

A large offshore wind turbine stands in the foreground on the right side of the frame. The background features a vast expanse of blue ocean meeting a sky filled with soft, pink and orange clouds, suggesting a sunset or sunrise. A small boat is visible on the horizon in the distance.

INTRODUCTORY GUIDE TO OFFSHORE WIND





A leading offshore wind developer
with a global pipeline of bottom-fixed
and floating projects



A pioneer in the offshore wind
sector in New Zealand

We have been working in partnership since 2021 to support the development of
an offshore wind industry in Aotearoa. To date, we have announced two projects
which you can learn more about at the following websites:

southtaranakioffshorewindproject.com

waikatooffshorewindproject.com



WAIKATO

Offshore Wind



**SOUTH
TARANAKI**

Offshore Wind

What is offshore wind?

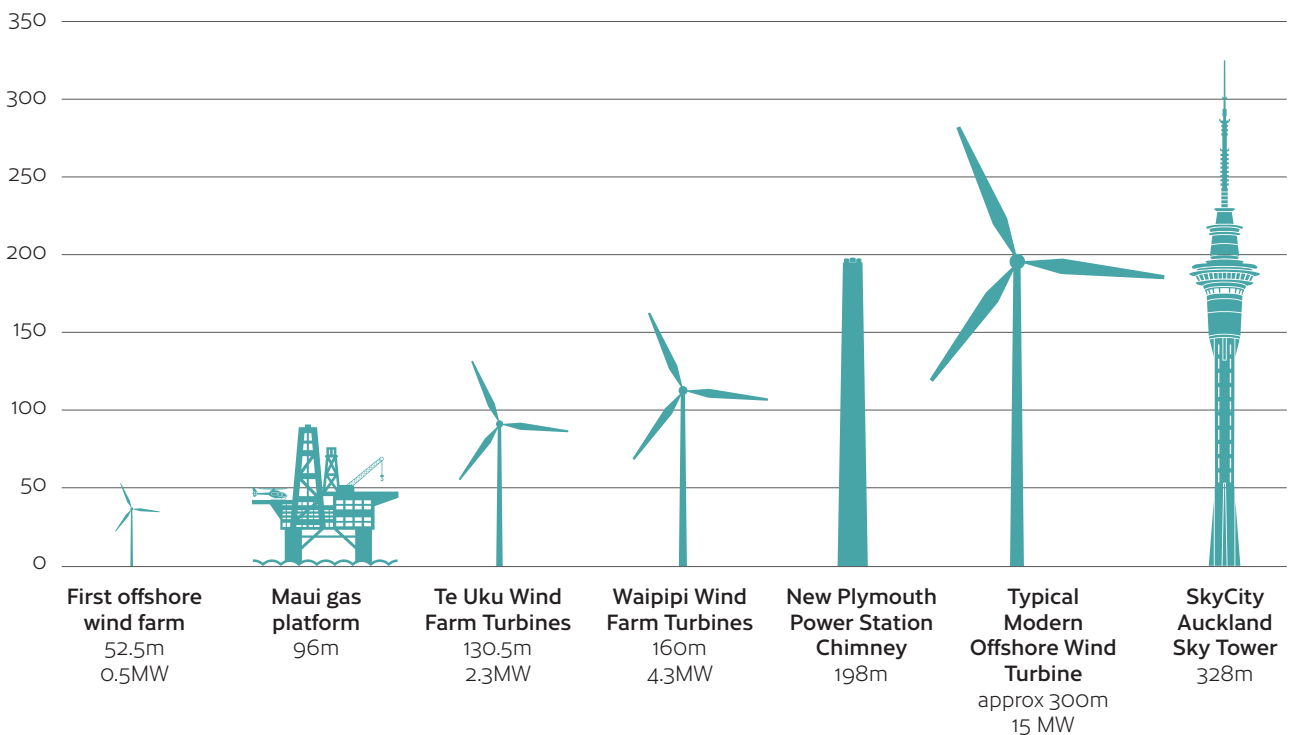
Offshore wind is a form of renewable energy which uses turbines to turn wind energy into electricity. An offshore wind farm is a group of turbines located at sea, using technology similar to that used in onshore wind farms.

Is offshore wind technology new and high risk?

Whilst windmills have been around for centuries to pump water and make power, the first offshore wind farm came into operation in 1991 in Denmark. Since that time, offshore wind farms have been developed in many countries around the world. Through the industry's development, the technology has become highly reliable and standardised.

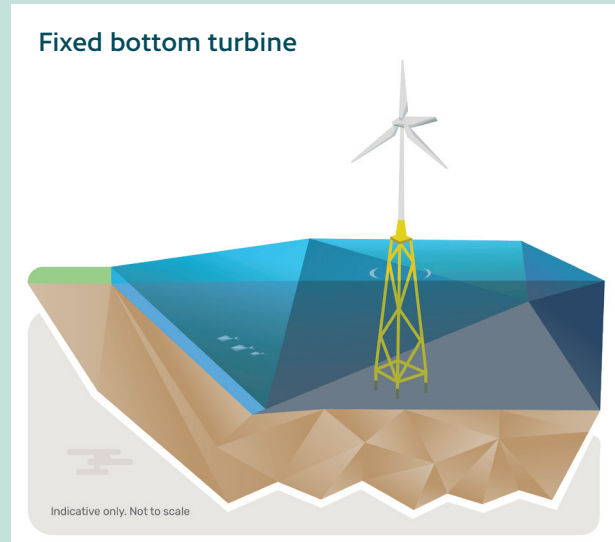
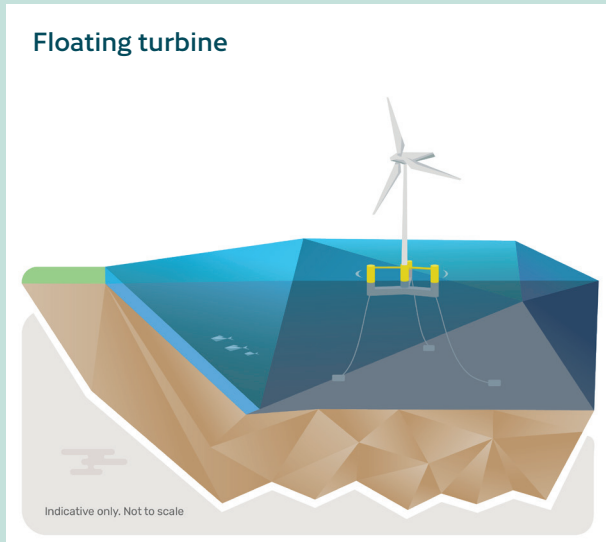
How big are offshore wind turbines?

Since those first 0.5MW turbines installed in 1991, there has been significant growth. Current technology allows for 15MW turbines to be deployed offshore, which are approximately 300m tall (above sea level). This advancement has resulted in significant increases in efficiency and reductions in cost.



What are the types of offshore wind turbines?

Offshore wind turbines can be fixed to the bottom of the ocean, or they can be floating which means they are anchored to the ocean floor using mooring cables. Floating foundations are suitable for deeper waters and are generally made from steel or concrete. Common types of fixed bottom foundations include steel monopiles, steel jackets (as shown in the picture below) and concrete gravity based foundations.



What are the environmental considerations for offshore wind developments?

Offshore wind power has the potential to deliver positive environmental outcomes by aiding the transition away from fossil fuels which reduces emissions and helps to avoid global warming. The scale and generation profile offered by offshore wind can help to accelerate these goals.

However, like any large project, we need to be conscious of the local ecological risks. Local wildlife, such as seabirds and mammals, will be studied to understand their existing populations and behaviours. We will carry out detailed environmental studies to determine the risks and develop a plan for how those risks can be managed and mitigated. There is also the potential for positive impacts on local species, as turbine foundations can help to create habitats to support increased biodiversity.

Does New Zealand need new power generation?

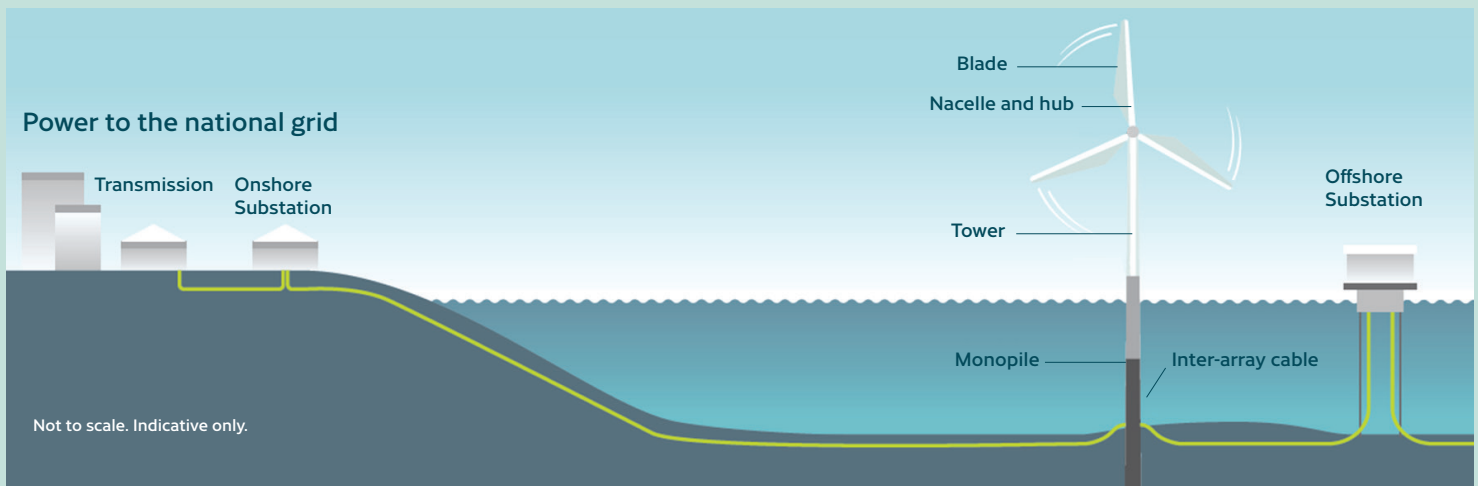
Our country has a commitment to reduce emissions and reliance on fossil fuels like oil, coal and natural gas. As a result of the growing need for electricity due to electrification (vehicles, manufacturing, operations), Aotearoa needs even more clean energy than currently available to achieve net-zero targets. Recent government forecasts show that New Zealand's electricity demand is expected to be around 2.5 times more than current demand by 2050. That could require the development of more than 20GW of new renewables, or the equivalent of two Clyde dams or seven Waipipi onshore wind farms per year until 2050.

Doesn't New Zealand have very harsh ocean conditions?

Yes, however offshore oil and gas platforms have operated in this environment for decades. Our projects will be planned and designed for the local environmental conditions and turbines will have features to protect themselves during extreme weather conditions.

How does an offshore wind farm work?

Wind turbines generate electricity by capturing the kinetic energy of the wind and converting it into electrical energy. Turbines are connected by array cables on the seabed to a substation transformer, which converts the electricity to a higher voltage for transmission. Power is then transferred to shore through a high voltage cable, where the electricity is injected to the national grid or provided to local industries.



What are the benefits of offshore wind development in Aotearoa?

Some of the key benefits of offshore wind farms:

- **Renewable Resource** – Offshore wind is a renewable energy source that is efficient and abundant
- **Suitable location** – NZ has a world class wind resource which means that the wind blows consistently
- **Impact on land use** – Wind farms at sea will not impact agricultural or other land uses
- **Economic benefits** – Revenue generation, employment and investment opportunity
- **Social impact** – Visual and noise impact can be minimised
- **Net-zero targets** – It helps achieve net zero targets for NZ in combination with other clean energy technologies

What happens when the wind is not blowing?

Offshore wind is a variable form of generation which depends on natural wind resources. This means it will require back-up from technologies such as batteries, gas/hydrogen peakers or pumped hydro. However, offshore wind produces much more reliably than some other renewable generation sources, which reduces the need for these back-up options.

New Zealand is blessed with abundant natural energy sources like solar, hydro, wind and geothermal. By relying on a diverse range of different generation types in different locations, we create a more reliable and resilient energy system.

What is the impact on fishing activities?

Turbine foundations can promote increased local biodiversity and fish stocks. As turbines are spaced 1-2km apart, recreational fishing boats are generally able to enter the wind farm (subject to local regulations). However, it is common for some types of commercial fishing activities to be restricted within wind farms to avoid damage. The rules about exclusion zones and permitted activities are yet to be determined in New Zealand, but we are committed to working constructively with the local fishing industry to support a positive co-existence.

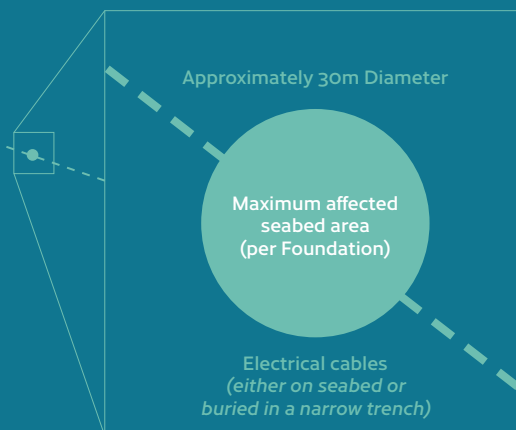
Are the onshore transmission lines built underground or overhead?

The offshore cables will be laid on or under the seabed floor. Once the cables reach land, the transmission lines can be built either overhead or underground. Underground lines come at a much higher cost and can be more difficult to repair and maintain. Transmission route design will be finalised having regard to environmental impacts and feedback from local communities.

Does the wind farm have any impact on seabed?

Offshore wind farms – both bottom-fixed and floating – use the seabed primarily to hold themselves in place and transfer the power they generate to shore via electrical cables. These cables are typically laid on or just under the seabed. Turbines will be located to minimise any impact on reefs or sensitive marine environment.

Typical affected seabed areas for fixed bottom offshore wind.



Will I see or hear the turbines from the beach?

One of the benefits of offshore wind is that the visual impact can be lower than onshore developments. We plan to develop our South Taranaki and Waikato projects >20km from the coast. From this distance, the turbines will not be audible from shore, but they will be visible on a clear day. The image below shows the visual simulation for our South Taranaki Offshore Wind farm from Ōhawe Beach. You can visit our project websites to explore our visual simulations in more detail.



What is in it for the community?

Offshore wind offers a means of achieving our climate change goals, whilst creating positive outcomes for local communities. In addition, these projects will create significant job and supply chain opportunities, in both the construction and operations phases. By supporting a reliable, affordable and sustainable electricity system, offshore wind will promote the growth of existing and new industries for a prosperous future.

Are the turbine materials recyclable?

Up to 90% of wind turbine components (by mass) are made of steel which can be recycled for future use. The blades are made of composite material which are traditionally more difficult to recycle. Thanks to technology advancements, manufacturers are innovating and providing blades that are recyclable.

How long does it take to offset the carbon emitted from constructing an offshore wind farm?

In Europe where offshore wind farms have been operational for many decades, it takes approximately 2-6 months to offset the carbon emissions from construction. This is often referred to as the carbon payback. Offshore wind compares favorably to onshore wind for carbon payback due to higher windspeed and larger turbines.

Where are the turbines manufactured?

Europe and Asia are currently the main manufacturing centres for turbine components. Whilst some components will inevitably need to be imported, we are committed to working closely with local companies to maximise opportunities for New Zealand businesses to participate in the value chain.



Project timeline and different phases

The Government is working on a regulatory framework now and we expect this will be completed by late 2024. With that in place, feasibility permits are expected to be awarded in 2025, allowing developers to move to the next phase of detailed studies and surveys. Following this, environmental impacts will be assessed, and engineering designs finalised such that initial projects can reach a final investment decision later this decade. Turbines could be operational shortly after 2030. These turbines are expected to have an operational life of 30-40 years.

