Haumoana:

OFFSHORE WIND CAPACITY BUILDING IN NEW ZEALAND

NOVEMBER 2021

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BlueFloat ENERGY

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About the publishers

BlueFloat Energy is comprised of a team of offshore wind pioneers who have extensive knowledge and hands-on experience in developing, consenting, financing, constructing, commissioning and operating fixed-bottom and floating offshore wind projects. With a corporate vision of accelerating the global deployment of offshore wind as a key enabler for the energy transition and economic growth, BlueFloat Energy is currently developing offshore wind energy projects in multiple countries globally including UK, France, Spain and Italy.

BlueFloat Energy is backed by 547 Energy, the renewable energy investment platform of Quantum Energy Partners, a US-based sustainable energy focused private equity firm with over $17 billion of assets under management.

For more information please visit **https://www.bluefloat.com**

Energy Estate's mission is to accelerate the transformation of the energy sector and decarbonisation of industry. Energy Estate is a developer and accelerator and provides commercial, technical and strategic advisory services. Our team has decades of experience and knowledge across the energy value chain coupled with broad and deep relationships globally with producers, developers, traders, utilities, investors, contractors and suppliers, regulatory bodies, NGOs and other stakeholders.

Senior members of our team began their careers in New Zealand and have developed and advised on large scale energy projects in New Zealand. Our team's track record in offshore wind includes advising on the first offshore wind projects in Europe and developing large scale offshore wind projects in new markets.

Energy Estate's development principles embed the Sustainable Development Goals. A key driver for Energy Estate is supporting the communities in which we operate and delivering enduring outcomes for all indigenous people and all stakeholders.

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Elemental Group is an international energy services group dedicated to providing better energy solutions to our clients. We provide a full range of professional geoscience, science, engineering, environmental, project management, and financial modelling services for the energy sector.

We have offices in New Plymouth, Auckland and Perth.

For more information please visit: **https://elementalgroup.com**

Executive Summary

Haumoana

Ngā mihi ki a Ranginui
Ngā mihi ki a Papatūānuku
Ngā mihi ki a Tangaroa
Ngā mihi ki a Tāwhiri-mātea
Ngā mihi ki tēnei wāhi, ko Aotearoa
Ngā mihi ki ngā tangata whenua
Ngā mihi ki ngā tangata o Aotearoa

Aotearoa is blessed with some of the finest offshore wind resources in the world. Across the globe, this resource is being harnessed and sought out to power the green economy of the future. Now is the time for the people of Aotearoa to learn about the benefits and challenges of developing an offshore wind industry, so that current and future generations may benefit from employment, regional development and clean manufacturing opportunities.

We have prepared this report to give stakeholders insights into the opportunities a domestic offshore wind industry can deliver in terms of developing local supply chains, offering new skills and employment options and diversifying energy supply. We hope this is a start of a journey to realise dreams that come from collaboration and learning. As Maūi harnessed the power of the sun, we offer to help harness the power of Haumoana.

Offshore wind is a rapidly developing field of energy production around the globe. Having started in Denmark in 1991 and been incubated in Europe, it has spread recently to new markets in the Americas and Asia. New Zealand has some of the best offshore wind resource in the world and an existing skilled workforce of seafarers, offshore oil and gas workers and people employed in the manufacturing industry. These capabilities will enable Aotearoa to harness offshore wind energy and develop an offshore wind industry in partnership with local communities, financiers, international developers and service providers.

The World Bank has estimated Aotearoa's offshore wind resource to be 150 times the size of its electricity market. This means that Aotearoa could supply green energy exports to the rest of the world, helping drive the decarbonisation of the global economy. Becoming a green energy exporter would be a major multigenerational undertaking that would also ensure cheap, clean energy for Aotearoa.

This report has been created with the intention of starting a conversation through which Aotearoa can learn from the experiences of other jurisdictions and adequately plan for the growth of the offshore wind industry in a way that also contributes to the nation's social, cultural, environmental and economic wellbeing.

Part one of this report is focused on the opportunities for New Zealand. The first section provides an insight into the workforce requirements for a 30-year investment programme in offshore wind. The second section is an interview with Sarah Sinclair, Chair of MinterEllisonRuddWatts and a member of the New Zealand Infrastructure Commission. Sarah shares her perspective on the skills required to successfully develop an offshore wind industry as well as the challenges and opportunities for the services sector.

Part two focusses on what is happening across the Tasman. Chris Briggs, one of the authors of the recent Blue Economy CRC report on offshore wind in Australia, discusses the role of offshore wind within the Australian economy and energy mix, as well as the potential for collaboration between Australia and New Zealand. The Australian journey to embed local content requirements by governments and support local supply chains is discussed by Simon Corbell, the former Chief Minister of the Australian Capital Territory.

The final section of the report explores case studies and learnings from other jurisdictions which are relevant to Aotearoa's journey. Jeremy McIver, from the global law firm DLA Piper, shares an overview of the evolution of the offshore wind market. He explores the changing drivers of offshore wind markets globally, from government subsidies to increasingly the procurement demands of large corporates. Peter Conway of Energy Estate presents the United Kingdom's experience of developing an offshore wind supply chain over the last 30 years, and BlueFloat Energy showcase case studies of local companies and projects which demonstrate how the opportunities in the sector can be captured.

Our vision is that the insights into capability development set out in this report prove both thought provoking and useful and it provides a platform for the start of a broader discussion.

Ngā mihi

New Zealand

Building an offshore wind workforce in New Zealand

GERMÁN PEREZ GAIDO
Master of Energy, University of Auckland

This section summarises a research project completed as part of the University of Auckland Master of Energy programme in 2020/1. It is the first study to analyse the potential employment opportunities which could be created through development of an offshore wind industry in New Zealand.

New Zealand has a very high-quality offshore wind resource within its Exclusive Economic Zone. *Offshore Wind – a new energy opportunity for Taranaki*, a discussion paper published by Venture Taranaki, identified over 90 GW of wind capacity in the waters surrounding Taranaki alone.[1]

To put this in context, the New Zealand electricity system currently has capacity of 9 GW. Future demand for electricity in New Zealand, however, is forecast to grow strongly over the coming decades as we switch from fossil fuels and achieve higher levels of electrification across the economy. This demand could be met from other renewable resources such as onshore wind, solar, geothermal and hydro, but offshore wind is a viable option for New Zealand as it strives to meet its decarbonisation goals.

The scale and quality of our offshore wind resources and the complementarity of our hydropower assets also creates the prospect of New Zealand becoming a renewable energy export superpower by developing green hydrogen and e-fuels industries and attracting new energy-intensive industries such as data centres and advanced manufacturing to New Zealand. Positive steps have already been taken by Meridian Energy and Contact Energy with the Great Southern Hydrogen Project which has attracted significant levels of global interest.

This section of the report is based on analysis by German Perez Gaido, undertaken as part of a research project *"Offshore wind in Taranaki - Assessment of potential regional long-term employment and expenditures"* submitted as part of his studies for a Master of Energy at the Faculty of Engineering, the University of Auckland.

This analysis assumes that around 11% of the identified offshore wind resource in the Taranaki report is developed in New Zealand over the medium term to 2050. The research is focused primarily on operations and maintenance workforce requirements. Operations and maintenance jobs are expected to require 4,400 people to support offshore wind infrastructure by 2050, based on an assumed build-out of 10GW and a 50% probability. However, when combined with the skilled jobs created during the long development and construction period, and the multiplier effect of the creation of an offshore wind industry on the Taranaki region and New Zealand as a whole, this number will be much greater.

Offshore wind farms start with an investment phase of 6.5 to 9.5 years followed by operations and maintenance and finally decommissioning. Estimated project stage durations for offshore wind farms are shown in Figure 1.

Operations and maintenance activities largest part of lifecycle

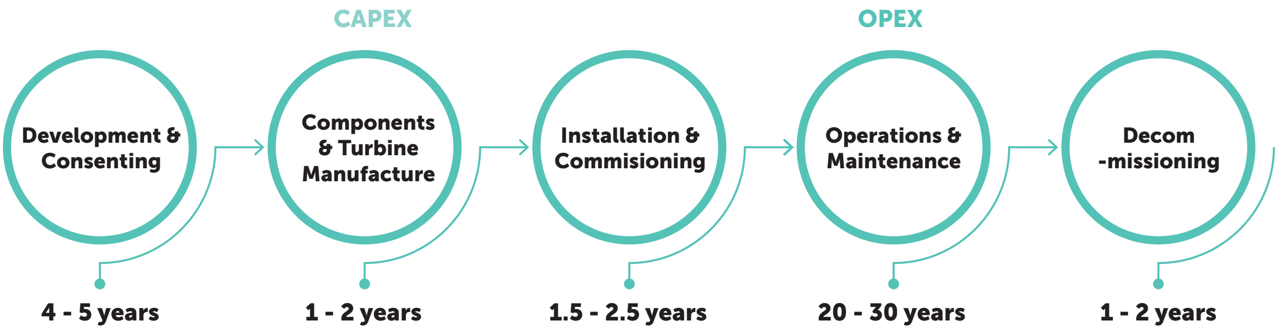


Figure 1 - Offshore wind project lifecycle.[1]

1 https://www.venture.org.nz/sector-development/energy/offshore-wind-energy/

2 Dinh, V. N., & Nguyen, H. X. (2019). Design of an offshore wind farm layout. In Lecture Notes in Civil Engineering (Vol. 18, pp. 233–238).

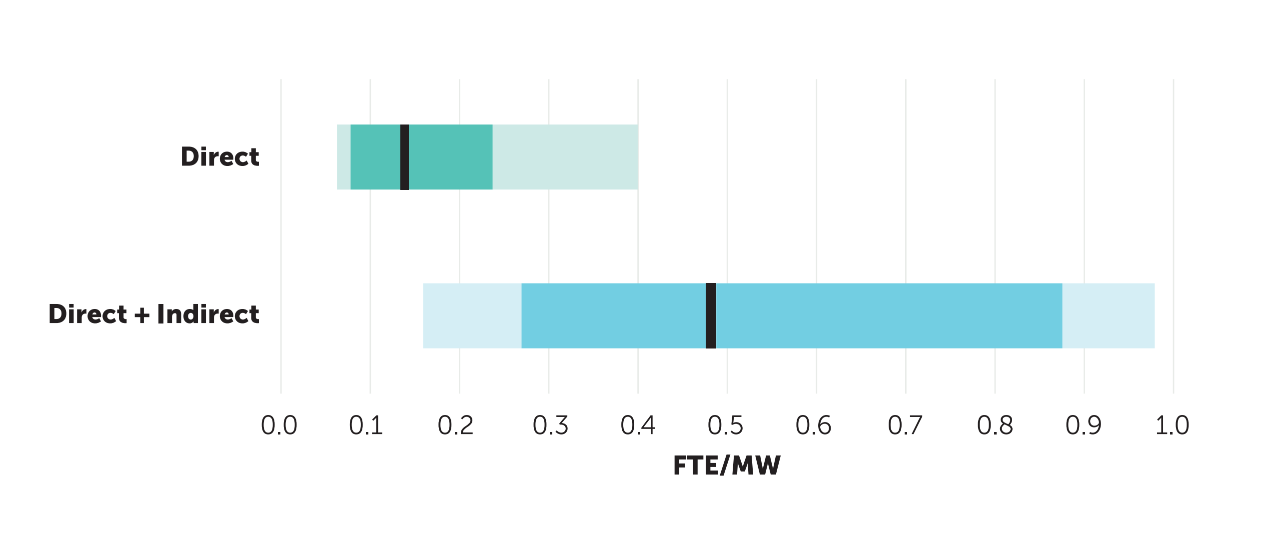


Figure 2 – FTE/MW. Medium intensity colours mark the used range (P20 – P80). Dark colours refer to the P50 and light ones to the full range of data gathered.

The operations and maintenance phase is expected to last between 20 and 30 years, and is likely to become longer as the technology matures and turbine lives are extended and upgraded.[3] The activities performed in this phase are related to the daily operations and maintenance of the windfarm and the repairs or replacements required to fix faults and increase the capacity of the projects (amount of time that the wind farm is capable of producing electricity).

Due to the duration of the operations and maintenance phase and the nature and location of the project, these activities are usually performed by local trained and highly-skilled employees, benefiting not only those performing them but also the region in which they are living.[4]

Employment multipliers

A recent study[5] investigated the employment requirements for offshore wind projects around the globe (comprising over 30 developments from US and Europe). This provided a set of multipliers to allow for the estimation of the annual full-time equivalent[6] (FTE) regional jobs for any offshore wind farm based on the generation output of the project.

The following two employment categories are proposed to be used to incorporate not only the people working in the offshore wind farm, but also those working in the related supply chain:

- "Direct" jobs refer to those immediately involved in the windfarm activities, either employed by the operator or contractors.
- "Indirect" jobs include people employed by suppliers or sub-suppliers of the windfarm that also provide services or materials for other industries.

Figure 2 shows the range of multipliers found in existing developments, highlighting the range considered to be valid and therefore recommended for future estimations. Table 1 shows the range in employment multipliers for direct and indirect jobs.

Table 1 – Developed local O&M Employment multipliers

		P20	P80
FTE/MW	Direct	0.08	0.24
	Direct + Indirect	0.27	0.88

3 GL Garrad Hassan. (2013). A Guide to UK Offshore Wind Operations and Maintenance.

4 QBIS. (2020). Socio-economic impact study of offshore wind. https://winddenmark.dk/sites/winddenmark.dk/files/media/document/Technical%20report-Socioeconomic%20impacts%20of%20offshore%20wind-01.07.2020.pdf

5 Perez Gaido G., Jun 2021. Offshore wind in Taranaki. Assessment of potential regional long-term employment and expenditures. The University of Auckland.

6 1 FTE = 1 full time job (40 hs per week); 2 persons working 20hs/week are considered 1 FTE

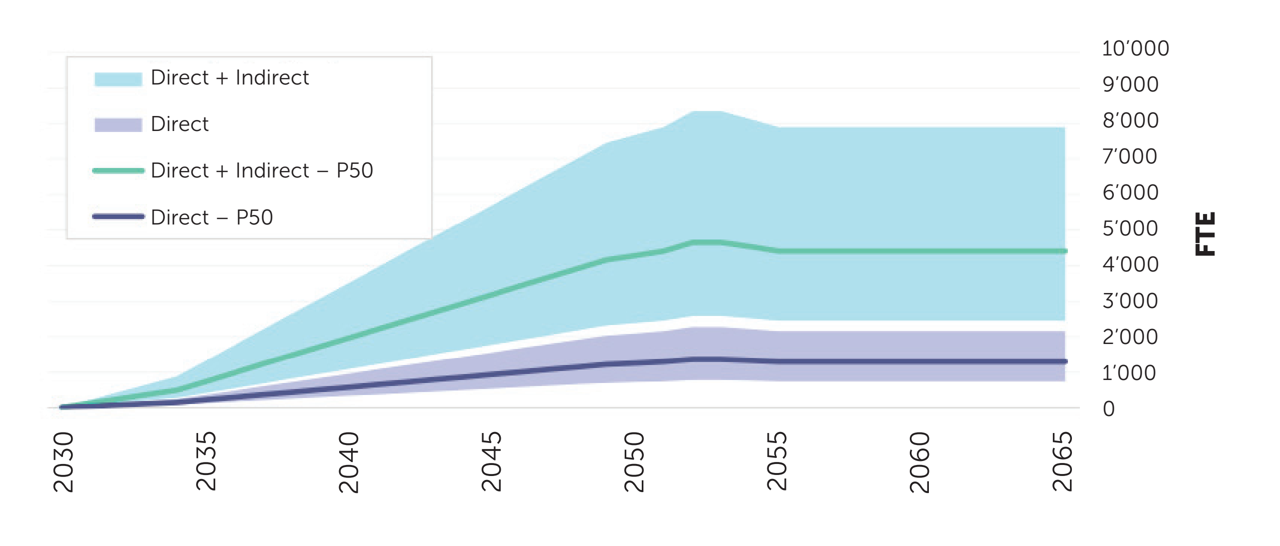


Figure 3 - Indicative development O&M employment requirements

Employment multipliers

We have assumed that an offshore wind installed capacity of 10 GW will be developed across New Zealand region within 20 years. As the industry scales up, the supply chain will further develop to allow for faster deployment. Our analysis also anticipates that a refurbishment of key components will occur after 20 years of operation.

Figure 3 shows the estimated employment requirement range for the indicative development scenario. It is expected that around 1,000 people directly and up to 4,000 people directly and indirectly will be employed within the first decade to work on offshore wind farms or as part of the supply chain. Once all the offshore projects are operational (by 2050), it is estimated that the O&M related activities would require 4,400 employees on a 50% probability basis, with a range between 2,500 and 8,300 employees.

Offshore wind farm construction and components production: additional employment opportunities

While the jobs related to the operations and maintenance phase provide a long-term employment opportunity and are more likely to be sourced locally, the construction and component manufacturing phases require a large number of people to deploy the turbines, substations, cables and several other components of an offshore wind farm.

It is important to recognise that the offshore wind sector has to date often been more successful than other renewable energy technologies in achieving enduring local content and supply chain outcomes. We cannot assume that this will be the case in New Zealand where we have a lower manufacturing base than other countries however, its remoteness may provide the vehicle for developers to foster a local supply chain and expertise.

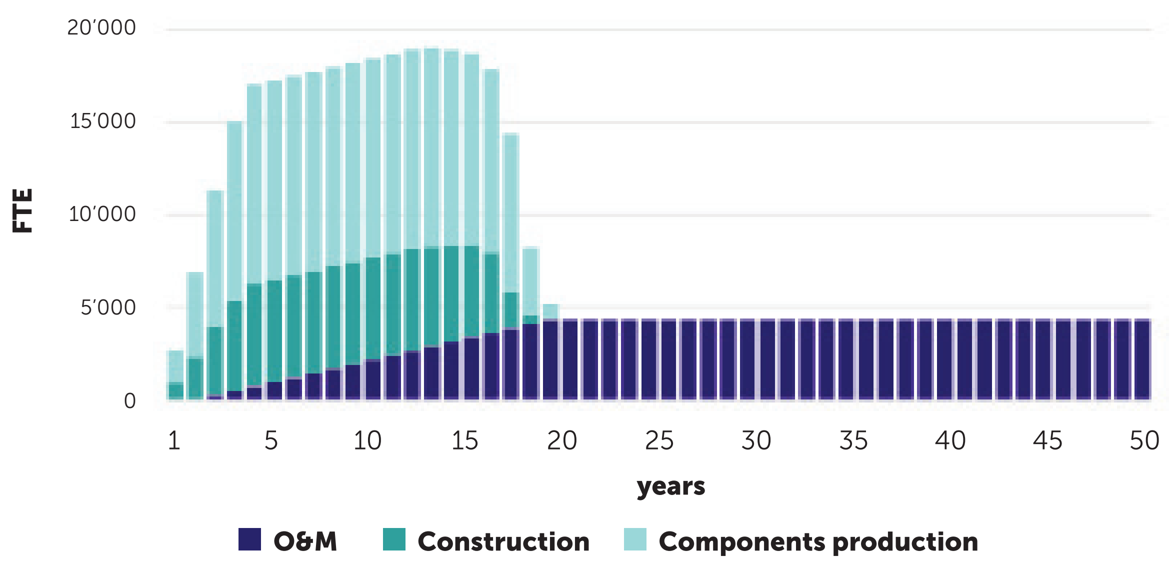


Figure 4 - Local full time Equivalent jobs per year[7]

Figure 4 presents an estimation of the employment related to each of the mentioned phases, averaging 17,000 full time jobs for approximately 15 years during the investment phase. Of those, approximately 5,500 jobs are related to the construction phase.

While usually employing experienced and technically knowledgeable people, a development of this duration would increase the likelihood of several thousand being sourced locally. The component production phase would require almost 11,000 full time workers per year for a decade from the 5th year of development. For these jobs to be sourced locally, it is fundamental that the components are also produced locally. A large-scale development is required to justify building factories to enable the mentioned component production.

It has been estimated that for a 4 GW development, 20% is highly likely to be sourced locally. This value increases to 40% in an 8 GW development.[8] Following this reasoning, it can be expected that for the presented indicative scenario half of the jobs could be sourced locally to produce some of the components that will be used in the wind farms.

Summary

The development of an offshore wind industry in New Zealand has been modelled on the assumption that 10 GW of projects are installed and help power decarbonisation of the economy and energy exports. To support this industry, the research indicates there will be enduring employment of 4,400 people for operations and maintenance functions. The construction and product manufacturing phase can be expected to employ up to 17,000 people, although to capture a significant portion of this work over the long-term New Zealand and our partners will need to invest in developing the local supply chains and skills base.

7 Adapted from: BVG Associates Limited, 2017. U.S. Job Creation in Offshore Wind: A Report for the Roadmap Project for Multi-State Cooperation on Offshore Wind.

8 BVG Associates Limited, 2017. U.S. Job Creation in Offshore Wind: A Report for the Roadmap Project for Multi-State Cooperation on Offshore Wind.

What is needed to successfully develop an offshore wind industry in New Zealand

SARAH SINCLAIR
Chair of MinterEllisonRuddWatts and a Member of the New Zealand Infrastructure Commission, Te Waihanga

Do you see offshore wind playing a part in the future of New Zealand's energy system?

Aotearoa has long considered itself fortunate to have a relatively high proportion of renewable energy production (hydro, onshore wind and geothermal), however there is now a significant and renewed focus on New Zealand's electricity generation portfolio and the changes that are required to meet both increasing energy demands and New Zealand's net-zero carbon by 2050 aspiration (with these zero emission targets now reflected in legislation).

As a country brimming with renewable energy resources, this has recently led to a focus on new opportunities available to New Zealand to leverage its low-emissions resources – this includes offshore wind. Although, to date, no consent applications (under the Resource Management Act environmental consenting regime) have been made for the development of offshore farms, it is starting to emerge as a topic of discussion at a national and regional level.

The New Zealand Government has identified both opportunity and interest in the development of offshore windfarms – for example through the "Wind Generation Stack Update" report published by the Ministry of Business, Innovation and Employment (as part of its 'generation stack' which is developed to assist with the government's modelling of how forecast electricity demand may be met). The Wind Generation Stack identifies potential sites for offshore wind, takes a view as to costs and likelihood of development and also the hurdles for the development of offshore wind in New Zealand (such as cost, supporting infrastructure and size of market). Given historic views that offshore wind has simply not been an option in New Zealand, it is significant that this report identifies sites and considers that "the possibility of offshore wind in New Zealand cannot be ruled out." Whilst this may not appear as a resoundingly positive statement, it is most certainly a step in the right direction!

Is the potential of offshore wind recognised by Te Waihanga – New Zealand's Infrastructure Commission?

The opportunity for offshore wind is now on the radar of New Zealand's infrastructure body, Te Waihanga New Zealand Infrastructure Commission. The Commission recently released its 30-year Infrastructure Strategy for consultation which identifies the opportunity for offshore windfarms to play a significant part in New Zealand's future energy system, thereby leveraging our low-emissions energy resources and supporting the net-zero strategic direction. However it considers that they are not yet commercially competitive. The strategy frames this within the wider economic benefits for New Zealand:

> *By harnessing our low-emissions energy resources alongside other complementary technologies like hydrogen, we could treble our annual electricity supply. If we harness these resources, we can attract energy-intensive industries to grow our economy, create higher paying jobs and improve our quality of life. This is good for us and it's good for the planet.*

There are a number of industry bodies that have a strong interest in the potential of offshore wind – this includes Ara Ake, the government-backed national new energy development centre with the mission of supporting New Zealand's transition to a low emissions future. Venture Taranaki held the first offshore wind conference in November 2020 with support from Ara Ake. This year Venture Taranaki and Ara Ake are co-hosting the offshore wind energy forum with support from other industry bodies including the New Zealand Wind Energy Association, the Aotearoa Wave and Tidal Energy Association, WITT, Bluefloat Energy, Energy Estate and Elemental Group.

What are some of the challenges you think will need to be overcome?

As with any change, we need to make sure we have the right settings to enable the opportunity to be realised. For offshore wind in Aotearoa, this includes the need to critically examine the regulatory settings (including the planning system) and to ensure that we have the right supporting infrastructure in place. A key constraint is the infrastructure required in a long skinny isolated country to support the development of offshore wind - planning of offshore windfarms will for example no doubt require hand-in-hand strengthening of the transmission grid. The potential for offshore wind to anchor green hydrogen and e-fuels industries will also need to be carefully considered.

The Taranaki region is a logical place to start when thinking about offshore wind – it could be regarded as New Zealand's traditional energy centre as the home of the oil and gas sector – and now home to Ara Ake. In this regard, it has managed licence blocks for the oil and gas sector (and understands that regime) and sits on a coast with a wonderful offshore wind resource. Taranaki also has a concentration of infrastructure and technical expertise, and an economy that has supported and understands the importance of the energy sector to New Zealand. Energy production enjoys a social licence in this region which is not always the case across the rest of the country.

How we gear up for large projects is front of mind not just in the energy sector but more widely as New Zealand looks at a significant programme to address its infrastructure deficit in a sustainable decarbonised way. Across the board there is a conversation about how the infrastructure sector can deliver on this programme – energy, transport, water, and social infrastructure. This conversation is required at a national coordinated level to consider how the programme is delivered including through supporting infrastructure, legislative frameworks and resources.

What types of skills will be required for the offshore wind industry?

A skilled workforce – including a highly skilled services sector – is critical to enable these opportunities to be realised. We need to be gearing up and engaging with the whole eco-system that is required to deliver large projects – from engineers and designers, market modellers and technical forecasters, project managers, planners, lawyers, economic and commercial advisors – and critically the iwi and the community.

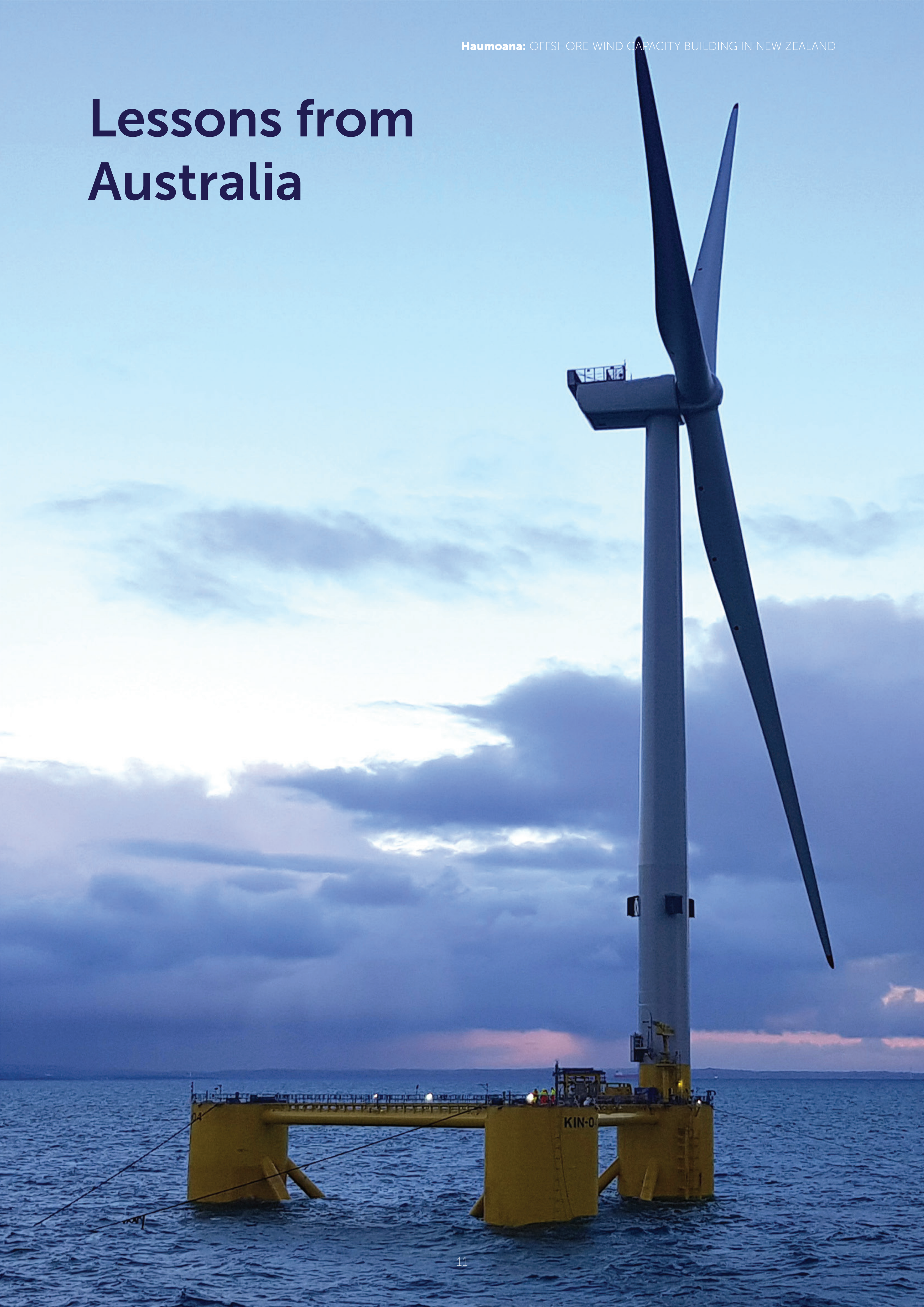
Whilst offshore wind will be new to Aotearoa and we will want to access international knowledge, experience and expertise, there is a skilled workforce in New Zealand, particularly in Taranaki from its oil and gas history, that can be leveraged. There are also a range of skills that are unique to and can only come from within New Zealand – in particular in relation to iwi engagement.

Offshore wind projects require years of development activity before construction starts. From a jobs and skills perspective this means that people will be employed, and services contracted, well before any construction activities are started. The teams in the Taranaki region who have supported the development and operation of the offshore oil and gas sector have the right skills and experience to pivot to the development of this industry – from the issues faced in consenting, onshore infrastructure or seafloor conditions.

The offshore wind sector is infrastructure heavy with strong dependence on ports, transmission and construction supply chains. The experience globally is that planning for the growth of the industry is required from the outset and collaboration between stakeholders is key. There will be exciting opportunities to support the industry by managing government relations at national and local level and ensuring that the different voices and concerns are heard and addressed.

I see that the development of the offshore wind industry in Aotearoa can play a key part in our long-term infrastructure goals and help us build a skill base which is transportable to other industries and can also be exported across the region.

Lessons from Australia



Employment in an emerging offshore wind market

CHRIS BRIGGS
Research Director at the Institute for Sustainable Futures, University of Technology Sydney

In Australia, there are currently more than 10 offshore wind projects under development with a combined capacity of over 16 GW. A recent study by the Commonwealth Scientific Industrial Research Organisation (CSIRO) and the Institute for Sustainable Futures, University of Technology assessed the potential for offshore wind in Australia.[9] Resource mapping found Australia has an abundance of high-quality sites for offshore wind – along the coast of New South Wales, the Bass Strait near Victoria and Tasmania and the coast of South Australia and Western Australia. At a range of offshore wind sites, capacity factors were found to be higher than the nearest onshore wind sites (usually 10-15%, sometimes up to 25%) and a different generation profile that can complement onshore solar and wind.

Australia is blessed with an abundance of high-quality onshore solar and wind energy sites which will dominate new renewable energy generation in coming years, but offshore wind could become a strategic resource. Diversifying electricity generation sources to include offshore wind can reduce some of the risks, constraints and impacts with the build-out of onshore renewable energy. Under the Step Change scenario in Australian Energy Market Operator's Integrated System Plan (AEMO, ISP) for the future electricity system, 50 GW of renewable energy generation would be built by 2035. Most of the coal plant closures are scheduled to occur in the late 2020s and early 2030s but there is high uncertainty over the pace and timing of closures. In this context, diversifying to offshore wind would be strategic:

- the combination of high-capacity factors and scale enables the construction of capacity equivalent to multiple on-shore projects with lower risk around timeframes. An offshore project could be 1.5-2GW under one set of agreements, whereas onshore wind farms are generally 200 – 600MW.
- offshore wind can connect near to existing electricity infrastructure built around coal power plants near the La Trobe Valley and Hunter Valley.
- as the scale of onshore renewable energy development increases towards 50 GW, there may be increased conflicts over land use and community acceptance.
- The ability to build and connect a large volume of renewable energy through a single project could be a valuable resource to mitigate against risks of a disorderly transition later in the decade.

The larger opportunity for offshore wind however is as a source of electricity to support the development of Australia as an 'energy superpower'. A series of major energy market bodies have identified the opportunity for Australia to become a green energy superpower, replacing coal and gas exports with green hydrogen production for port-based export facilities, local heavy industry (e.g. 'green steel') and as a transport fuel.[10] [11] Within the National Hydrogen Strategy, the volume of electricity required for hydrogen production ranges from one-third to as high as four and a half times the size of the current National Electricity Market.[12] With electricity requirements of the scale under this type of scenario, hydrogen produced by offshore wind directly or through the supply of

9 Briggs, C., M. Hemer, P. Howard, R. Langdon, P. Marsh, S. Teske and D. Carrascosa (2021). Offshore Wind Energy in Australia: Blue Economy Cooperative Research Centre, Launceston, TAS. 92p.

10 Miller, D. (2021). *A Critical Decade* | LinkedIn. LinkedIn Blog. https://www.linkedin.com/pulse/critical-decade-darrenmiller/?trackingId=90OYFrqSRymhpJtFlFazRQ%3D%3D

11 Transgrid (2021) *Energy Vision: a Clean Energy Future for Australia*, https://www.transgrid.com.au/media/x4mbdody/transgrid_energy_vision.pdf

12 COAG Energy Council (2019) National Hydrogen Strategy, https://www.industry.gov.au/sites/default/ f iles/2019-11/australias-national-hydrogen-strategy.pdf

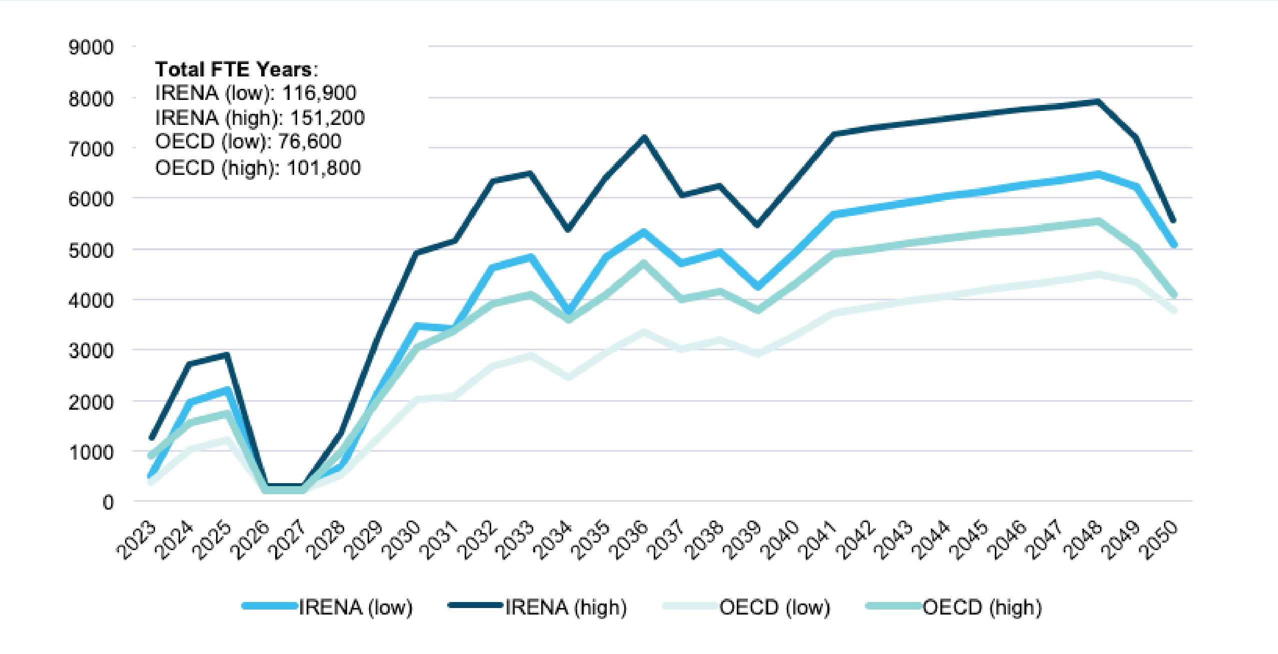


Figure 5: Blue Economy CRC Employment Scenarios for Offshore Wind in Australia

Note: due to uncertainty over labour intensity, two different employment factors were used for construction, manufacturing and operations and maintenance from a study by the International Renewable Energy Agency (2018) and a review of various OECD projects and literature (Briggs et. al. 2021). Under the 'low' manufacturing scenario for both employment factors, it is assumed there is a 10% share of manufacturing and in the high scenario a 25% share.

electrolysers located in port facilities could play a significant role – which is now being incorporated into AEMO's ISP modelling.

Offshore wind can play an important role in providing alternative employment for fossil fuel workers, especially in the offshore oil and gas industry as well as coal fired power stations. International experience has shown that the main pathways into offshore wind from technically-related sectors (such as offshore industries and the energy sector) include workers with skills that cut across sectors (such as business / commercial, IT and data analytics, drone and underwater ROV operators) and new entrant apprentices and graduates.

The Blue Economy CRC report generated four scenarios to understand the employment potential, using different levels of labour intensity and local shares of manufacturing.

In the lower scenario, employment scales up to between 3,000 – 4,000 jobs annually from 2030 and in the higher scenario to 5,000 – 8,000 jobs each year. Oil and gas extraction currently employs around 20,000 – 25,000 people, with employment in the offshore sector likely to be less than 10,000. A key factor in the level of local employment is the share of supply chain and manufacturing which is the most labour-intensive phase. An increase in local share from 10% to 25% increases jobs per year by 1,000-1,500.

Australia and New Zealand should investigate opportunities for collaboration to increase local employment and industry development. Market scale and pipeline certainty is one of the barriers to increasing local employment. BV Associates (2017), for example, estimated an annual pipeline of 950 MW per annum, would be needed to attract manufacturing investment. The Victorian Renewable Energy Target implemented local content requirements which defined the scope of 'local' as Australia and New Zealand and there could be further opportunities to create a 'common market'. Supply chain and workforce mapping also needs to occur in both Australia and New Zealand which provides a platform for joint investigation to assess local opportunities.

An Australian perspective on local supply chain and capacity building in the renewable energy sector

SIMON CORBELL
Board Chair & Chief Executive Officer at the Clean Energy Investor Group and Chief Advisor at Energy Estate

Simon Corbell is Chief Adviser at Energy Estate and CEO of the Clean Energy Investor Group, representing institutional investors with wind and solar assets worth $11 billion across the Australia national electricity market. Simon has more than two decades of senior experience in public policy leadership, governance and implementation.

Between 2017 and 2019 he was the Victorian Renewable Energy Advocate, advising the Victorian state government on renewable energy policy and projects, including the Victorian renewable energy auction scheme. From 1997 to 2016, Simon was a Member of the ACT Legislative Assembly, serving as Deputy Chief Minister of the Australian Capital Territory and in a wide range of ministerial portfolios including climate change, energy, water and the environment. His advocacy for a strong climate change policy for Canberra saw the ACT achieve national and international recognition as a best-practice jurisdiction, achieving 100% renewable energy by 2020 and with a target of net zero emissions by 2050.

In 2019 he received the Clean Energy Council's recognition for Outstanding Contribution to Industry by an Individual for his advocacy of sub national government renewable energy auction schemes. Simon is widely recognised as a leader in the areas of renewable energy, climate change mitigation and adaptation, urban sustainability and public transport. Simon is an Adjunct Professor at the University of Canberra and an Honorary Associate Professor at the Australian National University.

What are the lessons learned from the ACT renewable energy program?

The key lessons of the ACT's renewable energy program, in the context of supporting supply chain and local economic development outcomes, is the importance of linking procurement and development activities with broader economic development objectives.

The ACT Government's program of large renewable energy procurement, by the awarding of long-term offtake agreements, secured approximately 900MM of large-scale wind and solar development to deliver the equivalent of 100% clean energy for the Australian Capital Territory.

The award of these contracts was based on a range of criteria, including price, project delivery and a number of other technical, planning and financial factors. However, a key criterion was a requirement for project developers to deliver enduring economic development outcomes for the ACT.

This procurement requirement meant that developers were incentivised to identify suitable long-term economic development activities which would contribute to the long-term growth of the ACT's knowledge-based economy. Project proponents worked with tertiary education institutions, ACT based professional services firms and the government to deliver over a $500 million of direct investment into the ACT economy over the life of the project scheme.

The successful implementation of this mandated economic development objective was realised through clear guidelines and target areas for private sector participants to focus on, while still permitting flexibility in approach and potential benefits. This saw innovation from competing proponents deliver the most significant economic development outcome.

What are the enduring success stories from this program?

The enduring benefits of this program can be seen in three key respects.

Firstly, through the establishment of an ACT based renewable energy sector. The ACT company, Windlab, based its headquarters in Canberra to grow its wind development and operations capability. This major office presence has recently grown in profile following the company's acquisition by Australian billionaire Andrew Forrest. French clean energy developer Neoen also established its wind development and Australian operations centre in the ACT. From a small office of only 3 people, Neoen's Canberra office now employs approximately 50 locally, and is the largest office for the French global clean energy developer outside of its Paris HQ. Spanish based GPG also maintains a wind development and operations facility in the city for its growing portfolio of wind assets in Australia.

Secondly, through strong investment in the ACT tertiary education centre, the Australian National University has received 20 commitments for funding focused on renewable energy technical training and research activities, including for wind resource mapping qualifications and development of its Battery and Grid Integration Program. The technical trade training institution, CIT, has also received funding for the ongoing development of Australia's first wind turbine trades training program.

Thirdly, through innovation and technology transfer. Key commitments from successful proponents have enabled the provision of hydrogen fuel cell vehicles for the ACT government's fleet, along with the establishment of Australia's first public hydrogen refueling station.

What can New Zealand take from Victoria's approach to renewable energy procurement under Victoria Renewable Energy Targets?

The Victorian Renewable Auction Scheme adopted a similar approach to the ACT scheme, mandating local outcomes as part of its own renewable energy procurement approach. As a larger economy, similar in scale to the New Zealand economy, with substantial manufacturing and fabrication capability, the Victorian Government was able to leverage local wind tower manufacturing capability and enable it to expand its operations. It was also able to secure investment, building local electricity transformer manufacturing capability and the development of an expanded apprenticeship workforce in this key area of area of future industry supply chain. Victoria was also able to see investment in local skills and trade training capability, mirroring the ACT approach, with a dedicated wind turbine maintenance trades training facility in a key regional centre.

These outcomes highlight the value of private investment which can be leveraged to grow a local renewable energy industry and supply. Similar opportunities for local component manufacture, trades training and skills development, are available with the right policy approaches and private sector commitment.

What opportunities do you see for Trans-Tasman co-operation in the offshore wind sector?

Offshore wind development will be a key new clean energy resource development sector for Australia and New Zealand. Offering opportunities for a more diverse generation profile and balancing the performance of onshore wind and solar in meeting grid requirements, offshore wind will require substantial new local supply chain development or augmentation across both the Australian and New Zealand economies.

New Zealand and Australia have steel manufacturing industries which can collaborate to deliver local solutions for the industry. Steel fabrication and component assembly capabilities can be shared across both markets, offsetting the energy and cost intensive requirements of shipping certain components from distant markets. Both countries are also well placed to transition their steel industries to green steel due to the abundant renewable resources.

Skilled trades are already portable between the jurisdictions and opportunities exist for creating first of kind trades training for offshore wind operations. Existing capabilities and experience in the marine and offshore oil and gas sectors should also be explored, and new partnerships created that enable existing workforces to pivot into a new offshore wind sector as it develops. The stretch goal is to create a Trans-Tasman centre of excellence which can serve the domestic industries and support the wider Asia-Pacifc markets as the offshore wind industries expands across the wider region.

Learning from Global Experience

UK Offshore Wind: Growth and Measurement of the Supply Chain

PETER CONWAY
Director Energy Estate UK

In August 2013, the UK Government published the Offshore Wind Industrial Strategy which was developed in partnership with industry.[13] Its vision was that:

> ***"Industry and Government work together to build a competitive and innovative UK supply chain that delivers and sustains jobs, exports and economic benefits for the UK, supporting offshore wind as a core and cost-effective part of the UK's long-term electricity mix."***

Initial development of wind projects had no specific requirement for UK content, this being defined as *"the percentage of the total undiscounted expenditure by the Wind Farm Asset Owner on a Wind Farm that is ultimately spent through Contracts awarded to companies operating in the UK"* (excluding amounts spent on sub-contracts to companies not operating in the UK).

Given the strong financial support through initially the Renewables Obligation ("RO") and thereafter Contracts for Differences ("CfDs"), UK content was a sensitive issue and in 2014 methodology was implemented to track UK content, broken down between:

- The generation asset - includes the turbines, foundations, array cables and the offshore substation medium voltage switchgear; and
- The transmission asset - For wind farms with high voltage (HV) alternating current (AC) transmission, transmission assets include the onshore substation and offshore substation(s) (if present) and the onshore and offshore HV (export) cabling. The transmission asset is ultimately under the ownership of the Offshore Transmission Owner (OFTO). For wind farms with HV direct current (HVDC) transmission, any HVAC infrastructure (cables and collector stations) is part of the generation asset.

The focus initially on measurement delivered an initial focus on UK content and accelerated the significant growth in the supply chain that was underway. This was given significantly greater focus following Brexit (the leaving of the UK from the European Union), when the UK formalised the requirement for at least 60% UK content in order to be eligible for the full CfD.

This section provides some examples of capacity building on the River Humber and the River Tees, both of which have a rich petrochemical heritage but were declining along with UK oil and gas reserves and which have been reinvigorated through the demands of offshore wind growth in the North Sea.

Humberside and the River Humber

Siemens Gamesa: 2014-2016 (Phase 1)

The development of major items for offshore wind turbines in the UK was kick-started by the development by Siemens Gamesa Renewable Energy of its original blade factory at its site in Hull on the north bank of the River Humber.

This was completed in 2016 by VolkerFitzpatrick and comprised a 3.4 ha site to supply what were then the leading edge (in terms of length) wind turbine blades, to the early North Sea wind farms.

The evolution of the blade size has seen an increase from the initial 154m 6MW blades through to the current manufacture of blades of 200m and 11MW.

Year	Model	Rotor Diameter	Capacity
2014	SWT-6.0-154	154m	6MW
2017	SWT-7.0-154	154m	7MW
2019	SG 8.0-167 DD	167m	8MW
2022	SG 11.0-200 DD	200m	11MW

In the period from 2016, the plant produced more than 1,500 blades at the factory.

13 Offshore Wind Industrial Strategy - Business and Government Action, HM Government, August 2013

Able Marine Energy Park

This development by Siemens Gamesa was supplemented by the development of ABLE Marine Energy Park, situated on the South bank of the Humber Estuary.

AMEP was designed to meet the needs of the offshore wind sector and offers 1,349m of new heavy-duty deepwater quays and 217 hectares (potentially expanding to 331 hectares) of developable land. The facility provides a multi-user facility for the manufacture, storage, assembly and deployment of next generation offshore wind turbines and their associated supply chain(s) and is particularly suited for the deployment of new generation jack-up installation vessels.

This integrated cluster on the Humber has been designed to enable relationships between manufacturers and key suppliers to be enhanced, allow a critical mass of activity in one geographic area, shortening 'time to market' and accelerating installation rates through an optimal deployment location (long quays, designed to -17m CD) in close proximity to market.

Siemens Gamesa Expansion (Phase 2)

The rapid development of the offshore wind industry and Siemens Gamesa's desire to retain its place as a leading supplier of offshore wind turbine technology has resulted in its decision to double the size of its Humber offshore wind turbine blade factory through a £186 million investment in its manufacturing facility in Hull, creating 200 new direct jobs and safeguarding hundreds more. The decision was confirmed in September 2021 and the expansion will be undertaken by VolkerFitzpatrick, who built the initial facility.

It will expand its offshore blade factory by 4.2 hectares, more than doubling the size of the manufacturing facilities and is planned to be completed in 2023. It will allow the manufacture of the next-generation offshore wind turbine blades and assist in meeting Siemens Gamesa's offshore wind power order backlog of €9.4 billion (announced during its Q3 FY21 results presentation on July 30, 2021).

When set against the original blade diameter of 154m and 6MW, the growth to the anticipated 236m 14MW blades over a period of just 10 years

demonstrates the rapid scaling up that has taken place in the offshore wind sector.

Year	Model	Rotor Diameter	Capacity
2024	SG 14-222 DD	222m	14MW
2024	SG 14-236 DD	236m	14MW

Teesside and the River Tees

Developments at Teesside have been led by Able UK through its **ABLE Seaton Port ("ASP")**. Possessing some of the strongest quays in Europe, ASP has become a key provider of fabrication and assembly services in the offshore wind sector. Able to undertake offshore wind manufacturing activities as well as the full erection/assembly of offshore wind turbines, since 2016 it has become a key location for manufacturing, construction and deployment of offshore wind turbines and associated components.

The site is capable of undertaking a range of activities including blade manufacturing and testing, cable manufacturing and storage, offshore wind turbine component pre-assembly and operations and maintenance.

The dry dock is ideal for the construction/fabrication of large-scale components such as gravity based (concrete) foundations, allowing for a variety of manufacture and load out concepts to be tested and implemented. The dry dock can be used for prototype and serial manufacture of gravity-based foundations.

GE Haliade-X Generaors and Supply for Dogger Bank

Supplementing the existing ASP facilities, in March 2021 GE announced the development of a new blade manufacturing facility at the Seaton Port site. LM Wind Power will establish and operate the plant which will produce its 107m long offshore wind turbine blades which will go into GE's Haliade-X, which it claims to be the most powerful offshore wind turbine in operation.

It is estimated that the new plant, set to start production in 2023, could create up to 750 direct renewable energy jobs and up to 1,500 indirect jobs in the area. The plant will initially provide the turbines for the Dogger Bank Wind Farm project.

Offshore Wind in New Zealand – the potential role of Corporate Power Purchase Agreements

JEREMY MACIVER
DLA Piper

Large scale renewable energy projects usually need to secure guaranteed, stabilised long-term sources of revenue to reach financial close and proceed to construction. In the global offshore wind sector, these fixed income streams were initially provided through revenue-stabilising measures backed by governments. Over the last decade, corporate procurement of renewable energy has played an increasing role in accelerating the development of offshore wind farms. In this section of the report, we look at the lessons from the UK and other offshore wind markets, as well as examine the potential for corporate PPAs in New Zealand generally and how they can accelerate the development of the offshore wind industry.

Lessons from the UK and other markets

The UK offshore wind sector is the largest in the world and a major driver behind its success has been the subsidy schemes and government initiatives implemented to support renewable generation in recent decades. The two major initiatives for encouraging large scale investment in the UK have been the Renewables Obligation (RO) scheme and the Contracts for Difference (CfD) scheme. The RO was introduced in the UK in 2002. Renewables Obligation Certificates (commonly known as ROCs) were issued to generators to certify their renewable generation. Electricity suppliers were obliged to supply a specified amount of electricity to their consumers from renewable sources and compliance was demonstrated by the use of ROCs. This created a market for ROCs and therefore provided an additional revenue stream for generators of green energy.

Trading-based support schemes like the RO emerged in several countries in the 2000s including Sweden, Belgium, the Netherlands, and Australia. The development of offshore wind farms was accelerated under the RO by awarding early-stage offshore wind projects 2 ROCs per MWh of electricity that they generate (for reference, onshore wind projects would only receive 0.9 ROCs/MWh). Under the RO regime offshore wind farms would have two primary sources of revenue – the ROCs and the electricity generated. It is important to note that while the value of ROCs generated by an offshore wind farm was effectively fixed the electricity price was dependent upon prevailing wholesale power prices in the UK. In many cases the offshore wind farm would enter into a bundled arrangement with ROCs and electricity sold to the same market participant.

In other European markets the preferred method of support for offshore wind have been Feed-in Tariffs (FiTs) and Contracts-for-Difference (CfDs). The emerging Asian offshore wind markets such as Taiwan, Japan and China are currently based on FiT regimes. In simple terms, under a FiT the offshore wind farm receives a fixed price for every MWh of generation which mitigates their long-term exposure to fluctuating electricity market prices. The government is usually the counterparty to the FiT, either directly or through local utilities which are entitled to pass on the costs of the FiT to their customers. A variant to a FiT is a Feed-in Premium regime - where the seller receives a premium on top of the price of electricity sold into the market if the price falls below a guaranteed minimum level.

A CfD operates slightly differently but also results in the offshore wind farm receiving a fixed price for electricity generated. The UK moved from the RO regime to a CfD regime over the last decade. A CfD is usually structured as a two-way transaction in which the generator may be required to compensate its CfD counterparty if the market price for electricity exceeds the fixed price agreed in the CfD. Across Europe, Feed-in Premium schemes (or one way CfDs) have proven to be the most popular and successful support schemes for offshore wind development. This includes the Feed-in Premium schemes in Germany and the Netherlands which operate with a one-way CfD structure.

Over recent years Europe and other markets have moved from FiTs and CfDs being set at a fixed level by governments to a reverse auction mechanism. The winning bidder offers the lowest fixed price and is awarded the contract with the government.

Investors and financiers have generally preferred the CfD scheme to the ROC scheme for a number of reasons. Firstly, a project is often awarded a CfD prior to final investment decision (FID) whilst projects could not become accredited to receive ROCs until they were commissioned. Secondly, whilst ROCs were intended to provide projects with an additional fixed revenue stream, this was not always the case. Although on paper the value of ROCs was underwritten by a balance between supply and demand, in practice the sale and purchase of ROCs became a buyer's market which suppressed the price at which generators could sell their ROCs. This has also happened in Australia as the supply of LGCs (the Australian equivalent of ROCs) has out-stripped the legislated level of demand and forecast revenue from LGCs no longer plays a material part in the economics of Australian wind and solar projects.

Thirdly, the RO regimes did not provide protection to a project against the risk of low or volatile electricity prices. In contrast, the CfD scheme fixes the electricity price that a generator will receive and therefore mitigates the long term price risk for the project which is attractive for investors such as infrastructure and pension funds.

What is a Corporate Power Purchase Agreement?

Corporate power purchase agreements (cPPAs) offer very similar benefits to renewables projects as government backed CfDs. The most significant similarity is that a cPPA also provides a developer with a long-term fixed price for the electricity that it generates.

Whilst there are various forms that a cPPA can take, they most commonly involve a direct contract between a generator of renewable energy (PPA Seller) and a consumer of electricity (the PPA Buyer) in respect of one or more specified renewable sources owned by the PPA Seller. This has the net effect of hedging both parties' exposure to wholesale market prices. Instead of corporates purchasing electricity directly from the wholesale market or from a utility or retailer they contract directly with the generator.

Corporates have a variety of different reasons to source power from renewables by incorporating cPPAs into their energy strategy. The possibility to secure lower and fixed electricity costs has been a major factor in their growing popularity. A recent survey of 1,200 companies found that 92% that were sourcing from renewable energy technologies were doing so to reduce their electricity costs. In the face of a steep global decline in the price of renewables, companies are entering the PPA market to take control of their electricity costs. Another reason why corporates enter into cPPAs include meeting their ESG and sustainability goals. Organisations like Rocky Mountain Institute, RE100, Renewable Energy Buyers Alliance (REBA) and Business Renewables Centre-Australia play a key role in accelerating the take-up of cPPAs by corporates around the world.

New Zealand market and the opportunity for cPPAs

The New Zealand market has experienced increasingly high and volatile wholesale electricity prices in recent years. Since 2018 the average daily spot price has been above $100/MWh. The average spot price for 2019 was $119/MWh, in 2020 it was $105/MWh, and for 2021 to 30 June it was $239/MWh. For comparison, the average price from 2009 - early 2018 was $67/MWh. In July 2021 alone, electricity prices increased by 15.4% for commercial consumers of electricity. This month the Electricity Authority, New Zealand's electricity regulator, released their information paper on 'Market Monitoring Review of Structure, Conduct and Performance in the Wholesale Electricity Market'. In this paper, the Electricity Authority reported that they have *"observed evidence to suggest that prices may not have been determined in a competitive environment". It was noted that "generators have an increased incentive and ability to exercise market power".*

In light of the figures above, it is clear that there is an incentive amongst corporate offtakers in New Zealand to secure fixed price long term arrangements where possible. By contracting directly with a new onshore or offshore wind farm, users of electricity can substantiate claims for additionality which is now seen as a key criterion by organisations such as RE100 and REBA. Additionality means that a corporate has not just agreed to purchase renewable electricity but has done so from a project that is not operating or even in construction (so the purchase is additional and new renewable capacity is added to the system). Corporates are also able to verify that they have contracted with renewable generation and reduced their Scope 2 GHG emissions by utilizing voluntary market renewable energy certificates. As companies develop their ESG policies there has been a clear trend in corporates seeking to reduce their carbon footprint. This factor has been particularly noticeable amongst the Big Tech sector, which has played a very significant role in the cPPA market for many years.

Whilst the New Zealand cPPA market remains in its early stages, activity has recently picked up pace led by the Major Electricity Users' Group (MEUG). DLA Piper recently advised Contact Energy on cPPAs with members Oji Fibre and Pan Pac. These were the first and second cPPAs to have been closed in New Zealand.

The emergence of cPPAs is also changing the procurement activities by the major retailers, which mirrors what has happened in other markets. Tilt Renewables and Genesis Energy concluded a 20-year power purchase agreement in 2019 in respect of the entire output from Genesis' Waipipi wind farm. The two parties have also recently concluded a similar transaction in respect of Genesis' Kaiwaikawe wind farm. This supports Genesis selling carbon neutral products to the market.

In New Zealand, all cPPAs to date have taken the form of financially settled agreements (otherwise known as synthetic cPPAs). Financially settled cPPAs are based on the same contractual principles as CfDs. Despite the name, a financially settled cPPA does not involve the direct sale or purchase of electricity. Instead, the parties agree a fixed price which is set at a specified rate of $/MWh (Strike Price). To the extent that the New Zealand wholesale market price for electricity (Final Price) is higher than the Strike Price in a relevant period, the PPA Seller will make a payment to the PPA Buyer equal to the amount by which the Final Price exceeds the Strike Price for each MWh of electricity generated by the PPA Seller's facility. To the extent that the Final Price is lower than the Strike Price, the PPA Buyer will make a payment to the PPA Seller equal to the amount by which the Final Price exceeds the Strike Price for electricity generated by the PPA Seller's facility. The PPA Seller will then contract separately to sell its power to the grid at wholesale prices (or otherwise at its own discretion); the PPA Buyer will similarly enter into an electricity supply agreement for its physical consumption of electricity.

PPAs in the global offshore wind sector

It is likely that cPPAs will play a greater role in the early development of the New Zealand offshore wind sector than we have seen overseas. The New Zealand government offers no direct subsidies for renewable generation comparable to the schemes seen in Europe or Asia and no such intervention is anticipated in the near future. As generators will not be able to rely on government-backed schemes, they will either enter long term contracts with retailers or turn to the cPPA market. Moreover, corporates will be able to directly engage with the domestic offshore wind sector without facing competition with government backed tenders for renewable generation as happens in other countries.

The market for cPPAs in the global offshore wind sector has developed at a slower rate than the onshore wind and solar sectors. The first offshore wind PPA was only signed in 2018. This slow start was primarily due to the popularity of CfD schemes and the scale of offshore wind farms. Nevertheless, the volume of offshore wind cPPAs has grown rapidly in recent years. In 2020 almost 20% of new offshore wind generation in Europe was contracted under cPPAs. Earlier this year, DLA Piper advised chemicals multinational BASF on the acquisition of a 41% shareholding in the Hollandse Kust Zuid offshore wind farm in the Netherlands. BASF will also acquire electricity from the wind farm through a cPPA. Once fully operational, the wind farm will be the largest offshore wind farm in the world and will also be the first offshore wind farm in the world which does not receive any price subsidies for the power produced. In 2020 Ørsted signed one of the world's largest cPPAs in Taiwan with the leading semi-conductor firm, TSM. TSMC will offtake the full production from Ørsted's 920MW Greater Changhua 2b & 4 offshore wind farm. The 20-year fixed-price contract period starts once Greater Changhua 2b & 4 reaches commercial operations in 2025/2026.

It is unsurprising that offtakers have looked to the offshore sector to green their electricity consumption. Whilst offshore wind projects may take longer to achieve commercial operations than other technologies, they do present a number of benefits over rival generation sources. In particular, the ability of an offshore wind project to match an offtaker's demand profile is a significant advantage. This is largely due to the more constant and higher average capacity factor that an offshore wind farm offers in comparison to other technologies. Solar, for example, drops to 0% capacity factor during the night-time and onshore wind resources are generally more intermittent than offshore wind production.

Whilst historically real-time matching of generation and consumption has not been a priority for many corporate offtakers, this is likely to change in the near future. Corporates' ESG commitments and actions have come under increasing scrutiny in recent years and this trend will continue. Companies that do not deliver on their green commitments (or are found to be guilty of greenwashing) will suffer financial and reputational consequences. Therefore, it is likely that the time of generation and the time of consumption will become increasingly relevant and necessary for an electricity user when making claims regarding the green source of their electricity. It may become difficult for an offtaker to claim that their electricity is green when the generation profile of the relevant source does not match the offtaker's demand profile. Real-time matching is already a major consideration for a small number of the most advanced corporate offtakers in the global cPPA market. For instance, in September 2020 Google announced that by 2030 they will match on an hourly basis their electricity consumption from local grids with the carbon-free electricity acquired under their PPAs. Google has already closed cPPAs to achieve this goal. Similarly, last year German carmaker Daimler signed a real-time matching PPA with Statkraft AS and Enovos. We anticipate that this will become a key consideration for corporates in the future and New Zealand is well placed to attract energy users wanting real-time matching due to our high penetration of renewable energy and the potential for new offshore and onshore wind farms.

The relatively constant and high-volume output from an offshore wind farm also provides generators with a greater access to bulk generation than other technologies such as onshore wind or solar. On certain offshore wind cPPAs that we have worked on recently this has allowed the parties to contract tranches of baseload volume as well as tranches of pay-as-produced volume (which are generally sold at a lower price). This contractual structure and certainty of generation is more difficult to achieve via more intermittent generation technologies.

Offshore wind facilities can also be located offshore close to load centres, such as cities or large industrial areas, without the need for new long distance transmission lines. This is particularly relevant in New Zealand where load centres are generally coastal and would ensure that electricity is made available where is it needed most. In New Zealand there is a high degree of variance between nodal prices at any given point in time. This presents a risk to generators and offtakers as the price that they agree in their financially settled cPPA may not reflect the price that generator actually receives for its electricity at its local grid injection point or an offtaker pays at its local grid exit point. For example, there would be significant basis risk if a generation facility in Southland contracted with an energy intensive user in Auckland. However, this risk can be reduced for all parties on an offshore wind transaction as the underlying facility can be located close to the relevant centre of load.

In a New Zealand context, we expect the size of offshore wind farms to be smaller than the multi-GW projects now being developed in Europe. This should make them well suited to cPPAs with large energy users as the wind farm can contract a greater portion of its output with a single user or a club of corporates.

About DLA Piper

DLA Piper is a global law firm with lawyers located in more than 40 countries throughout the Americas, Europe, the Middle East, Africa and Asia Pacific, including in Auckland and Wellington, positioning us to help clients with their legal needs around the world.

DLA Piper is committed to accelerating the race to Zero. We recognise our role in the transition towards global net zero both directly (through setting our own science-based targets and other initiatives) and through the services that we provide. We are the most active law firm in the renewable energy sector globally, having advised on more renewables deals in every quarter of 2021 than any other law firm. We have advised on more than 150 PPAs around the world across over 30 countries. From our New Zealand offices, we have experience on over 4GW of global corporate PPAs.

Global Case Studies

Bluefloat Energy – Global Offshore Wind Developer and Pioneer in Floating Offshore Wind Technology

Bluefloat Energy believe New Zealand is a prime location for offshore wind development, not only because of its fantastic wind resource, but the depth of the local skills base, oil and gas industry experience and industries. New Zealand has the opportunity to learn from the growth of offshore wind in other markets globally, and to facilitate the emergence of this domestic industry in a way that supports and involves Iwi, the community and key stakeholders.

In this section of the report, we have included a range of case studies from across the world that showcase the potential for local capacity building and supply chain development in New Zealand.

From black to green in Almeria: Mar de Agata Offshore Wind Farm

The Joint Venture of BlueFloat Energy and SENER (its local partner in Spain) is currently developing a 300MW floating offshore wind farm off the coast of Almeria (Andalusia, Spain) named Mar de Ágata. This offshore wind farm will build upon the strengths of the local supply chain and skills base, specifically in R&D, engineering, highly specialised steel works, and project management. The goal is to maximise local content during both the construction and operation phase, positioning Andalusia in the growing Mediterranean and wider international offshore wind markets and generating long-term economic value for the region.

Mar de Ágata has been conceived in response to the closure of a 1159 MW coal power plant in Almeria and will replace a major source of CO^2 emissions with a clean and sustainable energy supply.

Mar de Ágata has signed an MoU with Caldererías Indálicas, a local steel components manufacturer, to capture synergies with other initiatives in the surrounding area such as:

- A green hydrogen plant to fuel the large truck fleet exporting vegetables from Almeria to Europe, and
- A new industrial development to manufacture locally the floating structures
- Repurposing of the existing coal import terminal at the Carboneras port into an quay for final assembly of floating units and for exporting floating wind components to other markets

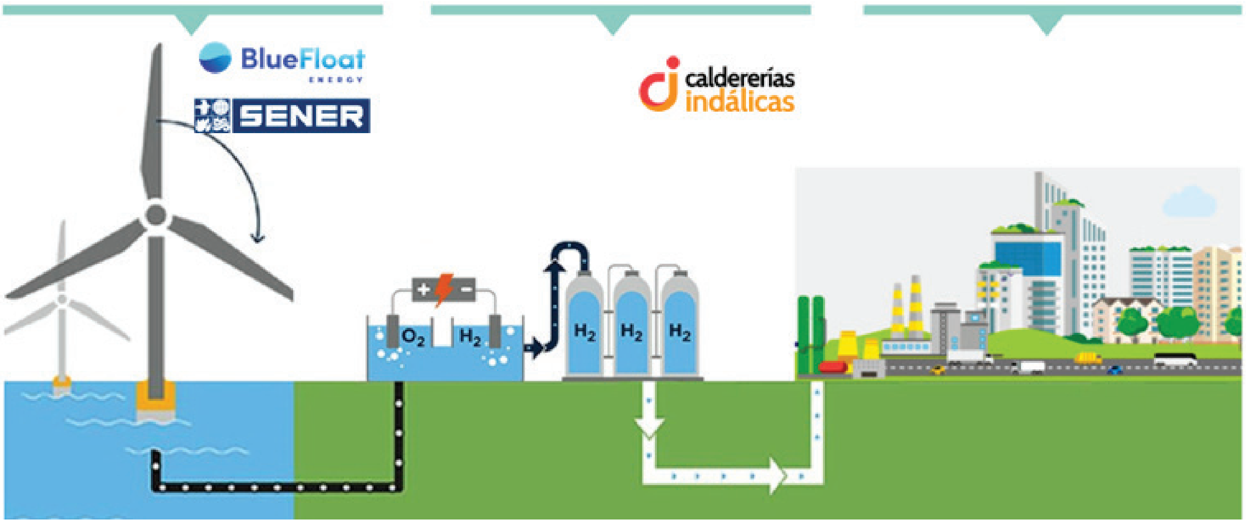
Synergies

- Production from Mar de Agata is to be used to meet part of the electricity demand of the hydrogen plant, ensuring the green origin of the hydrogen production.
- Harnessing the technical capabilities and facilities of Caldederías Indálicas for the local manufacturing of the floating structures.
- Development and upscaling of the local supply chain for the construction, operation and maintenance of Mar de Agata.

Mar de Agata Offshore Wind Farm produces renewable energy.

The energy produced by the wind farm is used to separate water into oxygen and green hydrogen.

Green hydrogen is used for various purposes by local industries.



WFA triggers supply chain development in Portugal: ASM Industries

WindFloat Atlantic (WFA) is an offshore floating wind farm located 18km off the coast of Viana do Castelo, Portugal. WindFloat Atlantic is comprised of three MHI Vestas 8.4MW wind turbines installed on semi-submersible floating platforms.

Members of BlueFloat Energy's team participated in the development and construction of the WindFloat Atlantic project from concept to Final Investment Decision and onto commissioning (while working at EDPR). The project is the world's first semi-submersible floating wind farm and the first floating wind farm in continental Europe.

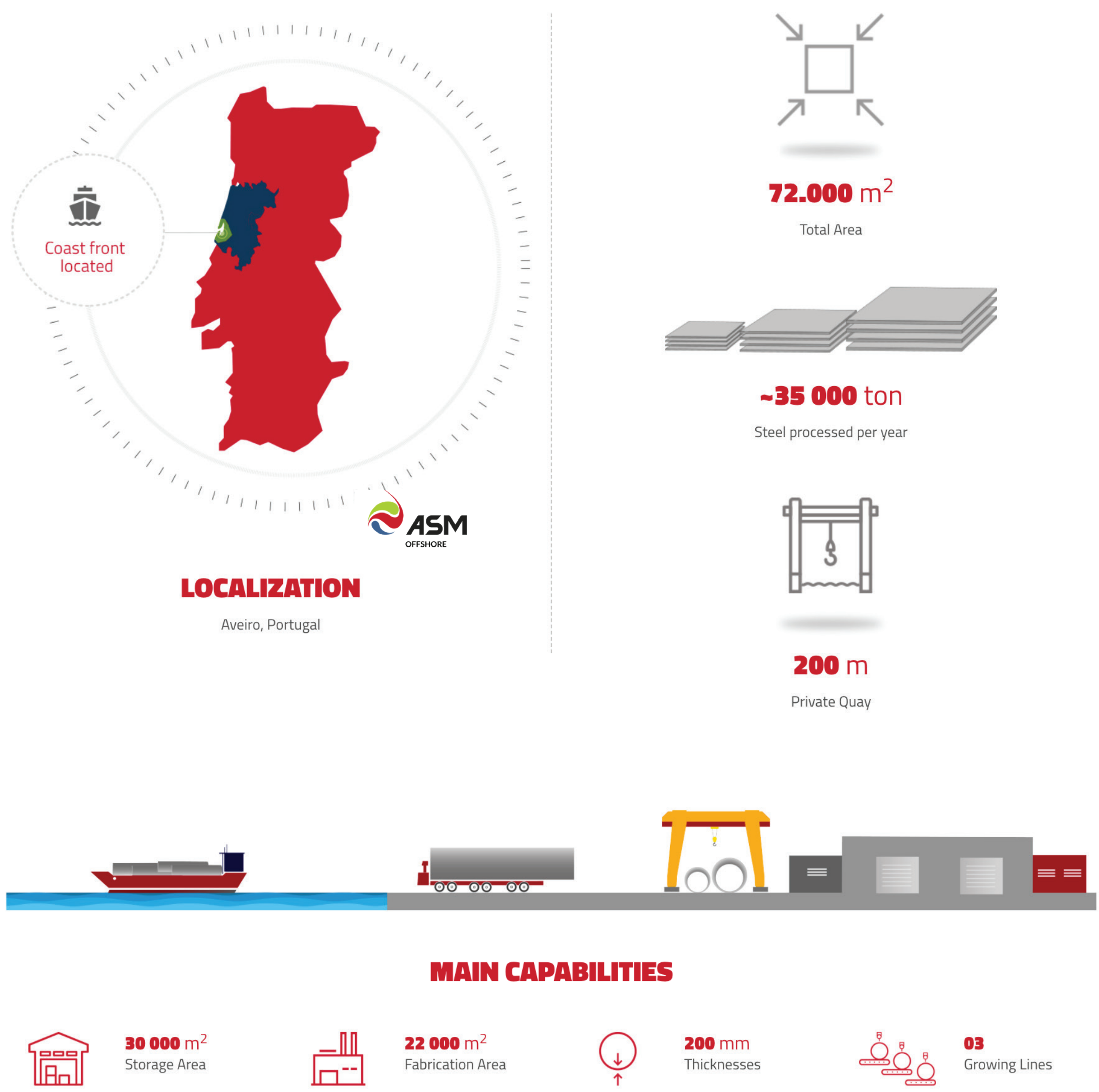
ASM Industries is a Portuguese company that manufactures steel equipment for renewable and marine industries. In their Aveiro facilities in Portugal, ASM built two of the three floating foundations for the 25MW WindFloat Atlantic wind farm.

WindFloat Atlantic placed Portugal in the spotlight of the global floating offshore wind market and demonstrated ASM Industries' competence and resilience in complex and challenging projects.

Since the WFA contract, ASM Industries was successful in winning a major contract for an offshore wind farm in The Netherlands. In August 2021, in a major vote of confidence for the Portuguese supply chain, CS Wind, the world leader in steel tower manufacturing from Korea, acquired a majority stake in ASM Industries.

"A clear victory for our strategy to position ASM Industries among **Europe's leading suppliers** of steelworks for the energy sector, including wind towers, **offshore foundations and marine structures**," said Adelino Costa Matos, **CEO of ASM Industries**. "At this stage we are **investing a total of 40 million euros** in two new units in Setúbal and Aveiro to serial manufacture offshore structures, because as we know it is a strategic area with potential to be explored." **ASM, 2018**

Characteristics of the existing facilities in Aveiro



French port to service the Mediterranean offshore wind industry: Port-la-Nouvelle

Given the resource potential and number of floating offshore wind projects under development in the Mediterranean, Port-La-Nouvelle, located in south-eastern France, is seizing the opportunity to become a key participant in the offshore wind industry.

New deep-sea infrastructure (increasing water depth to 16m from current 8m) is currently under construction in the port. This is driven by the need for a new deep-sea port to operate larger vessels, increase handling and storage areas, develop specialised terminals and offer optimized logistics.

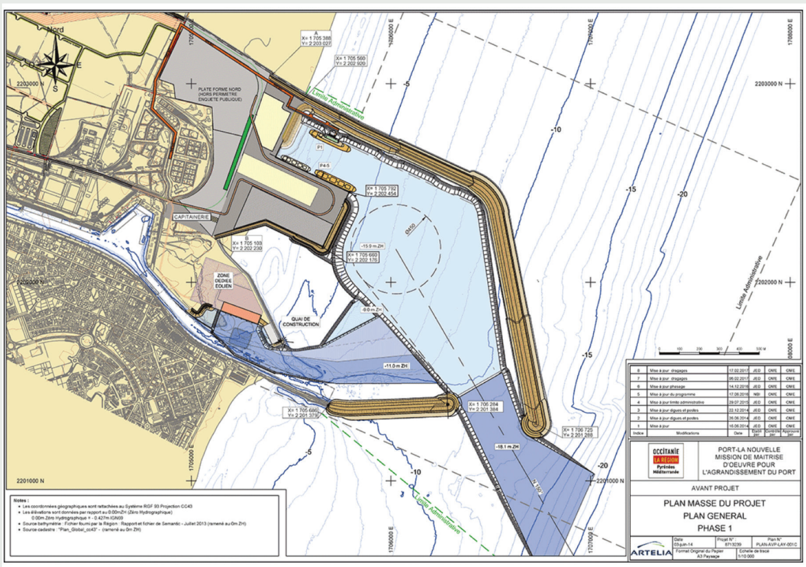
The extension will enable the port to accommodate the construction and assembly of the first floating wind farms planned off the coast of Occitanie.

The port is encouraging the development of green hydrogen production and storage projects and promoting rail transportation to ensure the low-carbon footprint of goods distribution within its hinterland in France and Europe.

Port-La-Nouvelle's goal is to strengthen its role within the Mediterranean Rim by acting as a regional hub of the energy transition. The port's expansion project forms part of the region's larger programme for coastline development and construction and represents an investment of around €234 million.

Location of Port-La-Nouvelle

Sketch of Phase 1 harbour expansion



About the authors

Chris Briggs

Chris is a Research Director at the Institute for Sustainable Futures, University of Technology and Technical Director, Business Renewables Centre-Australia (a not-for-profit collaboration between ISF, WWF and Climate-Kic with over 200 members which supports organisations undertaking renewable energy power purchase agreements). Chris has a combination of climate, energy and labour market expertise developed over 20 years of experience working in roles as a political adviser, policy maker, program leader and researcher.
Recent projects include the Potential for Offshore Wind in Australia (Blue Economy CRC), Employment, Skills and Supply-Chains: Renewable Energy in NSW (NSW Renewable Energy Sector Board & Department of Planning, Industry and Environment), Employment and Material Requirements for Electricity Infrastructure (Infrastructure Australia) and State of the Market: Corporate Renewable Power Purchase Agreements in Australia (Business Renewables Centre-Australia, ARENA).

Peter Conway

Peter has more than 25 years' experience of project development and financing in the Energy & Utilities sector with specific focus on renewables. He has worked in an Advisory, Debt Structuring and Lending capacity during his 14 years in the finance sector. Latterly, in addition to advisory, he has acted as a Principal for a range of energy projects where he was engaged in executive and non-executive directorship roles of several operating or development companies.

Peter has direct experience of a range of formative projects, including early UK merchant risk projects, the initial IPP / IWPP / IWP developments across the GCC, the early private sector projects in Eastern Europe and latterly bio ethanol, biomass and waste to energy projects. This allows him to provide not only the overall understanding of the inter-related contractual structure of any project, but also the financial and risk framework and analysis to develop, execute and deliver successful projects.

Simon Corbell

Simon is Chief Adviser at the renewable energy advisory and accelerator firm Energy Estate and the independent chairperson of the Clean Energy Investor Group, representing institutional investors with wind and solar assets worth $9 billion across the national electricity market.

Simon has more than two decades of senior experience in public policy leadership, governance and implementation. Simon is widely recognised as a leader in the areas of renewable energy, climate change mitigation and adaptation, urban sustainability and public transport. Simon is an Adjunct Professor at the University of Canberra and an Honorary Associate Professor at the Australian National University.

Simon Currie

Simon is a principal and co-founder of Energy Estate – an advisory and accelerator business focussed on the transformation of the energy sector, previously Global Head of Energy at Norton Rose. He has advised clients across 70 countries on over 30GW of wind power projects, 10GW of solar power projects and many GWs of biomass, hydro and geothermal projects.

Simon was at the forefront of the development of the offshore wind sector in Europe including many of the first projects in different countries. He is committed to the development of the offshore wind sector across the APAC region.

Simon is recognised as a leader and pioneer in the transformation of the energy sector and integrating renewables with other industries. He is passionate about digitisation of the industry, new and emerging technologies and the potential for creating jobs and economic growth through this approach.

Germán Perez Gaido

Germán has broad experience in engineering, project management, asset valuation and asset developments. After more than a decade of working in the Oil & Gas industry, he decided to join the low emissions energy industry. Germán completed a Master of Energy which provides him with the tools needed to transfer his experience, allowing him to contribute to developing a clean energy world and a better future for the next generations.

Jeremy McIver

Jeremy is a senior associate at global law firm DLA Piper. He works in the firm's London and Wellington (New Zealand) offices. Jeremy's practice concentrates exclusively on the renewable energy sector and he regularly acts for developers, investors, lenders and offtakers in that space. Jeremy has worked on some of the largest European wind transactions in recent years and has a particular focus on corporate PPAs.

Jarek Pole

As Country Manager for Aotearoa, Jarek Pole drives the projects there for the Joint Venture between Blue Float Energy and Energy Estate. He has been involved in the renewable energy sector for most of his professional life.

Jarek's career in the offshore wind industry has provided him with the privilege to work in several international markets and, equally importantly, to learn from many experts (both individuals and companies) in thesector . He was been involved in wind project development in multiple European countries to include France, the UK and Poland.,

As country Manager for New Zealand, Jarek is excited about contributing to the establishment of the Offshore Wind industry supported by his global BlueFloat team of offshore wind pioneers who have extensive knowledge and hands-on experience in developing, consenting, financing, constructing, commissioning and operating fixed-bottom and floating offshore wind projects.

Brett Rogers

Brett co-founded Elemental in 2012 as a petroleum consultancy and heads up Strategy and Development for the company. It has widened its focus to new energy businesses of onshore solar, wind and storage, as well as offshore wind. He has worked in energy businesses for 30 years, initially with Shell and Todd Energy. His work in offshore asset development was shaped by the multi-billion dollar Maari, Maui and Pohokura projects. He has worked in New Zealand, Australia and the Netherlands with clients from Singapore to the US. He is also passionate about developing young people, through the Elemental intern programme that has employed over a dozen young undergraduates, and chairing the SPE NZ Education Trust.

Sarah Sinclair

Sarah is Chair of the MinterEllisonRuddWatts partnership and is a highly-regarded construction and infrastructure specialist. She has extensive experience acting for both Government and private sector clients in large-scale, complex infrastructure programmes and projects. She is known for providing commercially pragmatic, strategic advice on infrastructure funding models, procurement strategies and contracting structures. Sarah sat on the Board of Infrastructure New Zealand from 2012-2019 and is an officer of the International Construction Projects Committee of the International Bar Association. She sits on the inaugural board for New Zealand Infrastructure Commission, Te Waihanga – a new entity responsible for planning and prioritising the country's infrastructure initiatives.

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