (SVC) transformer, SVC plant, harmonic filter, Mechanically Switched Capacitor (MSC), Mechanically Switch Reactor (MSR) and associated 13.9 kV switchboard

**Phase 2 Infrastructure Works: additional works needed to export the full rated output (504 MW)**

- Galloper OSP (G-OSP)
- 2 x export cables from G-OSP to the onshore substation at Leiston
- Works at Leiston substation for the connection of the two remaining circuits to NGET
- Inter-site cable between G-OSP and IG-OSP; including reactive compensation
- BOP SCADA required to operate these works and
- Other associated works

In practice this phase involved the installation of the following equipment:

- G-OSP structure & jacket: water storage & bunkering systems; switchgear & transformer rooms; accommodation modules; ancillary systems

In addition, the equipment making up 'Module 1' and 'Module 2' included the following assets:

- Onshore and submarine cables
- IG-OSP: High Voltage Gas-Insulated Switchgear (HIS) units, 180MVA 132/33 kV transformers; earthing/auxiliary transformers
- G-OSP: transmission assets (transformers, HIS unit; reactors; auxiliary/earthing transformers); HIS units; Static Var Compensator (SVC) transformers; SVC plant; harmonic filters; Mechanically Switched Capacitors (MSCs), Mechanically Switch Reactors (MSRs)
- GGOWL compound onshore: associated 13.9 kV switchboards

## 2 COSTS APPLICABLE TO THE TRANSMISSION ASSETS

DNV KEMA has compared the costs which GGOWL estimates will be incurred by project completion with baseline costs which have already been agreed by Ofgem. The baseline used is the Indicative Transfer Value (ITV) which was established in September 2009. The ITV costs were subsequently re-allocated into the categories by Ofgem<sup>10</sup> in order to better fit the actual costs which GGOWL has declared as having been incurred by June 2012<sup>11</sup>. Annex A shows a comparison of these estimated costs to be incurred with the 're-allocated ITV'.

The figures at Annex A seem to indicate that the total Capital Expenditure (CAPEX) costs which GGOWL proposes to include in the FTV are higher than those specified in the ITV:

Total CAPEX (re-allocated ITV)	£ 241,223,264
<u>Total CAPEX incurred (June 2012)</u>	<u>£ 244,827,015</u>
<b>Variance</b>	<b>(£ 3,603,751)</b>

Included within the incurred costs are variation orders with a total value of [REDACTED].

The term 'total CAPEX' in this context refers to all planned or incurred costs related to the fabrication and installation of the physical transmission assets. It does not include any GGOWL internal project development costs, interest during construction (IDC) or costs related to the OFTO process itself.

However if internal project costs are included, it can be seen that, excluding IDC and OFTO transaction costs, the total actual costs incurred are slightly lower than those established in the ITV.

Total excl. IDC & transaction costs (re-allocated ITV)	£ 279,351,475
<u>Total excl. IDC &amp; transaction costs incurred (June 2012)</u>	<u>£ 279,176,104</u>
<b>Variance</b>	<b>£ 175,371</b>

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<sup>10</sup> 'Cost re-allocation reconciliation for Gabbard.xls' , provided to DNV KEMA by Ofgem 17<sup>th</sup> October 2012

<sup>11</sup> 'Cash Flow Actual OFTO spend to June 2012\_OFGEM v 28 Nov'

As such, it is evident that the total cost of the transmission assets which is being considered by this report is lower than that which was agreed in the re-allocated ITV. However DNV KEMA has been instructed to look at some individual aspects of the total costs in order to investigate if these were genuinely incurred in the development and construction of the transmission assets and were incurred in an efficient and economic manner:

Specifically DNV KEMA has evaluated the following elements:

1. Variations orders incurred
2. 28x 33 kV circuit breakers which were incorrectly regarded as transmission assets

A number of variation orders were raised after the signing of the original BOP contract. DNV KEMA has formed an opinion as to whether the cost of these variation orders can be regarded as transmission CAPEX costs. These are discussed in more detail in Section 3.1.

DNV KEMA has been informed by Ofgem that the proposed transmission costs include 28x 33 kV circuit breakers installed on the OSPs. This equipment will actually be the property of the generator and as such the cost of these items, their associated cabling, engineering, installation and commissioning may be deducted from the value to be allocated to the FTV. DNV KEMA has produced an estimate of the cost of this equipment. These are discussed in more detail in Section 3.2.

### 3 COMMENTARY ON COST VARIANCES

#### 3.1 Variation Orders associated with the transmission assets

DNV KEMA has conducted a review of those variation orders (VOs) which appear in the 'Variation Orders' tab of the cost allocation template. The total value of these variation orders under consideration is [REDACTED].

GGOWL also proposes to claim an additional [REDACTED] for the rental of a cable reel plus [REDACTED] for the cable reel offloading crane as part of the proposed Final Transfer Value. However the investigation of these VOs does not fall under DNV KEMA's scope.

##### **[VO 01] – Helicopter deck size**

Variation Order (VO) Costs:	[REDACTED]
Stated reason for VO:	Increase in size due to new requirements
DNV KEMA recommended allowable value:	£0

##### Findings

This VO was raised to increase the size of the helideck so as to accommodate a Bell model 429 helicopter. In the functional specification<sup>12</sup>, the helideck was originally sized for the Eurocopter E135 which requires a D-value<sup>13</sup> dimension of 12.2 m and to support a helicopter weight of 3.5 tonnes. The proposed Bell 429 helicopter has a larger D-value dimension of 13.2 m thus necessitating a larger helideck.

However there is evidence which suggests that the need for the helideck is driven by the requirements of the generator and not the OFTO. DNV KEMA understands that the OFTO business plan is based on the OFTO staff gaining access to the OSP by means of a boat. The principal reason for the helicopter landing deck is to use the OSP as a staging post to allow GGOWL and/or Siemens staff access to the wind turbines. This seems to be confirmed

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<sup>12</sup> 2.2.1\_Functional specification for offshore substation platform\_GG.pdf

<sup>13</sup> D-Value - The largest overall dimension of the helicopter when rotors are turning.

by industry reports regarding helicopter use at the wind farm<sup>14</sup>. We note that in October 2012 GGOWL signed a contract with Bond Air Services to airlift maintenance teams out to the turbines<sup>15</sup>. For safety reasons a 7-passenger helicopter (such as a Bell 429) would not normally be fully laden when winching personnel to a wind turbine. Instead staff would be dropped at the OSP and ferried to each wind turbine individually.

For this reason, DNV KEMA does not feel that this upgrade to the helideck has been for the benefit of the OFTO and we are not minded to recommend that this cost is included in the FTV.

Note also, that contrary to the cost allocation template, the VO states that the value of the variation is [REDACTED] and not [REDACTED].

### **[VO 03] – Additional Fire Control**

Variation Order (VO) Costs:	[REDACTED]
Stated reason for VO:	Improvement due to new requirements
DNV KEMA recommended allowable value:	£0

### Findings

According to the original functional specifications<sup>16</sup>, the OSP should have been treated as a 'Normally Unattended Installation' as defined in CAP 437 for the purpose of fire safety and other design aspects. The variation order explains that 'new requirements' arose and the platform can no longer be classified as 'Normally Unmanned'.

GGOWL has stated<sup>17</sup> that the platform will only be used as a refuge location in an emergency. The requirement to change the classification is to allow for people to use the

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<sup>14</sup>

[http://www.windpoweroffshore.com/article/l1r0RB4rwM/2012/09/14/greater\\_gabbard\\_gears\\_up\\_for\\_uk\\_helicopter\\_first/](http://www.windpoweroffshore.com/article/l1r0RB4rwM/2012/09/14/greater_gabbard_gears_up_for_uk_helicopter_first/) , dated 14 September 2012

<sup>15</sup>

[http://www.eadt.co.uk/news/sizewell\\_helicopter\\_service\\_for\\_greater\\_gabbard\\_wind\\_farm\\_is\\_a\\_uk\\_firs\\_t\\_1\\_1665182](http://www.eadt.co.uk/news/sizewell_helicopter_service_for_greater_gabbard_wind_farm_is_a_uk_firs_t_1_1665182), dated 12 October 2012

<sup>16</sup> 2.2.1\_Functional specification for offshore substation platform\_GG.pdf

<sup>17</sup> 'Explanations for variations on GG – 141112.xlsx'



OSP on an ad hoc basis. The proposal for VO 03<sup>18</sup> states; “the requirement for additional capability arises from the planned use of the helideck being such that it cannot be classified as Normally Unmanned.” As in our assessment of VO 01, DNV KEMA feels that the ‘planned use’ of the OSP which has created the need for this additional equipment has been driven by the needs of the generator and not of the OFTO. Namely we understand that the OSP will be used as a staging post for wind turbine visits.

As such we do not feel that any incremental costs associated with this change in usage can be regarded as transmission CAPEX costs. This would include costs for the associated fire fighting equipment and the additional rescue and evacuation items.

**[VO 05] – Short circuit study re DRC14 – Fault In-feed Curves**

Variation Order (VO) Costs: ██████████  
 Stated reason for VO: Fault in circuit  
 DNV KEMA recommended allowable value: £0

Findings

According to the variation order, GGOWL asked Fluor for an additional Short Circuit Study. The VO proposal for this work does not explain why this additional work was required. DNV KEMA feels that GGOWL has not provided a clear explanation as to why this work was not covered in the original BOP.

**[VO 07 + 13] – Provision of Life Raft and Associated Evacuation Equipment**

Variation Order (VO) Costs: ██████████ + ██████████  
 Stated reason for VO: Additional work involved  
 DNV KEMA recommended allowable value: £0

Findings

GGOWL has stated that there is an operational requirement to have three viable escapes means from an OSP. Hence a primary, secondary and tertiary means are required. The provision of a life raft and associated equipment was deemed to be a tertiary means of evacuation. Additionally there is a requirement for this equipment due to the frequency of visits. If this is the case, DNV KEMA maintains that the life safety equipment should have been included in the BOP.

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<sup>18</sup> ‘Variation Proposal - Additional Fire Fighting Equipment OSP Helidecks’, Fluor, dated 14 April 2008

**[VO 08] – SVC Plus Training**

Variation Order (VO) Costs: [REDACTED]  
Stated reason for VO: Additional work involved  
DNV KEMA recommended allowable value: [REDACTED]

Findings

GGOWL has stated that the purpose of the training was as follows:

*Basic training was provided as part of the EPC [Engineering, Procurement and Construction]. At the time it was prudent for the GGOWL operations personnel to undertake this training given the uncertainty in timing for the handover of the transmission assets. At the time the SVC system was a relatively new system and the training allowed the operations team develop their operational philosophy which is now being delivered. This knowledge, understanding and documentation of training conducted on this system can now be passed through to the OFTO when they take over ownership and operation of the assets. This will ensure a smooth transfer and operation of the system going forward.*

DNV KEMA understands this point and we would accept that the training of OFTO operational personnel could be seen as a bona fide BOP cost and could therefore be seen as a justifiable component of the FTV. We understand that the people who were trained will be doing a handover to the OFTO’s staff and will be transferring the documentation.

**[VO 14] – Harmonic Studies**

Variation Order (VO) Cost: [REDACTED]  
Stated reason for VO: New NGET requirements  
DNV KEMA recommended allowable value: [REDACTED]

Findings

The variation order states that recent changes to the Siemens Wind Power Wind Turbine Generators data and updates to previously issued NGET data resulted in the necessity to rework the Harmonic Study.

GGOWL has stated:

*The revised profile had to be taken on board to ensure the limits were met and achieved. The harmonic profile of the turbines had changed and thus necessitated that the harmonic study*

*had to be rerun. This was required to comply with the requirement in relation to the British Energy site being a nuclear site.*

DNV KEMA agrees that if this work was required by changes to equipment which could not have been foreseen, these costs could be transferred to the FTV.

**[VO 16] – Provision of additional davit crane on north east corner of the Galloper OSP**

Variation Order (VO) Costs: [REDACTED]  
Stated reason for VO: Instructed by Una Power  
DNV KEMA recommended allowable value: [REDACTED]

Findings

GGOWL has stated that the (presumably GGOWL) operations team identified the need for an additional crane, post contract signature. GGOWL stated that it is common practice on an OSP to have a number of locations for lift operations to mitigate changing currents and tides.

DNV KEMA understands that Ofgem has accepted the need for this equipment.

**[VO 26] – Installation of Inertia Reel Brackets and System on Jackets**

Variation Order (VO) Costs: [REDACTED]  
Stated reason for VO: additional requirements  
DNV KEMA recommended allowable value: [REDACTED]

Findings

DNV KEMA understands that Ofgem has accepted the need for this equipment.

**[VO 60] – Temporary Power at Leiston Substation**

Variation Order (VO) Costs: [REDACTED]  
Stated reason for VO: temporary power due to commissioning  
DNV KEMA recommended allowable value: [REDACTED]

Findings

In the variation order it is explained that temporary power was needed for commissioning and testing the Leiston substation during the time the EDF supply was not yet operational. GGOWL has made the following statement:

The commissioning and testing was supposed to be undertaken with a power supply from the grid. As National Grid had not finished the works they were unable to provide a connection and power supply to allow commissioning and testing to take place. Within the contracts there is a clear obligation to provide power either at HV or LV.

Clause 4.21.1 of the BOP states that BOP contractor was not required to provide a Grid Connection for works which it was conducting. We assume that this is one of the 'contracts' to which GGOWL is referring above. We infer from this that this responsibility fell to GGOWL. This should have been fulfilled under GGOWL's Connection Agreement with NGET<sup>19</sup>. If this connection was not completed on time by NGET, we feel that these costs would have been necessary and can be allocated to the FTV.

### Summary of Variations Orders

In summary, Table 2 shows those variation orders where DNV KEMA feels that GGOWL has not yet shown that the costs are transmission asset related costs which have been incurred in an economic and efficient manner.

**Table 2: DNV KEMA recommended allowable variation orders**

Item	Description	Value (£)	Allowable (£)	Not allowable (£)
VO 01 A	Helideck Size	██████		██████
VO 03	Firefighting equipment OSP Helideck	██████		██████
VO 05	Short Circuit Study re: DRC 14 Fault In-Feed Curves	██████		██████
VO 07	Provision of Life raft & evacuation Equipment IG-OSP	██████		██████
VO 08	SVC Plus Training	██████	██████	
VO 13	Provision of Life Raft Galloper OSP	██████		██████
VO 14	Rework of Performance Loci	██████	██████	
VO 16	Davit Crane on North East Corner of the Galloper OSP	██████	██████	
VO 26	Installation of Inertia Reel Brackets and System on Jackets	██████	██████	
VO 60	Temporary Power at Leiston Substation	██████	██████	
<b>Total</b>		██████	██████	██████

<sup>19</sup> 'Agreement to vary the bilateral connection agreement and construction agreement at Sizewell', NGET and GGOWL, dated 7<sup>th</sup> March 2007

### 3.2 OSP 33 kV Circuit Breakers

Ofgem has informed DNV KEMA that it deems that the 28x 33 kV circuit breakers and attendant cabling on the generator side of the OSPs should be regarded as generator equipment. The current cost template regards these as a transmission asset cost. The cost of this equipment should therefore be deducted from the total cost to the allocated to the FTV.

DNV KEMA has estimated that the value of this equipment would be [REDACTED]. The equipment cost estimate were derived from consultants employed by DNV KEMA from their experience of unit costs paid in the procurement of similar equipment whilst engaged on other offshore wind projects. The costs for commissioning, engineering, installation and project management are estimated based on typical proportions of the equipment costs.

A breakdown of our costing estimate can be seen at Table 3.

**Table 3: Estimated cost of 28 33 kV circuit breakers (£,000)**

	Units	Unit cost	Total
33 kV Circuit Breakers	[REDACTED]	[REDACTED]	[REDACTED]
Busbar / wiring / earthing	[REDACTED]	[REDACTED]	[REDACTED]
LCCs / Marshalling box	[REDACTED]	[REDACTED]	[REDACTED]
Commissioning	[REDACTED]	[REDACTED]	[REDACTED]
Engineering	[REDACTED]	[REDACTED]	[REDACTED]
M&E Installation	[REDACTED]	[REDACTED]	[REDACTED]
Project Management	[REDACTED]	[REDACTED]	[REDACTED]
<b>Sub-total</b>			[REDACTED]
<b>Risk value (10%)</b>			[REDACTED]
<b>Total</b>			[REDACTED]

## 4 PROJECT DELAYS

DNV KEMA is aware that the project suffered significant delays. DNV KEMA has developed an opinion as to whether any costs resulting from project delays can be included in the FTV.

DNV KEMA notes that the Balance of Plant (BOP) contract requires the BOP contractor (Fluor) to provide explanations for any delays to the project and for the Employer (GGOWL) to respond to these. No such documents have been made available to DNV KEMA.

This timeline of events which resulted in project delays has been put together based on those documents and responses which have been made available by GGOWL to DNV KEMA, either directly or via Ofgem.

### 4.1.1 Original plan and actual development and construction

In September 2009 it was expected that the project would be fully operational by March 2011<sup>20</sup>. As can be seen at Table 4, since October 2009, project phases have consistently been completed later than was originally planned.

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<sup>20</sup> 'Information Memorandum Greater Gabbard Offshore Transmission Assets', RBC Capital Markets, September 2009

**Table 4: Original plan and actual development and completion**<sup>21 22 23 24 25</sup>

Item	Phase	Action	Plan completion	Actual completion	Delay (days)
1		BOP contract signed	2008	14/04/2008	
2		Construction of offshore wind farm and offshore transmission system commences	09/2009	10/2009	Ca. 30
3	1	Issue of Interim Operation Notification (ION) by National Grid		17/12/2009	
4	1	Flashover on NGET Leiston 132 kV switchboard during commissioning		w/c 11/01/2010	
5	1	GGOWL able to close their circuit breakers on Leiston 132 kV Substation to provide a backfeed to the GGOWL compound.	01/10/2009	08/04/2010	189
6	1	First attempted energisation of Module 3 Export Circuit and subsequent fault after 25 seconds	26/09/2009	06/08/2010	314
7	1	Subsequent successful re-energisation and 24 hour soak test of Module 3 Export Circuit after repair of initial fault	26/09/2009	29/09/2010	368
8	1	Inner Gabbard OSP Installed and Available	10/11/2009	19/01/2011	435
9	2	Successful energisation of Module 2 Export Circuit into Inner Gabbard OSP.	25/04/2010	07/04/2011	347
10	2	Energisation of transmission assets at Galloper OSP (Interconnector)	05/07/2010	10/06/2011	340
11	2	Galloper OSP - Installed, commissioned and Available	05/08/2010	18/11/2011	470
12	2	Successful energisation of Module 1 Export Circuit and provision of capacity on offshore transmission assets to export 500MW (Export Cable 1).	04/10/2010	31/05/2012	605
13		Final Project Completion	Q2 2010	10/09/2012	

<sup>21</sup> 'Planned v Actual Completion Dates 23rd August.pdf', provided by GGOWL to DNV KEMA 17 September 2012

<sup>22</sup> 'Timeline for Phase 1 & Phase 2 Energisation Dates for Greater Gabbard Offshore Windfarm Transmission Assets', GGOWL, 12 August 2012

<sup>23</sup> 'Information Memorandum Greater Gabbard Offshore Transmission Assets', RBC Capital Markets, September 2009

<sup>24</sup> <http://www.windpowermonthly.com/news/1149097/Greater-Gabbard-completed-operational>

<sup>25</sup>

[http://www.yourindustrynews.com/arrival+of+seajacks+leviathan+lifboat+marks+start+of+contract+at+world%E2%80%99s+largest+offshore+wind+development\\_39552.html](http://www.yourindustrynews.com/arrival+of+seajacks+leviathan+lifboat+marks+start+of+contract+at+world%E2%80%99s+largest+offshore+wind+development_39552.html)

#### 4.1.2 Reasons for Delays to Offshore Transmission Assets

In response to queries from DNV KEMA regarding the reasons for delays in the installation of transmission equipment, GGOWL presented the following response<sup>26</sup>:

*"The first circuit grid connection date had been scheduled for Oct 09 which was only completed in April 2010. The IG sub was initially delayed in fabrication, subsequent delays to the manufacture and transport and installation of the first export cable and then delays to the commissioning of the first circuit led to first power being achieved in Dec 10/Jan 11."*

This statement therefore gives the following reasons for project delays:

1. Delay in fabrication of IG-OSP
2. Delay to manufacture, delivery and installation of first export cable
3. Delay to commissioning of first circuit

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]



[Redacted text block]

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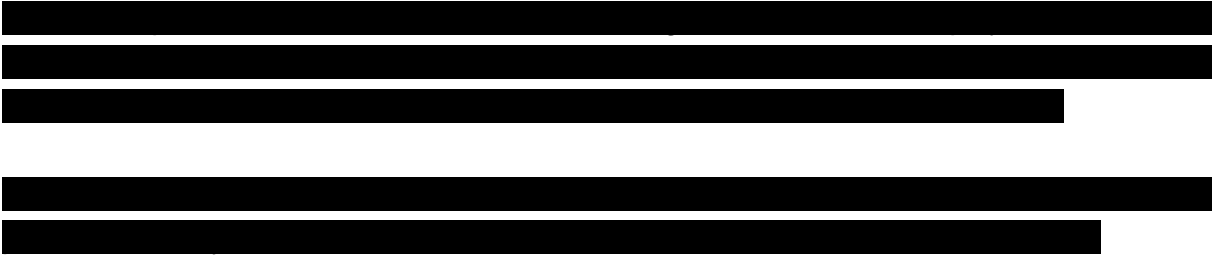
[Redacted text block]

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The reasons for the delays in the transmission assets were (as has been seen in the previous section):

- Delays in equipment fabrication
- Delays in equipment delivery
- Delays in transport of equipment
- Delays in installation of equipment

In the opinion of DNV KEMA, none of these reasons falls corresponds to any of the allowable reasons to delay the Target Infrastructure Commissioning Date shown above.

As a result of this, DNV KEMA maintains that any costs in excess of those quoted in the ITV which resulted from project delays should be settled with the BOP contractor not be demanded from the OFTO.

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<sup>32</sup> E.g. Existing site pollution, archaeological finds, unexploded munitions, unexpected soil conditions, alien material

## 5 CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Variations orders

DNV KEMA recommends that the variation orders listed in Table 5 are not included in the FTV. Depending on the equipment in question, our opinion is based principally on one of these reasons:

1. The VO appears to have been raised for equipment mainly for the benefit of the generator and not of the OFTO.
2. The equipment should have been included within the original BOP contract and that a VO should not have been necessary.

**Table 5: DNV KEMA recommended not allowable variation orders**

Item	Description	Value (£)
VO 01 A	Helideck Size	████████
VO 03	Firefighting equipment OSP Helideck	████████
VO 05	Short Circuit Study re: DRC 14 Fault In-Feed Curves	████████
VO 07	Provision of Life raft & evacuation Equipment IG-OSP	████████
VO 13	Provision of Life Raft Galloper OSP	████████
<b>Total</b>		████████

### 5.2 OSP 33 kV Circuit Breakers

The current cost template assumes that the 28 circuit breakers on the generator side are transmission asset costs. DNV KEMA understands that Ofgem has deemed that these should be regarded as generator costs and should not be allocated to the FTV. DNV KEMA estimates the value of this equipment (including associated cabling, engineering, installation and commissioning) to be ██████████.

### 5.3 Project delays

The BOP contract between the Employer (GGOWL) and the BOP contractor (Fluor) specifies that Fluor should have informed GGOWL of any reasons for delays in the project and given

any explanations for why these were allowable reasons for delay. DNV KEMA has seen no such correspondence. We see no reason to accept that the reasons for delay were for allowable reasons as defined by BOP contract. Therefore, for the purposes of this study, we have assumed that any delays in the project were due to actions or failure to act by the BOP contractor or subcontractors employed by the BOP contractor

However the total incurred cost of the transmission assets (not including IDC and OFTO related costs) is lower than that stated in the ITV. For this reason, DNV KEMA does not have any further recommendations for costs to be disallowed, other than those which have already been mentioned.

## ANNEX A: COMPARISON OF ITV AND FINAL SUBMITTED COSTS

Annex A redacted

## ANNEX B: GLOSSARY

BOP	Balance of Plant
CAPEX	Capital Expenditure
EPC	Engineering Procurement and Construction
FTV	Final Transfer Value
GGOWL	Greater Gabbard Offshore Winds Ltd
G-OSP	Galloper Offshore Substation Platform
HV	High Voltage
IDC	Interest During Construction
IG-OSP	Inner Gabbard Offshore Substation Platform
ITV	Indicative Transfer Value
LV	Low Voltage
MP	Monopile
NGET	National Grid Electricity Transmission
OFTO	Offshore Transmission Owner
OSP	Offshore Substation Platform
RWE	RWE npower renewables
SPV	Special Purpose Vehicle
SSE	Scottish and Southern Energy
SVC	Static Var Compensator
TP	Transition Piece
VO	Variation Order
WTG	Wind Turbine Generator