





High Potential International Offshore Wind Markets to 2030 Webinar 11 May 2021











Agenda

14.00	Introduction to webinar and agenda
14.05	Overview of SOWEC offshore wind activities
14.10	High potential offshore wind markets to 2030
14.45	Overview of international finance support
15.00	International in-country activity and support
15.10	Q&A session

15.30 Webinar close

Gillian Morrison HIE

Stephen Thompson SOWEC

Alan Duncan Scotia Supply Chain

Alistair McMillan UK Export Finance

David Rennie Scottish Development International

Paul O'Brien

Scottish Offshore Wind Clusters: DeepWind / Forth and Tay Offshore SOULEC



Stephen Thompson - Lead Supply Chain and Clusters

11 May 2021

SOWEC Supply Chain & Clusters Workstream: Update



- Offshore Wind Stakeholder Mapping: To identify and map the organisations involved in the supply chain growth and enablement of the Scottish offshore wind industry. Objectives were to provide information to help businesses understand who the stakeholders are and how they fit together, helping businesses know who to engage with, what for, and when and also; to help companies collaborate more and to simplify the landscape, where rational, over time.
- **Procurement streamlining:** Following the BVGA recommendations, SOWEC are now developing road map's to look at simplification and increasing visibility for the following:
 - -Pre-qualification of suppliers for offshore wind projects
 - -Advertising of tenders
 - -Supply Chain Charter and possible standardisation of Terms & Conditions.

All the above initiatives, if successful, will lead to opportunities for cost reduction

Scottish contents baseline and road map for supply chain growth: The purpose of this workstream was to align Scottish intent to increase local content with wider UK intent, and to enable tracking, over time, of Scottish content. SOWEC now has visibility of the current performance of the Scottish supply chain and there is much work to be done to improve local contents. Together with the pending publication of the Scottish Investment Assessment (SIA), there are identifiable opportunities to increase the ability of the Scottish supply chain to compete with established overseas suppliers and contractors. More information to follow.

HIGH POTENTIAL INTERNATIONAL OFFSHORE WIND MARKETS TO 2030

Alan Duncan, Owner / Director





Agenda / Context

- Credentials & contributors
- OSW export aspirations & commitments to 2030 OWIC & SOWEC
- International context the offshore wind revolution
- Understanding prevalent OSW industry dynamics the 'standard' OSW lifecycle spend profile
- Perceived high potential Scottish export sub-elements *logic, logistics & longevity*
- International OSW market attractiveness index *scale, stage* & 'Scotishness'
- High potential market deep-dive *top 10 (+1)*
- Emerging market summary *watching brief, mid-term market?*
- Closing thoughts *positioning for international success*





OSW export aspirations & commitments to 2030

UK-level 2030 targets (OWIC)

- 2019 OSW Sector Deal commitments & recent updates
 - 30GW UK deployment by 2030 (superseded in 2020 by Government target of 40GW) (#2 market globally)
 - Round 4 concluded additional 8GW of development leases awarded (front-end fee maximisation focus)

climate change ambition of net-zero greenhouse gas emissions by 2045.

Scotland which can deliver both domestically and in the global offshore wind

market, with a focus on project development, deeper water capability and

• Work to increase local content in line with the ambitions set out in the UK

• The number of offshore wind jobs in Scotland will increase to more than

Sector Deal, developing a sustainable, world-class supply chain in Scotland.

innovative technology solutions.

6,000; an increase of 75% on 2019 figures.

- 60% 'local content' achieved in UK across the OSW project lifecycle by 2030 (international markets likely to adopt a similar indigenous protection position, through time)
- 1GW of floating OSW by 2030 target announced in 2021 (UK plans for Irish Sea FOSW-specific auctions to challenge Scottish first-mover aspirations for this technology variant)

Enablement of a five-fold increase in UK OSW exports to £2.6bn (per year) by 2030 (essentially the Supply Chain & Cluster Export Market Objectives focus of this international guide) Targets:

Goals

Scottish-level 2030 • Deliver at least 8GW of offshore wind in Scottish waters by 2030. • Develop a plan for offshore wind's contribution to achieving Scotland's targets (SOWEC) • Create a competitive, commercially-attractive offshore wind sector in

- Align with UK OWIC SC Delivery Group tasked with developing an export growth programme through the Sector Deal: work with UKTI and Scottish Development International to promote trade missions and overseas collaboration opportunities for Scottish suppliers.
- Collaboration with foreign clusters

Deliverables

- · A Scottish representative will attend UK export missions overseas on behalf of SC&C group and report the findings to SOWEC. (Attendance for 1 person at 2-3 events per year, to commence when travel resumes)
- · Assist, where appropriate, the Scottish Clusters to establish links and collaboration with targeted overseas clusters, to enhance inward/outward internationalization (attract investment and technology in and export out). (ongoing)

How contribute to SOWEC's Strategic Goals?

· 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.





International context – the offshore wind revolution

- The need to rapidly de-carbonise the global energy mix is stark the UK OSW journey to commercialisation is an incredible success story of our time; having ٠ played its part, it is fitting that the eyes of the world will be fixed on Scotland when Glasgow hosts COP26 in late 2021.
- 'Green tax' villains to largest energy mix change enablers in five years as the UK moves from the early commercialisation phase into maturity, many nations globally are just beginning their own offshore wind journey – deployment will grow exponentially around the world over the next decade and this presents the experienced Scottish supply chain with a fantastic window of opportunity to help global markets evolve at speed, taking heed of lessons learned in the UK's trailblazing journey to 10GW deployment by 2020.
- No one-size-fits-all approach by geography or supply sub-element Scottish companies are already thriving in global wind markets, but, in order to succeed internationally, a number of *logistical, socio-economic, contracting and cultural challenges must be evaluated* and understood at a granular market level.
- Gloatin aboot Floatin Scotland is a nation that has always punched above its weight historically in innovation and international trading terms by finding its ۲ niche - aspirations to become the *global centre of excellence for floating wind may be our niche*, a number of global markets will go straight to floating and the long-term potential may be greater than fixed wind. *Time is of the essence* though and *competition is fierce*....

11 international markets offer a 20V encerturity	Deproyed capacity	2020 Actual	2050 FOIECast	
11 International markets offer a 20X opportunity	UK	10GW	40GW	30GW
versus the Scottish 8GW 2030 deployment aspiration	Europe – Top 7	29GW	62GW	33GW
	Asia – Top 3	0.3GW	27GW	27GW
	USA	0.1GW	20-30GW	20-30GW

UK versus Top 11 Identify key international considerations & leverage Scottish relationships – An unprecedented number of international developers expected to be active in Scotland via ScotWind - the time has never been better for Scottish exporters to leverage export opportunities via these multinational entities and their main contractors. The Scottish offshore wind supply chain can be the vanguard of a new green recovery era in Scottish international trading; by understanding deployment and specific project requirements, prevalent contracting arrangements, possible technology choices, logistical challenges, in-country supply threats and plotting against known Scottish OSW competencies, the highest potential export opportunities can be targeted....

10GW v 30GW

40GW v 150-160GW

30GW v 80-90GW

Understanding prevalent OSW industry dynamics (1)

International market sizing is based on a '*mid-2020s standard Scottishesque*' project of 500MW, operating for 35 years, with a lifetime spend of circa £2.75bn

Different countries are at *different stages of the technology adoption lifecycle* and *no two wind farms are the same*. In order to articulate the prevailing opportunities at a more granular subelement level, the international market sizing is based upon a likely mid-2020s Scottish 'standard' offshore wind project; most international markets are *behind Scotland* in technology evolutionary terms, it has been deemed that this gives the most appropriate view across global markets for the next decade.

Development phase - *Standard Scottish lifetime 500MW spend assumptions: 6-year developer cycle, no site pre-development*

As the OSW sector has matured, the 'standard' development phase has reduced significantly – *early 10-year development cycles have generally halved*. Whilst the core consenting, environmental assessment, FEED and survey activities are common across all projects, *international market nuances* must be considered:

- Scottish exporters may be *challenged* with development activities that require *specialist local market knowledge* (e.g. access to site-specific condition data or technical information in a foreign language)
- Unlike the UK market, many *international markets 'pre-develop'* offshore wind zones via *state agencies*, before putting them out to tender Scottish exporters should not overlook these early development opportunities and should be mindful that subsequent *developer DEVEX phases may be shorter* as a result of the early pre-development activity
- Development cycles are heavily influenced by how advanced OSW / seabed licence processes are in-country early international offshore wind adopter lifecycles can be more
 protracted
- A number of *innovations* will increasingly *change the nature of early development activities* including non-fixed data acquisition solutions, advanced high-definition surveying and dynamic engineering modelling- *this presents Scottish export opportunities*



Understanding prevalent OSW industry dynamics (2)

Procurement & contracting phase (CAPEX) - Standard Scottish lifetime 500MW spend
 assumptions: EPCI contracting via six EPC packages (foundations, export cables, inter-array cables, onshore substation, offshore substation and turbines) and six separate installation packages
 With >95% of lifetime project spend committed after a Financial Investment Decision is taken, it is important for Scottish exporters to understand the prevalent contracting approaches in each international market.

Similar to the world-leading UK market, developers will continue to use bespoke package procurement strategies that generally split into *two broad contracting approaches*:

• Engineer, Procure, Construct, Install (EPCI): Most international projects pre-2030 are likely to be contracted via this approach, where a smaller number of large packages of work are managed by a contractor, generally

known as a 'tier one' supplier. Packages are likely to be split in different ways with design, manufacturing and installation packaged together or split apart and managed by a tier one contractor with any of these specialisms (e.g. a foundation EPCI package contracted by an installer-led EPCI contractor where design and/or manufacture can be subcontracted at a tier two level) – via this arrangement, Scottish exporters most likely to enter the international market via a pre-existing tier one relationship

• Multi-contracting: Typically employed by only the biggest international developers with the ability to assume interface and construction risk, this multiple package direct procurement approach will likely be the exception rather than the rule across most international markets – via this arrangement, Scottish exporters are most likely to contract directly with the project developer (in-country or via global centralised procurement functions)

CAPEX – Foundation Supply - Standard Scottish lifetime 500MW spend assumptions: 62 non-monopile steel jackets and associated piles, water depth of 40m

Foundation technology will evolve at pace across the 2020s as projects go further from shore, into deeper water and into areas with particularly challenging seabed conditions.
 Foundation technology choice is generally well-known for the majority of international markets to 2025. All projects likely to be deployed in high potential countries to 2030 have been assessed individually – where foundation technology choices are not publicly confirmed, assumptions have been made based on prevailing site conditions. Although technology selection is based on a number of factors, site water depth is generally the prevailing factor and the following broad assumptions have been used within this analysis:







Understanding prevalent OSW industry dynamics

CAPEX – Cable supply - Standard Scottish lifetime 500MW spend assumptions: circa 150km of MVAC 66kV inter- array cables / circa 60km of offshore HVAC 220kV export cables and 20km onshore

Innovation in cable technology is expected across the 2020s as projects go further from shore (increasing the potential for transmission loss) and assets become larger in size (driving the development of high-capacity DC solutions). International markets are likely to evolve by deploying nearer shore sites first, which will influence the export cable requirements most significantly. Although design variations exist, offshore wind cables are increasingly becoming a commodity item.

Standard Scottish Lifetime Spend - 500MW £m 3000 Courtesy of: Scotia DECEX ecommissioning £50m 2500 **OPEX - Operations, Maintenance &** 2000 Servicing - £1.375m 1500 CAPEX - Installation - £360m 1000 CAPEX - Turbine supply - £450m **CAPEX - Substation** 500 supply - £110m APEX - Cable supply Development - f

CAPEX – Substation supply - Standard Scottish lifetime 500MW spend assumptions: two offshore AC substations / one onshore substation

International substation demand will be heavily influenced by distance to shore and the rate of offshore capacity increase, but markets largely expected to follow the UK market precedent.

CAPEX – Turbine supply - Standard Scottish lifetime 500MW spend assumptions: 62 8MW turbines

- Turbines will continue to drive innovation and technology advancement across the wind farm balance of plant, with larger capacity (upscaled) turbines and improvements in power electronics driving changes to foundation sizing and the optimisation of electrical transmission systems. International market turbine selections are generally known for projects out to 2025; beyond this, assumptions have been made considering the turbine capacity roadmap below:
- Fixed foundation projects will likely see one further generational evolution beyond the current Generation 2 turbine platforms (~220m rotor diameter), which are due to achieve *commercial operation by 2022*. The next generation of turbine platform (Generation 3) will feature a rated capacity in the order of 17-20MW (~250m rotor diameter) and could deploy around the middle of the decade. Considering early-stage international markets, Scottish exporters should be aware that Generation 2 turbine platforms may be further industrialised to maintain the viability of larger monopile foundations.



Understanding prevalent OSW industry dynamics (4)

CAPEX – Installation - Standard Scottish lifetime 500MW spend assumptions: construction / marshalling port for turbine, foundations and installation support services; cables and substations delivered directly to a site circa 30km from shore

- Large European vessel contractors are investing heavily in next generation installation resources and are expected to be active in all high potential international markets.
 - **OPEX Operations, Maintenance & Servicing** Standard Scottish lifetime 500MW spend assumptions: small boat crew transfer vessel (CTV) access strategy, 10-year turbine warranty followed by 25-year post-warranty operational servicing
- Next generation wind farms are designed to operate for up to 40 years an increased level of deployment in one geographical concentration or further from shore will increase the need for remote / intervention-less solutions and the use of large service operation vessels (SOV) for economical access.

DECEX - Decommissioning

Scotland is expected to have a number of competencies in this area, but the international decommissioning market is unlikely to reach critical mass until the turn of the decade.





OSW industry dynamics – lifecycle & spend



 Scottish exporters must approach international markets mindful that significant procurement activity is undertaken well before the point of financial investment decision on a project; this is of particular significance when seeking to access international opportunities via established European tier one contractors Export markets are moving quickly, try to understand where each target project is on the 'standard' development lifecycle





Perceived high potential Scottish export sub-elements

In order to	Spend Phase	Project %	Major sub-	£m	Scottish canability	Scottish OSW track	Export suitability
identify sub-	DEVEX - £50m	2%	Consenting,	37.5	capability	record	successively
elements of			Leasing & Development		High	High	Low
most interest			Environmental	4			
to Scottish			assessment & Professional		High	High	High
exporters,			Subsea survey	3			
this analysis					Medium	Medium	Low
focusses on							
the size of			Advisory services	2	High	High	High
the							
international			Offshore data & Metgcean services	2	High	Medium	High
opportunity						meanann	
for high			Site survey	1.5	115-1	115-14	
Scottish					High	High	LOW
potential	CAPEX (FOUNDATION	11%	Jackets	265			
export sub-	OEM) - £300m				High	Medium	Medium
elements			Piles	35			
					High	High	Medium
	CAPEX (CABLE OEM)	2%	Export	33			
	- £55m				Low	Low	Low
			Inter-array	17			
					High	Low	Medium
			Cable accessories	5			
					High	High	High
	CAPEX	4%	Onshore	52			
	OEM) - £110m				High	High	Low
			Offshore	58			
					High	Medium	Medium

Spend Phase	Project %	Major sub- element	£m	Scottish capability	OSW track record			
CAPEX (TURBINE OEM) - £450m	16%	Nacelies	330	Medium	Low	Low		
		Blades	70	High	Low	Medium		
		Towers	40	High	Medium	High		
		Assembly	10	High	Medium	High		
CAPEX (INSTALLATION) - £360m	13%	Foundations	200	Low	Low	Low		
		Cables	60	Low	Low	Low		
		Cable services	15	High	Medium	High		
				Turbine	50	Low	Low	Low
		Onshore substation	30	High	Medium	Low		
		Offshore substation	5	Low	Low	Low		
OPEX (Operations, Maintenance & Servicing) -	50%	Operations and project management	410	High	High	Low		
£1,375m		M & S turbine warranty (10 years)	230	High	Medium	Medium		

	Spend Phase	Project %	Major sub- element	£m	Scottish capability	Scottish OSW track record	Export suitability
	OPEX (Operations, Maintenance & Servicing) -	50%	M & S turbine post-warranty (25 years)	460	High	Medium	High
	£1,375m		M & S Balance of Plant	275	High	Medium	High
-	DECEX - £50m	13%	Decommission	50	High	Low	Medium

A simple high / medium / low grading has been applied to perceived general Scottish national competences, areas of strong Scottish offshore wind track record and perceived exportability from a practical, logistical and competitive supply chain perspective (Note - the Scotia SC basis for this categorisation is not contained below but is included in the wider report)

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International OSW market attractiveness index

- Having identified likely international project timescales, spend profiles and perceived high potential Scottish export sub-elements in the previous slides, a number of influencing factors affect the perceived attractiveness, from a Scottish exporter's perspective, of any given international market
- Market scale to 2030 Size is everything international wind markets have been graded on relative market size to 2030; this is the strongest influencing factor for a country's perceived attractiveness from a Scottish export standpoint.
 International deployment to 2025 is well understood most international markets have stated 2030 deployment aspirations
- Appetite for importing expertise International markets are likely to have varying degrees of appetite for accepting imported Scottish goods and services, based on a number of factors such as domestic supply chain strength, gaps in expertise, price competitiveness and political pressure
- Early-stage supply chain development International markets at an *early stage* of maturity are perceived as good export markets. The perceived level of local supply chain development has been assessed in key markets in order to highlight where Scottish exporters may be able to excerpt more influence
- Low cultural / logistical barriers Language, culture & geographical proximity are important factors that impact the relative attractiveness of goods and services supplied by Scottish companies. Markets closer to Scotland, where a strong trading precedence exists, will understandably score higher in this area.
- Political support / mix change urgency International markets have varying levels of political support and offshore wind enabling mechanisms in place; is linked to a nation's need to change its energy mix and deploy offshore wind.

Scottish attractiveness index Very Low Low Moderate High

		Influence weighting	50%	15%	15%	10%	10%
		Country	Market scale to 2030	Appetite for importing expertise	Early-stage supply chain development	Low cultural / logistical barriers	Political support / mix change urgency
High	Europe	Germany					
potential		Netherlands					
export		Denmark					
markets		France					
to 2030		Belgium					
		Poland					
		Ireland					
	Asia	Taiwan					
		Japan					
		South Korea					
	Americas	USA					
Medium	Europe	Norway					
potential		Sweden					
export	Asia	China					
markets		Vietnam					
to 2030		Australia					
		Brazil					
Low	Europe	Estonia/Latvia					
potential		Lithuania					
export		Italy					
markets		Finland					
to 2030		Spain					
		Faroe Islands					
	Asia	India					
		Saudi Arabia					
	Americas	Canada					



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High potential market deep-dive - Europe



• Europe top-level summary – Short-term market (Forecast - 29GW)

Based on the relative market scale, technology maturity and geographical proximity to Scotland, Europe is undoubtedly the key region for offshore wind, offering Scottish exporters the greatest supply opportunities to 2030

A post-2020 trade deal between the UK and the European Union has been agreed but it is too early to assess the impact on supply from Scotland; whilst a trade deal will facilitate supply opportunities, there are potential risks around competitiveness

Seven high potential markets will drive 97% of the total European deployed capacity to 2025; this will increase capacity by 16GW in the next five years, more than doubling the 13GW already in the water at the end of 2020

Germany and Netherlands are the largest near-term markets by some margin (likely to account for 63% of total deployment in Europe by 2025), but a re-engaged Danish market, along with strong new entrants such as France, Poland and Ireland, will drive demand for almost 7GW of new capacity

• Europe top-level summary – Mid-term market (Forecast - 62GW)

Installed and commissioned capacity across the high potential European export markets is expected to more than double again from 2026 to 2030, rising from 29.1GW in 2025 to 61.9GW by 2030 (an increase of circa 32GW); this is significantly more than the 20GW target set for the same period in the UK

Germany and the Netherlands will continue to be the largest markets (contributing 52% of the European total) but Denmark, France, Poland and Ireland will show accelerated growth, accounting for a further 41% of the total European opportunity





High potential market deep-dive - Germany



- Germany Short-term market (Forecast 11.7GW)
- 1.1GW of offshore capacity commissioned in 2020 via OWP Albatross, Hohe Se, Deutche Bucht and Bokrum West; further deployment will be low in the short-term before ramping dramatically in 2025
- Similar to the UK, Germany is transitioning to a new CfD-type auction mechanism, therefore, the short-term deployment outlook is relatively fixed, with only circa 1,300MW of new capacity expected to deploy by 2024
- Deployment expected to upturn strongly in 2025, 2030 target increasing from 15GW to 20GW (WindSeeG act, 2020)

Project	Capacity (MW) Total 3,992	Developer (Expected lead)	Turbines	Foundations (Forecast)	Location	Project status	Km to shore	Forecast online
Kaskasi	342	RWE (100%)	38 x 8.0MW SGRE	Monopile	North Sea	Pre-construction (FID '20)	35	2022
Arcadis Ost 1	256	Parkwind (100%)	27 x 9.5MW MVOW	Monopile Baltic Consen		Consented (FID forecast '21)	19	2023
Baltic Eagle	476	iberdola (100%)	27 x 9.5MW MVOW	Monopile	Baltic Sea	Consented (pre-FID)	30	2023
Wikinger Sud	10	Iberdola (100%)	ТВС	Likely Monopile	Baltic Sea	Consented (pre-FID)	40	2023
Gode Wind 3	242	Orsted (100%)	22 x 11.0MW SGRE	Likely Monopile	Baltic Sea	Consented (pre-FID)	42	2024
Borkrum Riffgrund 3	900	Orsted (100%)	82 x 11.0MW SGRE	Likely Monopile	Baltic Sea	Consented (pre-FID)	75	2025
Gennaker	865	wpd (100%)	82 x 11.0MW SGRE	Likely Monopile	Baltic Sea	Consented (pre-FID)	15	2025
He Dreiht 1	900	EnBW (100%)	ТВС	Likely Monopile	Baltic Sea	Consented (pre-FID)	20	2025

	Canadia										
Project	Capacity	Developer	Online	IU	rbines			Foundation			
	(MVV)			OEM	Installer	Monopile OEM	Transition Piece OEM	Jacket OEM	Installer		
Borkum Riffgrund 2	464.80	Orsted (50%) / Gulf Int (50%)	2018	MVOW - 8MW	Fred. Olsen (NOR)	Steelwind (GER)	Steelwind (GER)	ST3 (POL)	Jan de Nul (LUX) / Geosea (NED)		
Wikinger	350.00	Iberdrola (100%)	2018	Adwen - 5MW	Boskalis (NED)			Bladt (DEN) / Navantia (ESP)	Fred. Olsen (NOR)		
Arkona	385.00	E.on (50%) / Equinor (50%)	2019	SGRE - 6MW	Geosea (NED)	EEW (GER)	Bladt (DEN)		Van Oord (NED)		
Merkur Offshore	396.00	APG (64%) / TRIG (36%)	2019	GERE - 6MW	Fred. Olsen (NOR)	Steelwind (GER)	Idesa (ESP)		Geosea (NED)		
Borkum West 2.2	203.20	EWE (37.5%) / Trianel (37.5%)	2020	Senvion - 6MW	Fred. Olsen (NOR)	Steelwind (GER)	SIF / Smulders (NED/BEL)		Seaway7 (UK)		
Deutsche Bucht	269.00	Northland (100%)	2020	MVOW - 8MW	Van Oord (NED)	EEW (GER)	Idesa / Windar (ESP)		Seajacks (UK)		
Hohe See	497.00	EnBW (50.1%)	2020	SGRE - 7MW	Fred. Olsen (NOR)	Sif (NED)	Smulders (BEL)		Geosea (NED)		
Albatros	112.00	EnBW (50.1%)	2020	SGRE - 7MW	Fred. Olsen (NOR)	Sif (NED)	Smulders (BEL)		Geosea (NED)		
Project	Capacity	Developer Contracting		Sub	station	A	rray Cable	Exp	port Cable		
Froject	(MW)	Developer	Contracting	Offshore	Onshore	OEM	Installer	OEM	Installer		
Borkum Riffgrund 2	464.80	Orsted (50%) / Gulf Int (50%)	Multi-contract	HSM (NED)		Nexans (FRA)	Van Oord (NED)	Hellenic (GRE)	Van Oord (NED) / Jan de Nul (LUX)		
Wikinger	350.00	Iberdrola (100%)	EPCI	Navantia (ESP)		Prysmian (ITA)	Sub - Global Marine (UK)	Pry	smian (ITA)		
Arkona	385.00	E.on (50%) / Equinor (50%)	Multi-contract	STX (FRA)		Nexans (FRA)	Boskalis (NED)	Pry	smian (ITA)		
Merkur Offshore	396.00	APG (64%) / TRIG (36%)	EPCI	Engie (UK) /	Smulders (BEL)	Prysmian (ITA)	Geosea (NED)	NSW (GER)	Deepocean (UK)		
Borkum West 2.2	203.20	EWE (37.5%) / Trianel (37.5%)	EPCI			NSW (GER)	Siem (NOR)	Hellenic (GRE)	Jan de Nul (LUX)		
Deutsche Bucht	269.00	Northland (100%)	EPCI	Van Oord (NED) /	Sub - Smulders (BEL)	Sub - NSW (GER)	Van Oord (NED)	Pry	smian (ITA)		
Hohe See	497.00	EnBW (50.1%)	EPCI	Engie (UK)	Siemens (UK)	JDR (UK)	Boskalis (NED)	ZTT (CHI)	Van Oord (NED)		
Albatros	112.00	EnBW (50.1%)	EPCI	Engie (UK)	Siemens (UK)	TKF (NED)	Boskalis (NED)	ZTT (CHI)	Van Oord (NED)		

- 4GW of well-advanced projects nearing construction, highly likely to be deployed by 2025; activity in the short-term expected to focussed around the Baltic Sea zone
- Orsted, RWE and Iberdrola to have 50% of the short-term deployment market; all have a strong existing UK presence that can be leveraged by Scottish exporters
 - Outside of the UK, Germany has one of the most developed offshore wind supply chains globally: *Turbines:* more dispersed than the UK market ; Fred Olsen have a leading position in terms of installation
 - *Foundations:* Dominated heavily by monopiles; international supply Geosea are the most successful installer to date
 - Substations: small onshore market as much of capacity to be connected offshore; offshore substation topside / OTM supply historically supported by a diverse international OEM base
 - Array cables: often contracted as an EPCI contract, historically covered mainly by three OEMs (Nexans, Prysmian and NSW); Boskalis and Van Oord are the largest installers
 Export cables: often contracted as an EPCI arrangement, Jan de

Nul and Van Oord have been strong historical players



High potential market deep-dive - Germany



• Germany– Mid-term market (Forecast – 21.4GW)

The new Government targets forecast 20GW deployment by 2030; project attrition is likely, but if all of the development zones are tendered as planned to 2025, the 9.7GW German pipeline could raise deployment to 21.4GW by 2030

All post-2025 German deployment will draw from 14 tender zones (where a timeline of leasing and commissioning has been drawn up) predominately in the North Sea; the three 2021 project auctions (totalling 958MW) were initiated earlier this year
 Zones
 Capacity (MW)
 Water depth / Assumed foundations
 Location Tender / Instantion







Zones	Capacity (MW)	Water depth / Assumed foundations	Location	Tender / Install
N-3.7 (Tender Zone)	225	31-35m / likely Monopiles	North Sea	2021 / 2026
N-3.8 (Tender Zone)	433	up to 35m / likely Monopiles	North Sea	2021 / 2026
O-1.3 (Tender Zone)	300	43-45m - likely Jacket	Baltic Sea	2021 / 2026
N-7.2 (Tender Zone)	930	to 40m / 50% Monopile: <mark>50% Jacket</mark>	North Sea	2022 / 2027
N-3.5 (Tender Zone)	420	25-35m / likely Monopiles	North Sea	2023 / 2028
N-3.6 (Tender Zone)	480	25-35m / likely Monopiles	North Sea	2023 / 2028
N-6.6 (Tender Zone)	630	up to 40m / likely Monopiles	North Sea	2024 / 2029
N-6.7 (Tender Zone)	270	up to 40m / likely Monopiles	North Sea	2024 / 2029
N-9.1 (Tender Zone)	1000	to 30m / likely Monopiles	North Sea	2024 / 2029
N-9.2 (Tender Zone)	1000	40-42m - likely Jacket	North Sea	2024 / 2029
N-9.3 (Tender Zone)	1000	to 30m / likely Monopiles	North Sea	2025 / 2030
N-9.4 (Tender Zone)	1000	to 30m / likely Monopiles	North Sea	2025 / 2030
N-10.1 (Tender Zone)	1000	30m to 50m / 50% Monopile: 50% Jacket	North Sea	2025 / 2030
N-10.2 (Tender Zone)	1000	30m to 50m / 50% Monopile: 50% Jacket	North Sea	2025 / 2030
	9688			







High potential market deep-dive - Germany

Weighting	50%	15%	10%	10%	15%
Country	Market scale to 2030	Appetite for importing expertise	Low cultural / logistical barriers	Political support / Mix change urgency	Early stage supply chain development
Germany					

Supply Chain Challenges

- An advanced indigenous supply chain means there is little scope for Scottish exporters to leverage first-mover advantages; experience gained in the advanced UK sector may count for less in this market
- Germany has a strong tier one and sub-tier supply chain and an abundance of developed manufacturing and quayside infrastructure in place; similar to the UK market, project 'strike prices' are low therefore Scottish exporters will need to offer solutions that can challenge incumbents through improved quality, innovation or cost-competitiveness
- Whilst English is commonly spoken, some administrations and agencies such as BSH (Bundesamt für Seeschifffahrt und Hydrographie, the German equivalent of Marine Scotland) operate in German only, making it important for Scottish companies either to hire German speaking personnel or to partner with local companies to overcome the language barrier

Supply Chain Opportunities

- With >12GW of new capacity expected in the 2020s and a further 20GW in the 2030s, Germany is one of the largest international target markets for Scottish exporters; Government support for offshore wind is strong and consenting and auction processes are well-developed and streamlined
- The recently adopted German Climate Protection Plan and new CfD-type auction mechanisms *do not* drive a local content protectionist agenda; analysis of recently deployed projects shows that companies from a *very wide international mix are trading effectively* here
- German projects will mostly be *deployed in the North Sea* therefore the logistical cost burden associated with goods imported from Scotland will be much less than for many overseas markets
- Scottish offshore wind capabilities are well-renowned in-country; Scottish companies have been involved in most of the German offshore projects to date, providing goods and services across array cables, export cables, foundations, metocean masts, vessel provision, transformers and substations
- The German Wind Association has identified a number of *technical challenges* in areas where *Scottish capabilities are strong*: required solutions include corrosion protection, noise mitigation for installation and innovative / costcompetitive OMS



In-country engagement

- WAB (<u>www.wab.net</u>)
- Renewable Energy Hamburg (<u>www.erneuerbare-energien-hamburg.de</u>)
- Wind Energy Network (<u>www.wind-energy-network.de</u>)
- ***** Maritime Cluster Norther Germany (<u>www.maritimes-cluster.de</u>)

High potential market deep-dive - Netherlands

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- Netherlands Short-term market (Forecast 6.7GW)
- Installation of Borssele 1&2 in 2020 signaled the start of next generation Dutch wind farm deployment; installation will remain spikey until the deployment of the second and third auction zones by 2023
- Dutch authorities planning to release zones for auction on a regular basis; there are broad in-country assumptions that projects will be commissioned three years after auction (nb significant site pre-development is done prior to tender)
 - The Dutch Government roadmap provides a clear pathway for a further two zones to be commissioned by 2025; cumulative deployment of 6.7GW is highly likely

	Proj	ject	(MW)	Develo	hei	Unine		OEM	Installer	Monopile	EM	Tran	sition Piece O	EM
	Pro	iect	Capacity	Develo	ner	Online		Turbine	es				Founda	ation
Hollandse West	e Kust II	70	700 Auction 2022		TBC	Likely Mono	opile	North Sea	Devel	opment	53		2025	
Hollandse West	e Kust I	70	0	Auction 2021	TBC	Likely Mono	opile	North Sea	Devel	opment	53		2024	
Hollandse Noor	e Kust 'd	75	9	Eneco (50%) / Shell (50%)	70 x 11.0MW SGRE	Likely Mono	opile	North Sea	Pre-construction (pre-FID)		19		2023	
Hollandse K 3 & 4	ust Zuid 4	76	0	Vattenfall (100%)	70 x 11.0MW SGRE	Monopil	e	North Sea	Pre-construc	tion (post-FID)	26		2023	
Hollandse K 1 & 2	ust Zuid 2	76	0	Vattenfall (100%)	70 x 11.0MW SGRE	Monopil	e	North Sea	Pre-construc	tion (post-FID)	30		2023	
Friesland W	ind Park	38	3	Windpark Friesland (100%)	89 x 4.3MW SGRE	Monopil	e	North Sea	In construction		6		2021	
Borssele	3&4	73	1	Blauwwind (100%)	77 x 9.5MW MVOW	Monopil	e	North Sea	In cons	In construction			2021	
Proje	ct	Capacity Total 4	7 (MW) 4,793	Developer (Expected lead)	Turbines	Foundatio (Forecas	ons t)	Location	Projec	t status	Km to shore	o e	Forecast online	•

Project	Capacity	Developer	Online	IVI	NIIICO		Foundation		
Froject	(MW)	Developer	Unime	OEM	Installer	Monopile OEM	Transition Piece OEM	Jacket OEM	Installer
Luchterduinen	129.00	Eneco Group (50%) / MHI (50%)	2015	MVOW - 3MW	Van Oord (NED)	SIF / Smulo	lers (NED/BEL)		Van Oord (NED)
Westermeerwind	144.00	Westermeerwind (100%)	2016	SGRE - 4MW	Van Oord (NED)	Sif (NED)			Van Oord (NED)
Gemini	600.00	Northland (60%)	2017	SGRE - 3MW	Van Oord (NED)	Sif (NED)	Smulders (BEL)		Van Oord (NED)
Borssele 1&2	752.00	Orsted (100%)	2020	SGRE - 8MW	Geosea (NED)	SIF (NED) / EEW (GER)	EEW (GER) / Bladt (DEN)		Geosea (NED)
		•							
Project	Capacity	Developer	Contracting	Subs	station	Arra	y Cable	Expor	t Cable
FTOJECT	(MW)	Developei	contracting	Offshore	Onshore	OEM	Installer	OEM	Installer
Luchterduinen	129.00	Eneco Group (50%) / MHI (50%)	EPCI	CG Pov	wer (IND)	LS Cable (KOR)	NKT (GER)	LS Cable (KOR)	Boskalis (NED)
Westermeerwind	144.00	Westermeerwind (100%)	EPCI		Siemens (UK)		Boskalis (NED)		
Gemini	600.00	Northland (60%)	EPCI	Engie (UK) /	lemants (BEL)	Van O	ord (NED)	NKT (GER)	Van Oord (NED)

- The fourth tender zone (Hollandse Kust West 1&2) is expected to be auctioned across 2021 and 2022; the short-term pipeline of 4.8GW of additional capacity is expected to be online by 2025
 - **Turbines:** supply market similar to the UK market SGRE and MVOW are the dominant OEMs; Dutch installers Van Oord and Geosea have dominated turbine installation
 - Foundations: currently built solely around monopiles and transition pieces, supply historically dominated by Sif and Smulders; Orsted introduced a more international supply mix on Borssele 1&2 and broke the Van Oord installation monopoly via the introduction of Geaosea for foundation installation. No
 - jacket or floating demand anticipated.
 - *Substations:* historical supply has tended to be much more internationally focused
 - Array cables: the historical supply chain is very similar to other European markets with the large tier one OEMs / installers dominating
 - Export cables: whilst OEM supply has been historically very international, installation activities have exclusively been undertaken by Dutch contractors

Scotia

High potential market deep-dive - Netherlands • Netherlands - Mid-term market (Forecast - 11.4GW)



- The Dutch Government has announced an offshore wind deployment target of 11.5GW by 2030, with a longer-term aspiration of an additional 20-40GW by 2050; there is a programme being mooted to extend the lifetime of operating assets, as the Government strives to hit 2030 commitments
- Further zonal tenders totalling 6.1GW are expected across the first half of the 2020s with the intention of projects being online by 2030; with no project attrition, this could deliver a maximum of 12.7GW by 2030, but for the purposes of this analysis, 11.4GW has been assumed

Of the 6.1GW tenders mooted, a roadmap across five zones exists for 4.7GW of capacity to be deployed by 2030; this roadmap will bring the Netherlands to 11.4GW by 2030 (*very close to the Government's 11.5GW target*)

weighting	50%	15%	10%	10%	15%	
	Market scale to 2030	Appetite for	Low cultural /	Political support /	Early stage supply	Su
Country	Market Scale to 2050	importing expertise	logistical barriers	Mix change urgency	chain development	
Netherlands				-		
						-

Supply Chain Challenges

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- A relatively advanced indigenous supply chain means there is limited scope for Scottish exporters to leverage first-mover advantages
- The Dutch policy and auction mechanism *does not* drive a local content protectionism agenda, however, early Dutch projects have exhibited a *very high level of local content at a tier one contractor level*; with low 'strike' prices and strong competition, *Scottish exporters will be challenged to compete*

In-country engagement

- Netherlands Wind Energy Association (www.newa.nl)
- Northern Netherlands Offshore Wind (<u>www.nnow.nl</u>)
- Association of Dutch Suppliers in the Offshore Energy Industry (www.ipo.nl)

Zones	Capacity (MW)	Water depth / Assumed foundations	Location	Tender / Instal
Ijmuiden Ver I	1000	to 38m / likely Monopiles	North Sea	2023 / 2026
Ijmuiden Ver II	1000	to 38m / likely Monopiles	North Sea	2024 / 2027
ljmuiden Ver III	1000	to 38m / likely Monopiles	North Sea	2025 / 2028
Ijmuiden Ver IV	1000	to 38m / likely Monopiles	North Sea	2026 / 2029
Ten Noorden van de Waddeneilanden	700	to 38m / likely Monopiles	North Sea	2026 / 2030
	4700			

Supply Chain Opportunities

- With **9GW** of new capacity expected in the **2020s** and a **further 20-40GW by 2050**, Netherlands is clearly one of the largest international target markets for Scottish exporters; **Government support for offshore wind is strong** and a well-publicised auction roadmap, with **regular auctions**, means that **market certainty is high**
- Dutch projects will be *deployed exclusively in the North Sea* therefore the logistical cost burden associated with goods imported from Scotland will be less
- The main installation contractors expected to be active in this market and OEMs such as HSM, Sif and Smulders are expected to be strong; Scottish exporters can proactively engage with these entities on a non-project specific basis
- Strong *historical Scottish-Dutch trading relationship* established in sectors such as O&G, perceived trading and cultural barriers are low



High potential market deep-dive - Denmark



- Denmark Short-term market (Forecast 3.2GW)
- One of the first countries to deploy offshore wind, Denmark has only increased deployed capacity by 1GW via two projects in the last decade; Denmark is set to step up its focus on offshore wind dramatically across the next decade via a progressed 1.5GW pipeline of projects that will likely raise deployed capacity to 3.2GW by 2025
- The Danish Government has recently announced legislation for 2030 commitments that will see a 6.8GW uplift in deployed capacity across the next decade; none of these new tenders are expected to result in construction pre-2025

Project	Capacity (MW) Total 1,513	Developer (Expected lead)	Turbines	Foundations (Forecast)	Location	Project status	Km to shore	Forecast online	•
Kriegers Flak	605	Vattenfall (100%)	72 x 8.4MW SGRE	Monopile	Baltic Sea	In construction	15	2021	
Vesterhav Nord	170	Vattenfall (100%)	20 x 8.4MW SGRE	Monopile	North Sea	Pre-construction (FID '18)	9	2023	
Vesterhav Syd	178	Vattenfall (100%)	21 x 8.4MW SGRE	Monopile	North Sea	Pre-construction (FID '18)	9	2023	
Jammerland Bugt	240	European Energy (100%)	твс	Likely Monopile	North Sea	Consented (pre-FID)	8	2024	
Omo Syd	320	European Energy (100%)	ТВС	Likely Monopile	North Sea	Consented (pre-FID)	8	2024	

Deployment will continue in both Danish North Sea and Baltic Sea zones, with Vattenfall the dominant near-term developer; demand is generally sporadic pre-2025

Project	Project Capacity Developer (MW)		Online	Tur	Turbines		Foundation				
Fioject			Onine	OEM	Installer	Monopile OEM	Transition Piece OEM	Jacket OEM	Installer		
Anholt	399.60	Orsted (50%)	2013	SGRE - 3.6MW	A2Sea (UK)	Bladt (DEN)			Ballast Nedam (NED)		
Horns Rev 3	406.7	Vattenfall (100%)	2019	MVOW - 8MW	Fred. Olsen (NOR)	Bladt (DEN) /	Smulders (BEL)		Geosea (NED)		
Project	Capacity	Developer	Contracting	Substation		Arra	y Cable	Expo	ort Cable		
Froject	(MW)	Developer	Contracting	Offshore	Onshore	OEM	Installer	OEM	Installer		
Anholt	399.60	Orsted (50%)	Multi-contract	Bladt (DEN)		Nexans (FRA) Boskalis (NED)		NKT (GER)			
Horns Rev 3	406.7	Vattenfall (100%)	EPCI	Hollandia (NED)		Prysmian (ITA)	Boskalis (NED)	NKT (GER)	Energinet (DEN)		

- **Turbines:** the Danish turbine supply market is similar to the UK market whereby SGRE and MVOW are the dominant OEMs
- Foundations: the Danish market has been exclusively monopiles / transition pieces; Danish OEM Bladt are likely to be very strong in this area going forward
- Array & export cables: the supply chain is very similar to other European markets, whereby the large tier one specialists are dominant, irrespective of country of origin



High potential market deep-dive - Denmark • Denmark - Mid-term market (Forecast - 10.4GW)



Although no official Government 2030 target exists, roadmaps suggest that deployment will pick up pace from 2027; the market is essentially expected to treble in size by 2030 – reaching 10GW – via a number of zonal auctions that started in 2020

Weighting	50%	15%	10%	10%	15%
	Market scale to 2030	Appetite for	Low cultural /	Political support /	Early stage supply
Country		importing expertise	logistical barriers	Mix change urgency	chain development
Denmark					

Supply Chain Opportunities

- With over 8GW of new capacity expected in the 2020s and a further mid-term pipeline, Denmark is one of the largest international markets for Scottish exporters later in the decade; Governmental support for offshore wind is strong
- With many of the large next generation projects at an *early stage of development*, the window of opportunity across the project lifecycle is open for Scottish exporters
- A significant proportion of Danish projects will be deployed in the *North Sea*, therefore, the logistical cost burden associated with goods imported from Scotland will be less
- Given the *strong historical Scottish-Danish trading relationship* already established via sectors such as Oil & Gas, perceived trading and cultural barriers are low

Zones	Capacity	Assumed foundations	Location	Fcst
Thor	1000	likely Monopiles	North Sea	2027
Hesselø	1200	likely Monopiles	Baltic Sea	2028
Island Zone	3000	likely Monopiles	North Sea	2029/30
Island Zone	2000	likely Monopiles	Baltic Sea	2029/30
	7200			

The Danish authorities recently launched the North Sea Thor tender and are expected to tender the Baltic Sea Hesselo zone in 2021. Two newly identified offshore island zones will be tendered in the mid-2020s in order to target deployment by 2030

The near-term auction roadmap plans to release projects in four zones (x1 North Sea and x3 Atlantic Sea); this will contribute to deployed capacity in the early 2030s

Supply Chain Challenges

- A relatively *advanced indigenous supply chain* means there is limited scope for Scottish exporters to leverage first-mover advantages
- The Danish policy and auction mechanism *does not* drive a local content protectionism agenda. However, Denmark has a *strong developer, tier one and sub-tier supply chain* and an abundance of *developed manufacturing and quayside infrastructure in place*, Esbjerg being the largest offshore wind hub in Europe; Scottish exporters will need to offer solutions that can challenge incumbents through improved quality, innovation or cost-competitiveness



In-country engagement

Wind Denmark (www.winddenmark.dk)

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High potential market deep-dive - France • France - Short-term market (Forecast - 3GW)



• Offshore wind has had a number of false starts in France but with re-negotiated 'strike prices' now in place, deployment will begin in earnest with the first tranche of projects totaling 3GW – across 10 wind farms – likely to deploy between 2022 and 2024

Project	Capacity (MW) Total 3,028	Developer (Expected lead)	Turbines	Foundations (Forecast)	Location	Project status	Km to shore	Forecast online
Saint-Nazaire	480	EDF (50%)	80 x 6MW GERE	Monopile	Bay of Biscay	In construction	15	2022
EFGL Floating Wind	30	Ocean Winds (80%)	3 x 10MW MVOW	Floating (<i>Windfloat</i>)	Mediterranean	Pre-construction (FID '20)	16	2022
PGL Floating Wind	24	EDF (100%)	3 x 8MW SGRE	Floating (TLP)	Mediterranean	Approved (pre-FID)	14	2022
Saint-Brieuc	496	Iberdrola (100%)	62 x 8MW SGRE	Jacket	English Channel	Pre-construction (FID '20)	16	2023
Le Treport	496	Ocean Winds (60.5%)	62 x 8MW SGRE	likely Jacket	English Channel	Consented	17	2023
EolMed	30	Quair (80%)	3 x 10MW MVOW	Floating (Damping Pool)	Mediterranean	Consented	15	2023
Groix	28	CGN (50%); Eolfi (Shell) (50%)	4 x 9.5W MVOW	Floating (Naval Energy Float)	Bay of Biscay	Consented	30	2023
Noirmoutier	496	Ocean Winds (60.5%)	62 x 8MW SGRE	likely Jacket	Bay of Biscay	Consented	29	2024
Fecamp	497	<i>EDF (35%) /</i> wpd (30%)	71 x 7MW SGRE	likely Monopile	English Channel	Consented (FID '21)	22	2024
Courseulles sur Mer	450	EDF (42.5%)	75 x 6MW GERE	likely Monopile	English Channel	Consented (FID '21)	10	2024

Turbines: the short-term French turbine supply market is quite diverse, with each of the three main OEMs scoring early success
 Foundations: the early market is diverse in terms of technology selection, with different seabed conditions in the English Channel, Bay of Biscay and Mediterranean Sea. Early OEM supply has a strong international flavour indicating that technology trumps local content, to some extent. Like Scotland, France is seeking to be an early floating wind adopter

• *Export cables:* Prysmian and Nexans have scooped early EPCI awards suggesting that a cable-led tier one arrangement may be the preferred in-country arrangement going forward



It is significant for Scottish exporters that early prominent French developers (EDF, Ocean Winds, Iberdrola) have a strong existing Scottish presence; given the level of interaction in Scotland, opportunities in France can most certainly be leveraged in this way

Offshore wind 'strike prices' in France are higher than in other parts of Europe; Governmental expectations for high local content are consequently very strong and very visible

Project	Capacity	Developer	Online	Tur	bines		Founda	tion		
Froject	(MW)	Developer	Onine	OEM	Installer	Monopile OEM	Transition Piece OEM	Jacket OEM	Installer	
Saint-Nazaire	480.00	EDF (50%)	2022	GERE - 6MW	Jan de Nul (LUX)	Sif (NED)	SIF / Smulders (NED/BEL)		DEME (BEL)	
EFGL Floating Wind	30.00	Ocean Winds (80%)	2022	MVOW - 10MW			Ideol (I	RA)		
PGL Floating Wind	24.00	EDF (100%)	2022	SGRE - 8MW			SBM Offsho	re (NED)		
Saint-Brieuc	496.00	Iberdrola (100%)	2023	SGRE - 8MW		Navantia / Windar (ESP) Van Oord (
Project	Capacity	Developer	Contracting	Subs	station	Arr	ay Cable	Export Cable		
Project	(MW)	Developer	Contracting	Offshore	Onshore	OEM	Installer	OEM	Installer	
Saint-Nazaire	480.00	EDF (50%)	EPCI	DEME (BEL)		Prysi	mian (ITA)	Prysmia	n (ITA)	
EFGL Floating Wind	30.00	Ocean Winds (80%)	EPCI			JDR (UK) DEME (BEL)				
PGL Floating Wind	24.00	EDF (100%)	EPCI			Prysmian (ITA)				
Saint-Brieuc	496.00	Iberdrola (100%)	EPCI	Eifage <mark>(</mark> FRA)	GE Grid (FRA)	Prysi	mian (ITA)	Nexans	(FRA)	

• *Substations:* Supply is likely to be heavily focused on local companies going forward

• Array cables: Prysmian are the early market EPCI force incountry and have a large cable OEM capability

High potential market deep-dive - France



France – Mid-term market (Forecast – 7.4GW)

The French Government finalised OSW targets in 2020 via its 2030 National Energy and Climate Plan (NECP); with plans to tender 8.75GW of new capacity by 2028 (total award of 12.4GW), a 2030 target of 7.4GW makes France one of the fastest growing markets

Weighting	50%	15%	10 %	10%	15%	s
Country	Market scale to 2030	Appetite for	Low cultural /	Political support /	Early stage supply	
Country		importing expertise	logistical barriers	wix change urgency	chain development	
France						•

Supply Chain Challenges

- Although the market is relatively early-stage, the *French supply chain is* developing guickly; with such strong European tier one presence already evident, limited scope for Scottish first-mover advantages
- Despite little evidence that French policy and auction mechanisms expressly require local content commitments, it is well-understood that *local supply is* likely to be prioritised; without existing in-country footprint presence or access to *partnerships with French suppliers*, Scottish exporters may struggle to make traction. An ability to converse technically in French is likely required
- France has a strong track record of *investing heavily in infrastructure at a* national level; with extensive guayside investment already committed and a strong tier one offshore wind OEM presence, Scottish exporters may find it challenging to compete commercially in-country

In-country engagement

Various – contact Deepwind & SDI for a fully listing

Projects / Zones	Capacity (MW)	Assumed foundations	Location	Tender / Install
Dunkirk Offshore Wind Farm (EDF/Enbridge/RWE)	600	Monopiles	North Sea	Complete / 2027
Manche Est Mer du Nord (Fixed Wind)	1000	likely Monopiles	North Sea	2021 / 2027
Oleron (Fixed Wind)	1000	likely Monopiles	Atlantic Ocean	2022 / 2028
Floating Zones x3	750	Floating	Atlantic Ocean	2022 / 2028/29
South Atlantic (Fixed wind)	1000	likely Monopiles	Atlantic Ocean	2023 / 2029
	4350			

With 3.6GW of awards already made and 8.75GW of new tenders by 2028, a 2030 cumulative deployment of 7.4GW means that circa 5GW of capacity will be awarded for deployment in the early 2030s

Supply Chain Opportunities

- With **7GW** of new capacity expected in the **2020s** (a large % likely floating), France is a key export market; Government support for offshore wind is strong (only recently) and a roadmap into the 2030s is already in place
- The majority of mid-term projects will be deployed in the North Sea
- Despite a strong push for local content, there is realisation that French tier 2/3 SMEs lack experience in OSW; sharing lessons learned is angle for Scottish companies
- Scotland and France have a long trading history, business and cultural barriers are perceived to be low; Scottish exporters should seek to leverage existing Scottish developer linkages
- Deepwind & SDI developing strong links with French clusters; strong Scottish in-country reputation in subsea engineering and already active with mooring systems, anchor technology, dynamic cables / equipment and expert consultancy
- SDI / SG developing research and innovation linkages between Scotland and France; SGs Nov-20 tender call for the identification of collaboration opportunities for the OSW-related production of green hydrogen is likely to foster international collaboration



High potential market deep-dive - Belgium



• The Belgian Government has mooted plans to target 4GW of deployment by 2030, but no zones have been identified for this additional 1.7GW; late decade deployment is best case



Supply Chain Challenges

- Small project pipeline, limited deployable offshore area and only a modest 2030 target
- Advanced indigenous supply chain
- Strong tier one and sub-tier supply chain and an abundance of
 developed manufacturing and quayside infrastructure in place

- Belgium Short-term market (Forecast 2.3GW) / Mid-term market (Forecast 4GW)
- The commissioning of Northwester 2 in 2020 (Belgium's 7th offshore farm) takes installed capacity to 1.8GW; there is only one offshore project now in the 'live' planning process, therefore, a 2025 capacity of 2.3GW is virtually certain
- The Belgian market is unlikely to be a key short-term focus international market for Scottish CAPEX exporters given the lack of an 'active' pipeline; installed capacity is relatively large therefore OPEX opportunities exist in-country

		Project	Capacity (MW) Total 487	Develo (Expected	per lead)	Turb	oines Fo (F	undations Forecast)	Locati	on	Project sta	itus	Km to shore	Forecast online
	2 1)	Seamade Marmaid)	235	Otary (7	70%)	28 x 8 SG	.4MW N	1onopile	North S	Sea	In construc	tion	54	2021
	Seam	ade (Seastar)	252	Otary (7	70%)	28 x 8 SG	.4MW N	1onopile	North S	Sea	In construc	tion	40	2021
Project	Capacity	Deve	loper	Online		Turk	pines				Founda	ition		
110,000	(MW)		lopol		OEN	1	Installer	Monop	ile OEM	Tran	sition Piece OEM	Jack	et OEM	Installer
Rentel	309.00	Ot	ary	2019	SGRE - 7.	3MW	DEME (BEL)	Sif ((NL)	S	mulders (BEL)			Geosea (NED)
Norther	369.60	Elicio	(50%)	2020	MVOW - 8	8.4MW	Van Oord (NEE)) Sif ((NL)	S	mulders (BEL)			Van Oord (NED)
Northwester 2	224.00	Parkwir	nd (70%)	2020	MVOW - 9	.5MW	Van Oord (NEE)	Blad	lt (DEN				Jan de Nul (LUX)
Seamade	487.00	Otary	(70%)	2021	SGRE - 8	BMW	DEME (BEL)	Sif ((NL)	S	mulders (BEL)			DEME (BEL)
Project	Capacity	Dove	loner	Contracting		Subs	tation		Arra	y Cabl	e		Export	Cable
Toject	(MW)	Deve	loper	contracting	Offsho	ore	Onshore	O	M		Installer	c	DEM	Installer
Rentel	309.00	Ot	ary	Multi-contract	STX (FF	RA)		Prysmia	an (ITA)		DEME (BEL)		ABB (SUI)
Norther	369.60	Elicio	(50%)	EPCI	Engie (E	BEL)		LS Cabl	e (KOR)	Vá	an Oord (NED)	LS Cal	ole (KOR)	Van Oord (NED)
Northwester 2	224.00	Parkwir	nd (70%)	Multi-contract	Bladt (D	DEN)		Prysmia	an (ITA)	Ja	n de Nul (LUX)	Nexa	ns (FRA)	Jan de Nul (LUX)
Seamade	487.00	Otary	(70%)		Engie /	DEME /	Smulders (BEL)	JDR	(UK)		DEME (BEL)	Heller	nic (GRE)	DEME (BEL)
	1													
Weighting		50%		15%		10	0%	1	1 0 %		15%			
			App	etite for	L	ow cu	ultural /	Politica	l support	t/	Early stage s	upply		
Country	Warke	t scale to 20	importir	ng expertise	e log	gistica	l barriers	Mix char	nge urgei	ncy	chain develop	oment	In-co	untry
Belgium				- •					_ •	·			enga	gement

Supply Chain Opportunities

- Belgian projects have been / will be deployed in the North Sea, the logistical cost burden from Scotland is less; likely to be more short-term OPEX than CAPEX opportunities
- Tier 1 commonality with UK enter market via relationships with tier 1 contractors in the UK



Belgian Offshore

replatform.be)

(www.belgianoffsho

Platform

No major cultural or logistical barriers perceived

High potential market deep-dive - Poland

11336

Poland - Capacity (MW) мw мw 1600 4000 3800 1400 3500 1200 3000 1000 2500 800 2000 600 1500 400 1000 200 500 0 Ο 25 27 28 29 30 26 Development Install

• Unlikely that Poland will have any OSW deployed pre-2025, just awarded first CfDs (similar to UK format) in Apr-21; a ramped 3.8GW is expected later in the decade- developers have stated an aspiration to deploy by 2025, but, this was a pre-pandemic position and projects are more likely to be looking at full commissioning by 2026/7

- The recently approved 'Offshore Wind Act' will see offshore wind become a central part of the Polish energy mix across the next 20 years; a roadmap has been published targeting 3.8GW by 2030, 10GW by 2040 and 28GW by 2050. The Baltic Sea is reported to have a total OSW potential of 93GW, much of this in Polish waters
- Poland is seeking to award a first tranche of CfDs up to 5.9GW;
 3 were awarded in Apr-21, totaling 2.8GW. Developers are targeting pre-2030 deployment
- The remaining 8.5GW pipeline likely to contribute the remaining 1GW of the 3.8GW by 2030 – is likely to be the same pool of projects to deliver the 10GW by 2040 target.
- Grid connections agreed with a number of projects, some awaiting results from ongoing CfD auction. PKN Orlen and Equinor suggest projects could be online from the mid-2020s

Weighting	50%	15%	10%	10%	15%
Country	Market scale to 2030	Appetite for importing expertise	Low cultural / logistical barriers	Political support / Mix change urgency	Early stage supply chain development
Poland					

Supply Chain Challenges

- Polish agencies pushing for a UK-style Sector Deal Declaration of Cooperation (signed by Govt, developers and supply chain) will drive a local content agenda; partnering in-country may be key
 - Strong indigenous fabricators with excellent quayside infrastructure;



Turbine Turbine Foundations Km from Fcst Project Capacity Developer # turbines Location Project status rating OEM (forecast) shore Online Baltica 2 1500 Orsted (50%) / PGE (50%) 10.00 TBC likely Monopiles Baltic Sea CfD awarded ('21) & Grid awarded 25 by 2030 150 Baltica 3 1050 Orsted (50%) / PGE (50%) 105 10.00 TBC likely Monopiles Baltic Sea CfD awarded ('21) & Grid awarded 25 by 2030 50 E.W. Baltic II 350 TBC TBC TBC Monopiles RWE (100%) Baltic Sea CfD awarded ('21) & Grid awarded TBC Baltic Powe 1200 **PKN Orlen (100%)** TBC TBC TBC likely Monopiles **Baltic Sea** Grid awarded - CfD applied 2026 Baltyk III 1440 Equinor (50%) : Polenergia (50%) TBC TBC TBC likely Monopiles Baltic Sea Grid awarded - CfD applied 30 2026 твс 1440 Equinor (50%); Polenergia (50%) TBC TBC likely Monopiles Baltic Sea 2027 Baltyk II Grid awarded - CfD applied likely Monopiles **B-Wind** 200 Ocean Winds (100%) TBC TBC TBC Baltic Sea Grid awarded - CfD applied TBC C-Wind 200 Ocean Winds (100%) TBC TBC TBC likely Monopiles Baltic Sea Grid awarded - CfD applied TBC Baltica 1 896 PGE (100%) TBC TBC TBC likely Monopiles Baltic Sea Grid awarded - development 80 post-2030 Baltyk I 1560 Equinor (50%); Polenergia (50%) TBC TBC TBC likely Monopiles Baltic Sea Grid awarded - development by 2030 500 RWE (100%) TBC TBC TBC likely Monopiles Baltic Sea Development Sharco II TBC 500 RWE (100%) TBC TBC 30 TBC Sharco IV likely Monopiles Baltic Sea Development Sharco V RWE (100%) TBC TBC TBC likely Monopiles **Baltic Sea** Development TBC

Supply Chain Opportunities

- Although modest to 2030, the mid-term market potential is huge; Government support for OSW is strong, energy mix change urgency high (70% fossil fuels in 2019) and forecasts highly likely to be met or exceeded
- Baltic Sea focus allows Scottish exporters to target economies of scale accordingly
- Early stage of evolution therefore perceived opportunity for Scottish exporters to provide input from lessons learned in the advanced UK market



In-country engagement

www.oneplace.marketplanet.pl

www.psew.pl

www.ptmew.pl

Strong cultural connections, no perceived trading barriers

n potential market deep-dive - Ireland



Although the Irish Government has yet to announce how auctions will be run – and there are still foreshore licensing issues to be concluded – an aspiration exists to deploy 1GW by 2025

Project	Capacity (MW) Total 528	Developer (Expected lead)	Turbines	Foundations (Forecast)	Location	Project status	Km to shore	Forecast online
Arklow Bank 2	520	SSE (100%)	ТВС	Monopile	Irish Sea	Consented	10	2025

deployment commitments (min 3.5GW). SSE Arklow 2 likely to be first to deploy as an extension of Arklow 1



The mid-term Irish market to 2030 is likely to be a mix of shallow and deep-water sites; shallow water Irish Sea projects likely to deploy early based on monopile economics

70% of 33GW long-term pipeline in water depths >60m; Scottish synergy with South Irish Sea and West Atlantic zones

						_ (
Weighting	50%	15%	10 %	10%	15%	
Country	Market scale to 2030	Appetite for importing expertise	Low cultural / logistical barriers	Political support / Mix change urgency	Early stage supply chain development	
Ireland						
						-

Supply Chain Challenges

• Ireland – Short-term market (Forecast – 1GW) / Mid-term market (Forecast 3.5GW)

7 'relevant' projects were identified in 2020; anticipated that these projects will be 'fast tracked' to hit 2030 Irish

For 1GW by 2025, one of the other six relevant projects will need to be progressed; some developers are aspiring to deploy in the mid-2020s, but this may be a challenge given the current state of auctioning and consenting in-country

Project	Capacity	Developer	# turbines	Turbine rating	Turbine OEM	Foundations (forecast)	Location	Project status	Km from shore	Fcst Online
Codling Bank	600.00	EDF (50%) / Fred. Olsen (50%)	TBC	TBC	TBC	likely Monopiles	East - Irish Sea	Development - Relevant Project	10	2026
Dublin Array	900.00	RWE (50%) / Saorgus Energy (50%)	TBC	TBC	TBC	likely Monopiles	East - Irish Sea	Development - Relevant Project	10	2027
Codling Bank 2	1000.00	EDF (50%) / Fred. Olsen (50%)	TBC	TBC	TBC	likely Monopiles	East - Irish Sea	Development - Relevant Project	13	2028
Oriel	330.00	Parkwind (65%) / ESB (35%)	TBC	TBC	TBC	likely Monopiles	East - Irish Sea	Development - Relevant Project	8	TBC
North Irish Sea Array	530.00	Statkraft (100%)	TBC	TBC	TBC	likely Monopiles	East - Irish Sea	Development - Relevant Project	7	TBC
Skerd Rocks	392.00	Fuinneamh Sceirde Teoranta (100%)	TBC	TBC	TBC	likely Monopiles	West - Atlantic Sea	Development - Relevant Project	5	TBC
Braymore Point	800.00	SSE (100%)	TBC	TBC	TBC	likely Monopiles	East - Irish Sea	Development	12	TBC
Celtic Sea	800.00	SSE (100%)	TBC	TBC	TBC	likely Floating	South - Irish Sea	Development	25	TBC
Clogher Head	500.00	ESB (65%) / Parkwind (35%)	TBC	TBC	TBC	likely Monopiles	East - Irish Sea	Development	5	TBC
Cooley Point	500.00	ESB (100%)	TBC	TBC	TBC	likely Monopiles	East - Irish Sea	Development	12	TBC
Emerald Floating Windfarm	100.00	Simply Blue Energy (100%)	TBC	TBC	TBC	Floating	South - Irish Sea	Development	35	TBC
Helvick Head	1000.00	Energia (100%)	TBC	TBC	TBC	likely Jacket	South - Irish Sea	Development	10	TBC
Kilmichael Point	500.00	ESB (100%)	TBC	TBC	TBC	likely Monopiles	East - Irish Sea	Development	5	TBC
TBC	1400.00	ESB / Equinor	TBC	TBC	TBC	Floating	West - Atlantic Sea	Development	TBC	by 2031
	9352.00									

Supply Chain Opportunities

Early-stage supply chain development, known indigenous supply gaps, geographical proximity, strong cultural / trading links, similar offshore conditions and common future aspirations regarding floating wind makes Ireland one of the highest potential overseas export and collaboration markets for Scottish exporters

High potential market deep-dive - Asia



Asia - High Potential Markets (MW) **Courtesy of: Scotia** 30000 **Supply Chain** 26562 25000 ■ Taiwan ■ Japan ■ South Korea 24% 20000 15000 38% 10000 6252 8% 5000 34% 38% 58% 0 26 27 28 29 25 30

• Asia top-level summary – Short-term market (Forecast – 6.3GW)

The Asian market (excluding China and Vietnam – covered later) will ramp quickly in the next four years, but is still significantly smaller than the UK and European demand across the same period (6GW versus 10GW and 16GW respectively). Specialist Scottish companies are already trading successfully in these early-stage markets, but Scottish exporters may encounter a number of additional cultural, logistical and indigenous OEM competitive threats within this region

Installed and commissioned capacity in the three key Asian markets will rise rapidly in the first half of the 2020s, growing from 0.3GW in 2020 to 6.3GW by 2025.

Taiwan is undoubtedly the most advanced Asian offshore wind market, however, a strong Japanese market is set to emerge in the next two to three years ahead of a burgeoning floating market in South Korea towards the end of the decade

• Asia top-level summary – Mid-term market (Forecast – 26.6GW)

From 6.3GW by 2025, deployment in the three high potential Asian countries is expected to rise by around 20GW from 2026-30; although this is some way behind the 32GW planned for Europe across the same period, it is comparable with the 20GW expected to deploy in the UK (assuming the UK targets 40GW capacity by 2030)

The Asian high potential markets will grow, however, on a faster trajectory than Europe and UK in the second half of the decade; floating wind is likely to play a proportionately higher role earlier than is the case in UK and Europe

Japan is expected to reach deployment parity with Taiwan by 2030, South Korea is likely to grow quickly later in the decade as floating wind is available at commercial scale



High potential market deep-dive - Taiwan - Short-term market (Forecast - 3.6GW)



• Aside from China, Taiwan is the most developed Asian market, consents have been given to several international developers and a FIT mechanism is in place; Government identified 11 projects in 2018 for short-term deployment

• As the sector gears up to deploy at scale from 2021, a pathway exists for 3.6GW to be deployed by 2025; this is broadly in line with the Governmental mid-decade target of 4GW

- Five projects (2GW) have entered the construction phase and are followed by a further five projects (1.5GW) that are consented and targeting deployment by 2025
- Nine out of the ten projects have already nominated the wind turbine manufacturer SGRE have won five, MVOW three and Hitachi one
- Similar to the Scottish market, the early Taiwanese market will be dominated by jacket foundations; only wpd's Yunlin project has confirmed the use of monopiles and transition pieces

Project	Capacity (MW) Developer Total 3,514 (Expected lead		Turbines	Foundations (Forecast)	Project status	Km to shore	Forecast online
Formosa 2	376	Swancor (50%) / JERA (49%)	47 x 8MW SGRE	Jacket	In construction	10	2021
Changhua 1	605	Orsted (100%)	74 x 8MW SGRE	Jacket	In construction	35 - 60	2022
Changhua Pilot	109	Taiwan Power (100%)	21 x 5MW Hitachi	Jacket	In construction	10	2022
Changhua 2a	295	Orsted (100%)	37 x 8MW SGRE	Jacket	In construction	35 - 60	2022
Yunlin	640	wpd (48%)	80 x 8MW SGRE	Monopile	In construction	8	2023
Changfang	541	CIP (87.5%)	57 x 9.5MW MVOW	Jacket	Post-FID / Consented	16	2024
Xidao	47	CIP (87.5%)	5 x 9.5MW MVOW	Jacket	Post-FID / Consented	10	2024
Zhong Neng	300	CIP (87.5%)	32 x 9.5MW MVOW	Jacket	Pre-FID / Consented	10	2024
Changhua 2	300	Taiwan Power Company (100%)	твс	Likely Jacket	Pre-FID / Consented	11	2025
Hai Long 2 - Phase 1	300	Northland (60%) / Mitsui (20%)	21 x 14MW SGRE	Likely Jacket	Pre-FID / Consented	50 - 70	2025

Project	Capacity	Developer	Online		urbines		Foun	dation	
Troject	(MW)	Developei	Oninic	OEM	Installer	Monopile OEM	Jacket OEM	Pin pile OEM	Installer
Formosa 2	376.00	Swancor (50%) / JERA (49%)	2021	SGRE - 8MW	Seajacks (UK)		Saipem (ITA)	EEW (GER)	Jan de Nul (LUX) / Seaway7 (UK
Changhua 1	605.00	Orsted (100%)	2022	SGRE - 8MW	Seajacks (UK)		China Steel / M&T & Hyundai (KOR)	CWP & FHI (TWN) / EEW (GER)	Heerema (NED)
Changhua Pilot	109.20	Taiwan Power (100%)	2022	Hitachi - 5.2MW	Jan de Nul (LUX)		Samkang (KOR)	Edgen Murray (UK) / SeAH (KOR)	Jan de Nul (LUX)
Changhua 1	605.00	Orsted (100%)	2022	SGRE - 8MW	Seajacks (UK)		China Steel / M&T & Hyundai (KOR)	CWP & FHI (TWN) / EEW (GER)	Heerema (NED)
Yunlin	640.00	wpd (48%)	2022	SGRE - 8MW	Fred. Olsen (NOR)	Steelwind (GER) / FHI (TWN)			Van Oord (NED) / Jumbo (NED)
Changfang	541.50	CIP (87%)	2023	MVOW - 9.5MW	DEME (BEL)		Bladt (DEN) / CWP (TWN)	CTCI (TWN)	Boskalis (NED)
Xidao	47.50	CIP (87%)	2024	MVOW - 9.5MW	DEME (BEL)		Bladt (DEN) / CWP (TWN)	CTCI (TWN)	Boskalis (NED)
Zhong Neng	300.00	CIP (87%)	2024	MVOW - 9.5MW				CTCI (TWN)	DEME (BEL)
Changhua 2	300.00	Taiwan Power (100%)	2025						
Hai Long 2 - Phase 1	300.00	Northland (60%) / Mitsui (20%)	2025	SGRE - 14MW					
Project	Capacity	Developer	Contracting	Sı	ubstation	Ar	ray Cable	Export	Cable
Project	Capacity (MW)	Developer	Contracting	Su Offshore	ubstation Onshore	Ar OEM	ray Cable Installer	Export (OEM	Cable Installer
Project Formosa 2	Capacity (MW) 376.00	Developer Swancor (50%) / JERA (49%)	Contracting EPCI	Su Offshore	ıbstation Onshore Fortune Electric (TWN)	Ar OEM JDR (UK)	ray Cable Installer Jan de Nul (LUX)	Export (OEM LS Cable (KOR)	Cable Installer Jan de Nul (LUX)
Project Formosa 2 Changhua 1	Capacity (MW) 376.00 605.00	Developer Swancor (50%) / JERA (49%) Orsted (100%)	Contracting EPCI Multi-contract	Su Offshore	ubstation Onshore Fortune Electric (TWN) TCC (TWN)	Ar OEM JDR (UK)	ray Cable Installer Jan de Nul (LUX) Van Oord (NED)	Export (OEM LS Cable (KOR) LS Cable (KOR)	Cable Installer Jan de Nul (LUX) Van Oord (NED)
Project Formosa 2 Changhua 1 Changhua Pilot	Capacity (MW) 376.00 605.00 109.20	Developer Swancor (50%) / JERA (49%) Orsted (100%) Taiwan Power (100%)	Contracting EPCI Multi-contract EPCI	Su Offshore	ubstation Onshore Fortune Electric (TWN) TCC (TWN)	Ar OEM JDR (UK) JDR (UK)	ray Cable Installer Jan de Nul (LUX) Van Oord (NED) Jan de Nul (LUX)	Export (OEM LS Cable (KOR) LS Cable (KOR) JDR (UK)	Cable Installer Jan de Nul (LUX) Van Oord (NED) Jan de Nul (LUX)
Project Formosa 2 Changhua 1 Changhua Pilot Changhua 2a	Capacity (MW) 376.00 605.00 109.20 295.00	Developer Swancor (50%) / JERA (49%) Orsted (100%) Taiwan Power (100%) Orsted (100%)	Contracting EPCI Multi-contract EPCI Multi-contract	Su Offshore	ubstation Onshore Fortune Electric (TWN) TCC (TWN) TCC (TWN)	Ar OEM JDR (UK) JDR (UK)	ray Cable Installer Jan de Nul (LUX) Van Oord (NED) Jan de Nul (LUX) Van Oord (NED)	Export (OEM LS Cable (KOR) LS Cable (KOR) JDR (UK) LS Cable (KOR)	Cable Installer Jan de Nul (LUX) Van Oord (NED) Jan de Nul (LUX) Van Oord (NED)
Project Formosa 2 Changhua 1 Changhua Pilot Changhua 2a Yunlin	Capacity (MW) 376.00 605.00 109.20 295.00 640.00	Developer Swancor (50%) / JERA (49%) Orsted (100%) Taiwan Power (100%) Orsted (100%) wpd (48%)	Contracting EPCI Multi-contract EPCI Multi-contract EPCI	Su Offshore	ubstation Onshore Fortune Electric (TWN) TCC (TWN) TCC (TWN)	Ar OEM JDR (UK) JDR (UK) LS Cable (KOR)	ray Cable Installer Jan de Nul (LUX) Van Oord (NED) Jan de Nul (LUX) Van Oord (NED) Seaway7 (UK)	Export (OEM LS Cable (KOR) LS Cable (KOR) JDR (UK) LS Cable (KOR) LS Cable (KOR)	Cable Installer Jan de Nul (LUX) Van Oord (NED) Jan de Nul (LUX) Van Oord (NED) Seaway7 (UK)
Project Formosa 2 Changhua 1 Changhua Pilot Changhua 2a Yunlin Changfang	Capacity (MW) 376.00 605.00 109.20 295.00 640.00 541.50	Developer Swancor (50%) / JERA (49%) Orsted (100%) Taiwan Power (100%) Orsted (100%) wpd (48%) CIP (87%)	Contracting EPCI Multi-contract EPCI Multi-contract EPCI EPCI	Su Offshore	ubstation Onshore Fortune Electric (TWN) TCC (TWN) TCC (TWN) TECO / Pacific (TWN)	Ar OEM JDR (UK) JDR (UK) LS Cable (KOR) LS Cable (KOR)	ray Cable Installer Jan de Nul (LUX) Van Oord (NED) Jan de Nul (LUX) Van Oord (NED) Seaway7 (UK) Fred. Olsen (NOR)	Export (OEM LS Cable (KOR) LS Cable (KOR) JDR (UK) LS Cable (KOR) LS Cable (KOR)	Cable Installer Jan de Nul (LUX) Van Oord (NED) Jan de Nul (LUX) Van Oord (NED) Seaway7 (UK) Fred. Olsen (NOR)
Project Formosa 2 Changhua 1 Changhua Pilot Changhua 2a Yunlin Changfang Xidao	Capacity (MW) 376.00 605.00 109.20 295.00 640.00 541.50 47.50	Developer Swancor (50%) / JERA (49%) Orsted (100%) Taiwan Power (100%) Orsted (100%) wpd (48%) CIP (87%) CIP (87%)	Contracting EPCI Multi-contract EPCI Multi-contract EPCI EPCI EPCI	Su Offshore	Ubstation Onshore Fortune Electric (TWN) TCC (TWN) TCC (TWN) TECO / Pacific (TWN) TECO / Pacific (TWN)	Ar OEM JDR (UK) JDR (UK) LS Cable (KOR) LS Cable (KOR) LS Cable (KOR)	ray Cable Installer Jan de Nul (LUX) Van Oord (NED) Jan de Nul (LUX) Van Oord (NED) Seaway7 (UK) Fred. Olsen (NOR) Fred. Olsen (NOR)	Export (OEM LS Cable (KOR) LS Cable (KOR) JDR (UK) LS Cable (KOR) LS Cable (KOR)	Cable Installer Jan de Nul (LUX) Van Oord (NED) Jan de Nul (LUX) Van Oord (NED) Seaway7 (UK) Fred. Olsen (NOR) Fred. Olsen (NOR)
Project Formosa 2 Changhua 1 Changhua Pilot Changhua 2a Yunlin Changfang Xidao Zhong Neng	Capacity (MW) 376.00 605.00 109.20 295.00 640.00 541.50 47.50 300.00	Developer Swancor (50%) / JERA (49%) Orsted (100%) Taiwan Power (100%) Orsted (100%) wpd (48%) CIP (87%) CIP (87%) CIP (87%)	Contracting EPCI Multi-contract EPCI Multi-contract EPCI EPCI EPCI EPCI	St Offshore	ubstation Onshore Fortune Electric (TWN) TCC (TWN) TCC (TWN) TECO / Pacific (TWN) TECO / Pacific (TWN)	Ar OEM JDR (UK) JDR (UK) LS Cable (KOR) LS Cable (KOR) LS Cable (KOR)	ray Cable Installer Jan de Nul (LUX) Van Oord (NED) Jan de Nul (LUX) Van Oord (NED) Seaway7 (UK) Fred. Olsen (NOR) Fred. Olsen (NOR)	Export (OEM LS Cable (KOR) LS Cable (KOR) JDR (UK) LS Cable (KOR) LS Cable (KOR)	Cable Installer Jan de Nul (LUX) Van Oord (NED) Jan de Nul (LUX) Van Oord (NED) Seaway7 (UK) Fred. Olsen (NOR) Fred. Olsen (NOR)
Project Formosa 2 Changhua 1 Changhua Pilot Changhua 2a Yunlin Changfang Xidao Zhong Neng Changhua 2	Capacity (MW) 376.00 605.00 109.20 295.00 640.00 541.50 47.50 300.00	Developer Swancor (50%) / JERA (49%) Orsted (100%) Taiwan Power (100%) Orsted (100%) wpd (48%) CIP (87%) CIP (87%) Taiwan Power (100%)	Contracting EPCI Multi-contract EPCI Multi-contract EPCI EPCI EPCI EPCI EPCI EPCI	St Offshore	Ibstation Onshore Fortune Electric (TWN) TCC (TWN) TCC (TWN) TECO / Pacific (TWN) TECO / Pacific (TWN)	Ar OEM JDR (UK) JDR (UK) LS Cable (KOR) LS Cable (KOR) LS Cable (KOR)	ray Cable Installer Jan de Nul (LUX) Van Oord (NED) Jan de Nul (LUX) Van Oord (NED) Seaway7 (UK) Fred. Olsen (NOR) Fred. Olsen (NOR)	Export (OEM LS Cable (KOR) LS Cable (KOR) JDR (UK) LS Cable (KOR) LS Cable (KOR)	Cable Installer Jan de Nul (LUX) Van Oord (NED) Jan de Nul (LUX) Van Oord (NED) Seaway7 (UK) Fred. Olsen (NOR) Fred. Olsen (NOR)

Turbines: SGRE and MVOW expected to be dominant players in-country but Asian OEMs likely to enter this market; installation dominated by European vessel contractors. A number of local frameworks agreed for component supply
 Foundations: Early jacket supply has a heavy Asian flavour, many European OEMs establishing local footprint and capability with indigenous fabricators
 Substations: Early projects focusing heavily on substation capacity onshore; all works, as expected, will most likely be

contracted with local companies • Array & Export cables: LS Cables an early dominant OEM,

UKs JDR also; specialist European installers taking an early dominant position



High potential market deep-dive - Taiwan



- 4.7GW of projects (not consented) required to deploy 2028-2030; will likely pull from the 9.5GW development pipeline
- Seabed conditions around Taiwan are likely to be most suited to jackets; there is likely to be a floating wind opportunity towards the turn of the decade, as the technology commercialises

Supply Chain Challenges

- Round 3 auctions are seeking *local content* commitments to 60%; may restrict some Scottish exporters as *developers seek local* content auction advantages
- The logistical cost burden on goods from Scotland is likely to be high; Scottish exporters may need to consider in-country partnering. Danish tower OEM Welcon have committed to local partnerships and skills development
- Multiple European, Japanese, Malaysian, Australian and US companies already operating in-country; *strong international competitive threat*

Taiwan – Mid-term market (Forecast – 10GW)

In-country engagement

 Taiwan Offshore Wind Turbine Foundation and Marine Engineering Association (www.clustercollaboration.eu)

Scotia

- Taiwan Offshore Wind Industry Association (TOWIA)
- Metal Industries Research & Development Centre (www.mirdc.org.tw)
- The remainder of the 11 consented projects (1.7GW) from 2018 will likely be deployed 2026-27; national targets of 10GW by 2030 and 15GW by 2035 are in place
- With an established Power Tariffs (FIT) mechanism in place that has been broadly accepted by developers, a strong mix of domestic and international developers are expected to be active in this market

	Project	Capacity	Developer	# turbines	Turbine rating	Turbine OEM	Foundations (forecast)	Project status	Km from shore	Fcst Online
Grea	ter Changhua NW (Changhua	a 4) 582.90	Orsted (100%)	39	15	TBC	likely Jacket	Pre-FID / Consented	40	2026
Grea	ter Changhua SW (Changhua	2b) 337.00	Orsted (100%)	22	15	TBC	likely Jacket	Pre-FID / Consented	40	2026
	Hai Long 2 - Phase 2B	232.00	Northland Power (60%) / Mitsui (20%) 15	15	TBC	likely Jacket	Pre-FID / Consented	35	2026
	Hai Long 3	512.00	Northland Power (60%) / Mitsui (20%) 32	16	TBC	likely Jacket	Pre-FID / Consented	35	2027
	Chu Feng	448.00	RWE (50%)	TBC	TBC	TBC	likely Jacket	Development	3	TBC
	Formosa 3 - Haiding 1	552.00	JERA / GIG / EnBW	TBC	TBC	TBC	likely Jacket	Development	40	TBC
	Formosa 3 - Haiding 2	732.00	JERA / GIG / EnBW	TBC	TBC	TBC	likely Jacket	Development	40	TBC
	Formosa 3 - Haiding 3	720.00	JERA / GIG / EnBW	TBC	TBC	TBC	likely Jacket	Development	40	TBC
	Formosa 4-1	1467.00	Swancor (100%)	TBC	TBC	TBC	likely Jacket	Development	20	TBC
	Formosa 4-2	1467.00	Swancor (100%)	TBC	TBC	TBC	likely Jacket	Development	20	TBC
	Formosa 4-3	1467.00	Swancor (100%)	TBC	TBC	TBC	likely Jacket	Development	20	TBC
Grea	ater Changhua NE (Changhua	a 3) 570.00	Orsted (100%)	TBC	TBC	TBC	likely Jacket	Development	40	TBC
	Guanyin	360.00	wpd (50%)	TBC	TBC	TBC	likely Jacket	Permit denied	3	TBC
		9446.90								
ting	50%	15%	10%	10%		15%	S	upply Chain Op	portuni	ties
	Market scale to 2020	Appetite for	Low cultural / Politi	cal suppor	t/ Ea	arly stage	supply •	Good mid-ter	m float	ing
y	iviarket scale to 2030 in	nporting exper	tise logistical barriers Mix ch	ange urge	ncy ch	ain devel	opment	potential ; op	portuni [.]	ties
n								exist for Scott	tish inno	vation

10GW market, strong government support, established OSW mechanisms and long-term roadmap; high potential market

One of the few international markets to deploy jackets, high synergy with Scottish projects

- Receptive to overseas contractors; indigenous supply gaps perceived in EIA and OMS services
- In March 2021, in-country developers joined forces to set up a new group focusing on floating offshore wind; the *British Chamber of Commerce Renewables Committee are very influential* in-country

High potential market deep-dive - Japan • Japan - Short-term market (Forecast - 2.1GW)



Foundation selection not yet made beyond the Marubeni projects (confirmed monopiles), a 50:50 split has been assumed between jackets and monopiles, given the known nearshore geography challenges that may drive some jacket demand

- Marubeni's Akita / Noshiro 140MW project Japan's first commercial-scale project entering construction, online by 2022
- Despite aspirations to deploy 1GW p.a. through the 2020's, deployment pre-2025 likely to be modest, from a standing start
- Japanese bathymetry and soil conditions very different from Europe; early characterisation phase deployment will be via fixed foundation developments on narrow bands of seabed, close to shore

Project	Capacity (MW) Total 2,049	Developer (Expected lead)	Turbines	Foundations (Forecast)		Project status	Km to shore	Forecast online
Akita	55	Marubeni (51%)	13 x 4MW MVOW	Monopile		In construction	5	2022
Noshiro Port	85	Marubeni (51%)	20 x 4MW MVOW	Monopile		In construction	2	2023
Hibikinada	229	Hibiki Wind (100%)	24 x 9.5MW MVOW	Monopile or Jo	acket	Pre-FID	2	2023
Norther Akita	455	Obayashi Corporation (100%)	57 x 8MW SGRE	Monopile or Jo	acket	Pre-FID	2	2023
Yurihonjo	700	RENOVA (25%)	70 x 10MW TBC	Monopile or Jo	acket	Pre-FID	2	2024
Happo Noshiro	155	ENEOS (33.3%) / JERA (33%)	22 x 8MW TBC	Monopile or Jo	acket	Pre-FID	2	2024
Choshi	370	Tepco (51%) / Orsted (49%)	ТВС	Monopile or Jo	acket	Development	3	2025

Project	Capacity	Developer	Online	Turbi	ines	Foundation					
Froject	(MW)	Developei	Online	OEM	Installer	Monopile OEM	Transition Piece OEM	Jacket OEM	Installer		
Akita	55	Marubeni	2022	MVOW - 4.2MW	Seajacks (UK)	Kajima (JPN) - EPCI / Sif (NED)	Smulders (BEL)		Seajacks (UK)		
Noshiro Port	85	Marubeni	2023	MVOW - 4.2MW	Seajacks (UK)	Kajima (JPN) - EPCI / Sif (NED)	Smulders (BEL)		Seajacks (UK)		
Project	Capacity	Capacity Development Co		acity Developer Contracting		Substation		Array C	Export Cable		
Froject	(MW)	Developer	contracting	Offshore	Onshore	OEM	Installer	OEM	Installer		
Akita	55	Marubeni	EPCI				Sumitomo (JPN) - EPO	CI			
Noshiro Port	85	Marubeni	EPCI			Sumitomo (JPN) - EPCI					

• **Turbines:** MVOW, understandably, have entered their 'home' market strongly but other turbine OEMs are expected to play an active role; UK's Seajacks will carry out the installation

• Foundations: the Sif/Smulders JV will supply the monopiles and transition pieces for the Marubeni projects from Europe, there is no indication of any short-term localisation of OEM supply at this stage; again, Seajacks will undertake installation activities

• Array & Export cables: Japan has a strong in-country cable OEM capability, Sumitomo have been handed the first full cable EPCI scope in-country



High potential market deep-dive - Japan



- There is insufficient pipeline of projects to deploy 10GW by 2030; in 2020, the Japanese Government announced 10 'promising zones' suitable for OSW
- Developers have been allocated for around 4.7GW of the 7.9GW pipeline; Iberdrola recently partnered to acquire 3.3GW across six projects. It has been reputed that 50% of these projects could deploy floating foundations
- 4 areas in the tender cycle: Goto floating (application closed), Noshiro-Mitane-Oga, Yurihonjo (North/South)and Choshi; all are part of the first promotional areas selected by the government in 2019
- Sites suitable for monopile deployment are likely to deplete over time; assumed that the proportion of jackets versus monopiles will increase towards 2030
- Of the 2.7GW of new sites required to hit the 10GW 2030 target, assumptions have been made, for the purposes of this analysis, that this will be split between fixed & floating

Japan – Mid-term market (Forecast – 10GW)

In-country engagement

Japanese Wind Power Association (www.jwpa.jp)

Japan has intimated a 2030 deployment target of 10GW; circa 8GW of capacity is likely to be installed 2026-30, however, the profile is likely to be a little spikey as the market ramps up to increased levels of deployment through the 2030s in order to meet the Japanese mid-term 2040 capacity target of 45GW (i.e. 10GW of deployments in 2020s / 35GW in 2030s). Japan has an estimated offshore wind seascape to support 128GW of fixed and 424GW of floating wind capacity

	Project	Capacity	Developer		# turbines	Turbine rating	Turbine OEM	Foundations	(forecast)	Project status	Fcst Online
	Goto Floating Wind	21.00	ТВС		TBC	TBC	TBC	Floa	ting	Out to tender	2026
	Noshiro-Mitane-Oga	480.00	Various		TBC	TBC	TBC	Monopile	or Jacket	Development	2026
	Ishikari Bay	520.00	JERA (100%)		65	8.00	TBC	Monopile	or Jacket	Development	2026
	Nishikita (Aomori North West)	500.00	Eco Power (50%) / Hitachi Zo	osen (50%)	125	4.00	TBC	Monopile	or Jacket	Development	2027
	Saga Karatsu City	600.00	Iberdrola (50%) / Macqua	rrie (50%)	TBC	TBC	TBC	Monopile	or Jacket	Development	2028
	Satsuma	600.00	Iberdrola (25%) / Mitsu	i (25%)	TBC	TBC	TBC	Monopile	or Jacket	Development	2028
	Hokkaido (Ishikari Bay New Port)	112.00	Green Power (50%) / Hokka	ido (50%)	TBC	TBC	TBC	Monopile	or Jacket	Development	2029
	Ibaraki 1 (Kashima Port)	94.00	Wind Power Energy (1	00%)	18	5.20	Hitachi	Monopile	or Jacket	Development	2029
	Murakami City (Iwafune Offshore)	220.00	Hitachi (33.4%) / Mitsubish	i HI (33%)	40	5.50	TBC	Monopile	or Jacket	Development	2029
	Fukui Konpira	525.00	Iberdrola (50%) / Macqua	rrie (50%)	TBC	TBC	TBC	Floa	ting	Development	2030
	Nanao Shika	525.00	Iberdrola (50%) / Macqua	rrie (50%)	TBC	TBC	TBC	Floa	ting	Development	2030
	Shiroishi Kosugo	525.00	Iberdrola (50%) / Macqua	rrie (50%)	TBC	TBC	TBC	Floa	ting	Development	2030
	Tono	525.00	Iberdrola (50%) / Macqua	rrie (50%)	TBC	TBC	TBC	Monopile	or Jacket	Development	2030
	Floating Estimate	700.00	ТВС		TBC	TBC	TBC	Floa	ting	Pre-development	2030
	Fixed Estimate	2000.00	TBC		TBC	TBC	TBC	Monopile	or Jacket	Pre-development	2030
		7947.00									
		Weighting	50%	15	5%		10 %		10 %	159	6
-				Appet	tite for	Lo	w cultura	l/ Pol	itical suppo	ort / Early stag	e supply
Sup	ply Chain Challenges	Country	Market scale to 2030	importing	g expertise	logis	tical bar	riers Mix	change urg	ency chain deve	lopment
		Japan									
•	lananese authorities n	an on rea	ching 60% local	Com	ulu Chai						
-	supuriese dutionnes p			Sup	piy Chai	n Opp	ortunit	les			
	<i>content</i> by 2040; Scott	ish export	ers may need <i>local</i>								
	presence			•	Energy	/ mix c	hange	urgency	high, sup	port for OSW	strong

- Strong indigenous engineering capability; many trading houses with heavy industry & banking divisions are gearing up for OSW, heavily influential in-country
- The coal & fishing lobbies in Japan continue to be a formidable force which may impede the development of OSW if deemed too costly or instrusive
- Early-stage market, open to importing expertise
- Developers anticipate there will be short-term *gaps in supply* for a number of floating sub-elements
- Strong and established trading and innovation Scot links with Scotland

High potential market deep-dive – *S Korea*

Weighting

Country South Korea





Government announced in 2020 that it planned to deploy at least 6GW of floating wind from 2023 Supply Chain Challenges

- Strong domestic OEM and shipbuilding industry targeting OSW
- Perceived trading challenges without local presence
- Strong fishing lobby, may inhibit OSW deployment

Logistical burden surrounding CAPEX supply from Scotland

• South Korea – Short-term market (Forecast – 0.4GW) / Mid-term market (Forecast 6.5GW)

Will essentially be one of the first countries to go straight to floating OSW; given the early-stage of FOSW commercialization, high deployment pre-2025 seems unlikely (Note - 3GW by 2025 is a possibility but a stretch)

The 2 projects mos likely to deploy by 2025 have been assumed for this analysis:

ost	Project	Capacity (MW) Total 400	Developer (Expected lead)	Turbines	Foundations (Forecast)	Project status	Km to shore	Forecast online
ру	Donghae 1 Floating	200	Equinor (33%)	Doosan	Floating	Development	50	2025
	Donghae TwinWind Floating	200	CoensHexicon (50%) / Shell (50%)	твс	Floating	Development	60	2025

Donghae 1 Floating (200MW) – Similar to Scotland's Hywind II, Equinor seeking to deploy the first floating semi-commercial scale project by 2023; significantly, Doosan have been selected to supply the turbines (expected to be smaller 8MW assets) and Hyundai selected to supply the floating foundations Donghae Twin (200MW) – Partnering with floating foundation OEM Hexicon, Shell is reported to be

targeting installation by 2024

	Project		Capacity	Developer	# turbines	Turbine rating	e Turbine OEM	Foundations (forecast)	Project status	Fcst Online	
	Incheon (TB	C)	1600.00	Orsted	100	TBC	TBC	Likely Jacket	Development	2026/7	
	South Jeolla Flo	ating	800.00	GIG / Total	TBC	TBC	ТВС	Floating	Development	2028	
	Ulsan Floatir	ng	1500.00	GIG / Total	TBC	TBC	TBC	Floating	Development	2029	
	Ulsan City Floa	ating	500.00	EDPR / Aker	60	TBC	ТВС	Floating	Development	твс	
	White Heron Flo	oating	200.00	CIP / SK E&S	25	TBC	ТВС	Floating	Development	TBC	
	Incheon		600.00	Korea South-East Power	60	TBC	твс	Likely Floating	Development	твс	
t	KOEN Wando Is	sland	600.00	Korea South-East Power	60	TBC	ТВС	Likely Floating	Development	твс	
	Jeju Island (Daej	jeong)	84.00	KOSPO / Samsung	12	твс	твс	Likely Floating	Development	твс	
	Saemangeur	m	99.20	SOWP	28	TBC	ТВС	Likely Floating	Development	твс	
	Hanlim		100.00	КЕРСО	ТВС	твс	ТВС	Likely Floating	Development	твс	
			6083.20								
	50%	15%		10%	10%		15%	Supply Chain	Supply Chain Opportunities		
Marke	at scale to 2030	Арре	etite for	Low cultural /	Political sup	port /	Early stage su	oply • Good mid	d-term <i>floati</i>	ng	
- Carrix	importing exper			logistical barriers	Mix change u	irgency	chain developr	nent potentia	; opportuniti	es	
								exist for s	Scottish inno	vation	
De	eployment of	FOSW 1	wind will	ramp at pace in the	e second h	alf of th	ne decade ass	suming I CoF reduces	: aovernmen	t	

Deployment of FOSW wind will ramp at pace in the second half of the decade assuming LCoE reduces; government support is strong despite auction and consenting mechanisms being quite early-stage.

Low domestic OSW track record; renowned Scottish FOSW capabilities likely to be a strong in-country enabler presenting *full supply lifecycle opportunities*, including early site characterisation development works

Scotia

potential market deep-dive - USA



- A number of US projects have clarified turbine rating and WTM; 3 projects (Skipjack, Vineyard Wind and Ocean Wind) will use large GERE 12MW designs
- Foundation technology selection mot clarified on any project so broad assumptions can only be made at this stage; seabed conditions are currently unknown and significant survey works are currently ongoing / planned



USA – Short-term market (Forecast – 6.4GW)

- In 2020, US administrators tabled proposals to push for 12.5GW of deployment by 2025; 50% achievement has been assumed as deployment capacity is likely to be a limiting factor in such a condensed timeframe
- Managed at a state rather than federal level, numerous auctions have taken place over the last 3 years up and down the eastern seaboard; it has been assumed that the 6.4GW of consented projects (with a stated developer intent of deployment by 2025) is likely to be the maximum achievable, given the US currently has less than 100MW installed

Project	Capacity (MW) Total 6,428	Developer (Expected lead)	Turbines	Foundations (Forecast)	Project status	Km to shore	Forecast online
Deepwater 1 - South Fork (Massachusetts)	132	Eversource Energy (50%); Orsted (50%)	15 x 8.6MW TBC	Likely Jacket	Transmission consented	26	2023
Revolution Wind - Connecticut	304	Eversource Energy (50%); Orsted (50%)	38 x 8MW SGRE	Likely Monopile	PPA consented	31	2023
Vineyard Wind (Massachusetts)	800	Avangrid (50%) / Copenhagen Infrastructure Partners (50%)	67 x 12MW GERE	Likely Monopile	Transmission consented	25	2023
Empire Wind - Phase 1 (New York)	816	BP (50%); <i>Equinor (50%)</i>	82 x 10MW TBC	Likely Gravity Based Structure	Consent application made	23	2024
Ocean Wind (New Jersey)	1100	Orsted (100%)	92 x 12MW GERE	Likely Monopile	Consent application made	24	2024
Revolution Wind - Rhode Island	400	Eversource Energy (50%) / Orsted (50%)	67 x 6MW TBC	Likely Monopile	PPA consented	24	2024
Sunrise Wind (New York)	880	Eversource Energy (50%) / Orsted (50%)	110 x 8MW SGRE	Likely Monopile	PPA consented	48	2024
Mayflower Wind (Massachusetts)	804	Ocean Winds (50%) / Shell (50%)	твс	Likely Jacket	Long term contract approved	105	2025
Park City (Connecticut)	804	Avangrid (50%) / Copenhagen Infrastructure Partners (50%)	80 x 10MW TBC	Likely Monopile	Consent application made	37	2025
Marwin (Maryland)	269	US Wind (100%)	твс	Likely Monopile	Consent application made	32	2025
Skipjack (Maryland)	120	Orsted (100%)	10 x 12MW GERE	Likely Monopile	Awaiting permit	30	2025

European vessel contractors and OEMs will likely be required to deliver a growth rate of this magnitude; with these assets and companies known to be supporting high growth markets in Europe and Asia, the US deployment rate may be tempered

Despite announcements in March 2021 that the new US administration is seeking to 'fast track' 30GW of deployment by 2030, a 2030 deployment of 22.5GW has been assumed; with state-level offshore wind targets totaling circa 23GW by 2035 from Maine to Virginia, this may be a little optimistic



High potential market deep-dive - USA

- USA Mid-term market (Forecast 22.5GW)
- The US has a development pipeline of around 16GW with 6.5GW likely to be deployed by 2025, this creates a natural total pipeline ceiling of 22.5GW; very little clarity exists on the expected deployment order of projects in the planning and development cycle. For the purposes of this analysis, a 50:50 split has been assumed for jackets and monopile foundations

Project	t	Capacity	Develop	ber #	turbines #	Turbine rating	Turbine OEM	Foundations (f	orecast)	Project status	Fcst Online
Virginia Wind -	Phase 1	880.00	Dominion (100%)	63	14	TBC	Likely Monopile	or Jacket	In planning	26-30
Virginia Wind -	Phase 2	880.00	Dominion (100%)	63	14	TBC	Likely Monopile	or Jacket	In planning	26-30
Virginia Wind -	Phase 3	880.00	Dominion (100%)	63	14	TBC	Likely Monopile	or Jacket	In planning	26-30
North Carolina (K	(itty Hawk)	1500.00	Avangrid (:	100%)	TBC	TBC	TBC	Likely Monopile	or Jacket	In planning	26-30
Atlantic Shores 2		2500.00	EDF (50%) / SI	hell (50%)	TBC	TBC	TBC	Likely Monopile	or Jacket	Development	26-30
Bay State Wind		2000.00	Eversource (50%) /	Orsted (50%)	TBC	TBC	TBC	Likely Monopile	or Jacket	Development	26-30
Beacon Wind		2400.00	BP (50%) / Equi	nor (50%)	TBC	TBC	TBC	Likely Monopile	or Jacket	Development	26-30
Boardwalk	Wind	1000.00	Equinor (1	00%)	TBC	TBC	TBC	Likely Monopile	or Jacket	Development	26-30
Empire Wind -	Phase 2	1184.00	BP (50%) / Equi	nor (50%)	TBC	TBC	TBC	Likely Monopile	or Jacket	Development	26-30
Garden St	ate	1000.00	Orsted (5	0%)	TBC	TBC	TBC	Likely Monopile	or Jacket	Development	26-30
Humboldt Float	ing Wind	150.00	Ocean Winds (35%) / Pr	inciple Power (25%)	18	8	TBC	Floating	g	Development	26-30
Liberty W	ind	1300.00	Avangrid (50%)	/ CIP (50%)	TBC	TBC	TBC	Likely Monopile	or Jacket	Development	26-30
Maryland Wind Z	one South	375.00	US Wind (1	. 00%)	TBC	TBC	TBC	Likely Monopile	or Jacket	Development	26-30
		16049.00									
Weighting	5	0%	15%	10%		10 %		15%			
Country	Market so	ale to 2030	Appetite for importing expertise	Low cultural / logistical barriers	Politi Mix ch	cal suppor ange urge	t/ Ea ncy cha	rly stage supply in development	:		

In-country engagement

- * Bureau of Ocean Energy Management (www.boem.gov)
- Business Network Offshore Wind (www.offshorewindus.org) *
- American Clean Power Organisation (www.cleanpower.org)



Supply Chain Challenges

- High local supply aspirations and a strong incumbent onshore wind supply chain
- US has a strong domestic OEM and shipbuilding industry targeting OSW; port ٠ docking and labour restrictions may exist for non-US resources
- Knowing which US state to establish footprint
- Potential logistical cost burden for CAPEX items shipping from Scotland
 - O&G track record may count for less in NE US states
 - Low integrity overseas supply likely to be scrutinized for local alternatives

Supply Chain Opportunities

Huge size potential on a par with any global market

- FOSW deployment to ramp at pace in 2030s, west US market will emerge •
- Trading links between US and Scotland are extremely strong; early-stage US supply chain ٠ development means Scottish exporters have a window of opportunity for proven solutions from lessons learned in the developed UK market

21

23

24

25

26

27

28

29

Technical project and procurement activity will be resourced overseas, opportunities likely via existing relationships from Europe



Medium potential / emerging market summary

Scottish attractiveness index Very Low

w Low I

Moderate High

		Influence weighting	50%	15%	15%	10%	10%
		Country	Market scale to 2030	Appetite for importing expertise	Early-stage supply chain development	Low cultural / logistical barriers	Political support / mix change urgency
Medium	Europe	Norway					
potential		Sweden					
export	Asia	China					
markets		Vietnam					
to 2030		Australia					
		Brazil					
Low	Europe	Estonia/Latvia					
potential		Lithuania					
export		Italy					
markets		Finland					
to 2030		Spain					
		Faroe Islands					
	Asia	India					
		Saudi Arabia					
	Americas	Canada					



Closing thoughts – positioning for international success Thinking opportunistically Navigating challenges

'Saudi Arabia of Renewables'? The UK is the most developed offshore wind market globally and has the most advanced auction, FIT mechanism and road-tested supply chain

A number of international markets may copy elements of the UK system, Scottish exporters should leverage this experience where possible – irrespective of market, variations of the UK *skills, innovation and competition* focus will pervade all markets and subsequent sourcing decisions

Small nation, big ambitions – Scottish offshore wind suppliers are succeeding in every international market, across all phases of the offshore wind lifecycle

Prospective Scottish exporters should learn from those that go before us, identify who these companies are, understand what makes them special and leverage on their success through mentoring, partnering or copying

If you've got it, flaunt it – Track record is everything in offshore wind

33

The Scottish supply chain has developed an offshore wind track record surpassed by few; in an offshore wind world where risk aversion in the face of rapid innovation is the norm, Scottish experience is a real differentiator

#SCOTLANDISNOW – Scotland's offshore wind(ow) of opportunity will narrow over time

Scottish exporters are uniquely placed to help early international markets develop using lessons learned in the UK, markets are moving quickly so speed is of the essence when seeking first-mover advantage *Making an offer that's too good to refuse* – Effective proposition communication

With a multitude of early market challenges, international players do not have the time or inclination to go international shopping; Scottish exporters must articulate USPs clearly and concisely via the correct in-country industry trading forums or via pre-existing relationships

Its not what you say, its how you say it – Responsibly adding value internationally

Like the UK, virtually every market will seek to protect the local supply chain and promote domestic content commitments. Scottish exporters should be sympathetic to such aspirations – complement rather than compete, partner rather than preach, trade experience for market exposure. Being visible and giving a little to the sector in-country is key – be involved with in-country industry technical challenges, offer opinion at industry events and seek to help with establishing indigenous long-term capability

Spending an extra penny to save pounds - Articulation of lifetime benefit

The downward cost pressure throughout the offshore wind supply chain is well-documented – in order to mitigate perceived commercial and logistical disadvantages, Scottish exporters must articulate cost, quality, delivery lifetime benefits in real LCoE or practical case study terms



Thank you for your time, bon voyage - lang may your lum electrical charging point reek hum

Get in touch: aland@scotiasc.co.uk





How UKEF can help you take advantage of - High potential International Offshore wind markets to 2030

Presenter:

Alistair McMillan – Clean Growth Export Development Manager, Scotland & Northern Ireland





Who, why, what, how?

Who?UK Govt's Export Credit AgencyMission Statement – 'To ensure no viable export fails due to lack of finance or insurance'.

- Why?Relevant if contract bonds and/or working capital (cash-flow borrowing) are required from
your bank.
- What? we provide UK Treasury-backed guarantees to banks as security to enable them to extend or increase borrowing/facilities to UK exporters. (i.e. goods/services to overseas buyers).
 We can provide contract-specific or general guarantees.
 General guarantees can cover some UK, as well as export, business for existing exporters.
- How(to access)? present financial case & requirements to your bank.If facilities totally, or even partially, required to cover exports ensure Bank's Trade Specialist is
involved.

Products (New)

All UKEF products can support offshore wind projects

Financing	Guarantees	Insurance
Win contracts: attractive financing terms for overseas buyers of UK goods and services can help exporters make their offering more competitive	Fulfil orders: help companies access the support they need to fulfil a contract, giving them the confidence to take on more contracts and increase their turnover	Get paid: help companies and investors manage risks in challenging markets, ensuring that they get paid even where the private market is not able to offer insurance
 Buyer Credit Facility Direct Lending Supplier Credit Financing Facilities 	 Bond Support Scheme Export Working Capital Scheme General Export Facility Export Development Guarantee 	 Bond Insurance Policy Export Insurance Policy Overseas Investment Insurance (for investors)



Case Studies –

How we support UK businesses to fulfil export contracts.



First Subsea (First Tech Ltd, Aberdeen)

Opportunity

- First Subsea, part of First Tech Ltd, has made the transition from supplying predominantly oil and gas projects to renewable energy, with a new strategy and product development commencing 2014.
- First Subsea Ltd had a pipeline of CPS projects worth approximately £13 million and negotiated Advance Payments to assist cashflow.
- Advance Payment Guarantees (bonds) had to be issued by their bank in exchange for the advance payments.

Outcome

 we provided a guarantee through our <u>Bond Support Scheme</u> to First Subsea's bank, Clydesdale Bank, allowing them to increase the value of bonds they can issue, with the cash being used to fulfil the contracts.



UK REGION: Aberdeen/Lancaster DESTINATION MARKET: Multiple SECTOR: Engineering, renewable energy, Cable Protection Systems PRODUCT: Bond Support Scheme

PCT Group Sales

Opportunity

- secured £3 million contract to supply cranes to build wind turbines for the Neart na Gaoithe (NnG) offshore wind farm
- contract required PCT to supply performance and advance payment bonds upfront, which would have placed a strain on the company's resources

Outcome

 UKEF provided PCT's bank with a <u>guarantee for 80% of the bond</u>, allowing the company to retain working capital for its business operations and fulfil the contract



UK REGION: Glasgow SECTOR: Engineering, renewable energy PRODUCT: Bond Support Scheme



Case Study –

How we generate export opportunities.





Formosa 2 – Offshore wind in Taiwan

Project sponsor: Macquarie's Green Investment Group and Swancor Renewable Energy

Buyer: Taiwan Power Co

Clean growth features:

- Taiwan is developing 5.5GW of offshore wind up to 2025 and has an ambition of a further 5GW up to 2030
- Formosa project involves construction of 47 new turbines generating 376 megawatts of green energy
- UK content includes wind turbines, foundations and auxiliary facilities
- many international offshore wind companies, including 18 from the UK, have set up operations in Taiwan to help develop local industry in collaboration with Taiwanese partners



PROJECT LOCATION: Taiwan PRODUCT: Buyer Credit, NT\$9.2 billion (£230m)

Financing provided over 18 years in local currency to protect buyer from currency fluctuations.



Thank you

<u>https://www.gov.uk/government/collections/our-</u> products

Scottish Development International

SOWEC 11th May 2021

David Rennie Global Head of Energy Trade SDI <u>david.m.rennie@scotent.co.uk</u>

#SCOTLARD SNOW

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Who are we?

Scottish Development International (SDI) is the specialist trade and investment arm of:

- Scottish Government
- Scottish Enterprise
- Highlands & Islands Enterprise
- South of Scotland Enterprise

Single point of contact for all international business development needs

Working in close partnership with:

- Department for International Trade
- Local Authorities and Business Gateway
- Chambers of Commerce
- Business organisations



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SDI'S INTERNATIONAL PRESENCE



100+ 35 24 16+ STAFF INTERNATIONAL COUNTRIES LANGUAGES BASED OVERSEAS OFFICES SPOKEN

SDI GLOBAL TRADE ENERGY TEAM



How we can help COMPANIES

TRADE

- Identify market opportunities and provide market intelligence
- International strategy development
- Prepare businesses to trade internationally
- Identify business partners and finance support options
- Facilitate connections and business relationships

"Without Scottish Enterprise's guidance we wouldn't be started in China yet. They have helped us get the resources required, given us focus and the confidence to move into the Chinese market."

Rosie Hill, Business Development Manager at Ireland Alloys

INWARD INVESTMENT

- Collaboration and risk reduction
- Setting up and further expansion
- Identify staff, training, property and academia
- Identify business partners
- Potential financial assistance
- Dedicated aftercare

"We're looking forward to establishing our new base in Scotland, which we believe will provide us with the ideal launch pad to a number of international markets, initially in the UK and then beyond."

Les Byrne, Managing Director of Asystec

Tailoring EXPORT support to companies

- International Helpline
- International Market Research
- Export Digital Tools and Online Training
- International E-commerce
- Advice and guidance from GlobalScots and Export Champions
- In-market assistance via SDI/Partners
- Virtual Webinars, Missions and Learning Journeys via SDI/Partners



our toolkit – international helpline

International Helpline

- Advice and guidance via a range of self-service digital tools and resources
- Signposting to virtual workshops, webinars an online learning to help prepare companies for international growth
- Access to market research, and a helpline for technical export queries (export documentation, customs, legal/regulations, taxation, logistics, EU Transition (Brexit))

Telephone: 0300 013 3385 Email: <u>international@scotent.co.uk</u>

Website: www.scottish-enterprise.com/internationa



our toolkit - International market research

A free service for all Scottish companies at any stage of their export journey – reports within 5 days via a dedicated market research team

- Help companies delve deeper into global market trends, customer behavior, competitor activity and identify new opportunities.
- Companies based in Scotland get free access to reports on:
 - Competitor insights
 - Global market intelligence
 - Credit rating checks
 - Industry trends and forecasts
 - Consumer demographics
 - Supplier databases
- On-line one-to-one support and demos available

Telephone: 0300 013 3385

Email: research@scotent.co.uk

Website: www.scottish-enterprise.com/ResearchService



our toolkit - International market research

Research support every step of the way



OUr TOOLKIT - Sector / Market opportunities



Please see <u>here</u> for our guide to market opportunities

our toolkit – Globalscot network

GlobalScot aims to connect organisations in Scotland with worldwide business and community leaders. These leaders can offer one-to-one support, global market knowledge and vital contacts. It's free to join, whether you're looking for support or offering support.

Who can join?

- Scottish businesses looking for support
- Worldwide business experts who can offer support
- The GlobalScot team will also be sharing more information on how "**Team Scotland**" members can join the network in due course



www.globalscot.com

OUR TOOLKIT - Export champions

a business mentoring scheme that mobilises the experience of Scotland's exporters to support businesses who are either starting their international journey or have a specific exporting challenge.



Businesses can sign up to the programme, as either a mentor or mentee, by:

- Completing the online form at: <u>www.scottish-enterprise.com/export-mentoring-programme</u>
- E-mailing exportchampions@scotent.co.uk

Getting in touch with one of the programme team:

• Jennifer Broadfoot, Project Coordinator: jennifer.broadfoot@scotent.co.uk

our toolkit – Virtual International Market Events & Webinars

Webinar



ARE YOU A SPONSOR LICENCE HOLDER? HOW DOES THE NEW POINTS BASED SYSTEM AFFECT YOU? With he introduction of the new Points Based System which now applies equally to EU and non-EU citizens, we invite you to join us as we discuss the changes that affect the sponsorship process and your sponsor licence going forward. This webnical media is Sortikh based SM&s is presented by Brodes LLP TalentScotland's Immination specialists.

isday 25 May, 10am-11am



Register for the webinar



W SCOTTISH COMPANIES CAN EASILY ACCESS A NEW POOL OF ERNATIONAL TALENT WITH THE INTRODUCTION OF THE GRADUATE VISA	
ew graduate visa route is a new post study work visa that will enable UK employers to access an additional talent pool of ates who have studied in the UK. Join our webinar to hear more.	
day 27 May, 10am-10:30am	

International Exhibitions and Missions



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Our free business webinars provide insights on key topics and opportunities to grow your business. **Watch live or on playback.**



Exhibition: Offshore Europe 2021 - Aberdeen

www.scottish-enterprise.com/trade-missions

International market events – offshore wind

<u>Country</u>	Month	Event	Website	More information
United States	Apr	East Coast Offshore Wind Virtual Mission	https://tinyurl.com/y52fy66b	
Scotland	Jun	Virtual Energy Exports Conference	https://www.the-eic.com/Events/EnergyExportsConference	Lead by EIC
France	Jun	Floating Offshore Wind B2B event programme	https://tinyurl.com/y52fy66b	
Poland	Jun	PWEA 2021 Conference Serock	http://konferencjapsew.pl/en/	
United States	Aug	International Partnership Forum 2021 (IPF)	https://www.offshorewindus.org/2021ipf/	In partnership with Renewable UK
Scotland	Aug	All Energy	https://www.all-energy.co.uk/en-gb.html	Scotland rep stand
France	Sep	Seanergy	https://www.seanergy-forum.com/en/seanergyforum	
United States	Oct	American Clean Power	https://cleanpower.org/events/offshore-windpower-2021-conference- exhibition/	
Germany	Oct	Windforce Bremerhaven	https://windforce.info/	
Netherlands	Oct	Offshore Energy Event Conference	https://www.offshore-energy.biz/offshore-energy-2021/	
France	Nov	Floating Offshore Wind Turbines - FOWT Britanny	https://www.fowt-conferences.com/fr	
Denmark	Nov	Wind Europe Electric City	https://windeurope.org/ElectricCity2021/	Lead by Renewable UK
South Africa	Nov	Windaba 2021	https://www.windaba.co.za/	
United States	Mar	Americas Energy Tansition mission	https://tinyurl.com/y52fy66b	
Japan	Mar	Wind Expo Japan	https://www.windexpo.jp/en-gb/about.html	
Taiwan	Mar	Wind Energy Asia	https://www.windenergy-asia.com/en/index.html	

Our partners toolkit – Virtual International Market Events (Multi-sector)

The Scottish Chambers of Commerce Network have a programme of Trade Mission Opportunities for Scottish Businesses to identify new markets and start their exporting journey.



International Trade support - Contact Details

All export services can be accessed via the Exports and international markets section of the site: <u>www.scottish-enterprise.com/international</u>

Email: international@scotent.co.uk; Telephone: 0300 013 3385

Events: www.scottish-enterprise.com/events

Webinars: www.scottish-enterprise.com/learning-zone/webinars

International Market Research: <u>https://www.scottish-enterprise.com/IMRS</u>

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