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UK and Scottish content baseline and roadmap

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BVGassociates

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- We have a global client base, including customers of all sizes in Europe, North America, South America, Asia and Australia.
- Our highly experienced team has an average of over 10 years' experience in renewable energy.
- Most of our work is advising private clients investing in manufacturing, technology and renewable energy projects.
- We've also published many landmark reports on the future of the industry, cost of energy and supply chain.

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Executive Summary

The Scottish Offshore Wind Energy Council (SOWEC) commissioned BVG Associates (BVGA) to investigate how Scottish content could contribute to a UK-wide target of 60% lifetime local content for projects installed in 2030, building from a baseline in 2020. This analysis established a baseline against which future progress can be made and identified a rational pathway for increased Scottish and UK content by 2030, aligning to the Sector Deal target of 60% UK content.

For the baseline, five Scottish projects and two non-Scottish UK projects were analysed using information from developers and public sources. The relative number of Scottish projects and two non-Scottish UK projects does not reflect the market as a whole so an adjusted set of figures were produced for comparison with 2030 projections.

The 2030 vision characterised the market in 2030 in terms of the Scottish and non-Scottish UK capacity and the fixed and floating split. It sought to establish the most likely source of new Scottish and UK content by ranking investment types by probability of success. The analysis also considers the most logical and credible scenario for achieving 55% (low) and 60% (high) UK content and develops rational Scottish content targets to sit alongside these UK content targets.

A roadmap is presented to identify the number of investments needed to achieve the high and low Scottish and UK content vision. To achieve both scenarios, an approximate number of factories is presented with a view to how many of these would be built in Scotland.

Key findings

Baseline

- For Scottish projects, Scottish content is much closer to UK content, at 44%, but for non-Scottish UK projects, Scottish content is less than 1%.
- Adjusted relative installed capacities in Scotland and the rest of the UK to those assumed for 2030 reveal that the Scottish and UK content are 18% and 48% respectively.

2030 Vision

- The market characterisation in 2030 identified an annual UK market size of 4GW with a Scottish market share of 40%. The percentage of floating wind in Scottish and UK projects was assumed to be 25% and 5% respectively by 2030.
- For turbines, towers and blades are identified as the most promising investment opportunity in Scotland and the UK.
- Floating foundations presents the most likely investment opportunity for balance of plant, closely followed by monopiles. Jacket fabrication is more likely in Scotland as the most logical fixed bottom technology, although the long-term demand for jackets is likely to be low, particularly as floating foundation costs come down.
- The investment opportunity for installation and commissioning is deemed to be low. In reality, contractors will likely grow their operations at existing sites elsewhere in Europe, unless incentives or local content requirements encourage the growth of UK teams.
- To achieve 60% UK content by 2030, all turbine components, foundations, substations and cables must be procured from the UK. Within this scenario, the Scottish content was 24% and the Scottish content for Scottish and non-Scottish UK projects was 58% and 1% respectively. Higher Scottish and UK content figures are achieved for floating projects rather than fixed because floating foundations are more likely to be constructed locally.
- In the 55% scenario there is no nacelle assembly and fewer foundations supplied from the UK. Scottish content is 22% and the key change is fewer foundations from Scotland. Scottish content in Scottish projects reaches 54% but there is still low supply to non-Scottish UK projects. Higher Scottish and UK content figures are achieved for floating projects in this scenario

Roadmap

- The results of the analysis show that for the 60% UK scenario, 15 new manufacturing facilities would be needed in the UK, of which six would be in Scotland.
- For the 55% UK scenario, 10 new manufacturing facilities would be needed in the UK, of which four would be in Scotland.

1. Introduction

Established in 2019, SOWEC is a partnership between the Scottish public sector and the offshore wind industry to co-ordinate a Scotland-wide response to the UK Offshore Wind Sector Deal. The partnership aims to lead and support the industry, boost the local content of projects and increase jobs in line with the Sector Deal.

The council has five goals which are to:

- Deliver at least 8GW of offshore wind in Scottish waters by 2030.
- Develop a plan for offshore wind's contribution to achieving Scotland's climate change ambition of net-zero greenhouse gas emissions by 2045.
- Create a competitive, commercially attractive offshore wind sector in Scotland which can deliver both domestically and in the global offshore wind market, with a focus on project development, deeper water capability and innovative technology solutions.
- Work to increase local content in line with the ambitions set out in the UK Sector Deal, developing a sustainable, world-class supply chain in Scotland.
- Boost the number of offshore wind jobs in Scotland to more than 6,000; an increase of 75% on 2019 figures.

1.1. Supply chain work packages

SOWEC has commissioned BVG Associates to deliver a package of five workstreams related to SOWEC's goal of increasing local content and developing a world-class supply chain.

The purpose of this baseline and roadmap workstream is to align Scottish intent to increase local content with wider UK intent, and to enable tracking, over time, of Scottish content. The objective of this work is to establish how Scottish content could contribute to a UK-wide target of 60% lifetime local content for projects installed in 2030, building from a baseline in 2020.

A set of sample projects are selected that are representative of Scottish and non-Scottish UK projects. The baseline is composed of five Scottish projects and two non-Scottish UK projects to provide focus on the opportunity for Scotland. To characterise the market through to 2030 a set of adjusted figures are prepared to capture the changes that are expected.

Engagement was focused on developers and it was apparent that some had not assessed the split between Scottish and UK content or were unable to share data due to commercial restrictions. Generic cost breakdowns were therefore produced with Scottish and UK content figures derived from an understanding of where the product or service was delivered from and our experience in this type of analysis over the past decade.

UK content ambitions for offshore wind have been formally in place since 2012 and a reporting framework was introduced in 2015. Although the economic contribution to Scotland from offshore wind has been a focus area for the Scottish Government, Scottish content ambitions have not been defined or formally measured.

To achieve SOWEC's goal, it is first necessary to establish a baseline against which future progress can be made. This analysis develops such a baseline alongside an equivalent figure for the UK as a whole. It provides a rational pathway for increased Scottish and UK content in 2030, in the context of the Sector Deal target of 60% UK content. The analysis will consider the eight metrics shown in Table 1.

Table 1 Metrics considered for analysis.

	Scottish projects		Non-Scottish UK projects	
	Fixed	Floating	Fixed	Floating
Scottish content	✓	✓	✓	✓
UK content	✓	✓	✓	✓

2. Baseline

2.1. Methodology

Projects for inclusion

The challenge in developing a 2021 baseline is that if all projects are different and the narrow selection of the small number of recent or current projects produces a baseline that can be heavily skewed by the specific procurement and technology decisions made by individual projects.

We agreed with SOWEC that we would include a basket of projects that were as far as possible representative of Scottish and non-Scottish UK projects. These are shown in Table 2.

Since there has been no floating non-Scottish project, we formulated a theoretical project that draws on procurement patterns for non-Scottish fixed and Scottish floating projects. The Erebus project, off the coast of Wales, is the furthest developed but construction is not anticipated until the mid-2020s and there is unlikely to be sufficient data to merit inclusion.

The baseline was produced from five Scottish projects and two non-Scottish UK projects. The relative number of Scottish projects and two non-Scottish UK projects does not reflect the market as a whole. The selection of more Scottish projects was made because this analysis is focused on the opportunity for Scotland, which comes mainly from Scottish projects. Nevertheless, because this split is unlikely to be representative of the whole UK market in 2030, we calculated an adjusted set of figures and these are best used to consider the changes to 2030.

Table 2 Projects included in the baseline.

Scottish projects		Non-Scottish UK projects	
Fixed	**Floating**	**Fixed**	**Floating**
• Beatrice • Moray East • Neart na Gaoithe • SeaGreen	• Hywind	• Hornsea Two • Triton Knoll	• None

Data gathering

Data gathering had two main challenges:

1. Developers had not undertaken some or all the analysis, especially the split between Scottish and rest of the UK content and
2. Developers were unable to share data for commercial reasons, especially costs.

To address these challenges, we adopted a methodology in which we derived generic cost breakdowns for monopile, jacket and floating projects. For each category, we derived Scottish and UK content figures based on an understanding of where the product or service was delivered from and used typical local content figures in each case, drawing on our experience of undertaking this type of analysis for multiple clients over the past decade. For example, a significant proportion of the value of a turbine tower is in the steel and currently this is not available from the UK. The UK content of a UK tower is therefore typically less than 50%.

The disadvantage of this approach is that the data was not ‘real’ in that it is driven by generic rather than actual costs. In particular, the ratio of capital to operational spend for a project will vary between projects (often due to transmission charges or turbine size) and this can have a significant impact on the overall Scottish or UK content figure.

The advantage of the approach is that, apart from addressing the challenges described above, the figures for 2030 could be compared like for like and that changes over time would be due to developments in the supply chain and not artefacts of specific project expenditure patterns.

Information on the supply chain for projects came from internally held data, public information and discussions with developers. Developers were not provided with the resulting figures and derived data for each project was only shared with SOWEC in aggregated form.

2.2. Results

Overview

Table 3 shows the overall Scottish and UK content baselines for 2020 are 25% and 48% respectively. For Scottish projects, Scottish content is much closer to UK content, at 44%, but for non-Scottish UK projects, Scottish content is less than 1%. The reason for this is that Scotland captures the value of work that needs to be done locally, such as development and maintenance activities, but does not make a significant contribution in exportable activities.

Scottish companies are active in projects outside Scotland but in general these are of relatively low value.

This bias means the overall Scottish figure is highly dependent on the relative number of Scottish and non-Scottish UK projects. If we adjust the relative installed capacities in Scotland and the rest of the UK to those we have assumed for 2030, the results change significantly, with the baseline Scottish content dropping from 25% to 18%.

Table 3 Summary of UK and Scottish content for all projects considered in the analysis

	Scottish projects		Non-Scottish UK projects		All UK projects		Adjusted	
	Scottish content	UK content	Scottish content	UK content	Scottish content	UK content	Scottish content	UK content
DEVEX	66%	73%	0%	90%	38%	80%	27%	83%
CAPEX	9%	13%	1%	11%	5%	12%	4%	12%
OPEX	76%	81%	0%	80%	43%	81%	31%	81%
DECEX	30%	30%	0%	30%	17%	30%	12%	30%
Total	44%	48%	<1%	47%	25%	48%	18%	48%

Detailed results

Unadjusted baseline

Table 4 shows a detailed breakdown for all projects considered in the analysis.

In development and project management, most of the work is in the UK. The Scottish content is dependent on the number of Scottish projects included in the baseline. If fewer Scottish projects were included then the figure would be lower.

In the turbine, most UK content is provided by the supply of blades for most projects. A small proportion of towers overall were supplied from Scotland but steel and most towers were imported.

There is a relatively low contribution to foundation supply. UK jackets were supplied to two Scottish projects, one from a Scottish facility and one from elsewhere in the UK. Some transition pieces for an English project were also supplied from England.

One of the Scottish projects used substation platforms from Scotland but much of the UK content comes from engineering and onshore structures.

The marine contracting market has consolidated significantly in recent years and there is lower UK content in installation than there was five years ago. The UK content largely comes from some project management and the use of local support services.

Operations and maintenance contributes the major portion of Scottish and UK content. This comes from the day-to-day operation of the wind farms and, significantly, from grid and sea bed rental. The Scottish content is lower because Scotland makes only a very limited contribution to non-Scottish UK projects.

Table 4 UK and Scottish content 2020 baselines for all projects considered in the analysis.

		%cost	Scottish content	UK content
DEVEX	**Development and project management**	2%	38%	80%
CAPEX	**Turbine**	19%	1%	7%
	Substations	3%	8%	19%
	Foundations	9%	4%	7%
	Cables	2%	0%	7%
	Turbine and foundation installation	6%	4%	6%
	Cable installation	4%	5%	8%
	Installation Other	3%	42%	75%
OPEX	**Operations and maintenance**	49%	43%	81%
DECEX	**Decommissioning**	2%	17%	30%
TOTEX	Total	100%	25%	48%

Adjusted baseline

Table 5 shows the overall adjusted Scottish and UK content figures and Table 6 shows the Scottish and UK content figures for Scottish and non-Scottish UK projects. It shows that Scottish content for Scottish projects is 44% and not far short of the UK content figure of 48%. In contrast, Scottish content for non-Scottish UK projects is likely to be very low. This is because a large proportion of Scottish content overall comes from development and project management and operations and maintenance. By necessity, much of the work is local.

Table 7 shows the split between floating and non-floating projects. There is a higher Scottish content in floating projects. This is largely since the only floating project considered was in Scotland, although anchors for the project came from Scotland.

Table 5 Adjusted baseline Scottish and UK content for all UK projects.

		%cost	Scottish content	UK content
DEVEX	Development and project management	2%	27%	83%
CAPEX	Turbine	19%	1%	7%
	Substations	3%	6%	19%
	Foundations	9%	3%	7%
	Cables	2%	0%	7%
	Turbine and foundation installation	6%	3%	5%
	Cable installation	4%	4%	7%
	Installation Other	3%	30%	75%
OPEX	Operations and maintenance	49%	31%	81%
DECEX	Decommissioning	2%	12%	30%
TOTEX	Total	100%	18%	48%

Table 6 Adjusted baseline Scottish and UK content for Scottish projects and non-Scottish projects.

		Scottish projects		Non-Scottish projects	
		Scottish content	UK content	Scottish content	UK content
DEVEX	**Development and project management**	66%	73%	0%	90%
CAPEX	**Turbine**	1%	7%	1%	7%
	Substations	15%	20%	0%	19%
	Foundations	7%	9%	1%	6%
	Cables	0%	9%	0%	6%
	Turbine and foundation installation	8%	11%	0%	0%
	Cable installation	9%	9%	0%	6%
	Installation Other	73%	74%	0%	76%
OPEX	**Operations and maintenance**	76%	81%	0%	80%
DECEX	**Decommissioning**	30%	30%	0%	30%
	Total	44%	48%	0%	47%

Table 7 Adjusted baseline Scottish and UK content for all UK fixed and floating foundation projects.

		Fixed projects		Floating projects	
		Scottish content	UK content	Scottish content	UK content
DEVEX	Development and project management	27%	83%	3%	3%
CAPEX	Turbine	1%	7%	0%	0%
	Substations	6%	19%	14%	19%
	Foundations	3%	7%	11%	11%
	Cables	0%	7%	0%	0%
	Turbine and foundation installation	3%	5%	0%	0%
	Cable installation	3%	7%	11%	11%
	Installation Other	30%	75%	45%	45%
OPEX	Operations and maintenance	30%	81%	84%	86%
DECEX	Decommissioning	12%	30%	30%	30%
	Total	18%	48%	45%	46%

3. 2030 vision

3.1. Methodology

The Sector Deal's 60% UK content target was the main fixed point of reference for the analysis. In BVGA's view this is a highly ambitious target and we agreed with SOWEC to also develop alongside a 55% UK content scenario. From this starting point, the analysis was aimed to:

1. Characterise the market in 2030
2. Establish the most likely source of new Scottish and UK content by ranking investment types by probability of success, and
3. Develop this most logical and credible scenario for achieving 55% (low) and 60% (high) UK content and develop rational Scottish content targets to sit alongside these UK content targets.

Market characterisation

UK content in 2030 is likely to affected by the choice between floating and fixed foundations. Scottish content will not only be sensitive to the same factor but also the percentage of UK projects that are built in Scotland. This is because Scottish content in Scottish wind farms will be higher than Scottish content in non-Scottish wind farms given the amount of local work.

Scenarios for UK and Scottish content in 2030 will also be affected by the absolute size of the market and its relative size to other European markets. Scenarios to increase UK and Scottish content needed to be founded on credible business cases for new investment. Business cases for investment in Europe will be based on the market size. Once business cases are made for new investment, a choice of Scotland or the rest of the UK will be influenced by the strength of these markets.

Cost breakdown

Wind farms built in 2030 will differ from those under construction in 2021 in several respects, each of which will impact of the absolute and relative cost of offshore wind components and services. The most significant are:

- Turbine size, which will increase with consequences not only for turbine costs but also those for balance of plant components and their installation and maintenance. and.
- Foundation type.

Distance to port and shore is a significant factor in cost but based on the locations of projects that might be built in 2030, these are not necessarily further from shore than those used in the baseline. While floating projects can access high wind speeds further from shore, there are still likely to be fixed projects, such as those on Dogger Bank, that are equally far from shore.

For the 2030 scenarios, we developed revised cost breakdowns for Scottish projects to reflect these changes. We assumed:

- All turbines were 18MW
- Scottish fixed projects used jackets, and
- Non-Scottish UK projects used monopiles (as for baseline).

Investment ranking

Using the market characterisation agreed with SOWEC, we built up 2030 content scenarios. These would need to be achieved through a series of investments in capability and capacity. Not all parts of the supply chain can be secured equally easily. We developed a ranked investment list, with the parts of the supply chain most easily achieved at the top and the hardest at the bottom. The ranking depended on:

- Existing capacity and capability in the supply chain: the demand for investment by the European industry as a whole
- Sourcing trends: The extent to which sourcing is globalising
- Infrastructure requirements: the demands it places on port infrastructure
- Logic for UK or Scottish supply: the saving from supplying Scottish and other UK projects from local facilities, and
- Supply chain investment risk: the risks and challenges that an investor would take if from setting up or expanding in Scotland or elsewhere in the UK.

Each was scored on a 1-3 scale with a high score favourable to Scotland or the rest of the UK. The process assumed that industry makes rational business decisions to invest and different categories of the supply chain are affected equally by local content incentives or requirements.

UK and Scottish content scenarios

For the 55% and 60% UK scenarios, we built up UK content figures using the investment ranking by working progressively down the investment ranking list until the threshold UK content scenarios were reached. We used internal data on typical local contents associated with different investments.

We then developed a rational view of the Scottish content based on intelligence from industry, the availability of coastal infrastructure and the regional demand for key components.

3.2. Results

Market characterisation

If the UK government is to achieve its ambition to install 40GW by 2030, about 30GW (3GW annually on average) of new capacity will need to be installed in the 2020s. Based on the construction schedules of projects that have reached final investment decision, annual installed capacity will be less than 3GW in the early part of the decade and therefore installation rates will need to be higher in the alter part of the decade. Based on strong interest in the ScotWind leasing round, we concluded that Scotland would secure a higher proportion of new UK installed capacity than has hitherto been the case. There is increasing interest in the development of floating projects. Given that a typical period between the start of development and the start of operations is seven years. We concluded that the floating market still represents a small part of the UK market in 2030.

Overall, we assumed:

- An annual UK market size in 2030 (MW): 4GW
- A Scottish market share in 2030: 40%
- A percentage floating in Scottish projects (25%), and
- A percentage floating in non-Scottish UK projects (5%).

Investment ranking

This exercise aimed to identify the likelihood that different categories of the supply chain can have increased Scottish and UK content. We scored each category against a range of criteria (see Table 8) where a high score is when the situation is favourable for UK investment. The highest rank (the lowest number) are those categories that are most likely to be a significant source of Scottish and UK content. The assessment is not an exact science because investment decisions made by companies are complex and the size and location of existing capacities will be important factors.

The ranking is largely based on the scores, but some adjustments have been made because the criteria are not equally important and the importance varies with category.

Turbine

Turbine towers and blades appear high in the rankings. They have in common costly transport costs and supply chains are not complex. For these reasons, they are among the first components to localise in new markets. Siemens Gamesa's blade factory in Hull and GE's recent announcement of a new blade factory on Teesside bear this out. Because these investment decisions have been made, there is limited opportunity for Scotland to attract blade factory investment.

CS Wind's factory in Campbeltown is currently mothballed and seems unlikely to secure the investment needed to enable it to supply towers to 14MW+ turbines. Nevertheless, there are good reasons to believe that new investments in Scotland and potentially in the rest of the UK may be forthcoming.

Major nacelle or hub components ranks relatively highly because it has a low requirement for new coastal infrastructure. The challenge for any UK investor is that many turbine components are highly dependent on the technical and engineering expertise in their facilities and adjacent supply chain. An investment at a new location therefore represents a major risk.

Balance of plant

Based on the analysis, floating foundations and monopile foundations are a likely source of new UK content.

Floating foundations are large structures and the costs and risks of transporting them significant distances make UK, and particular Scottish, fabrication attractive. Despite this, the relatively small floating market in 2030 means that dedicated floating foundation fabrication facilities are unlikely by this date. Instead, subassemblies are most likely to be manufactured at established facilities making large steel fabrications in volume and brought together for final assembly. This may limit the levels of Scottish content until after 2030.

Monopile technology has continued to advance and a strong demand in a growing market is likely to lead to new investment, particularly is existing facilities are constrained by size. SeAH's reported interest in a UK investment supports this conclusion but monopile demand in Scotland is likely to be low and investments elsewhere in the UK are more likely.

Jacket fabrication is more likely in Scotland as the most logical fixed bottom technology. Nevertheless, the long-term demand for jackets is likely to be low, particularly as floating foundation costs come down. Although jacket foundations rank fairly highly in our analysis, the necessary investment in Scottish capability may not be forthcoming. There has been a trend towards supply from low-cost countries and Smulders' facility on Tyneside could meet demand for UK supply.

Scotland the rest of the UK has supplied AC substations of several UK projects. The infrastructure and expertise is therefore available. The has been a trend towards sourcing foundations from low-cost countries and there is very little suitable infrastructure for DC substations. The opportunity for Scottish content for future substations may therefore be more limited than the analysis suggests.

Installation and commissioning

Scotland and the rest of the UK currently has few marine contractors with the capacity to lead installation contracts. In theory it therefore represents an opportunity to provide greater levels of Scottish and UK content. The challenge is that there are few benefits from operating from a location close to the wind farm, with the market operating at a European level. If a contractor wished to recruit to meet extra demand, the most logical solution would be to grow at existing sites where its expertise is concentrated. In theory, any local content incentives or requirements could create some encouragement to grow new UK teams but there would be few business reasons for doing so.

Operation, maintenance and service

A significant amount of operation, maintenance and service work is undertaken locally. The UK, as Europe's largest market will continue to grow its capacity to meet local demand. This will increasingly happen in Scotland as its market accelerates. It is debatable whether this will drive new investment in the relative amount of local content, however, and we have therefore excluded it from the analysis

Table 8 **Investment ranking. Scoring 1-3 with a high score favourable to Scotland or the rest of the UK. Note that the ranking is guided by the scores but some adjustments have been made.**

Investment	Existing capacity in industry	Infrastructure requirements	Logic for UK or Scottish supply	Supply chain investment risk	Rank
Turbine nacelle and hub assembly	2	2	2	1	5
Turbine major nacelle or hub component	2	3	1	2	11
Turbine tower manufacture	2	2	3	2	1
Turbine blade manufacture	2	1	3	2	3
Jacket foundation manufacture	1	2	2	2	5
Monopile foundation manufacture	2	2	2	2	3
Floating foundation manufacture	3	1	3	2	1
Subsea cable manufacture	2	3	1	1	5
Substation platform manufacture	1	3	2	1	5
Substation foundation manufacture	1	3	2	1	5
High voltage component manufacture	2	3	1	1	5
Fixed wind farm installation vessel operation	1	2	1	1	12
Floating wind farm installation vessel operation	1	2	1	1	12
Cable installation vessel operation	1	2	1	1	12

60% UK content scenario

Table 9 shows how a 60% UK content scenario would most logically be achieved. There are significant increases in the UK content in the turbine (blade, towers, and nacelle assembly), foundations, substations, and cables. To reach 60% all these items must be procured from the UK for all projects. Scottish content is 24%, which is similar to the baseline figure unadjusted but 6 percentage points higher than the adjusted figure. This increase comes mainly from the supply of towers (to Scottish projects) and a greater share of foundation supply.

Table 10 shows the figures for Scottish and non-Scottish UK projects. Scottish content in Scottish projects is 58% but is still negligible for non-Scottish UK projects. This is because we assumed that Scottish projects would take all the capacity from a Scottish tower factory and that towers from non-Scottish UK projects would come from a UK factory outside Scotland. Foundations for Scottish projects are likely to either jackets or floating and there is likely to be little demand from non-Scottish UK projects. Monopiles are likely to remain the dominant fixed technology for non-Scottish UK projects and we assumed that demand is met from a UK factory outside Scotland.

Table 11 shows that high Scottish and UK content figures are achieved for floating projects rather than fixed. This is because floating foundations are more likely to be constructed locally, although in 2030 it is likely that subassemblies will be supplied from various locations rather than a single integrated factory. More of the installation work for floating wind farms takes place at onshore or at the quayside, which means that it is more likely to draw on a local supply chain.

Table 9 Scottish and UK content for all UK projects under the 2030 60% UK content scenario.

		%cost	%cost	Scottish content	UK content
DEVEX	Development and project management	2%	2%	27%	88%
CAPEX	Turbine	47%	19%	3%	20%
	Substations		3%	27%	51%
	Foundations		9%	32%	66%
	Cables		2%	2%	32%
	Turbine and foundation installation		6%	8%	3%
	Cable installation		4%	10%	7%
	Installation Other		3%	30%	76%
OPEX	Operations and maintenance	49%	49%	34%	86%
DECEX	Decommissioning	2%	2%	27%	47%
	Total	100%	100%	24%	60%

Table 10 Scottish and UK content for Scottish projects and non-Scottish UK projects under the 2030 60% UK content scenario.

		Scottish projects		Non-Scottish projects	
		Scottish content	UK content	Scottish content	UK content
DEVEX	Development and project management	69%	88%	0%	88%
CAPEX	Turbine	7%	19%	0%	21%
	Substations	35%	51%	22%	51%
	Foundations	70%	70%	4%	64%
	Cables	4%	32%	0%	32%
	Turbine and foundation installation	20%	7%	1%	1%
	Cable installation	25%	8%	0%	7%
	Installation Other	74%	77%	0%	76%
OPEX	Operations and maintenance	85%	86%	0%	86%
DECEX	Decommissioning	67%	67%	0%	33%
	Total	58%	61%	1%	59%

Table 11 Scottish and UK content for all UK fixed and floating foundation projects under the 2030 60% UK content scenario.

		Fixed projects		Floating projects	
		Scottish content	UK content	Scottish content	UK content
DEVEX	Development and project management	24%	88%	53%	88%
CAPEX	Turbine	3%	22%	4%	12%
	Substations	26%	51%	32%	51%
	Foundations	25%	68%	61%	61%
	Cables	1%	32%	3%	32%
	Turbine and foundation installation	6%	0%	43%	47%
	Cable installation	10%	6%	10%	13%
	Installation Other	25%	76%	57%	78%
OPEX	Operations and maintenance	29%	86%	65%	86%
DECEX	Decommissioning	21%	40%	69%	90%
	Total	20%	60%	47%	62%

55% UK content scenario

Table 12 shows how a 55% UK content scenario would most logically be achieved. The important differences with the 60% scenario are that in the 55% scenario, there is no nacelle assembly and fewer foundations are supplied from the UK. Scottish content is 22% and the key change is fewer foundations from Scotland.

Table 13 shows that Scottish content in Scottish projects reaches 54% but there is still low supply to non-Scottish UK projects. The Scottish content in non-Scottish UK projects comes mostly from offshore substation supply. Table 14 shows the split between fixed and floating projects. Floating projects achieve higher Scottish and UK content figures because of the opportunity to supply mooring systems and because more of the turbine installation work is undertaken onshore, meaning that existing expertise from the onshore market can be used.

Table 12 Scottish and UK content for all UK projects under the 2030 55% UK content scenario.

		%cost	%cost	Scottish content	UK content
DEVEX	Development and project management	2%	2%	27%	88%
CAPEX	Turbine	47%	19%	2%	11%
	Substations		3%	27%	51%
	Foundations		9%	19%	36%
	Cables		2%	2%	32%
	Turbine and foundation installation		6%	8%	3%
	Cable installation		4%	10%	7%
	Installation Other		3%	30%	76%
OPEX	Operations and maintenance	49%	49%	34%	86%
DECEX	Decommissioning	2%	2%	27%	47%
	Total	100%	100%	23%	55%

Table 13 Scottish and UK content for Scottish projects and non-Scottish projects under the 2030 55% UK content scenario.

		Scottish projects		Non-Scottish projects	
		Scottish content	UK content	Scottish content	UK content
DEVEX	Development and project management	69%	88%	0%	88%
CAPEX	Turbine	5%	12%	0%	10%
	Substations	35%	51%	22%	51%
	Foundations	40%	40%	4%	33%
	Cables	4%	32%	0%	32%
	Turbine and foundation installation	20%	7%	1%	1%
	Cable installation	25%	8%	0%	7%
	Installation Other	74%	77%	0%	76%
OPEX	Operations and maintenance	85%	86%	0%	86%
DECEX	Decommissioning	67%	67%	0%	33%
	Total	55%	57%	1%	54%

Table 14 Scottish and UK content for all UK fixed and floating foundation projects under the 2030 55% UK content scenario.

		Fixed projects		Floating projects	
		Scottish content	UK content	Scottish content	UK content
DEVEX	Development and project management	24%	88%	53%	88%
CAPEX	Turbine	2%	11%	4%	12%
	Substations	26%	51%	32%	51%
	Foundations	13%	34%	45%	45%
	Cables	1%	32%	3%	32%
	Turbine and foundation installation	6%	0%	43%	47%
	Cable installation	10%	6%	10%	13%
	Installation Other	25%	76%	57%	78%
OPEX	Operations and maintenance	29%	86%	65%	86%
DECEX	Decommissioning	21%	40%	69%	90%
	Total	19%	55%	45%	60%

4. Roadmap to 2030

Table 15 shows the number of investments needed to achieve the high and low Scottish and UK content visions. These figures are approximate because project sizes do not neatly map onto factory capacities and to be viable factories will also need to export. A typical factory could have a capacity of about 1.5GW annually. In the 4GW annual market assumed in this analysis, it would therefore take about three factories to meet total UK demand. In our 55% and 60% UK content scenarios, we have that in some categories of supply, some or all components are imported and these are in areas that ranked low in Table 8. We have also considered the split between floating, jacket and monopile foundations. We have assumed that non-Scottish fixed projects use monopiles and that two UK factories would be needed to meet demand.

Having determined the number of factories, we then considered how many would be built in Scotland. This is difficult because the respective Scottish and UK governments can influence investment decisions by offering attractive terms. From a logistical perspective also, the difference between a Firth of Forth factory and a Tyneside factory is marginal. In general, we assumed that where there was specific demand for components such as jacket or floating foundations, then this would be met from Scottish factories. For other components, important considerations are the larger number of projects in the southern North Sea (and not just in UK waters) and the availability of significant coastal infrastructure on the east coast of England. If a company's decision-making process is to first decide to make a UK investment and then decide where it should be, we concluded that in many cases there was not a compelling reason why a company would choose a Scottish location over a non-Scottish UK location.

The results of the analysis show that for the 60% UK scenario, 15 new manufacturing facilities would be needed in the UK, of which six would be in Scotland.

They show that for the 55% UK scenario, 10 new manufacturing facilities would be needed in the UK, of which four would be in Scotland

Table 15 Number of facilities required to meet 2030 content visions. Existing or planned figures are in brackets.

	60% UK content 24% Scottish content		55% UK content 22% Scottish content	
	Scotland	Other UK	Scotland	Other UK
Turbine nacelle and hub assembly	1	2	0	0
Turbine major nacelle or hub component	0	0	0	0
Turbine tower manufacture	1(1)	2	1(1)	2
Turbine blade manufacture	0	3(2)	0	3(2)
Jacket foundation manufacture	1	0	1	0
Monopile foundation manufacture	0	2	0	1
Floating foundation manufacture	1	0	1	0
Subsea cable manufacture	0	3(1)	0	2(1)
Substation platform manufacture	3(1)	0	1	1
Substation foundation manufacture	1	0	1	0
High voltage component manufacture	0	1(1)	0	1(1)
Total manufacturing facilities	8(2)	13(4)	5(1)	10(4)
Total new manufacturing facilities	6	9	4	6