CAITHNESS – MORAY HVDC REINFORCEMENT

OFFSHORE INSTALLATION CUMULATIVE IMPACT REVIEW

Revision	Date	Prepared by	Reviewed by	Approved By
01	30.03.16	P. Watson	C. Taylor	B. Mitchell
02	05.07.16	B. Mitchell	D. Gibb	B. Mitchell
03	22.12.17	[redacted]	D. Gibb	[redacted]

Contents

Revision 03 note (all revisions highlighted in yellow background):

1. Section 1.1 – minor additions to text
2. General – MORL changed to MOW(E)L
3. Section 5 – minor addition to text
4. Section 6 – amendments to programme dates and SIMOPS
5. Section 7 – minor addition to text
6. Section 8 – previous 4th bullet point removed

1 INTRODUCTION

This latest revision (rev.3) of the Cumulative Impact Review has been updated to reflect the requirements for increased rock armour protection (and supporting marine licence), within 0-12nm of both the Moray and Caithness Coast. Significant updates are highlighted in yellow.

The purpose of this document is to summarise the cumulative impact of the Beatrice Offshore Windfarm Limited (BOWL) and Moray Offshore Renewables Limited (MOW(E)L) windfarm developments and Scottish Hydro Electric Transmission plc's (SHE T) Caithness - Moray High Voltage Direct Current (CMHVDC) cable development on commercial fishing in the Moray Firth.

This document forms an addendum to SHE T's Fisheries Liaison Mitigation and Action Plan (FLMAP), SHE T's Socio-economic Assessment, BOWL's Environmental Statement (ES) and MOW(E)L's ES. It should be read in conjunction with these documents.

It should be noted that this review does not repeat the work already done by others but instead draws on their findings.

SHE T's CMHVDC cable is critical national infrastructure and, as such, SHE T has determined that the cable requires to be protected along its entire length.

2 REVIEW OF NOSS TO HUB ES CUMULATIVE IMPACT CONCLUSIONS

SHE T commissioned Aquatera in 2011 to produce an Environmental Statement (ES) in support of the application for a marine licence for the "Hub to Noss" section of the Caithness – Moray HVDC cable across the Moray Firth. This licence has been granted.

Chapter 11 of the ES (Cumulative and In-combination Issues) sets out possible synergies and antagonisms from the CMHVDC cable, other projects and plans. Table 11.1 below highlights the interactions between commercial fishing and cable infrastructure and notes that the interaction between the Noss to Hub Section of the C-M cable and commercial fisheries as being "possible". This is a lesser level of interaction than that noted between commercial fishing and offshore wind farms such as BOWL and MOW(E)L.

Key	×	?	+?✓	+✓✓	+✓✓✓
	×	?	?✓	✓✓	✓✓✓
	No interaction	Uncertain	Possible interaction	Likely interaction	Certain interaction

Issue/mechanism	Cable infrastructure	Offshore wind farms	PFOW tidal projects	PFOW wave projects	Oil and gas exploration	Conservation	Coastal development
Seabed character changes	✓✓	✓✓	✓✓	✓✓	✓✓	×	×
Water quality changes due to re-suspended sediments	?✓	?✓	×	×	?✓	×	?✓
Seascape changes	×	✓✓✓	✓✓	✓✓	✓✓	×	✓✓
Direct seabed disturbance	✓✓	✓✓	✓✓	✓✓	✓✓	×	?✓
Effects on migrating salmon	×	?	?	?	×	×	×
Disturbance to seabirds offshore	?✓	✓✓	?✓	?✓	?✓	×	?✓
Disturbance to marine mammals from noise	×	✓✓	×	×	✓✓✓	×	?✓
Ecological impacts from spillages of oil and chemicals	×	×	×	×	?✓	×	?✓
Disturbance to commercial fishing	?✓	✓✓	×	✓✓	✓✓	?✓	×
Obstacle to navigation from offshore structures	✓✓	✓✓✓	✓✓	✓✓✓	✓✓	×	×
Obstacle to oil & gas activities	✓✓✓	✓✓✓	×	×	✓✓	✓✓	×
Benefits to the wider renewables sector	+✓✓✓	+✓✓✓	+✓✓✓	+✓✓✓	×	?✓	+?✓
Benefits to the local economy	+?✓	+✓✓	+?✓	+?✓	+?✓	×	+✓✓

Table 11.1 Possible synergies and antagonisms within the current project and with other future projects and plans.

However, this assessment was only carried out in relation to the Noss to Hub section and is therefore not representative of the entire CMHVDC cable route although, it does include the impact from the now discontinued Moray Firth Offshore Hub and the associated 33kV power

supply cable. Thus, the assessment of the impacts on commercial fishing detailed in this document is conservative when compared to the scope of works actually being planned by SHE T.

However, this low level of interaction is consistent with the findings subsequently set out in 2016 in SHE T's Socio-Economic Assessment (for the whole CMHVDC route), which concluded that although there was interaction with fisheries, the likely socio-economic consequences of this was likely to be small.

3 REVIEW OF SHETLAND TO MORAY EA CUMULATIVE IMPACT CONCLUSIONS

SHE T commissioned Entec in 2008 to produce an Environmental Appraisal (EA) in support of their application for a marine licence for the “Shetland HVDC Link”. This licence was granted.

At that time, other developments of significance were considered to be at an early stage in their lifecycle with no formal consenting process having commenced and it was deemed unlikely that any such development would coincide with SHE T’s subsea HVDC cable installation. Hence, cumulative effects were not considered likely.

However, SHE T recognises that this snapshot is no longer representative of the developments that are now planned for the Moray Firth. Therefore, the content of this EA is not considered further in this review.

4 REVIEW OF BOWL AND MOW(E)L ES CUMULATIVE IMPACTS ASSESSMENTS

BOWL and MOW(E)L jointly commissioned ERM in 2011 to produce a Cumulative Assessment Discussion Document (MORL (i.e. MOW(E)L) ES Technical Appendix 1.3D) which set out the methodologies that these developments would use to assess and quantify their cumulative impacts.

BOWL's ES assessed the cumulative impacts of developments in the Moray Firth (including SHE T's C-M cable). Section 16.7 details the developments that were considered in the cumulative impact assessment. The output from this assessment is set out within Section 16 of BOWL's ES and broadly states that the impact on commercial fishing in the Moray Firth is expected to be minor to negligible, though it is considered that these impacts are probable. Table 16.8 from BOWL's ES (set out below) illustrates these findings for selected commercial species.

Table 16.8 Summary of Assessment on Haddock, Scallops and Squid (Operational Phase)

Effect	Receptor	Predicted Significance	Mitigation Proposed	Residual Effect Significance	Probability
Loss of habitat	All	Negligible	None Proposed	Negligible	Probable
Introduction of new habitat	All	Negative minor	None Proposed	Minor	Probable
Electromagnetic Fields	All	Negligible	None proposed	Negligible	Probable
Operational Noise	All	Negative Minor	None Proposed	Minor	Probable

MOW(E)L's ES assessed the cumulative impacts of developments in the Moray Firth (including SHE T's C-M cable). Table 15.1-1 discusses the impacts of individual developments against a variety of receptors. In summary, this notes that there will be moderate displacement of scallop, squid and nephrops fisheries within the wind farm areas and minor displacement of whitefish in the same area. It also notes that the impact will be similarly split for complete loss or restricted access to traditional fishing grounds.

Furthermore, there is no expected cumulative effect on crab and lobster fisheries. Full detail is set out in Section 15.1 of MOW(E)L's ES.

5. CAITHNESS – MORAY HVDC CABLE CONTRIBUTION TO THE OVERALL CUMULATIVE IMPACT

The assessments carried out by BOWL and MOW(E)L, as summarised above, indicate that the cumulative impact of all of the planned developments in the Moray Firth is generally considered to be moderate. However, there are some elements that are considered to be minor or negligible.

SHE T's Socio-economic Assessment describes and quantifies the impacts of the C-M cable on commercial fisheries. These are generally considered to be minor or negligible as set out in Section 3.3.

The table below sets out the impacted areas from each of the projects:

Project	Impacted area, i.e. excluded from mobile gear fishing
BOWL	285,348 m^2 (86 No. foundations x 3,318m^2 - assumed)
MOW(E)L (Round 3 Zone worst case)	1,393,689 m^2 (420 No. foundations x 3,318m^2)
SHE T C-M cable	262m^2 (over the Noss Head MPA)

This indicates that the contribution from the C-M cable to the overall impacted area in the Moray Firth is less than 0.1% of the area impacted by the combination of the BOWL and MOW(E)L turbine foundations (excluding inter-array or export cables, the inclusion of which would increase the impacted area). This is based upon mobile gear fishing not being prevented over the C-M cable however, some vessels may choose not to fish over the cable route.

The above is notwithstanding any legislation or conventions in place (detailed in ***Appendix A***) that protect subsea telecommunications or high voltage electricity cables (including associated cable protection measures) from injury, nor does it preclude the vessel master's responsibility to protect the safety and welfare of his vessel and crew.

SHE T would seek to recover the costs of any losses incurred as a result of the injury to the C-M cable from the party responsible for the injury.

6. CUMULATIVE IMPACT DURING INSTALLATION

There is a potential for simultaneous activities being carried out by various organisations and these are considered below:

- SHE T and BOWL:

  The subsea portions of the SHE T CMHVDC cables and the BOWL AC export cables are relatively close to each other within the first 7.5km off the Moray coastline. At the coastline, the cables are approximately 800m apart and at kp 7.5, the cables are approximately 100m apart. Beyond this, the cables diverge.

  Both installation programmes are available and indicate the following:

  - SHE T will carry out the re-scheduled cable pull-ins at Portgordon in February 2018. At that time, BOWL will not be carrying out operations in the vicinity at that time. There are therefore no expected simultaneous activities relating to SHE T's cable pull-in activities.

  - SHET will carry out the remaining rock placement operations in the areas within the 12nm limit of the Noss and Portgordon coasts, conditional upon receiving the appropriate marine licences, during April and May 2018. BOWL will be installing the second export cable during that time however, any simultaneous operations are expected to be limited to periods of 3 to 4 days when the SHE T rock placement vessel ins on site placing rock.

  - SHET will carry out the remaining mechanical (soil) backfill operations in the areas within the 12nm limit of the Noss and Portgordon coasts during May and June 2018. BOWL will have completed the installation of their second export cable by that time. There are therefore no expected simultaneous activities relating to SHE T's mechanical backfill activities.

- SHE T and MOW(E)L:

  The subsea portions of the SHE T HVDC cables and the MOW(E)L AC export cables cross each other approximately 40km off the Moray coastline. Furthermore, the SHE T HVDC cables are within 100m of the eastern periphery of the MOW(E)L wind farm zone.

  Both installation programmes are available and indicate the following:

  - MOW(E)L's export cable installation activities take place in 2020 i.e. in excess of 1 year after SHE T's cable is put into permanent service. There are therefore no expected simultaneous activities relating to MOW(E)L's export cable installation.

  - MOW(E)L's wind turbine installation activities take place between 2019 and 2021 i.e. in excess of at least 1 year after SHE T's cable is put into permanent service. There are therefore no expected simultaneous activities relating to MOW(E)L's wind turbine installation.

- Ardesier redevelopment:
  - This project is on hold pending re-sale. Therefore, potential construction programme overlap is unlikely.
- Nigg Harbour piling:
  - This work was completed in 2015. Therefore, there is no installation programme overlap.

7. SHE T MITIGATION MEASURES

SHE T's mitigation measures include:

- routing the cable to optimise burial in sediments;
- establishing a target trench depth at 1.8m;
- determining a minimum depth of cover being 1.0m;
- allowing for up to 0.65m of trench backfill between trenching and cable laying (noting that the cable diameter is 0.15m);
- issuing Notices to Mariners through agreed channels;
- provision of guard vessels during the installation phase;
- surveying of the trench profile, cable placement and mechanical backfill;
- placing rock where surveys indicate that minimum depth of cover has not been achieved;
- re-scheduling rock placement prior to mechanical backfill to reduce the quantity of rock required to protect the cable;
- final surveying of completed installation; and
- ongoing monitoring of the installation during its operational lifespan.

Scotland's National Marine Plan states the following:

> *New cables should implement methods to minimise impacts on the environment, seabed and other users, where operationally possible and in accordance with relevant industry practice.*
>
> *Cables should be buried to maximise protection where there are safety or seabed stability risks and to reduce conflict with other marine users and to protect the assets and infrastructure.*
>
> *Where burial is demonstrated not to be feasible, cables may be suitably protected through recognised and approved measures (such as rock or mattress placement or cable armouring) where practicable and cost-effective and as risk assessments direct.*

It is therefore evident that the mitigation measures detailed above discharge SHE T's obligations in this respect.

8. CONCLUSION

The following conclusions can be drawn from the above:

- SHE T acknowledges that the cumulative impact of all planned developments in the Moray Firth will have a moderate impact on mobile gear commercial fishing;
- it is not certain that all planned developments included in the cumulative impact assessment will proceed;
- the timeframes for the delivery of the planned developments other than SHE T's C-M cable are not defined;
- the area impacted by SHE T's C-M cable is negligible as a proportion of the total area impacted by BOWL and MOW(E)L;
- the mitigation measures that will be implemented by SHE T on the C-M cable are in accordance with the requirements set out in Scotland's National Marine Plan; and
- the mitigation measures that will be implemented by SHE T on the C-M cable are proportionate to its contribution to the cumulative impact of developments in the Moray Firth.

APPENDIX A

The International Convention for the Protection of Submarine Cables, 1884, as extended by the Convention on the High Seas, 1958 stipulates:

> *vessels shall not remain or close within 1 mile of vessels engaged in laying or repairing submarine cables or pipelines, and vessels engaged in such work shall show the signals laid down in the International Regulations for Preventions of Collisions at Sea 1972. Fishing gear and nets shall also be removed to, or kept at, a distance of 1 mile from vessels showing those signals, but fishing vessels shall be allowed 24 hours after the signal is first shown for them to get clear.*

The International Regulations for Preventions of Collisions at Sea 1972 rule 18/c states:

> *a vessel engaged in fishing when underway shall, so far as possible, keep out of the way of:*
>
> *(i) A vessel not under command*
>
> *(ii) A vessel restricted in her ability to manoeuvre.*

United Nations Convention on the Law of the Sea Article 113 states:

> *Breaking or injury of a submarine cable or pipeline*
>
> *Every State shall adopt the laws and regulations necessary to provide that the breaking or injury by a ship flying its flag or by a person subject to its jurisdiction of a submarine cable beneath the high seas done wilfully or through culpable negligence, in such a manner as to be liable to interrupt or obstruct telegraphic or telephonic communications, and similarly the breaking or injury of a submarine pipeline or high-voltage power cable, shall be a punishable offence. This provision shall apply also to conduct calculated or likely to result in such breaking or injury. However, it shall not apply to any break or injury caused by persons who acted merely with the legitimate object of saving their lives or their ships, after having taken all necessary precautions to avoid such break or injury.*

APPENDIX B

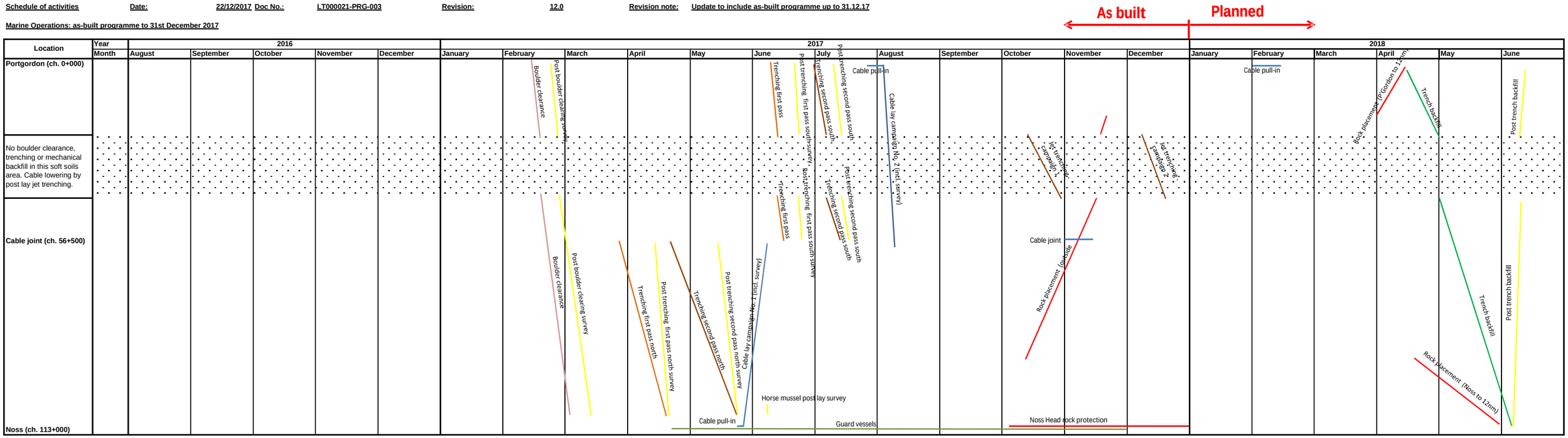
SHE T, BOWL and MOW(E)L Installation programmes

Scottish and Southern Energy

LT21 Caithness HVDC Reinforcement

Schedule of activities **Date:** **22/12/2017** **Doc No.:** **LT000021-PRG-003** **Revision:** **12.0** **Revision note:** **Update to include as-built programme up to 31.12.17**

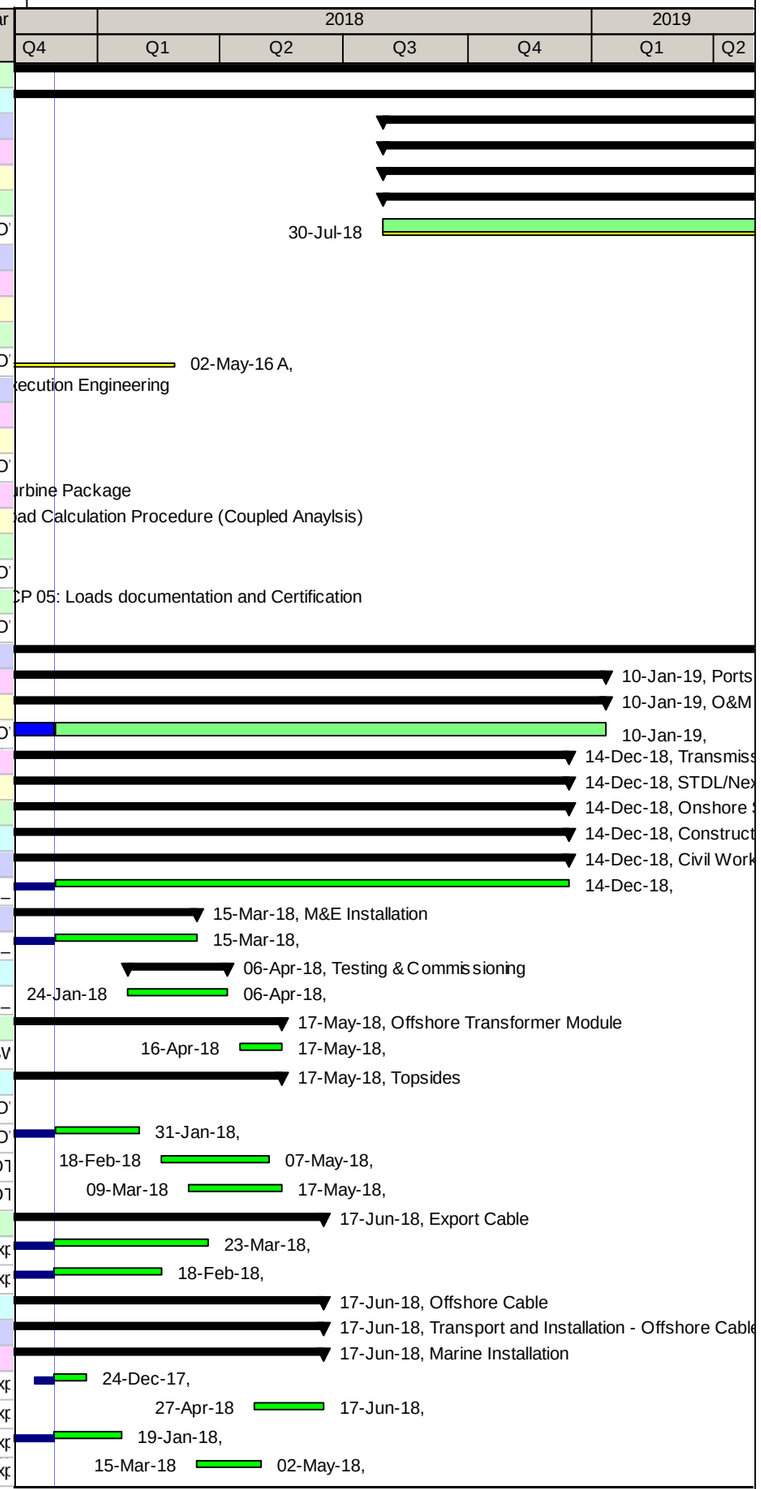
Marine Operations: as-built programme to 31st December 2017



As-built programme dates (up to 31.12.17)

Activity	Start date	Finish date	Duration (days)	
Boulder clearance	15/02/2017	02/03/2017	15	
Post boulder clearance survey	22/02/2017	10/03/2017	16	
Trenching first pass north	28/03/2017	21/04/2017	24	
Post trenching first pass north survey	13/04/2017	21/04/2017	8	
Trenching first pass south	09/06/2017	26/06/2017	17	
Post trenching first pass south survey	20/06/2017	27/06/2017	7	
Trenching second pass north	23/04/2017	25/05/2017	32	
Post trenching second pass north surv	14/05/2017	25/05/2017	11	
Trenching second pass south	30/06/2017	11/07/2017	11	
Post trenching second pass south surv	08/07/2017	12/07/2017	4	
Boulder target investigations north	25/05/2017	26/05/2017	1	
Boulder target investigations south	07/07/2017	12/07/2017	5	
Cable pull-in (Portgordon)	27/07/2017	28/07/2017	1	Aborted during 1st pull-in. Will be rescheduled.
Cable lay - campaign 2 (incl. survey)	31/07/2017	06/08/2017	6	
Cable pull-in (Noss)	27/05/2017	28/05/2017	1	
Cable lay - campaign 1 (incl. survey)	28/05/2017	04/06/2017	7	
Post cable lay HMB survey	04/06/2017	05/06/2017	1	
Jet trenching	15/10/2017	30/10/2017	15	
Jet trenching	08/12/2017	17/12/2017	9	
Cable joint	01/11/2017	16/11/2017	15	
Trench backfill	15/04/2018	06/06/2018	52	
Post trench backfill survey	07/06/2018	11/06/2018	4	
Rock placement (outside 12nm)	16/10/2017	23/11/2017	38	Includes survey
Rock placement (Portgordon to 12nm)	01/04/2018	20/04/2018	19	Includes survey
Rock placement (Noss to 12nm)	21/04/2018	31/05/2018	40	Includes survey
Noss Head rock protection	06/10/2017	31/12/2017	86	Includes survey
Guard vessels (varying quantity)	23/04/2017	11/06/2018	414	

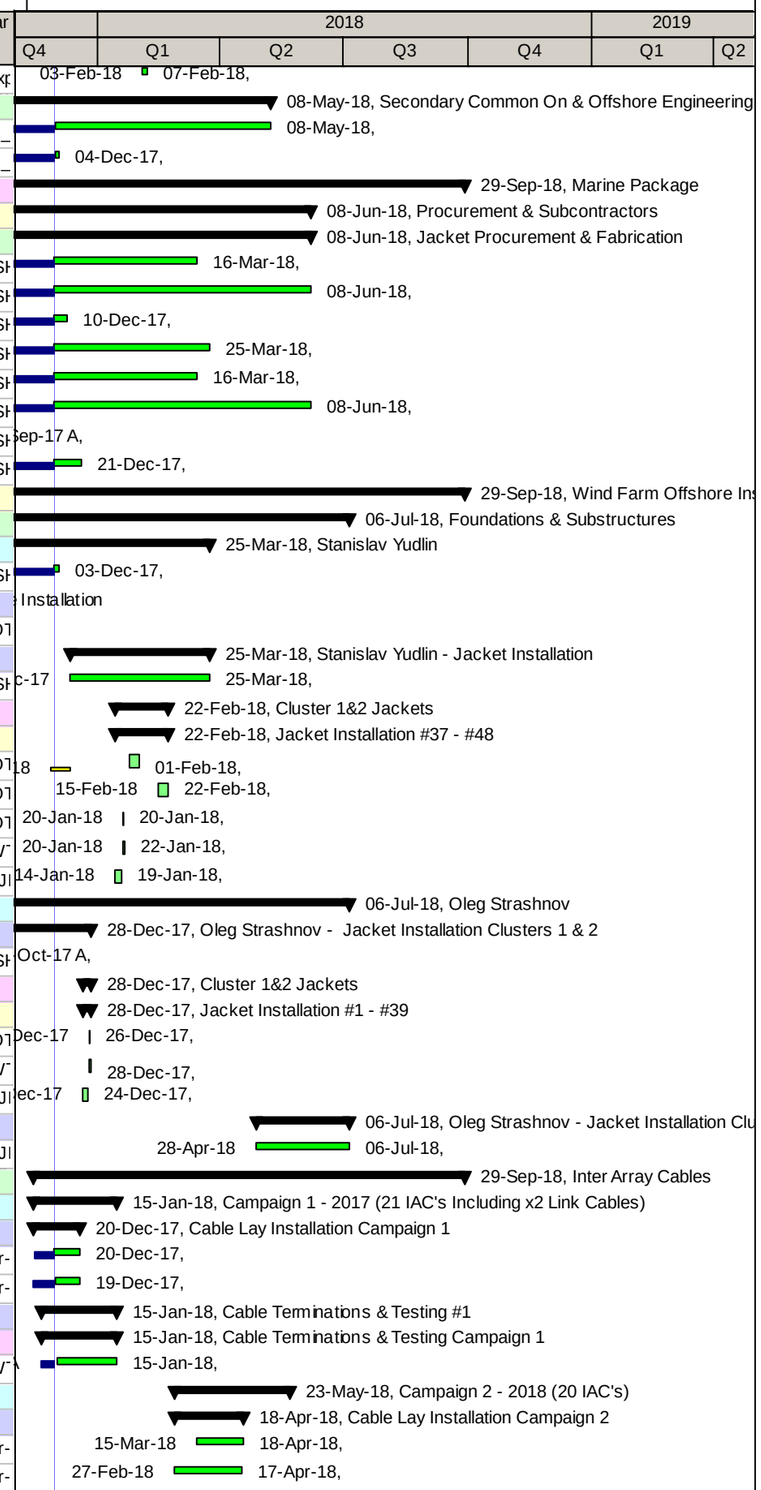
Activity ID	Activity Name	Start	Finish	Duration	Lead	Party	Monthly Movement	Baseline Rev11 variance	Calendar
Beatrice Offshore Wind Farm									
EXECUTION									
Execution Project Management									
Execution Project Management 3rd party Agreements									
OFTO Build									
OFTO (Offshore Transmission Owner)									
BT289310	OFTO Transfer (Summary)	30-Jul-18	12-May-22	960.00	Wilson, S	BOWL	-30.00	-329.13	00005_BO
Execution Regulatory & Consent									
Offshore Consent Condition Discharge									
Offshore Consent Conditions Discharge (Section 36) (Execution)									
Condition 22: Primary Radar Mitigation Scheme									
LINK3260	Condition 22: Primary Radar Mitigation Scheme Works & Discharge (Executi	02-May-16 A	02-May-16 A	0.00	Royle, L	BOWL	0.00	460.00	00005_BO
Execution Engineering									
Transmission Package									
STDL FEED Engineering									
LINK3190	Offshore Substation FEED (Summary)	14-Aug-15 A	16-Nov-16 A	321.88	Hubbard,	STDL	0.00	-58.88	00005_BO
Turbine Package									
Load Calculation Procedure (Coupled Anaylsis)									
LCP 04: Tower Loads Calculations									
LINK3020	SWP LCP-04 Loads and Tower Design Iteration 1.6 (Summary)	12-Jul-16 A	08-Aug-16 A	19.88	Borland, A	SWP	0.00	-33.00	00005_BO
LCP 05: Loads documentation and Certification									
A4380-sum10	SWP LCP-05 Final Tower Design documentation for certification (Summary)	09-Aug-16 A	28-Jul-17 A	244.94	Borland, A	SWP	0.00	-146.00	00005_BO
Execution Construction									
Ports & Harbours									
O&M Service Base Facilities									
BT30878890	O&M Service Base Facilities (Refinement Summary)	01-Feb-16 A	10-Jan-19	745.00	Hutton, D	BOWL	0.00	-610.00	00005_BO
Transmission Package									
STDL/Nexans Execution Programme									
Onshore Substation									
Construction & Installation									
Civil Works									
LINK29100	Onshore Substation - Enabling & Civil Works LoE Summmary	09-Jun-16 A	14-Dec-18	634.00	McSorley	STDL/Nex	-17.00	-344.00	DL_Nexs_
M&E Installation									
LINK29110	Onshore Substation M&E Installation LoE Summary	27-Feb-17 A	15-Mar-18	263.00	McSorley	STDL/Nex	-9.00	-43.00	DL_Nexs_
Testing & Commissioning									
LINK29120	Onshore Substation Commissioning LoE Summary	24-Jan-18	06-Apr-18	51.00	Tomlinso	STDL/Nex	7.00	36.50	DL_Nexs_
Offshore Transformer Module									
LINK17990	OTM 1 & 2 Offshore Commissioning - LoE Summary	16-Apr-18	17-May-18	30.76	Hubbard,	STDL/Nex	9.24	24.07	000005_SV
Topsides									
LINK20010	OTM Procurement LoE Summary	30-Apr-16 A	09-Mar-17 A	215.88	Hubbard,	STDL/Nex	0.00	22.00	00005_BO
LINK16610	OTM 1 & 2 Fabrication LoE Summary	24-Aug-16 A	31-Jan-18	359.88	Hubbard,	STDL/Nex	-8.00	-52.00	00005_BO
LINK17970	OTM 1 - Offshore Commissioning LoE Summary	18-Feb-18	07-May-18	73.13	Hubbard,	STDL/Nex	9.24	31.07	000005_OT
LINK17980	OTM 2 - Offshore Commissioning LoE Summary	09-Mar-18	17-May-18	64.76	Hubbard,	STDL/Nex	9.24	24.07	000005_OT
Export Cable									
LINK38800	Onshore Cable Civil Works, Cable Lay & Jointing - LoE Summary	03-Oct-16 A	23-Mar-18	392.50	Upton, T	STDL/Nex	-12.79	-35.50	00005_Exp
LINK38799	Submarine Cable Design & Manufacture - LoE Summary	20-May-16 A	18-Feb-18	510.00	Cowlisha	STDL/Nex	-1.00	0.00	00005_Exp
Offshore Cable									
Transport and Installation - Offshore Cable									
Marine Installation									
LINK20270	Export Cable 1 - Protection LoE Summary	16-Nov-17 A	24-Dec-17	32.42	Cowlisha	STDL/Nex	0.00	-7.75	00005_Exp
LINK20800	Export Cable 2 - Protection LoE Summary	27-Apr-18	17-Jun-18	50.00	Cowlisha	STDL/Nex	0.00	-13.00	00005_Exp
BT04TR00(	Export Cable Install 1 Lay LoE Summary	26-Sep-17 A	19-Jan-18	63.00	Cowlisha	STDL/Nex	-34.00	-49.63	00005_Exp
BT04TR00(	Export Cable Install 2 Lay LoE Summary	15-Mar-18	02-May-18	35.75	Cowlisha	STDL/Nex	0.00	7.25	00005_Exp



Remaining Level of Effort | Actual Level of Effort | Remaining Work | Rev11 Baseline
Critical Level of Effort | Actual Work | Critical Remaining Work | Summary

TASK filters: Execution Phase, Summary Report .

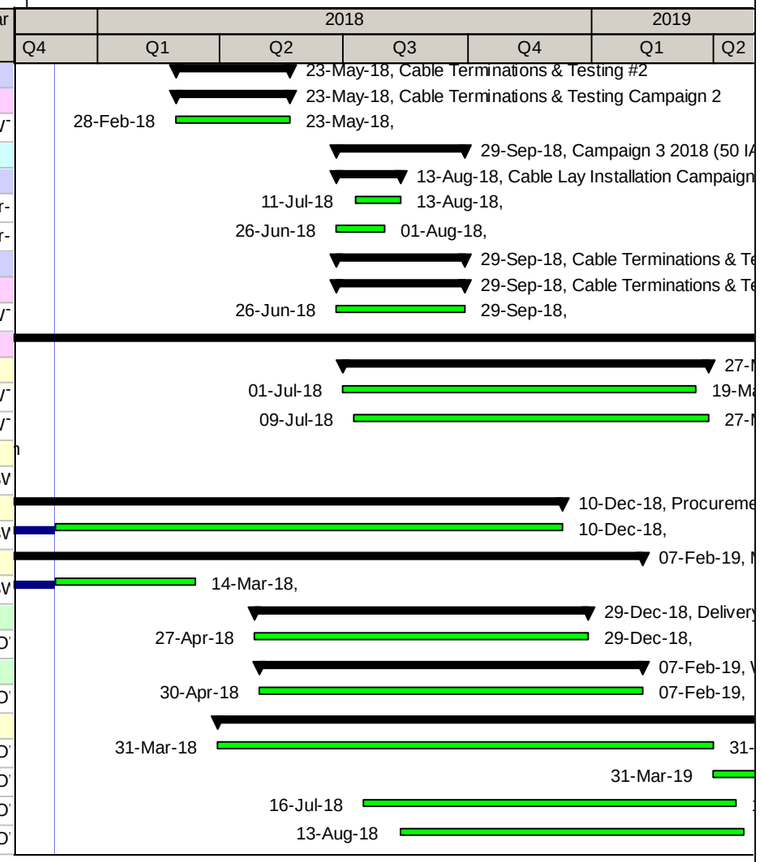
Activity ID	Activity Name	Start	Finish	Duration	Lead	Party	Monthly Movement	Baseline Rev11 variance	Calendar
BT04TR00(	Export Cable Install Interconnector LoE Summary	03-Feb-18	07-Feb-18	2.00	Cowlisha	STDL/Nex	-5.00	-48.63	)00005_Exp
Secondary Common On & Offshore Engineering (Protection & SCADA)									
LINK29320	SCADA Configuration & Test - Onshore & Offshore LoE Summary	23-May-16 A	08-May-18	491.00	Ogg, S	STDL/Nex	0.00	-78.00	~DL_Nexs_
LINK29300	SCADA Settings - Onshore & Offshore LoE Summary	18-Jul-16 A	04-Dec-17	350.00	Ogg, S	STDL/Nex	-20.00	-129.00	~DL_Nexs_
Marine Package									
Procurement & Subcontractors									
Jacket Procurement & Fabrication									
LINK40010	BiFab Jacket Fabrication Cluster 1 & 2 - LoE Summary	01-Jun-16 A	16-Mar-18	652.67	Plummer,	SHL	-12.00		000005_SH
LINK40013	BiFab Jacket Fabrication Cluster 3,4 & 5 - LoE Summary	17-Oct-16 A	08-Jun-18	599.00	Plummer,	SHL	30.00		000005_SH
LINK40012	Bladt Jacket Fabrication Cluster 1 & 2 - LoE Summary	01-Jun-16 A	10-Dec-17	556.67	Plummer,	SHL	-2.00		000005_SH
LINK40015	Bladt Jacket Fabrication Cluster 3,4 & 5 - LoE Summary	17-Oct-16 A	25-Mar-18	524.00	Plummer,	SHL	0.00		000005_SH
LINK34610	Jacket Fabrication Cluster 1 & 2 - LoE Summary	01-Jun-16 A	16-Mar-18	652.67	Plummer,	SHL	-12.00	-66.29	000005_SH
LINK34620	Jacket Fabrication Cluster 3, 4 & 5 - LoE Summary	17-Oct-16 A	08-Jun-18	599.00	Plummer,	SHL	30.00	-2.29	000005_SH
LINK40011	Smulders Jacket Fabrication Cluster 1 & 2 - LoE Summary	01-Jun-16 A	27-Sep-17 A	482.67	Plummer,	SHL	0.00		000005_SH
LINK40014	Smulders Jacket Fabrication Cluster 3,4 & 5 - LoE Summary	17-Oct-16 A	21-Dec-17	430.00	Plummer,	SHL	4.00		000005_SH
Wind Farm Offshore Installation									
Foundations & Substructures									
Stanislav Yudlin									
LINK38805	Pile Installation Offshore - LoE Summary (Stanislav Yudin)	01-Apr-17 A	03-Dec-17	246.65	Plummer,	SHL	-13.35	-50.27	000005_SH
Stanislav Yudlin - Pile Installation									
LINK38375	Pre-Pile OTM Locations (8 x OTM Piles) LoE Summary	01-Apr-17 A	08-Apr-17 A	4.00	Plummer,	SHL	0.00	11.94	000005_OT
Stanislav Yudlin - Jacket Installation									
LINK23580	Jacket Installation Cluster 1&2 LoE Summary (Stanislav Yudin)	12-Dec-17	25-Mar-18	103.34	Plummer,	SHL	-12.00	-87.75	000005_SH
Cluster 1&2 Jackets									
Jacket Installation #37 - #48									
LINK13720	Install OTM Topside 1	25-Jan-18	01-Feb-18	2.29	Plummer,	SHL	0.00	-14.04	000005_OT
LINK39796	Install OTM Topside 2	15-Feb-18	22-Feb-18	2.29	Plummer,	SHL	2.42		000005_OT
LINK39994	OTM Jacket #2 - Cantilever Deck (x2) and Boat Landings (x2) Installation	20-Jan-18	20-Jan-18	0.75	Plummer,	SHL	-11.00		000005_OT
LINK39877	OTM Jacket #2 - Jacket Completion Activities (Welding of Decks and Platfor	20-Jan-18	22-Jan-18	1.41	Plummer,	SHL	-26.00		)00005_W~
LINK39993	OTM Jacket #2 - Main Jacket Install	14-Jan-18	19-Jan-18	1.50	Plummer,	SHL	-18.17		=000005_JI
Oleg Strashnov									
Oleg Strashnov - Jacket Installation Clusters 1 & 2									
LINK34911	Jacket Installation Clusters 1 & 2 LoE Summary (Oleg Strashnov)	03-Aug-17 A	03-Oct-17 A	61.50	Plummer,	SHL	0.00	9.54	000005_SH
Cluster 1&2 Jackets									
Jacket Installation #1 - #39									
LINK39992	OTM Jacket #1 - Cantilever Deck (x2) and Boat Landings (x2) Installation	26-Dec-17	26-Dec-17	0.75	Plummer,	SHL	-6.00		000005_OT
LINK13550	OTM Jacket #1 - Jacket Completion Activities (Welding of Decks and Platfor	26-Dec-17	28-Dec-17	1.41	Plummer,	SHL	-14.00	-110.62	)00005_W~
LINK39991	OTM Jacket #1 - Main Jacket Install	21-Dec-17	24-Dec-17	1.50	Plummer,	SHL	-10.98		=000005_JI
Oleg Strashnov - Jacket Installation Clusters 3,4 & 5									
LINK13605	Jacket Installation Clusters 3,4 & 5 LoE Summary (Oleg Strashnov)	28-Apr-18	06-Jul-18	177.00	Plummer,	SHL	33.00	102.25	=000005_JI
Inter Array Cables									
Campaign 1 - 2017 (21 IAC's Including x2 Link Cables)									
Cable Lay Installation Campaign 1									
LINK28040	Cable Burial - Campaign 1 LoE Summary	16-Nov-17 A	20-Dec-17	32.04	Plummer,	SHL	6.65	-6.33	)005_Inter-
LINK23590	Cable Lay - Campaign 1 LoE Summary	15-Nov-17 A	19-Dec-17	13.25	Plummer,	SHL	3.65	-2.82	)005_Inter-
Cable Terminations & Testing #1									
Cable Terminations & Testing Campaign 1									
LINK24935	Cable Terminations & Testing Campaign 1- LoE Summary	21-Nov-17 A	15-Jan-18	38.80	Plummer,	SHL	-0.27	-16.98	)00005_W~
Campaign 2 - 2018 (20 IAC's)									
Cable Lay Installation Campaign 2									
LINK36020	Cable Burial - Campaign 2 LoE Summary	15-Mar-18	18-Apr-18	34.18	Plummer,	SHL	0.32	-6.00	)005_Inter-
LINK36010	Cable Lay - Campaign 2 - LoE Summary	27-Feb-18	17-Apr-18	28.62	Plummer,	SHL	0.32	-7.92	)005_Inter-



Remaining Level of Effort | Actual Level of Effort | Remaining Work | Rev11 Baseline
Critical Level of Effort | Actual Work | Critical Remaining Work | Summary

TASK filters: Execution Phase, Summary Report .

Activity ID	Activity Name	Start	Finish	Duration	Lead	Party	Monthly Movement	Baseline Rev11 variance	Calendar
Cable Terminations & Testing #2									
Cable Terminations & Testing Campaign 2									
LINK38010	Cable Terminations & Testing Campaign 2 - LoE Summary	28-Feb-18	23-May-18	67.50	Plummer,	SHL	4.50	-34.20	)00005_W
Campaign 3 2018 (50 IAC's Including x5 Link Cables)									
Cable Lay Installation Campaign 3									
LINK28060	Cable Burial - Campaign 3 LoE Summary	11-Jul-18	13-Aug-18	33.25	Plummer,	SHL	0.00	22.20	)005_Inter-
LINK25384	Cable Lay - Campaign 3 - LoE Summary	26-Jun-18	01-Aug-18	34.97	Plummer,	SHL	0.00	15.38	)005_Inter-
Cable Terminations & Testing #3									
Cable Terminations & Testing Campaign 3									
LINK25374	Cable Terminations & Testing Campaign 3 - LoE Summary	26-Jun-18	29-Sep-18	84.50	Plummer,	SHL	2.50	-17.67	)00005_W
Turbine Package									
Cost LOE									
BT04MHLOE031	Turbine Installation Offshore - LoE Summary (Manhour)	01-Jul-18	19-Mar-19	177.66	Borland, A	SWP	0.00	0.00	)00005_W
BT04MHLOE032	WTG Commissioning - LoE Summary (Manhour)	09-Jul-18	27-Mar-19	192.41	Borland, A	SWP	0.00	0.00	)00005_W
Design									
BT04MHLOE023	Turbine Engineering & Design LoE Summary	21-Aug-14 A	30-Jun-17 A	792.53	Borland, A	SWP	0.00	65.07	000005_SV
Procurement									
BT04MHLOE070	Turbine Procurement & Manufacture - LoE Summary	28-Aug-17 A	10-Dec-18	357.65	Borland, A	SWP	0.00	-0.25	000005_SV
Marshalling Port									
BT289390	Construction Port Development Works	01-Mar-17 A	14-Mar-18	379.00	Borland, A	SWP	0.00	0.00	000005_SV
Delivery of WTGs to Marshalling Harbour									
BT290050	WTG Delivery - LoE Summary	27-Apr-18	29-Dec-18	246.00	Borland, A	SWP	-2.86	-3.00	00005_BO
WTG Pre-Assembly									
BT04WT09000	Turbine Pre-Assembly - LoE Summary	30-Apr-18	07-Feb-19	196.00	Borland, A	SWP	0.00	-0.94	00005_BO
WTG Commissioning									
BT30878700	Investment Contract Phase 1 Target Commisioning Window	31-Mar-18	31-Mar-19	365.50	Borland, A	BOWL	0.00	0.00	00005_BO
BT30878740	Investment Contract Phase 2 Target Commisioning Window	31-Mar-19	30-Mar-20	365.00	Borland, A	BOWL	0.00	0.00	00005_BO
BT30878830	WTG Reliability Testing - LoE Summary	16-Jul-18	16-Apr-19	188.53	Borland, A	SWP	0.00	0.00	00005_BO
BT30878831	WTG Customer Take Over - LoE Summary	13-Aug-18	22-Apr-19	173.00	Borland, A	SWP	0.00	0.00	00005_BO



Remaining Level of Effort | Actual Level of Effort | Remaining Work | Rev11 Baseline
Critical Level of Effort | Actual Work | Critical Remaining Work | Summary

TASK filters: Execution Phase, Summary Report .

Item	Task	Start	Finish	Duration
		date	*date*	*Calendar days*
Project Milestones	FC	30-Sep-18		
	ION A	16-Sep-20		
	ION B	01-Apr-21		
	COD	31-Mar-22		
Survey Works	Wind Farm Area - CPTUs	05-Nov-17	31-Jan-18	87.00
	Landfall - Nearshore Survey	12-Mar-18	01-Apr-18	20.00
	Wind Farm Area - OEC route	15-Mar-18	08-Apr-18	24.00
	Wind Farm Area - IAC Route	08-Apr-18	22-Jun-18	75.00
	Pre construction Survey	22-Jun-18	21-Aug-18	60.00
Onshore Works	HV equipment leadtime	17-Dec-18	18-Feb-20	428.00
	Installation - Civil Works	01-Sep-18	04-Mar-20	550.00
	Installation - M&E	25-Oct-19	24-Aug-20	304.00
	Onshore Cable Installation	08-Nov-18	08-Jul-20	608.00
	Testing & Cold commissioning	16-Dec-19	16-Sep-20	275.00
	Onshore Works Energisation	16-Sep-20	26-Sep-20	10.00
OECs	Cable Lay	07-Jul-20	29-Sep-20	84.50
	Landfall Works	18-Jul-20	24-Sep-20	68.00
	OSP Termination and Testing	24-Jul-20	24-Sep-20	62.50
	Cable Burial	01-Aug-20	01-Oct-20	61.00
	OEC Energisation	26-Sep-20	26-Oct-20	30.00
OSP	HV Equipment Leadtime	01-Oct-18	27-Sep-19	361.00
	OSP Delivery	24-Dec-18	15-Jun-20	539.00
	Installation Window	01-Jun-20	01-Jul-20	30.00
	Cold Commissioning	01-Jul-20	30-Oct-20	121.00
	Hot Commissioning	26-Oct-20	15-Nov-20	20.00
	Energisation	15-Nov-20	15-Dec-20	30.00
Piles	Delivery	02-Mar-19	30-Oct-19	242.00
	Installaiton - NET	01-Apr-19	27-Sep-19	179.00
	Installation - P50	27-Sep-19	03-Nov-19	37.00
Jackets	Delivery	30-Mar-20	21-Sep-20	175.00
	Installaiton - NET	01-Jul-20	29-Sep-20	90.00
	Installation - P50	29-Sep-20	12-Oct-20	13.00
IACs	Laying - NET	01-Sep-20	13-Nov-20	73.00
	Laying - P50	13-Nov-20	27-Nov-20	14.00
	Trench&Burial - NET	15-Sep-20	02-Jan-21	109.00
	Trench & Burial - P50	02-Jan-21	07-Jan-21	5.00
	Testing & Termination - NET	05-Oct-20	27-Dec-20	83.00
	Testing & Termination - P50	27-Dec-20	14-Jan-21	18.00
	Energisation	15-Dec-20	03-Apr-21	109.86
WTG	Lead time	03-Jan-19	30-Aug-20	605.00
	Supply	01-Sep-20	08-Jun-21	280.00
	Transport	03-Sep-20	11-Jun-21	280.20
	Pre assembly	07-Sep-20	23-Aug-21	349.90
	Installation	01-Jan-21	15-Sep-21	257.00
	M&E	11-Jan-21	23-Sep-21	255.00
	Energisation	16-Jan-21	26-Sep-21	252.90
	Commissioning	22-Jan-21	04-Oct-21	255.00
	Test on Completion (per WTG)	01-Apr-21	14-Oct-21	196.38
	Technical Issue/Re-testing	14-Oct-21	13-Nov-21	30.00
	Final TSA Availability Test	13-Nov-21	03-Dec-21	20.00
	Taking Over Documentation and Approval	03-Dec-21	12-Jan-22	40.00
Completion Works	Facilities Agreement Availability Test	12-Jan-22	01-Feb-22	20.00
	OCPs to LCCC and Approval	01-Feb-22	02-Mar-22	29.00
	COD docs to Lenders and Approval	02-Mar-22	31-Mar-22	29.00