Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions

Preliminary Environmental Information Report

Volume 3

Appendix 29.3 - Socio-Economics Impact Assessment

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Table of Contents

List of Tables

Glossary of Acronyms

CAPEX	Capital Expenditure
DEP	Dudgeon Offshore Wind Farm Extension Project
DEVEX	Development Expenditure
FTE	Full-Time Equivalent
GVA	Gross Value Added
MW	Megawatts
OPEX	Operational Expenditure
SEP	Sheringham Shoal Offshore Wind Farm Extension Project

Glossary of Terms

The Applicant	Equinor New Energy Limited
Dudgeon Offshore Wind Farm Extension site	The Dudgeon Offshore Wind Farm Extension offshore wind farm boundary.
Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.
Sheringham Shoal Offshore Wind Farm Extension site	Sheringham Shoal Offshore Wind Farm Extension offshore wind farm boundary.
Sheringham Offshore Wind Farm Extension Project (SEP)	The Sheringham Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.

29.3 SOCIO-ECONOMICS IMPACT ASSESSMENT

29.3.1 Introduction

1. This note provides an overview of the total and annual economic impacts generated as a result of the construction and operations of the Dudgeon Offshore Wind Farm Extension Project (DEP) and the Sheringham Shoal Offshore Wind Farm Extension Project (SEP).

29.3.2 DEP & SEP Construction Cost and Sourcing

29.3.2.1 Total Construction Cost

2. Based on **Appendix 29.1 Socio-Economics Construction Costs and Sourcing Assumptions Note**, the overall construction cost for DEP and SEP (i.e. with a maximum generation capacity of 786MW) is estimated to be in the region of £2.14 billion without cost savings (or £2.00 billion once potential cost savings as a result of concurrent construction are taken into consideration).

29.3.2.2 DEVEX + CAPEX Sourcing

3. **Appendix 29.1** sets out two sourcing scenarios with regards to construction port and the retention of spend within the East Anglia study area, which are:
   - **UK-based port scenario** – a construction port is located within the UK but outside the East Anglia area; and
   - **Local port scenario** – at least one UK-based construction port is located within the East Anglia area.

4. Based on the various sourcing assumptions outlined in **Appendix 29.1** it is estimated that **between £19.2 million and £171.0 million of first round construction-related expenditure** will be retained in East Anglia across DEP and SEP. More detail about the expenditure retained in East Anglia and the rest of the UK for the two projects' various phases (ie. DEVEX, turbines, balance of plant (defined as all components other than those related to the turbine generators), installation and commissioning), under each scenario outline above is presented in **Table 29.3.1** below. Please note that the estimates presented below remain unchanged, irrespective of the construction scenario being considered.

*Table 29.3.1: Overall DEVEX and CAPEX for **DEP** and **SEP** captured within East Anglia and the rest of the UK by phase and sub-phase (£ million)*

	UK-based port scenario		Local port scenario	
	East Anglia	Rest of UK	East Anglia	Rest of UK
DEVEX	£8.4	£58.5	£8.4	£58.5
CAPEX	£10.9	£517.5	£162.7	£365.7
- Turbines (incl. rotor, nacelle, tower)	£0.0	£185.7	£0.0	£185.7

	UK-based port scenario		Local port scenario	
	East Anglia	Rest of UK	East Anglia	Rest of UK
- Balance of plant (incl. cables, foundations, substations and operations base)	£0.0	£87.3	£38.7	£48.6
- Installation and commissioning	£10.9	£244.5	£124.0	£131.4
Total	£19.2	£576.0	£171.0	£424.2

Source: Hatch calculations, based on The Crown Estate (2019).

29.3.2.3 Operations and Maintenance (O&M) Sourcing

5. Overall, it is assumed that operation activity of DEP and SEP will equate to a little over £1.1 billion over the 35-year operational lifetime for each project.

6. As set out in **Appendix 29.1 Socio-Economics Construction Costs and Sourcing Assumptions Note** it is assumed that the O&M port is located in East Anglia and all direct operational labour is sourced from within the study area.

7. Furthermore, it is assumed that 77% of total OPEX expenditure for both projects is sourced from within the UK, with overall sourcing being split 26%-49% between East Anglia and the rest of the UK. On this basis, **it is estimated that £10.1 million in direct staff wages and first round supply chain expenditure would be retained within the East Anglia study area each year.**

*Table 29.3.2: Overall annual OPEX for **DEP** and **SEP** captured within East Anglia and the rest of the UK by phase and sub-phase (£ million)*

	East Anglia	Rest of UK
OPEX	£10.1	£14.6
- Direct employment	£2.2	£0.0
- Supply chain expenditure	£7.9	£14.6

Source: Hatch calculations, based on The Crown Estate (2019).

29.3.2.4 Total East Anglia and UK Sourcing

8. Based on the assumptions outlined above, an overall generation capacity of up to 786MW, and a 35-year lifespan each wind farm, it is therefore estimated that the overall share of the construction and lifetime O&M expenditure retained in East Anglia will range **between 11% and 16% depending on whether a local construction port is used, which is equivalent to £371.7 million and £523.5 million (in current prices)**.

Table 29.3.3: Overall Construction and O&M Sourcing Assumptions for DEP and SEP, values (£ million)

	UK-based port scenario		Local port scenario	
Phase	East Anglia	Rest of UK	East Anglia	Rest of UK
Construction (incl. DEVEX)	£19.2	£576.0	£171.0	£424.2
Operation	£352.5	£511.6	£352.5	£511.6
Total	**£371.7**	**£1,087.5**	**£523.5**	**£935.8**

Source: Hatch calculations, based on The Crown Estate (2019).

9. Using employment and GVA coefficients and regional multiplier benchmarks from the Hatch Input-Output model (derived from UK national accounts data) it is possible to generate estimates for employment and economic output that could be supported by the sourcing assumptions outlined above. Please note that the assessment of economic impact uses an approach that is consistent with the methods for economic impact assessment set out in The Green Book (HM Treasury, 2020).

29.3.3 Headline Economic Impact (Totals)

10. This section provides an overview of the headline economic impacts generated as a result of the development, construction and operation of both DEP and SEP. Please note that the employment figures outlined in this section represent person years of employment (rather than annual jobs), whilst gross value added (GVA) figures are totals shown in current (i.e. 2020) prices.

29.3.3.1 Development and Construction

29.3.3.1.1 Construction of DEP

11. Overall, it is estimated that the development and construction of DEP will require an investment in the region of £1.23 billion, of which £344 million are estimated to be captured by UK-based businesses. Based on the sourcing assumptions set out in **Appendix 29.1 Socio-Economics Construction Costs and Sourcing Assumptions Note** it is estimated that between £11.0 and £100.1 million will be captured directly and/ or indirectly by businesses located in East Anglia.

12. Once these estimates are put through the Hatch Input-Output model, it is estimated that the construction of DEP has potential to support between 160 and 1,070 person years of employment within the East Anglia study area, generating between £7.6 and £56.9 million in GVA to the East Anglia economy. At the national level, the construction of DEP has potential to support around 4,020 person years of employment and contribute almost £222 million in GVA to the national economy.

*Table 29.3.4: Overall DEVEX + CAPEX impacts for **DEP***

	UK-based port scenario		Local port scenario	
	East Anglia	UK (Total)	East Anglia	UK (Total)
Construction cost (£ million)	£11.0	£344.0	£100.1	£344.0
Direct (incl. Tier 1) + indirect construction jobs (person years)	160	4,020	1,070	4,020
Direct (incl. Tier 1) + indirect construction GVA (£ million)	£7.6	£222.0	£56.9	£222.0

Source: Calculations by Hatch, 2020.

29.3.3.1.2 Construction of SEP

13. The development and construction of SEP is estimated to require an overall investment in the region of £903 million, of which £251 million have potential to be captured by UK-based businesses. Based on the sourcing assumptions set out in **Appendix 29.1 Socio-Economics Construction Costs and Sourcing Assumptions Note** it is estimated that between £8.3 and £70.9 million will be captured directly and/ or indirectly by businesses located in East Anglia.

14. Once these estimates are put through the Hatch Input-Output model, it is estimated that the construction of SEP has potential to support between 120 and 760 person years of employment within the East Anglia study area, generating a contribution of between £5.7 and £40.2 million GVA to the East Anglia economy. At the national level, the construction of SEP has potential to support around 2,910 person years of employment and contribute a little over £160.3 million GVA to the national economy.

*Table 29.3.5: Overall DEVEX + CAPEX impacts for **SEP***

	UK-based port scenario		Local port scenario	
	East Anglia	UK (Total)	East Anglia	UK (Total)
Construction cost (£ million)	£8.3	£251.3	£70.9	£251.3
Direct (incl. Tier 1) + indirect construction jobs (person years)	120	2,910	760	2,910
Direct (incl. Tier 1) + indirect construction GVA (£ million)	£5.7	£160.3	£40.2	£160.3

Source: Calculations by Hatch, 2020.

29.3.4 Operations

29.3.4.1 Operations of DEP

15. Based on an assumed 35-year operational lifetime, total expenditure (including labour costs) for DEP is estimated to be £648 million, of which £499 million is retained in the UK. Of this, around £200 million is estimated to be retained in East Anglia, supporting 2,250 person years of employment, and generating around £276 million in GVA to the local economy.

29.3.4.2 Operations of SEP

16. Based on an assumed 35-year operational lifetime, total expenditure (including labour costs) for SEP is estimated to be £474 million, of which £365 million has potential to be retained in the UK. Of this, around £153 million is estimated to be retained in East Anglia, supporting 2,040 person years of employment, and generating around £257 million in GVA to the local economy.

*Table 29.3.6: Lifetime operational impacts for **SEP** and **DEP***

	DEP		SEP	
	East Anglia	UK (Total)	East Anglia	UK (Total)
O&M expenditure (£ million)	£199.7	£499.1	£152.7	£364.9
Direct (incl. Tier 1) + indirect O&M jobs (person years)	2,250	5,370	2,040	4,240
Direct (incl. Tier 1) + indirect O&M GVA (£ million)	£276.0	£539.7	£256.6	£443.4

Source: Calculations by Hatch, 2020.

29.3.5 Construction Scenarios

17. The following section provides an overview of the annual employment and GVA impacts supported by the development and construction of DEP and SEP, and is based on the three construction scenarios outlined below:

- **Scenario 1:** Only one project goes ahead, delivery of either 338MW (SEP) or 448MW (DEP), construction period of four years;
- **Scenario 2:** DEP and SEP constructed concurrently, delivery of 786MW, construction period of four years; and
- **Scenario 3:** Both projects constructed sequentially, delivery of 786MW, total construction period of up to eleven years (split four years construction for Project 1, then a two to four-year break, followed by a three-year construction period for Project 2). At this point it is not clear which project will go ahead first, so a range based on low (i.e. SEP) and high (i.e. DEP) construction spend is presented.

18. Each of the three scenarios outlined above draws on the sourcing assumptions presented above in **Appendix 29.1 Socio-Economics Construction Costs and Sourcing Assumptions Note**. These values represent the lowest and highest bounds of the impacts that could be generated based on the two port scenarios (i.e. a UK-based port and a local port scenario) assessed.

19. In reality, should both projects be built, there might be a situation where one Project uses an East Anglia-based port for part of its construction activities, whilst the other Project makes use of another port located elsewhere in the UK). This means that in addition to the high and low estimates presented above, there are other potential options for expenditure retention within East Anglia. For this reason, the potential impacts generated across each scenario are presented as a range.

29.3.5.1 Scenario 1

29.3.5.1.1 DEP in Isolation

20. Under this scenario, it is assumed that the development and construction phase of DEP will take up to four years from start to finish. Based on the overall impacts outlined in **Section 29.3.3.1.1** and an assumed four-year construction period, it is estimated that the construction of DEP has potential to support around 1,000 Full-Time Equivalent (FTE) jobs and generate £55.5 million GVA each year at the national level.

21. Depending on the choice of construction port, and level of expenditure captured by local businesses, it is estimated that at the East Anglia level, the project has potential to support between 40-270 FTE jobs and generate £1.9-£14.2 million GVA each year over a four-year construction period.

*Table 29.3.7: Annual DEVEX + CAPEX impacts for **DEP***

	East Anglia		UK (Total)
	UK-based port	**Local port**	**UK-based port/ Local port**
Direct (incl. Tier 1) + indirect construction jobs (FTEs)	40	270	1,000
Direct (incl. Tier 1) + indirect construction GVA (£ million)	£1.9	£14.2	£55.5

Source: Calculations by Hatch, 2020.

29.3.5.1.2 SEP in isolation

22. If on the other hand, only SEP were to go ahead, it is estimated that its construction has potential to support around 730 FTE jobs and generate £40.1 million GVA each year at the national level.

23. Depending on the choice of construction port, and level of expenditure captured by local businesses, it is estimated that at the East Anglia level, the project has potential to support between 30-190 FTE jobs and generate £1.4-£10.0 million GVA each year over a four-year construction period.

*Table 29.3.8: Annual DEVEX + CAPEX impacts for **SEP***

	East Anglia		UK (Total)
	UK-based port	Local port	UK-based port/ Local port
Direct (incl. Tier 1) + indirect construction jobs (FTEs)	30	190	730
Direct (incl. Tier 1) + indirect construction GVA (£ million)	£1.4	£10.0	£40.1

Source: Calculations by Hatch, 2020.

29.3.5.2 Scenario 2

24. Under Scenario 2, which sees both projects built concurrently over a four-year development and construction period, it is estimated that the overall expenditure captured nationally has potential to support around 1,730 FTE jobs and generate around £95.6 million GVA each year of construction.

25. At the East Anglia level this means that between 70-460 FTE jobs have potential to be supported, along with the generation of £3.3-£24.3 million GVA per annum over a four-year construction period. These impacts are based on there being no cost savings resulting from economies of scale enabled by the parallel construction of DEP and SEP.

*Table 29.3.9: Annual DEVEX + CAPEX impacts of concurrent construction for **DEP** and **SEP***

	East Anglia		UK (Total)
	UK-based port	Local port	UK-based port/ Local port
Direct (incl. Tier 1) + indirect construction jobs (FTEs)	70	460	1,730
Direct (incl. Tier 1) + indirect construction GVA (£ million)	£3.3	£24.3	£95.6

Source: Calculations by Hatch, 2020.

26. The assessment has also considered the potential for cost savings resulting from economies of scale achieved as a result of parallel construction. **Appendix 29.1 Socio-Economics Construction Costs and Sourcing Assumptions Note** outlines where costs savings could be achieved as a result of parallel construction and indicates that savings in the region of 6-7% could be achieved.

27. It is therefore expected that cost efficiencies from parallel construction have potential to reduce the overall benefits supported by the development and construction of DEP and SEP. It is estimated that the parallel construction of DEP and SEP has potential to support around 1,540 FTE jobs and generate around £85.1 million GVA per annum over a four-year period. At the East Anglia level, this has potential to translate to between 60-400 FTE jobs supported, and the generation of £3.0-£23.1 million GVA each year over a four-year construction period.

*Table 29.3.10: Annual DEVEX + CAPEX impacts of concurrent construction for **DEP** and **SEP** (incl. cost savings due to economies of scale)*

	East Anglia		UK (Total)
	UK-based port	Local port	UK-based port/ Local port
Direct (incl. Tier 1) + indirect construction jobs (FTEs)	60	400	1,540
Direct (incl. Tier 1) + indirect construction GVA (£ million)	£3.0	£23.1	£85.1

Source: Calculations by Hatch, 2020.

29.3.5.3 Scenario 3

28. At this stage, it is not known which of the two Projects (i.e. DEP or SEP) would be constructed first under Scenario 3, and as such a range of potential benefits is presented. The first Project built, under a sequential approach to construction has potential to support between 730-1,000 FTE jobs per annum and generate £40.1-£55.5 million GVA per annum over a four-year period nationally. The second project built under a sequential approach to construction has potential to support between 970-1,340 FTE jobs per annum and generate £53.4-£74.0 million GVA per annum over a three-year period nationally.

29. At the East Anglia level, the level of employment and economic output generated will depend on the location of the construction port (relative to the study area), and local businesses' ability to capture supply chain expenditure generated by either or both DEP and SEP. That said, it is estimated that the sequential construction of the first project, over a four-year-period has potential to support between 30-270 FTE jobs within East Anglia depending on which project is constructed first and the level of supply chain expenditure secured by local businesses. This translates to an overall economic contribution ranging from £1.4-£14.2 million GVA for each year of construction activity.

30. The second project delivered, over a three-year period, has potential to support between 40-360 FTE jobs in East Anglia depending on which project is constructed second and the level of supply chain expenditure secured by local businesses. This translates to an overall economic impact/ contribution ranging from £1.9-£19.0 million GVA for each year of construction activity.

*Table 29.3.11: Annual DEVEX + CAPEX impacts of sequential construction for **DEP** and **SEP***

		East Anglia		UK (Total)
		UK-based port	**Local port**	**UK-based port/ Local port**
Project 1 (4-year construction period)	Direct (incl. Tier 1) + indirect construction jobs (FTEs)	30 / 40	190 / 270	730 / 1,000
	Direct (incl. Tier 1) + indirect construction GVA (£ million)	£1.4 / £1.9	£10.0 / £14.2	£40.1 / £55.5
Project 2 (3-year construction period)	Direct (incl. Tier 1) + indirect construction jobs (FTEs)	40 /50	250 / 360	970 / 1,340
	Direct (incl. Tier 1) + indirect construction GVA (£ million)	£1.9 / £2.5	£13.4 / £19.0	£53.4 / £74.0

Source: Calculations by Hatch, 2020.

29.3.5.4 Operations

31. Once commissioned, DEP and SEP will support ongoing employment opportunities throughout each project's 35-year operations phase. **Table 29.3.12** below provides an overview of the annualised impacts by DEP and SEP (as shown in **Table 29.3.6** above).

32. It shows that operation of DEP has potential to support around 150 FTE jobs and generate £15.4 million GVA for each year of operation, of which 60 FTE jobs and £7.9 million GVA will be captured/ generated within East Anglia. This includes the direct employment supported at the O&M base, in addition to employment within the East Anglia supply chain.

33. On the other hand, operation of SEP has potential to support 120 FTE jobs and generate £12.7 million GVA each year of operation, which at the East Anglia level means around 60 FTE jobs and a contribution of around £7.3 million GVA for each year of operation. This includes the direct employment supported at the O&M base, in addition to employment within the East Anglia supply chain.

*Table 29.3.12: Annual operation impacts for **SEP** and **DEP***

	DEP		SEP	
	East Anglia	UK (Total)	East Anglia	UK (Total)
Direct (incl. Tier 1) + indirect operation jobs (FTEs)	60	150	60	120
Direct (incl. Tier 1) + indirect operation GVA (£ million)	£7.9	£15.4	£7.3	£12.7

Source: Calculations by Hatch, 2020.

34. Should both DEP and SEP be built and in operation at the same time (i.e. either from concurrent or sequential construction), it is estimated that this has potential to support around 270 FTE jobs nationally, and generate £28.1 million GVA for each year of operation. At the East Anglia level, this would mean around 120 FTE jobs and an annual contribution in the region of £15.2 million GVA.

*Table 29.3.13: Annual operation impacts for **SEP** and **DEP** for concurrent operations (incl. both concurrent and sequential construction)*

	East Anglia	UK (Total)
Direct (incl. Tier 1) + indirect operation jobs (FTEs)	120	270
Direct (incl. Tier 1) + indirect operation GVA (£ million)	£15.2	£28.1

Source: Calculations by Hatch, 2020.

29.3.6 References

The Crown Estate (2019) *Guide to an offshore wind farm.*

HM Treasury (2020) *The Green Book*. [online]. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf.