

# AIA | ABERDEEN INTERNATIONAL ASSOCIATES

**Report for The Maritimes Energy Association and the Atlantic  
Canada Opportunities Agency:**

**International Opportunities for Oil & Gas Sector Companies  
with a Diversified Workforce**



**July 2022**



**Atlantic Canada  
Opportunities  
Agency**

## **Introduction**

Aberdeen International Associates was engaged by the Maritimes Energy Association to undertake a programme of research and deliver a report focused on international export opportunities for companies that have (or can develop) a diversified workforce beyond oil and gas, and in particular, skills and expertise that can be applied to the renewable energy sector.

A particular focus is on learning how other jurisdictions have and are supporting their workforce and companies to transition from oil and gas to renewables. It includes a specific emphasis on Aberdeen Renewable Energy Group (AREG) in Aberdeen, Scotland and how it has supported the transition over the past 20 years, alongside other agencies.

This project is a component of a larger body of work funded by the Atlantic Canada Opportunities Agency (ACOA) the purpose of which is to pursue opportunities in the energy sector based on oil and gas expertise that is transferable to renewable energy. This will include an analysis of existing technical and professional skills, and a skills transition map for companies and workers.

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- 2 – Examples of companies that have successfully diversified into the Renewable Energy sector
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## A Global Perspective

The renewable energy industry has been developing for several decades, growing from an initial focus on solar and onshore wind and now encompassing a wide range of offshore energy, including wave, tidal stream and fixed offshore wind. More recently, floating offshore wind and concentrated solar power (CSP) have taken their places at the future energies table. Simultaneously there has also been a growing interest in new solutions for storing and transporting renewable energy with battery technology and hydrogen being amongst the most popular.

Over the past five years however, a series of catastrophic events now clearly linked to climate change around the world, coupled with an overwhelming body of scientific study has led to a recognition that something needs to be done urgently to accelerate a realistic and manageable transition away from carbon dioxide producing fuels to non-polluting sources of energy for heat, light, power and transport.

During COP 26, held in Glasgow, Scotland in November 2021 most of the world 'signed up' to a series of commitments to help deliver a more rapid journey towards decarbonisation.

Some of the commitments include the following:

- To keep cutting emissions until they reach net-zero by mid century
- To further reduce pledges on CO2 reduction next year as these need to be amended to keep temperature rises within the 1.5C target that had been agreed in Paris 2015
- An explicit plan to reduce the use of coal – responsible for 40% of annual CO2 emissions
- To increase financial support to help the poorer nations cope with the effects of climate change and adopt clean energy technologies
- Phasing out fossil fuel subsidies
- A cooperation agreement between the USA and China (the biggest CO2 emitters) on areas including methane emissions and the switch to clean energy
- Over 100 nations pledged to stop deforestation, and cut methane emissions by 30% by 2030

Only 3 months later, the Russian invasion of Ukraine in February 2022 has resulted in greater uncertainty around security of energy supply, especially in Europe. In the short term this has led to concerns that some countries are bringing fossil fuels such as coal back into the energy production cycle and that other nations are sanctioning the development of new oil and gas fields that had previously been either refused or stalled.

In reality, the current problem has served to demonstrate to the wider public that it is not possible to switch straight over to renewable sources of energy without switching the lights off for many people and creating significant hardships/challenges across society.

What it has done, particularly in Europe, is to initiate greater urgency around investigating where the renewable resources are based, how to develop them and then how to get the energy to the marketplace.

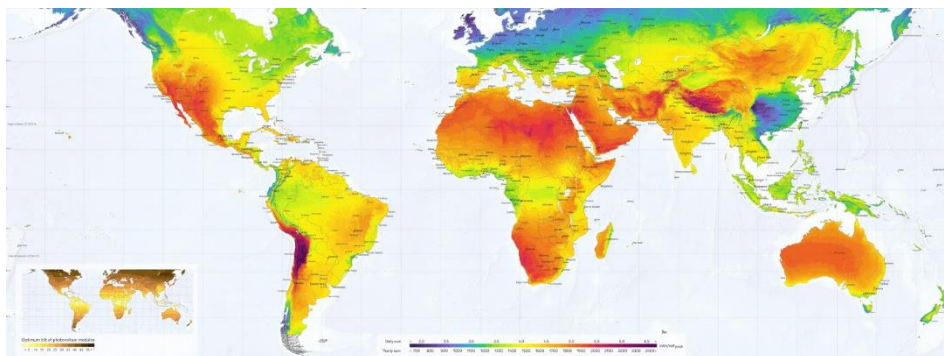
Maps of wind, tidal, wave and solar resources clearly show where there are real opportunities for new renewable energy industries:

Map 1            Global Wind Resource – areas of significant potential for both onshore and offshore development based on average wind speeds



Source: DTU Wind Energy, Global Wind Atlas

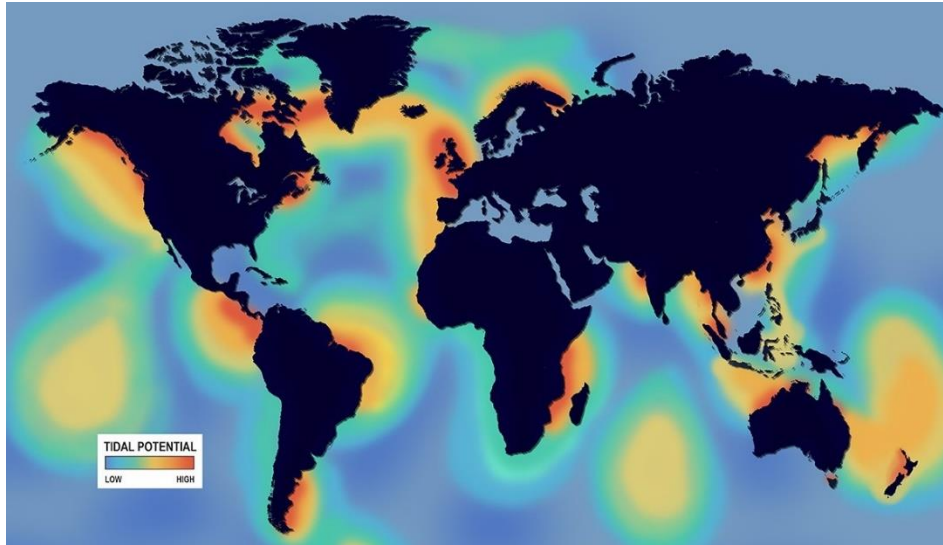
Map 2            Potential electricity production from PV Solar in global markets



Source: globalsolaratlas.info

Map 3

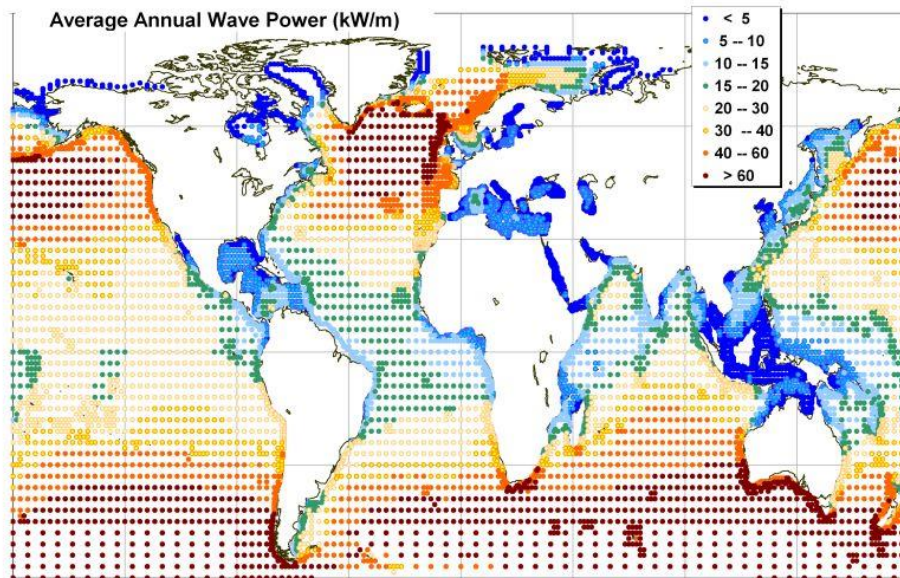
Global Tidal Energy Resource – areas of highest potential energy generation



Source: Novige AB (Swedish Marine Energy Firm)

Map 4

Global Wave Energy Resource – areas of highest potential energy generation



Source: Novige AB (Swedish Marine Energy Firm)

## **Market Overviews**

Later in this report we will make some recommendations as to where we consider the best export opportunities for diversified energy supply chain companies in Atlantic Canada.

What follows is a snapshot of where some of the key markets around the world are right now with respect to the development of renewable energy.

### **Australia**

Australia is often criticised for its production, use, and export of coal for energy producing purposes, especially to China. In 2019-20 renewable energy sources accounted for only 7% of Australian energy consumption.

However, the country is now beginning to waken up with the recent announcement of the Asian Renewable Energy Hub which (if built in full) will comprise of 1600 giant onshore wind turbines and a 78 sq. km array of solar panels. The combined solar/wind power plant will have a capacity of 26 gigawatts with most of it being planned to run 14 GW of electrolyzers that will convert desalinated seawater into hydrogen. This is one of the many proposals currently being developed which aims to capitalise on what has been described as Australia's potential to be a clean energy superpower.

Individual state governments have also been keen to progress investment in renewables and for example the New South Wales government have announced plans to underwrite 12 GW of renewable energy and 2 GW of storage over the next decade.

Of interest to Canada is that Fortescue Metals Group have already demonstrated their intention to move aggressively into renewable energy setting a goal of building 235 GW of production across the globe and have already started an interest and started discussions on opportunities in Canada.

### **Japan**

Japan is somewhat a surprise with regards to renewable energy generation when considering it has been one of the most technically advanced and innovative countries in the world over the last 50 years. Companies such as Toyota have led the way in the development of hydrogen fuel cell cars e.g. Toyota Mirai, yet the country has one of the highest volumes of carbon emissions per capita in the world. A nation with few carbon based resources, it had a strong focus on nuclear power generation of energy until the Fukushima nuclear power plant disaster in 2011. The government however has recently announced ambitious plans to become a net zero society by 2050. One has just to look at a map of the international wind resources to see the potential

that it has for offshore wind and floating offshore wind yet currently less than 2% of its energy comes from that source.

It is not surprising therefore to see Japan reaching out to Scotland and Europe in recent years to seek partnerships with regards to offshore wind and hydrogen development.

The city of Kobe has signed an MOU with Aberdeen that's focused on the development of renewable energy and is also a member of World Energy Cities Partnership (WECP) alongside Halifax and St. John's.

In addition to wind resource, Japan does also possess significant solar and geothermal opportunities.

Finally, Japan has announced an ambitious long term innovation strategy within the last two years that is centred on the development of technologies that are considered necessary to achieve carbon neutrality by 2050 with hydrogen being at the heart of those proposals.

## **Taiwan**

Taiwan has been of interest in relation to its plans to develop renewable energy for several years. Heavily reliant on imported oil and coal, Taiwan plans to generate 20% of its energy from renewable sources by 2025, up from 5% in 2020. The principal focus is on offshore wind and solar.

Between 2021 and 2025 Taiwan will add 5.7 GW of already sanctioned offshore wind to its grid with a further 10 GW being proposed for the period up to 2035. Solar will be increased by 14 GW by 2025. There is currently nearly CAD \$100 billion of work currently underway which is amongst the highest levels of investment and activity in Asia – Taiwanese projects have attracted investors from around the world and from Europe in particular, including Orsted, Siemens and MHI Vestas together with their supply chains.

Taiwan has also put in place a range of policies including a clear regulatory framework and incentives such as feed in tariffs to encourage investment and development and they regularly review the position through amendments to the Electricity Act and Renewable Energy Development Act. It is open to partnerships with international companies.

Nuclear power was once seen as the way forward but this has fallen out of favour and the last nuclear plant is due to be decommissioned by 2025.

Taiwan is undoubtedly a regional leader, and it has built a portfolio of offshore wind projects through competitive actions that have targeted foreign partners. Several countries around the world have targeted Taiwan including European countries and the USA.

## **South Korea**

South Korean manufacturing companies have been at the forefront of developing equipment for renewables for a considerable time e.g. Samsung (wind turbines), Hyundai (IX35 and Nexo hydrogen cars) so it is somewhat surprising that renewable energy only accounts for approximately 8% of South Korea's electricity generation at present. Until the recent elections, nuclear power seemed to be on the way out, but the new administration has decided to reverse this and has based much of their strategy to attain net zero by 2050 on a revitalised nuclear industry.

Notwithstanding the renewed focus on nuclear, offshore wind is still expected to play a leading role. The country has currently over 100 wind farm projects at the planning stages but less than 10 are actually operational at present. There has been concern over the regulatory framework not fully addressing the needs of offshore wind project and uncertainties around grid connection arrangements. Nevertheless, Norwegian company Equinor has recently announced that it plans to install significant capacity in the country including offshore wind farms.

It is clear that to strengthen energy security, South Korea intends to further diversify energy sources and work with other energy producing countries. In particular (and as may be expected) it intends to put more effort into building a hydrogen related infrastructure as part of its hydrogen economy roadmap, and developing low carbon energy generating technologies.

## **Vietnam**

Vietnam has used hydropower as a reliable source of renewable energy for many decades but with little ability to export, its relative share has been reducing slowly in recent years. Vietnam has been proactive in promoting renewable energy and in 2015 announced its first renewables development strategy. There has been a significant focus on solar which has led to an increase in curtailment events due to the grid not being able to cope with the increased generational capacity.

Whilst there are significant incentives for international players to enter Vietnam but several players are delaying final project decisions due to current uncertainties over the regulatory regime. That said, Vietnam is among the top ten nations globally with regard to installed capacity of solar PV. There is also a very real interest from investors in establishing wind projects in the country with an estimated wind resource of over 300 GW. According to the world Bank, more than 39% of Vietnam has windspeed of greater than 6 metres per second with the focus being initially on onshore developments.



## **China**

China has been at the forefront of the global supply and demand for renewable energy over the last few decades. For the 5 years up to 2020 it was responsible for approximately 40 per cent of capacity growth followed by Europe, then the US and India which together accounted for over 80% of growth and this is a trend that will most likely continue for the next five to ten years.

Driven by state owned utilities who have committed to invest heavily in solar and wind, China's influence both domestically and globally is growing. Best known for solar including concentrated solar power (CSP) and wind, China is also the largest producer of hydrogen in the world and is developing an important manufacturing industry around the production, storage and deployment of the gas. The country aims to have 80% of its total energy mix come from non-fossil fuel resources by 2060 including 1200 GW from solar and wind by 2030. In 2021 China surpassed the UK as the country with greatest installed capacity of offshore wind. Its reliance on coal however still makes it the largest emitter of greenhouse gasses.

It is calculated that China will need to install at least 100 GW of additional wind and solar capacity per annum up until 2030 if it is to meet its targets.

## **India**

With so much talk about India as a major polluter from coal and oil sources it may come as a surprise to some that the country is the world's third largest renewable energy producer as well as being the world third largest consumer of electricity.

The rapid growth of the country's population has meant that India's annual CO<sub>2</sub> emissions have risen to become the third highest in the world in global terms. On a per capita basis however it is a different story putting the country near the bottom of the world's emitters. India's population size and its predicted growth put it at the top of the world's rankings in future energy demand.

This good news is that principally through the deployment of solar, but with good support from wind, renewable energy is growing at a faster rate in India than any other major economy in the world. There is a very real focus on achieving net zero targets by the government, and related agencies and industry association are engaging internationally in seeking support to develop the necessary technologies e.g. the Indian Hydro Association (IHA). They are also building a significant local supply chain in renewable technologies such as wind turbine manufacturing and batteries. In particular, India aims to become a global hub for green hydrogen production, use, and export.

## **The Middle East**

The Middle East is one of the largest producers of oil and gas in the world and the bountiful resources have fuelled the development of sophisticated urban based modern economies over the past 50 years. The establishment of Masdar City as a renewable low carbon development back in 2010 in Abu Dhabi, was an indicator that at least in one part of the region there was an eye looking at future energy pathways.

More recently with the world's attention focussed on climate change, and with doubts appearing on the mid to long term acceptability of oil and gas, there has been a rapid move towards the expansion of renewables.

With money to invest and an impressive pipeline of projects in development particularly around solar and hydrogen, the region is set to be a leader in renewables development and deployment in the next decade and it is expected that the UAE along with Saudi Arabia and Qatar will be amongst the world's leading players.

Currently only around 7% of the region's power generating capacity comes from renewables with hydropower providing 75% of that but it is expected that, driven by government targets (e.g. Dubai 75% of its energy from renewables by 2050) a rapid shift will take place in the coming years.

## **Africa**

Africa is in an interesting position with regards to the development of renewable energy. The continent with the smallest proportion of its population connected to electricity there are hopes that many of those people can be connected to renewable energy in the next 20 years.

Approximately 10% of energy in Africa is currently generated from renewable sources with about 70% of that being hydro. But progress is definitely being made and interest in renewables is growing rapidly.

The countries in Northern Africa are particularly strong around solar including CSP but there are also significant wind projects being proposed there. The leaders in North Africa are Egypt, Algeria, Tunisia, Morocco, and Ethiopia. There has been a particular focus on the development of solar for hydrogen production. There has been talk of a pipeline to export the hydrogen to Europe from North Africa.

Currently there is considerable interest in projects being proposed for Central Africa.

A report from PWC in 2020 indicated the following current/under construction capacity of African renewable energy projects for 2021.

	Current Capacity (MW)	Under Construction (MW)
North Africa	24840	10095
Central Africa	10402	15201
West Africa	13110	100
East Africa	6298	4281
Southern Africa	4253	2209

According to the International Renewable Energy Agency (IRENA) countries like Egypt, Ethiopia, Kenya, Morocco, and South Africa have also shown firm commitment toward modern renewable energy.

Mozambique stands out as a good example of a country with huge power potential and well developed hydro via the 2075 MW Cahora Bassa hydro dam. It also has extensive offshore natural gas reserves which are currently being developed and which could provide a good feedstock for a blue hydrogen industry.

Despite Mozambique's enormous potential and resources, it is amongst the 10 poorest countries in the world and only 34% of its population has access to electricity.

A complex issue for many African countries is the relatively recent discovery of hydrocarbon sources. It will be interesting to see how the international community will react to the development of those resources which have the potential to develop those countries' economies. There is no doubt that these countries expect a just transition that allows them to sell their hydrocarbons in the international marketplace as we go through the transition but at the same time developing renewables industries inside their own borders.

### **South and Central America**

Latin America is an exciting place to be at this point in the energy transition and according to the IRENA hosts some of the world's most dynamic renewable energy markets.

**Brazil** has been a world leader in renewable energy for over 50 years and was manufacturing vehicles which could run on ethanol derived from sugar cane as far back as the mid-sixties. Hydro power on a massive scale has also been deployed since the 50's and 60's with the construction of major dams such as the Itaipu. Today it continues to be a leader with 1.76 GW of wind and 3.27 GW of solar capacity added in 2020 for a total of 17.2 GW and 7.9 GW respectively. Brazil has a total electricity capacity of approximately 170 GW of which around 100 GW comes from hydro.

**Chile** is currently second in the renewable's growth figure for the continent, and it increased its wind power capacity by 529 MW up to a total of 2.15 GW, and total solar is now 32 GW. This only tells part of the story however with rapid increase in wind power generation capacity being expected in the next 5 years and some expect Chile to be able to achieve carbon neutrality by 2030.

Chile also leads the way in electrification of public transport in Latin America with more than a thousand buses on the road. Since 2019 Colombia, Costa Rica and Panama have also launched electric mobility strategies.

One of the biggest surprises over the past 5 years with regards to progress in renewables has been **Uruguay** which now generates 98% of its electricity from carbon neutral sources with wind accounting for around a quarter of the total. Much of the push towards wind has been driven by challenges around lack of water (caused by climate change) to keep their hydro assets generating electricity.

Some of the most exciting developments are proposed in **Colombia** which already produces around 70% of its electricity from hydro. Plans to develop a new wind industry in the north of the country that is home to some of the most reliable (and highest speed) winds in Latin America have been announced recently with large onshore wind farms already being built, and a roadmap for Offshore Wind was released in Q1 2022. Colombia has also published an ambitious hydrogen development road map which has received international praise and is currently considering how best to set up hydrogen hubs around the country.

Other countries in the region that Atlantic Canada might like to watch include **Guyana** and **Argentina**.

In **Central America** we find the most diverse range of renewable generation including biomass, geothermal, wind and solar.

The individual amounts of production are not of themselves large, but it is interesting to note that on average, Central America derives nearly 60% of its electricity from renewables.

The final country to specifically mention is **Mexico** which has been amongst the top ten renewable energy markets in the world in terms of investment over the past 10 years, largely due to new modern solar projects. There is some uncertainty in the market due to the contrasting policy statements of the current President in relation to the development of renewable resources, however as recently as July 2022 he has indicated a desire for new projects to proceed.

## **Europe**

There is a tremendous amount happening in Europe from solar to offshore and onshore wind, wave and tidal development, and a strong interest in hydrogen, and carbon capture, utilisation and storage.

In addition, the roll-out of electric vehicles in parts of the continent such as Norway, and the Netherlands, is faster than anywhere else in the world. Some countries within the continent e.g. Norway and Scotland produce more renewable energy than they consume. Having said that, international organisations such as IRENA are still not happy that developments are not progressing quickly enough across the continent to meet individual countries net zero targets.

This section will seek to give a broad overview of development in Europe, split into 3 general areas as follows:

The North Sea, Southern Europe, and the Baltic Region.

### **The North Sea**

The countries that surround the North Sea including Scotland, England, Norway, Denmark, Holland, and Germany have been at the forefront of renewable development in Europe, and hydro has played a leading role in several of those countries for several generations. The development of the oil and gas industry in the 70's and 80's up to the present day has led to a subsea supply chain around the North Sea that has skills transferable into the renewable energy industry and in particular, the blue energy sector. Organisations such as Aberdeen Renewable Energy Group (AREG) were established over 20 years ago to support the diversification of the local supply chain into the renewable energy industry. In recent years, Governments of nations around the North Sea have increased the levels of support in place to help aid the transition which is covered in the next section of the report.

Taking an example of developments in the UK - the announcement earlier this year of the ScotWind Licensing round in waters principally located off the east and north of Scotland resulted in 17 projects being awarded from 74 applications, with £700m being paid in option fees for a seabed area of 7000 km<sup>2</sup>. The potential power to be generated if fully developed is approximately 25GW with almost 60% of the projects being floating offshore wind. It is also expected that a substantial number of the projects will relate to hydrogen production in some form. This will make Scotland a major exporter of electricity and/or hydrogen if fully developed given the country's current domestic requirement is for only one fifth of that production level.

Norway already exports significant volumes of green electricity to mainland Europe (principally from hydro) but is building on that solid base particularly through Equinor who are currently

constructing their Hywind Tampen project which will provide electricity for the Snorre and Gullfaks oil and gas fields. It will be the world's first and largest floating wind farm (88 MW) to power offshore oil and gas platforms and builds on the success of their Hywind floating windfarm off Peterhead in Scotland.

There has been huge investment in offshore wind off the English coast over the last 10 years and in 2013 the 175 London Array became the largest offshore wind farm in the world. The developments have been largely driven by the UK government's Contract for Difference scheme.

Hornsea 1 offshore windfarm is an example of recent developments which when commissioned off the Yorkshire coast, became the biggest in the world at 1.218 GW. Hornsea 2 is now under development and will add a further 1.3 GW from 165 Siemens GOMES 8 MW turbines.

In 2021, the offshore wind licensing round 4 for England and Wales announced six new projects with a potential to deliver around 8 GW of renewable electricity.

Denmark has been a key driver in renewable energy and several of the key global developers have their origins there including Orsted and Copenhagen Infrastructure Partners (CIP).

Electricity derived from renewable energy has reached 67% of the electricity supply (wind 46.8%). In 2021, Kriegers Flak, Scandinavia's largest wind farm was inaugurated.

Denmark is particularly strong in the development of bio-energy with manure, animal fats and straw used as a basis for biogas and liquid bio fuels. It is also a world leader in renewables based district heating systems.

Two innovative island projects have been announced by Denmark in the past 18 months including the "first energy island" to provide enough energy for three million households. It will serve as a distribution hub for 200 offshore wind turbines and will include export to other countries. It is to be the largest construction project in Danish history.

In May of this year (2022) Copenhagen Infrastructure Partners (CIP) announced plans to build an artificial island dedicated to the large scale production of green hydrogen from offshore wind and they have also entered into an agreement to build a similar project off the German coast.

The island, on the Dogger Bank, is proposed to be connected to 10 GW of offshore wind and produce an estimated 1 million tonnes of green hydrogen per year.

The Netherlands, despite many people's expectations has been relatively slow in European terms in developing and using renewable energy. In 2019 the Netherlands produced just around 9% of its total energy from renewables.

In June 2022 the Dutch government's transmission operator TenneT launched a tender to deliver a 40 GW offshore wind expansion in the German and Dutch North Sea. In May, at the North Sea Energy Summit, Germany, the Netherlands, Denmark, and Belgium agreed to jointly install at

least 65 GW by 2030. The TenneT announcement will account for nearly two thirds of this with 20 GW each in the German and Dutch North Sea areas.

In the last few years, the Dutch have announced proposals of a further 11 GW of offshore wind from other projects which should allow it to move off the bottom of the league of EU countries in the shift away from carbon based energy resources.

Germany has been a leader in developing and applying renewable energy technologies. Around 50% of the country's electricity mix come from wind, solar, biomass and hydroelectric. Despite this, Germany is very dependent on fossil fuels and in particular lignite and of course imported Russian gas.

Germany is a global leader in hydrogen technology and is in advance of most of the rest of Europe in developing an infrastructure for the production and use of hydrogen.

The German port of Hamburg together with Rotterdam in the Netherlands and Antwerp in Belgium are at the forefront of developing and delivering proposals for the import, storage and distribution of hydrogen from overseas to service the expected increase in demand for hydrogen in Central Europe in the coming decade and beyond.

### **Southern Europe**

Whilst France has lagged behind in the application of renewable technologies (other than nuclear) it has nevertheless been at the forefront in stimulating debate on the global energy transition. France gets around 70% of its power mix from nuclear and 10% from hydroelectric, and as a result has relatively low per capita carbon emissions compared to other developed nations.

There is an increasing interest in wind, solar and hydrogen however and French companies are leading developers of some key technologies.

The COP 21 Conference and the Paris agreement has helped focus and drive French ambition. In renewables and as hosts of the next Olympics, they hope to have several thousand hydrogen taxis in place via the Paris based company HYPE who currently operate over 200 Toyota Mirais in the capital.

Spain hopes to generate around  $\frac{3}{4}$  of its electricity from renewables by 2030 and is already a leader in wind energy production with 1265 windfarms. It is in solar power that it sees itself having huge advantages and recently announced proposals to develop huge solar resources in Aragon in Central Spain. Significant R & D facilities for wave and tidal have also been developed off Bilbao in the Bay of Biscay.

In Portugal, there have been announcements earlier this year (2022) to accelerate its energy

transition to increase renewable energy outputs of electricity from 60 percent to 80 per cent by 2026. The plans also include the mobilisation of over 25 billion euros of investment in the next 10 years. This has been explicitly linked as a necessary action resulting from the war in Ukraine although it does not import any gas from Russia.

Italy has seen considerable advances over the past five years in the installation of renewable energy where it has managed to consistently deliver its renewable energy targets and now 40.4% of electricity consumption comes from renewables. Italy however is heavily dependent on imported gas from Russia. The main focus in Italy is solar - it is expected that 2.1 GW of new projects will come online in 2023 and another 1 GW in 2024. It is notable that 100% of Italy's municipalities (7900) have at least one renewable plant in operation.

Greece until very recently was not very committed to the development of renewable energy and has traditionally produced most of its electricity from coal fired power stations. It has improved significantly in recent years however and now produces around 22% of its electricity from renewable sources. In April of this year (2022) Greece opened the largest double sided solar farm in Europe. It has a target of 61% of its energy needs through renewable resources by 2030.

### **Baltic Region**

The Baltic area of Europe including Sweden, Finland, Latvia, Lithuania, Estonia, and Poland is being highlighted as a separate area because the listed countries have ambitious plans to develop their renewable resources with this being accelerated by the impact of the war in Ukraine.

Latvia, Lithuania, and Estonia are a focus for future offshore wind development with potential projects of 3.2 GW over the next 10 years and they are actively seeking partners to develop the resource. In June 2021 the Global Wind Energy Council estimated that Estonia alone has a total technical resource potential of some 140 GW.

Sweden has a very low share of fossil fuels in its primary energy supply and has effectively used hydro and bio fuel resources coupled with carbon pricing (the highest in the world).

The Swedish utility Vattenfall has been a major player in the development of the international wind industry. The country has been particularly effective in home heating from bio fuels.

It is also worth noting that Poland is actively seeking to develop its offshore wind resource. Approximately 30% of its installed capacity comes from renewables at present.

Finland is an interesting case in that the most important fuels are bio energy fuels from the forestry industry with hydro power and wind playing their parts alongside ground sourced heat. There are several Finnish companies active in seeking innovative ways through which to produce hydrogen. In total, over 50% of Finland's electrical energy comes from renewable resources.



## **Other European Countries**

There are a range of developments in other European countries e.g. the deployment of hydrogen powered Hyundai HGVs in Switzerland or thermal electricity production in Iceland, which could all offer opportunities to the ambitious oil and gas supply chain companies.

For the purposes of this report however, it is considered that the Republic of Ireland be brought forward as a market of significant interest.

Ireland has some of the best offshore wind and wave resources in the world that have not yet been developed. The EU sees Ireland as an important part of the jigsaw in developing energy security for member states both for renewable electricity and hydrogen. The first 'Hydrogen Valley' based on an onshore windfarm is being developed in Galway on Ireland's Atlantic West Coast and it is expected that many more projects are likely to commence over the next decade.

## **USA**

The USA is of course Canada's nearest neighbour and main trading partner, and like Canada is also a nation blessed with significant renewable energy resources. It is estimated that if fully developed, the United States could generate around 100 times its annual electricity need. Despite the fact that it has been a world leader in the development and use of carbon based fuels for over a century there is now a real move to develop its renewable resources.

Renewable energy currently generates about 20% of all US electricity with wind (mostly onshore at present) providing around 9.5%, hydropower 6.5%, solar 3% and biomass and solar together just over 1%.

Wind is the fastest growing area, and it is estimated that the country has the potential of installing 10 terawatts of onshore wind power and 4 terawatts of offshore wind.

Hydro electricity is the second largest source of renewable electricity in the USA, and the USA is the fourth largest producer of hydroelectricity in the world after China, Canada, and Brazil, but much of the resource was developed in the mid-20<sup>th</sup> Century.

It is perhaps the developing offshore wind industry that has been creating most excitement in recent years and this is the area that is likely to provide the greatest opportunities for Canadian oil and gas supply chain companies looking to diversify into the renewable industry.

Opportunities are developing all around the country's long coastline but most attention has been focussed on the north east off New York and New England where there are two offshore windfarms in place already, and the recent licensing rounds off California.

There are currently a number of proposals at various stages of development in the north east and the region has attracted interest from European companies such as Equinor, BP, Orsted and CIP, as well as European supply chain companies looking to set up offices there.

More than 4.3 GW of offshore wind projects are already under development in New York including the Beacon and Empire windfarms.

Massachusetts is another key area for future development, and it has been signalled that in excess of 5,600 MW of projects are likely to be awarded in the next five years. Significant work is being undertaken by the state to develop a supply chain and provide workforce training for the opportunities that this future industry will provide.

Another notable development from earlier this year was an announcement that there would be a 'Call for Information and Nominations' to assess commercial interest in wind energy leasing offshore in the Central Atlantic area. There are 6 call areas consisting of around 3.9 million acres offshore of Delaware, Maryland, Virginia, and North Carolina.

Finally, Maine which is of course next door to Atlantic Canada, has announced a commercial lease sale within the Gulf of Maine will take place in 2024. The state has established an intergovernmental renewable energy task force to help prepare for this important development.

It should be noted in this context that there is an Atlantic Canada-New England, Premier and Governor forum already in existence that meets annually to discuss areas of cooperation and mutual benefits.

California is the latest part of the USA to announce its intentions over offshore wind. In the middle of June 2022, an auction seminar was held for prospective bidders in the proposed 'Pacific Wind Lease Sales 1'. The seminar described the auction format, explained the auction rules, and demonstrated the process.

Key areas off California include the Morro Bay Wind Energy area and Humboldt Wind Energy Area. It is expected that floating offshore wind will play the major role in the development of the significant offshore California resource.

Main source for this section: International Renewable Energy Association (IRENA) 'Annual Statistical Reports' and 'Country Profiles'

## **Preparing the Oil and Gas supply chain for opportunities resulting from the energy transition**

It is recognised that a mature energy sector supply chain exists in Atlantic Canada and there is a need to assist companies to prepare for the opportunities in renewable energy both domestically and in international markets. This section of the report will focus on the history, experiences, ongoing initiatives and lessons learned from this journey in Scotland/UK and the North Sea that could potentially be replicated in Atlantic Canada.

### **Aberdeen Renewable Energy Group (AREG) Experience**

The Aberdeen Renewable Energy Group (AREG) was established over twenty years ago because of a future economic development strategy exercise undertaken by Aberdeen City Council's Economic Development Department.

A group of 9 prominent business people supported by a facilitator were given the challenge of answering the question “can renewable energy provide opportunities to help diversify the oil and gas supply chain and also provide the opportunity for the city to rebrand from ‘Europe’s oil and gas capital’ into being recognised as a global energy hub?”

The group were also challenged to initiate a strategic plan to help grow and develop the sector, and form an industry led body to deliver it, should they consider that renewables provided real opportunity for the city. Fortunately, they decided to take up the challenge and the organisation that was soon to become AREG was first formed.

In its early days AREG provided a forum across industry, academia, and government to discuss the opportunities and challenges that this ‘new’ industry could provide. It was clearly established at an early stage that there was a significant overlap of skills and functions between oil and gas and the offshore renewables industries. One of its first priorities was to expand this forum to develop an annual renewable energy conference in Aberdeen to provide both a focus for discussion on the development of the sector and building block to help the region become a hub for future developments.

Representations were made to Aberdeen Exhibition and Conference Centre Board and a partnership was developed with an international exhibition organiser that resulted in the establishment of the All Energy Trade Show and Conference, with AREG at its heart.

AREG wanted to pioneer opportunities for its members and soon it was to establish a joint chair in renewables between the Aberdeen and Robert Gordon Universities, and plans were drawn up for a Renewable Energy Centre on the city’s Queens Links. AREG is perhaps best known however for the establishment of the groundbreaking European Offshore Wind Deployment Centre (EOWDC) in Aberdeen Bay which tested and stretched the regulatory framework for offshore wind development in many ways.

Initially proposed as a development between AREG and AMEC, the final project was delivered by Vattenfall who had bought out the AMEC interest but not before legal challenges from the Trump organisation through the Scottish and UK courts, finishing up in the Supreme Court in London which ultimately allowed the development to proceed. AREG sold its interest to Vattenfall prior to the construction phase and most of its profits were invested in 3 hydrogen fuel cells to provide heating and cooling for TECA Aberdeen, the new Exhibition and Conference Centre. In the early days, despite support from oil majors such as BP and Shell, the renewable energy future was a hard sell and other development agencies had little interest in promoting it. One well known oil and gas service company's Chairman was quoted as saying that renewable energy would never be successful in Aberdeen and that it was an oil and gas city.

AREG has grown into an association with over 250 members and styles itself as 'the original energy transition organisation'. The position in Aberdeen and Scotland is very different now with Government and development agencies all very proactive in supporting renewable energy developments and projects. Organisations such as the Oil and Gas Technology Centre, set up as part of the City Deal Programme with the UK and Scottish Governments in 2016, have changed their focus and name to the 'Net Zero Technology Centre' with a strong programme of renewable research and innovation. A new company named 'The Energy Transition Zone' has been set up to promote renewables and establish a renewables innovation park adjacent to the new south harbour extension being developed at Nigg Bay. The Energy Transition Zone is also partnering with the UK's 'Offshore Renewable Energy Catapult' to create a world leading 'National Floating Wind Innovation Centre' which accounts for £9 million of investment and it will be located at the ETZ site in Aberdeen.

Today AREG plays a key role in hosting and leading discussion on how best to develop the renewable opportunities for its members and to focus on the application of the use of renewable energy within the wider community whilst continuing to play a role in international development opportunities such as being members of the European Leaders in Blue Energy Consortium (ELBE) and MOU's with partners such as the European Space Agency.

AREG's members are a mixture of those that committed early to renewables and have been with the organisation for up to twenty years to those who have joined in the last few months as they seek to start their renewables journey – we will take a closer look at the experiences of some of the members later.

## **The Renewables Industry around the North Sea – Training and Capacity Building**

The renewables industry has been established in countries around the North Sea for over 40 years, and more if you include the hydro industry which was developed in various parts of Europe in the 1950's including Norway, Switzerland, France and Scotland. The onshore wind industry really started in the 1980's in Denmark and Scotland before the offshore sector started to take off in the 1990's and early 2000's. As a result, a range of courses in both universities and colleges have been available in these regions for at least 20 years.

In the past three years however there has been a growing recognition that the Energy Transition process for both individual employees and companies is going to require support through more targeted education and training initiatives. This has seen an increase in training schemes, new courses and the establishment of higher qualifications in renewable energy related subjects. There are two main sources of employees for the developing renewables industry with the first being individuals currently employed by the oil and gas sector that wish to take up posts in new companies or within their current employers' diversification into renewables. The second group is those students graduating from college or university with renewables-based qualifications.

This assignment seeks to investigate what is happening in the North Sea, and in particular the UK to support this transition. In this next section, we are going to review a series of actions and initiatives that are either already underway or are currently being developed to support the transition.

Following an examination of various initiatives, we have elected to highlight five of particular importance:

1. The North Sea Transition Deal
2. UK Offshore Energy Workforce Transferability Review (RGU)
3. Making the Switch (The future shape of the offshore energy workforce in the North East of Scotland) (RGU)
4. The Energy Skills Alliance (OPITO)
5. The Transition Training Fund (Skills Development Scotland)

**The North Sea Transition Deal** is probably the most relevant initiative globally for the purposes of this report. It was announced in March 2021 and is intended to be developed and seen as “a global example of how a partnership between government and the offshore oil and gas industry can support a key national sector through an ambitious energy transition and drive rapid progress along the road to net zero”.

At the heart of the deal is the recognition that fossil fuels will continue to play an important role during the transition and this has been reinforced over the past 6 months as a result of energy security issues laid bare by Russia's invasion of Ukraine.

The deal is fronted by the renamed North Sea Transition Authority (NSTA) (formerly the UK Oil and Gas Authority) whose mandate has been extended to cover renewables. The NSTA published its revised strategy in 2021 which puts Net Zero at the forefront of its proposals but notably “obliges industry to support the government in reaching the net zero target whilst optimising UK North Sea reserves”.

The deal focuses the 5 main areas as follows:

1. Offshore Electrification
2. Carbon Capture, Usage and Storage
3. Hydrogen
4. Supply Chain Transformation
5. People and Skills

All 5 areas can provide guidance and learning for Canadian companies and an introductory webinar on the transition was delivered alongside the MEA earlier this year in advance of developing this report. For the purposes of this work however we are going to focus on areas 4 and 5 – ‘Supply Chain Transformation’ and ‘People and Skills’.

In their 2022 review, the British Government restated that people and skills are at the core of the North Sea Transition Deal. Global energy sector standards and qualifications organisation OPITO has been asked to lead on a People and Skills Plan (PSP) and are engaging with key stakeholders to develop this - the delivery of the PSP is imminent.

They also added “we aim to build on the progress made thus far in the Offshore Wind Sector Deal, the Energy Skills Alliance and through the integrated PSP to make rapid progress on the transferability of the work force to ensure that we can facilitate the development of a flexible offshore energy workforce”.

In addition, Robert Gordon University (RGU) has also been engaged to carry out specific projects related to skills for the energy transition. We review the work of RGU and OPITO below.

The **UK Offshore Energy Workforce Transferability Review** carried out by RGU was reported in May 2021.

The key findings of the review were as follows:

- Over 90% of the UK’s oil and gas workforce have medium to high skills transferability and are well positioned to work in adjacent energy sectors

- Around 80% of positions in 2030 are envisaged to be in 9 key job families:
  1. Operations
  2. Technicians
  3. Engineering
  4. Projects
  5. Commercial/Business Development/Marketing
  6. Procurement/Supply Chain Management
  7. Finance
  8. HR
  9. Health, Safety, Sustainability and Environment
  
- Soft skills and other non-technical skills are generally highly transferable to adjacent energy sectors
  
- Around 100,000 of the jobs in 2030 (50%) are expected to be filled by people transferring from existing oil and gas jobs to offshore renewables roles, new graduates, and new recruitment from outside the existing UK offshore energy sector
  
- Of the c. 200,000 people projected to be directly and indirectly employed in the UK offshore energy sector by 2030 c. 90,000 (45%) are projected to support offshore wind, c. 70,000 (35%) oil and gas and c. 40,000 (20%) other offshore related energy projects and clusters in the renewable energy sector

In May 2022, Robert Gordon University reported on another related piece of work **Making the Switch - The future shape of the offshore energy workforce in the North East of Scotland.**

This review focused on 4 regional workforce scenarios to characterise a range of possible energy futures for the region together with associated investment requirements. The principal focus relates to achieving global energy hub status and the key relevant findings for this report are as follows:

- Attaining Global Energy Hub status will require over £17 billion in new regional investments between now and 2030 focused to a large extent on offshore wind
- Success would see offshore energy workforce levels reach as high as 54,000 (45,000 today) over the coming decade
- In making a successful transition from oil and gas to renewables will see 60% of the jobs eventually being in direct support of the renewable energy industry (currently c. 10%)

- There will be a move to capex based jobs from opex (37% to 50%)
- Ensuring workers currently employed in the oil and gas supply chain can fill/access future renewable jobs will require a managed and organised transition
- Investment at scale in technology and innovation will be critical for the region to sustain and strengthen its global leadership position
- Over 80% of people who are currently working in the sector are projected to still be employed in the wider industry by 2030
- Readily accessible induction training will be needed for up to 30,000 people who are expected to move within the energy sector or join the industry for the first time between now and 2030
- Upskilling training will be required for 10,000 people who have medium or low transferability of skills
- It will be necessary to ensure full recognition of site certification standards and accreditation between oil and gas and renewables

The report has an appendix, a useful set of role comparisons between oil and gas and different aspects of renewables including offshore wind, hydrogen and CCUS. Examples include Electrical Engineer, Business Development Manager, and HSE Manager – the full report is available to view [here](#) with the appendix at page 28.

OPITO revealed the **Integrated People and Skills Strategy** as part of the Energy Skills Alliance in late May 2022 and the key issues identified were as follows:

- **Aligning Offshore Industry Standards**  
There are multiple safety and technical standards across the different elements of the UK offshore energy sector. The current lack of recognition of standards between the relevant organisations creates barriers that are inhibiting people from pursuing opportunities across the offshore industry.
- **Meeting Future Skills Demand**  
Workforce demand forecasts are likely to outstrip potential supply over the next decade. There is no integrated proposition for the offshore energy sector to attract future skills. A fragmented approach to delivering apprenticeships exists at present and with over 3000 STEM delivery bodies there is much duplication and dilution of effort.



- Defining Workforce Skills  
Pathways between oil and gas and renewables are currently unclear and fragmented. There is a lack of integration and options that would enable transferability and the identification of reskilling opportunities.
- Championing Diversity and Inclusion  
Further work is required to improve representation of minority groups across the industry.
- Improving People and Skills Data and Intelligence  
There is a lack of robust and comparable workforce and skills data across the offshore energy sectors (oil and gas and renewables).

### **Some other important initiatives**

Whilst there is a plethora of initiatives in development around the North Sea to support the transition, the following have been chosen as examples of additional relevant actions:

#### **The National Energy Skills Accelerator (NESA) at the Energy Transition Zone in Aberdeen**

NESA is in the process of being established in Aberdeen to prepare the workforce for the energy transition and to provide access to new skills and capabilities required for delivering the net zero agenda. The NESA is a collaborative initiative between Robert Gordon University (RGU), the University of Aberdeen and North East Scotland College. It is intended that the NESA will provide a “one stop shop” for industry to access a wide range of energy courses, skills development programmes and R & D capabilities in the partner institutions, at the new Energy Transition Zone.

#### **The Transition Training Fund – Skills Development Scotland**

Operating since 2016, the fund offers support with training grants to help people retrain, improve their skills, or get accreditation that can help them move into a new job in the wider energy sector. It is focused on the restructuring of the sector helping retain relevant skills and experience from the oil and gas industry and redeploy them in the developing renewables industry.

#### **The ASET International Energy Training Academy**

This replaces the well-established ASET International Oil and Gas Training Academy in a relaunch that reflects the diversification of the business to support the changing needs of the industry, in particular it now focuses on renewables and low carbon technology building on the transferable skills within the oil and gas sector. ASET has a diverse client base spanning over 80 countries, and they have already sought to demonstrate to customers that they can innovate and adapt to delivery training internationally on wind, solar and other renewable energy sources.

## Companies and Organisations Making the Transition - Supply Chain Transformation

With the offshore wind industry having been established for over 20 years in the UK and organisations such as AREG and others promoting opportunities through procurement sessions and overseas trade missions, many Scottish companies in the oil and gas supply chain have dipped their corporate toes into renewable waters over the years. This has been particularly true in times of low oil and gas activity usually directly related to low oil prices.

In recent years there has been an increase in both interest and investment by oil and gas companies into renewables around the North Sea e.g. Norwegian companies such as Equinor, Aker and Borr Drilling, but also large UK based companies such as BP, Shell and Subsea 7.

In this section of the report, we are going to look at Scottish Renewables' annual review of the developing offshore wind cluster via the supply chain survey carried out by Xodus (a good example of a company that has diversified into renewable energy from oil and gas) on behalf of Scottish Enterprise. This includes a sample of their supplier case studies.

The survey had over 300 respondents and confirmed the existence of a diverse supply chain available to undertake work in the fast-developing offshore wind industry including both fixed and floating structures. The range included manufacturers, consultants, ancillary equipment providers, logistics providers, software and digital services providers, construction companies, training and education providers, inspection services and parts amongst others.

It is interesting that the majority of the companies have their origins in the oil and gas industry with over 70% of the respondents coming from the 'traditional' oil and gas territories in the North and North East of Scotland, centred on Aberdeen.

The survey included exports which is directly relevant to the objectives of this report. More than a third of the respondents were found to be already exporting to offshore wind clients overseas. Over half also noted that offshore wind exports are a priority for their businesses. A further 30 plus percent of correspondents are currently exporting to customers in other industries and should be well placed to enter the market in due course.

The respondents indicated that the countries being exported to were as follows:

Europe/North Sea	148
Europe/Baltic Sea	111
Europe/South	88
USA	78
South East Asia (APAC)	76
Ireland	65
APAC (Other)	57
South America	36
China	29
Other	16

An appendix has been included to highlight 6 case studies as examples of companies that were surveyed by Scottish Renewables:

1. Fulkrum
2. Global Energy Group
3. Inland and Coastal Marina Systems
4. Legasea
5. Pentagon Freight Services
6. Sonardyne International Ltd

One company support programme of particular note that operates across the UK is the Offshore Renewable Energy Catapult's '**F4OR – Fit For Offshore Renewables**' programme.

This programme was developed to help the UK supply chain get ready to bid for work in the rapidly growing offshore renewable energy sector. It is a programme focused on business improvement and sector specific capability building using a proven process that takes between 12 to 18 months. Companies are guided and supported through each stage by expert advisers.

It has been shaped by senior members of the offshore wind industry ensuring that when a company completes the programme and is awarded 'granted status' they are operating at a level that meets the needs of potential customers.

Successful companies have both a rigorous set of business management systems and principles in place, evidenced by concrete examples of where it is put into practice and a thorough understanding of the unique characteristics of the renewable energy sector. For companies to succeed on the programme, they must demonstrate that they can articulate their value proposition, understand their role in the supply chain and recognise their potential customer base.

Successful applicants must be above a certain size, achieve a minimum business excellence self-assessed score and must be committed to enacting positive change and making commercial headway in offshore renewables.

It is noticeable that several companies have attributed specific contract wins to the programme. Testimonials used by the Offshore Wind Catapult to promote their scheme are included in the Appendices for reference.

A list of "granted businesses" to date include the following:

2H Offshore Engineering Ltd. <https://2hoffshore.com/>  
Apollo Offshore Engineering <https://apollo-oe.com/>  
Aquaterra Energy Limited <https://aquaterraenergy.com/>  
Armultra Ltd <https://www.armultra.co.uk/>  
Aubin <https://www.aubingroup.com/>

Balmoral Comtec Ltd. <https://www.balmoraloffshore.com/>  
Birlinn Offshore Ltd. <https://birlinnoffshore.com/>  
Carnaud Metal Box Engineering <https://carnaudmetalboxengineering.co.uk/>  
CMP Products Ltd <https://www.cmp-products.com/>  
Dron & Dickson Ltd <https://www.drondickson.com/>  
EnerMech <https://enermech.com/>  
Fern Communications <https://ferncom.com/>  
First Marine Solutions <https://www.firstmarinesolutions.com/>  
Intermoor <https://intermoor.com/>  
JBA consulting <https://www.jbaconsulting.com/>  
JGC Engineering <https://www.jgc.co.uk/>  
KRG Specialist Engineering Services Ltd. <https://krg-engservices.com/>  
Leask Marine <https://www.leaskmarine.com/>  
Lintott Control Systems <https://www.lintottcs.co.uk/>  
MacLean Electrical <https://www.dnow.com/maclean>  
OSBIT Ltd <https://www.osbit.com/>  
Osprey <https://osprey.group/>  
Pangeo Subsea <https://www.pangeosubsea.com/>  
PD&MS <https://www.pdms-group.com/>  
Peritus International <https://www.peritusint.com/>  
PPI Engineering Ltd <https://www.ppi-engineering.com/>  
Prior Power Solutions Ltd <https://priorpower.com/>  
Proeon Systems <https://www.proeon.co.uk/>  
Rix Renewables <https://www.rixrenewables.co.uk/>  
Safinah <https://www.safinah-group.com/>  
Sealand Projects <https://www.sealand-projects.com/>  
Smulders <https://www.smulders.com/en/smulders-projects-uk>  
Southampton Marine Services Ltd <https://www.sms-marine.co.uk/>  
Stowen Clean Energy Ltd <https://www.stowengroup.com/>  
TecoSIM Simulation Ltd <https://tecosim.co.uk/>  
THREE60 Energy <https://three60energy.com/>  
Tyne Gangway <https://www.tynegangway.com/>  
Warren Services Ltd <http://www.warrenservices.co.uk/>

It is pertinent to note that at least one company in the list, Pangeo Subsea, has its roots in Atlantic Canada, and had taken steps some years ago to establish a presence in Aberdeen to take advantage of the developing north sea renewables opportunities.

There are also a series of initiatives from government and industry to help new companies get established to take advantage of the opportunities in the sector – one particular scheme worth highlighting is the ‘TechX Clean Energy Accelerator’ that is a programme provided by the aforementioned Net Zero Technology Centre.

This is an intensive 15-week programme for clean energy start-ups to help them with their strategic growth plans, and to accelerate the commercialisation of new technologies that can provide solutions to the domestic and global renewable energy industry. Each start-up that is selected to participate benefits from grant funding of up to £100k.

## **Internationalisation of the diversified Oil and Gas Supply Chain**

Our research has clearly shown that since renewables first started to emerge in other jurisdictions, and in particular around the North Sea oil and gas supply chain, companies have managed to successfully diversify into new energy opportunities. Over the years there has been an increasing amount of external support provided to help those businesses build the capacity of individuals within those companies but also to understand the different procurement requirements of the sector.

In addition, government bodies such as the UK Department of International Trade, and Scottish Development International in Scotland, have shifted their focus away from oil and gas and into renewable energy to support companies that are looking to internationalise and increase exports of goods/services.

In Europe, alliances such as ELBE (Europe's Leaders in Blue Energy) have developed across multiple countries to promote the capabilities of the supply chain and support international growth in key global markets.

It is apparent that companies which have been successful in expanding into international markets have achieved this through two main routes. Firstly, many of the companies that have been successful internationally have done so in markets that are already their existing export markets for oil and gas technology and services. Secondly, many companies have also been successful in tendering for work internationally with operators and project developers with whom they had already collaborated with in the UK market. There are companies who have been successful in new markets as well, however, it is clear from the interviews that took place that companies once successful internationally are broadening their horizons to new global markets where their growing expertise and experience is being increasingly recognised.

It is strongly suggested that oil and gas supply chain companies look at those markets with the 'softest' landing to allow them to gain experience in the industry in advance of further developments in Canada itself which may be five or ten years away.

To help accelerate readiness for the international market, it is recommended that government and industry association consider working together to produce a 'Fit for Renewables' programme with a focus on exporting to help support the development of the industry.

Our knowledge of the supply chain in Atlantic Canada would suggest that there are a large number of companies with the required level of skills and services to enter into the international renewables market particularly where they currently export into current oil and gas markets or other relevant energy markets. An example would be the expertise that has developed in electrification and transmission around the Muskrat Falls project in Newfoundland and Labrador.

## **Export Market Priorities**

The markets selected as a priority below have been chosen based on relative ease of opportunity together with existing market penetration. The Atlantic Canada Oil and Gas Export Strategy (January 2018) has been used as a foundation document around which to recommend the priorities suggested as follows:

1. Projects in other parts of Canada
2. East Coast USA
3. North Sea (UK/Norway/Holland/Denmark)
4. Latin America (Colombia/Brazil/Chile/Mexico)
5. West Coast USA
6. Southern Europe (Spain/Portugal)
7. Niche markets i.e. The Baltic Region, Republic of Ireland

## **Support with Internationalisation**

Canada has a range of bodies with a global reputation for supporting internationalisation from the Federal government's Trade Commissioner Service through its global network of High Commissions and Embassies to Export Development Canada. In East Coast Canada the Atlantic Canada Opportunities Agency along with the Provincial government's economic development teams provide extensive support to businesses looking to develop into new markets.

In addition, trade focused organisations such as the Maritime Energies Association and Energy NL have provided significant support for their member companies. It will be important to build on the international links already developed, but also to build new ones for the future.

At the H2O conference in June 2022, two significant Memoranda of Understanding were signed by AREG on behalf of the European Leaders in Blue Energy (ELBE) alliance with Canadas Ocean Supercluster and Marine Renewables Canada with a clear focus on supporting internationalisation of companies between the signatories. ELBE's member organisations came from Scotland, Spain, Denmark, Belgium, France, Norway, and Sweden and in turn represents over 1000 member companies and organisations. This is an example of how Atlantic Canada can work with targeted markets to support internationalisation.

Opportunities exist to develop further agreements with the other target markets recommended as part of this report above. Just before COVID struck, Canada also signed the Comprehensive Economic and Trade Agreement with the EU. The agreement has a specific focus on "environmental protection and climate action" which provides a further opportunity for collaboration and trade between East Coast Canada and EU member countries.

At a city level, both Halifax and St. Johns are active members of the World Energy Cities Partnership.

This is a powerful organisation that “connects leading energy cities on all continents that are committed to fostering the transition to a more sustainable energy future”.

Other key member cities in target markets include Stavanger in Norway, Esbjerg in Denmark, Barranquilla in Colombia, Houston in the USA, and Aberdeen in Scotland. Clearly there is an opportunity for all levels of government and their agencies to collaborate with all the trade and membership associations to maximise the opportunity for oil and gas supply chain companies who aim to transition into the renewable energy sector to build capacity, connections and opportunities in the international marketplace.

The research carried out as part of this report together with 30 years plus experience of working with the oil and gas supply chain in Atlantic Canada, clearly indicates that there are companies who can transition into renewable energy internationally. Capacity building support similar to what has been provided in other markets as outlined above would greatly help companies make that transition, and it is recommended that a wider discussion is sought with government and their responsible agencies on how this might be achieved.

The foregoing will be ever more important leading up to the further growth of the renewable energy industry in Canada and in particular onshore and offshore wind, but also tidal stream and wave. There is also the opportunity to expand hydro generation further in some parts of Atlantic Canada that can build on an existing experienced supply chain that should be nurtured. All of these potential generating methods are increasingly being linked to the production and use of hydrogen and ammonia with parts clearly going to play an important future role in this arena.

It goes without saying that supply chain companies will be better placed for future development in Canada if they can successfully deliver contracts internationally first.

Exporting does however come with a health warning, companies need to be fully aware of the pitfalls that can ensue and entering new export markets will be easiest for those with experience of exporting already. For others they will need to be well prepared and take advice from the export support agencies. The list of recommended export markets above have been suggested with such challenges in mind.



## **The AREG and Aberdeen/North Sea experience of renewable energy exports**

As part of the research relating to the development of this report, discussions were held with over 50 businesses who are already active in the renewable energy supply chain.

Many of the companies we spoke with had benefitted from participating in the developing UK offshore wind industry projects for example Beatrice, Moray East and Moray West and of course the European Offshore Wind Deployment Centre in Aberdeen Bay. Some of these companies having successfully bid for work in the UK then “followed the developer” to bid successfully (and unsuccessfully) for overseas work. It was found that companies with existing exporting experience were more likely to seek overseas markets usually but not always in markets where they had previous experience. Some companies are also clearly more entrepreneurial than other when it comes to exporting but generally the companies that we interviewed had a clear focus on which export market that they wanted to try to achieve success in.

The North Sea Transition Authority was included in the interviews and their representative was clear in advising to approach the renewables industry with a general expectation that it is harder to make money than the oil and gas industry as international operators having much tighter financial control measures in place.

We had a wide range of responses but generally the key pieces of advice abstracted from our research were as follows:

1. Analyse and select a limited number of markets to focus on initially.
2. If you already have experience of exporting to oil and gas markets that also have active plans to develop a renewables industry, these are where you should focus your efforts.
3. Wherever possible, try to collaborate with companies that you have worked with previously in relation to supply of goods and services to oil and gas projects.
4. Try to build a relationship with one or two operators/project developers and then seek to work with them in other international markets
5. Make maximum use of agencies/consultants who can help introduce you to key international markets
6. Get as much support as you can from government and other agencies who can help you build capacities for exporting into the renewables marketplace

## **Considerations to help develop a pathway towards energy industry transition through skills development and export opportunity**

This final section seeks to bring together lessons learned from the research undertaken from those parts of the world that have engaged their oil and gas supply chains with the opportunities that renewable energy transition is bringing.

### **Lessons from structured interviews**

Against the backdrop of research in global developments and available training programmes, as mentioned above we have also engaged with over 50 companies that have already started to look at the renewable energy market to provide a significant part of their future business. We selected 16 companies/organisations to inform some more structured research via face-to-face interviews. The companies came from Scotland, England, Norway, Denmark, and France. A copy of the questions used during the interviews is included as an appendix.

Companies and organisations that were interviewed included manufacturing, subsea servicing, floatation experts, suppliers of oil and gas machinery/equipment, gas pressure experts, training companies, government licensing agencies, international operators, and industry member associations amongst others.

Here is a synopsis of the key findings:

#### **Training and skills development**

It was clear from the interviews that there is a scarcity of available skills in the marketplace. Companies that have been at the forefront of diversification and who have staff with some experience, are losing personnel to new companies especially operators now branching into the renewables sector. There is a feeling that new skills programmes need to be put in place quickly if demand is to be met and the opportunity to diversify is fully maximised. One company interviewed has set up its own skills academy to address this issue.

Several companies had made use of training schemes to help build up a core of renewable expertise within their companies. Three companies interviewed had recruited “specialist expertise” as part of their senior management team to help the renewable side of their business.

In Scotland, the recent ScotWind leasing round for offshore wind asked for a Supply Chain Development Statement and all bids included these. There was a view from respondents that operators needed to develop procurement programmes well ahead of awarding contracts to allow the supply chain to ramp up its capacity to deliver.

There was a consistent view that all the solutions in relation to skills and capacity building were not yet in place but several of the companies spoke favourably of the ‘Fit4OffshoreRenewables’

programme which included a section on getting prepared to engage with major renewable energy operators.

Many of the respondents found the now abundant webinars available from AREG, other industry associations, and individual companies on training for renewables to be of benefit in keeping them up to date on development.

One issue that several companies found important, and which has also featured in AREG webinars, was the recognition and transferability of skills between the oil and gas sector and the renewables sector. This has been picked up by OPITO as part of the North Sea Transition Deal and action work is now taking place on the development of a skills passport.

### **Procurement**

This is being highlighted as a particular area of focus for aspiring oil and gas supply chain companies looking to move into renewables and was mentioned as a key challenge by several experienced companies that were keen to share their learning process with companies from Atlantic Canada.

Generally, the oil and gas industry has a well established two-way process in developing solutions to particular problems but this is not necessarily the case with renewable industry procurement.

Several of the respondents highlighted that the bureaucracy and level of detail around contracts was far greater in the renewables industry. One company stated that for a similar monetary value, the documentation around contractual terms and conditions was around 100 pages compared to around 12 for an oil and gas contract.

Renewable contracts when awarded have “no flexibility” and once awarded there is an expectation that they will be delivered for the contracted price with no further negotiation or variation.

A government body involved in contracts advised that one of the main lessons for oil and gas supply chain suppliers companies is that they need to go into contract “with their eyes wide open”.

Other respondents have said that you must be prepared to do much more “leg work” to win contracts and also be good at “working your network”.

It would appear that those companies who have invested in quality management systems and other oil and gas industry standards are better prepared than those who do not, resulting in winning more business.

Further advice given by two companies was to bid for small pieces of work initially.

## **International development**

A high number of the respondents had and do operate internationally in the oil and gas sector with two of the companies having more than 80% of their turnover from international sales.

Generally, those interviewed felt that it was an advantage to win contracts for the renewable sector in the UK and North Sea to help build their experience and understanding of the industry before looking further afield.

Those companies which currently export into the international oil and gas markets considered it sensible to then try and win contracts in renewables in those markets which were moving most rapidly in that direction, and to which they had experience of from their oil and gas activities.

One experienced company said that they would go anywhere that there was a real opportunity to win profitable work.

Several respondents felt that the support offered via trade missions into developing renewables markets can be very helpful.

One important trend that was picked up was that companies who had won contracts in the North Sea with international developers had a high chance of winning work in international markets with the same developers.

Finally many of the current European based exporters considered it important to build relationships with the big international developers, and government agencies felt it was particularly important to establish relationships in key markets e.g. “forge links with Scandinavian developers”

## Conclusions and Recommendations

It is clear from the research that we've undertaken, as well as the consultant's own engagement in over 30 markets around the world, that we are in the midst of a period of great change as we start the transition towards a net zero future. A series of events over the past few years involving 'freak weather' incidents across the world including wind, rain, and fire, together with campaigns by climate change activists, and most notably through younger people, have all influenced a growing recognition that urgent action needs to be taken to reduce CO<sub>2</sub> emissions.

This culminated in COP 26 last November in Glasgow, Scotland, with the signing of a host of agreements to tackle the issue, and even these are still considered by some activists as not going far enough.

The war that Russia has waged on Ukraine has only reinforced the need for change but at the same time has served as a reminder of how the world's economies are still heavily reliant on fossil fuels, and the time and investment that it will take to move away from this dependency.

There are now very few countries in the world that are not taking steps to move in some way to a renewable energy future. This is creating unprecedented opportunities for those companies with transferrable skills from the oil and gas sector.

The external reports referred to within this document all clearly indicate that the global oil and gas supply chain is home to skills that are transferable - it is clear from our knowledge and research that many companies are already using these successfully to win work in this new developing sector.

As one of the interviewed companies, which has worked successfully for 20 years in the oil and gas sector said: "the opportunity is going to be bigger than oil and gas ever was for us".

Training and skills development is seen as an extremely important part of ensuring that economies can maximise benefits from the oil and gas transition. As can be seen from the report, there are a significant number of initiatives suggesting what needs to be done and a range of support programmes in place. One in particular stood out, that being the 'F4OR - Fit For Offshore Renewables' programme run by the UK Offshore Renewable Energy Catapult. It is recommended that companies seek out the training identified in this programme and if not available in Canada that a similar programme be developed with supporting agencies.

The recommendation on markets that Atlantic Canadian companies should consider approaching were provided on page 31.

It is felt important however to emphasise that if possible, there should be early engagement with governments and their agencies to help establish a plan to develop a vibrant renewables sector in Atlantic Canada, building on tidal stream and hydroelectric success to date to move into offshore wind (both fixed and floating), wave, and hydrogen as soon as possible.

Companies can in the meantime seek to win experience in the international market place to prepare them to fully participate in a future vibrant Atlantic Canada renewables industry.

In conclusion we would recommend the following key actions that would be central to preparing companies within the Atlantic Canada Oil and Gas supply chain to take advantage of the opportunities provided by energy transition:

- An evaluation and analysis of the current capacity of the supply chain in Atlantic Canada in relation to oil and gas and renewable energy
  - We understand that this is already underway via the wider project
- Provision of adequate support (learning journeys) that can educate companies and help them understand the developing renewable energy industry and build skills and capacity
  - Information on specific requirements e.g. training and certification
  - Access to the bodies that can provide these services
  - Provision of funding and incentives where possible
- Engage/re-engage with training delivery agencies that already support skills development for renewable energy in other markets
  - As an example both Nova Scotia Community College and the College of the North Atlantic worked closely with ASET (Aberdeen) 25-30 years ago in relation to skills for the development of oil and gas in Atlantic Canada
  - Leading Universities such as Dalhousie and Memorial should also engage with European Universities that have been providing courses on renewable energy for many years
- Take time to investigate successful programmes like 'F4OR – Fit for Offshore Renewables' and consider collaborating with international organisations that could provide these e.g. UK ORE Catapult
  - Or consider developing a bespoke equivalent within Atlantic Canada
- Further investigate opportunities for export of products and services to global markets
  - Development of a focused export strategy
  - A series of support services to companies e.g. market research, trade missions etc
  - Utilise the Trade Commissioner Service, Export Development Canada and external consultants with specialist market knowledge and connections

- Engage with government and related agencies in developing a strategy and delivery plan for the early roll out of relevant licensing rounds for renewable energy
  - Development of a 'local' industry will further incentivise the regional supply chain to accelerate their move into the renewable energy sector and enable the companies to access additional international opportunities as a result
- Engage international operators in capacity building programmes now, in advance of upcoming projects and developments e.g. offshore wind licensing rounds
  - Identify their requirements so that any gaps in the local supply chain can be filled
  - Provision of procurement workshops with international operators and project developers
- Drive innovation by connecting international operators with the extensive ocean technology expertise in Atlantic Canada that can develop solutions to global challenges
  - This can also be facilitated via partnerships with international renewable industry organisations e.g. European Leaders in Blue Energy and many others

This research project was undertaken by Gordon McIntosh and Neil McIntosh, Directors of Aberdeen International Associates in Q2 of 2022 with the report delivered in July 2022.

Any requests for clarification on the content and/or additional information can be submitted by email to [Gordon@aiascot.co.uk](mailto:Gordon@aiascot.co.uk) or [Neil@aiascot.co.uk](mailto:Neil@aiascot.co.uk)

Aberdeen International Associates  
July 2022

Appendix 1 Feedback from participants in UK Fit for Offshore Renewables Programme

"As a result of internal and external reviews [undertaken] for the F4OR programme, [we] now have a **more defined strategic approach** to the sector. We have more documented plans and strategies and we have **developed a more proactive approach**, working with clients and potential customers to identify future potential hazards and cost savings."



"The F4OR programme is at the forefront of enabling the energy transition, helping to establish a truly world-class domestic supply chain. Accordingly, EnerMech are very proud of our involvement. More relevant is that what we learnt through achieving granted status has been **profoundly important in shaping our approach** to the opportunity the burgeoning renewable energy market represents; it has provided us with a key platform on which to build our future renewable energy business success"

"The F4OR process has **highlighted the opportunity** to work with other cohort companies in future. For example, Proeon, a company we have worked with successfully in the oil and gas sector now become a potentially valuable partner for future renewables projects"



"[There is a] **changed perception** within the company of the high-quality services that we can offer to the Offshore Wind Industry. [We are] developing new areas aligned to the sector, for our skilled and competent workforce which draw upon their hydraulic, mechanical and electrical knowledge

and experience to help us grow and sustain a business fit for the future. Importantly this is **now core to our forward strategy**"

"We are now tendering for two offshore wind packages [where] the F4OR [programme] has given us a **better understanding how the system works**. We have filled in gaps in our procedures and processes that were brought up during the process [which] will help the company moving forward in all areas not just wind."



"The process of the F4OR programme has made a **significant impact to how the leadership team communicate** to the work force, the programme enlightened how a strong communication line between the two can **bolster the output** from the workforce whilst giving the leadership a better understanding of where the gaps are."



## Appendix 2 Examples of companies that have successfully diversified into the renewable energy sector (from an Xodus survey for Scottish Renewables)

### [Fulkrum](#)

Aberdeen-based inspection provider supports landmark offshore wind farm projects. Fulkrum's most recent success in the offshore wind market is the award of a global contract with a major wind turbine original equipment manufacturer. The inspection provider will ensure conformity and quality of key wind turbine components to be used on all three phases of the Dogger Bank wind farm. Using its expert UK-based Quality Assurance and Quality Control personnel across sites in Europe, China and the UK, Fulkrum will ensure the project follows its local content pledge and will provide further employment in the UK. This latest win builds on their track record of supporting major European landmark offshore wind projects including Moray East, Seagreen, Hornsea, Galloper, Courselles-sur-Mer to name a few.

### [Global Energy Group](#)

Port of Nigg supports Scotland's offshore wind farms and announces UK's largest tower manufacturing facility 2021 has seen Global Energy Group delivering preassembly, storage, and marshalling works for two of the country's largest offshore wind farms: Moray East and Seagreen. Global's Port of Nigg facility bid farewell to the final components for the Moray East project, having successfully completed the entirety of the wind turbine generator pre-assembly works. The port welcomed every blade, tower and nacelle for the project which were offloaded, marshalled, and readied for installation before being loaded out to their final destination. The facility received the jacket foundations for the Seagreen project in August 2021. The company is to work with project owners, TotalEnergies and SSE Renewables throughout the entirety of the 12-month installation campaign, supporting up to 141 skilled jobs at the Port of Nigg. With growing aspirations in the industry, Global Energy Group also made an exciting announcement in 2021 confirming plans for a significant investment to create the UK's largest offshore wind tower manufacturing facility at Port of Nigg.

"Our continued strategic investment at our Port of Nigg facility demonstrates Global's commitment to leading the development of an offshore wind energy hub in Scotland, creating jobs and opportunities for the entire supply chain for generations to come." Iain Sinclair, Executive Director of Renewables & Energy Transition, Global Energy Group

### [Inland and Coastal Marina Systems UK](#)

Creating a safe base for offshore wind farm operations and maintenance crew Last year, Inland and Coastal Marina Systems won the contract to design and build bespoke crew transfer vessel berthing facilities for Moray East Offshore Windfarm Limited. The scope was to provide a safe 'all-in-one' base for the daily servicing, refuelling and usage of the vessels during the ongoing maintenance of the wind farm.

Inland and Coastal worked closely with Moray East Offshore Windfarm Limited, the Harbour Commissioners and multiple other partners to deliver the best value solution for the project. The key drivers were all-weather operation and turnaround time for the vessels. Inland & Coastal Marina Systems delivered a solution enabling a 25-minute turnaround time - including refuelling, change out of consumables and water resupply. The organisation has also delivered and installed bespoke pontoon solutions for Seagreen, Aberdeen Bay, Kincardine and Neart na Gaoithe offshore wind farms.

### [Legasea](#)

Startup becomes global service provider in just three years thanks to offshore wind. Since 2018, environmental service company Legasea has been specialising in a range of electrical, hydraulic, and mechanical engineering services. Promoting sustainability and reuse of subsea equipment, Legasea is reducing costs and carbon emissions for a wide range of global clients. Legasea designs, assembles, and tests a range of equipment within its facility near Aberdeen, for all areas of the energy sector. Recent projects completed include: the testing of subsea battery storage cells in a 1.2 million litre test pit, the modification of sub-sea production trees for a tidal project and the building and testing of dredging tools for the piling activity on an offshore wind farm in Taiwan. Throughout 2021, the company has more than doubled its headcount and plan to have a team of 30 by the end of 2022.

“In Scotland, we have an enviable array of opportunities with regards to renewable energy. Existing experience, coupled with the ingenuity of the energy supply chain, means that Scotland is perfectly positioned to play a pivotal role in the transition to net-zero, and we look forward to continuing to support the renewables sector in the years ahead.” Ray Milne, Operations Director, Legasea

### [Pentagon Freight Services](#)

2021 a year of standout accomplishments despite the global pandemic. Against the odds, 2021 has been a breakthrough year for Pentagon Freight Services. Its Scottish offices are seeing the volume of renewables work soar despite the global pandemic. Some stand-out accomplishments this year have been:

- Partnering with offshore installation companies to transport ‘walk to work’ gangways to their installation vessels
- The award of a five-year contract for global freight forwarding and logistics support from a major offshore wind farm
- Providing air and sea freight shipments to Taiwan from Scottish companies
- Supporting a UK manufacturer delivering to Brest and Fene for a 496MW capacity offshore wind farm off the coast of Brittany, France
- Working with many survey companies as their sole logistics provider where a large proportion of their work in 2021 involved the renewables sector
- Providing customs consultation services to a number of renewable energy clients

The success seen in 2021 has not only been great for Pentagon Freight Services in Scotland but also for its local suppliers. The company also premiered its apprenticeship programme, recruiting five apprentices who are currently progressing through a structured in-house training programme.

### [Sonardyne International](#)

Understanding Scotland's marine environment through cutting edge technology. With origins in the North Sea in the early 1970s, Sonardyne now has a portfolio of vessel-based and complementary sub-surface technologies that support many different types of marine operation throughout the life of a wind farm. From its service and operations base in Aberdeen, Sonardyne support offshore wind projects with the supply of equipment to survey contractors carrying out hydrographic, geophysical and geotechnical surveys for site characterisation, cable laying, and remote and autonomous vehicle navigation. As part of its five-year strategic plan, Sonardyne is aiming to become carbon neutral by the end of 2025. Initiatives already in place include installing three photovoltaic arrays producing 533kW of power at its Hampshire headquarters and manufacturing premises, upgrades to electrical and building fabric, and implementing certified energy management systems throughout its facilities.

Appendix 3 Copy of questions that were used during interviews with supply chain companies to inform the report

**How did traditional Oil and Gas Companies/Organisations diversify into Renewable Energy?**

**Interview Form**

<b>Organisation</b>	
<b>Address</b>	
<b>Website</b>	
<b>Contact</b>	
<b>Position</b>	
<b>Email</b>	

**When did you start to consider moving into the Renewables sector?**

**What were the key drivers that made you consider investigating opportunities in Renewables?**

**Did you seek any support from third parties to help you make the transition?**

**Are you aware of any training support to help companies make the transition into renewables, and if so did you make use of any of the programs?**

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**At what stage of the transition are you at as a company?**

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**Have you won contracts in the Renewables sector to date?**

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**What challenges have you faced in trying to win work in the sector?**

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**What lessons have you learned so far?**

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**What more needs to be done to support businesses and individuals making the move into Renewables?**

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**Are you looking at international markets?**

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**Have you sold any goods or services (related to renewables) internationally?**

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**Which international markets are you targeting and why?**

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