

OFFSHORE WIND

AUSTRALIA



Overview - Feb 2023
www.elisabetebelaunde.com

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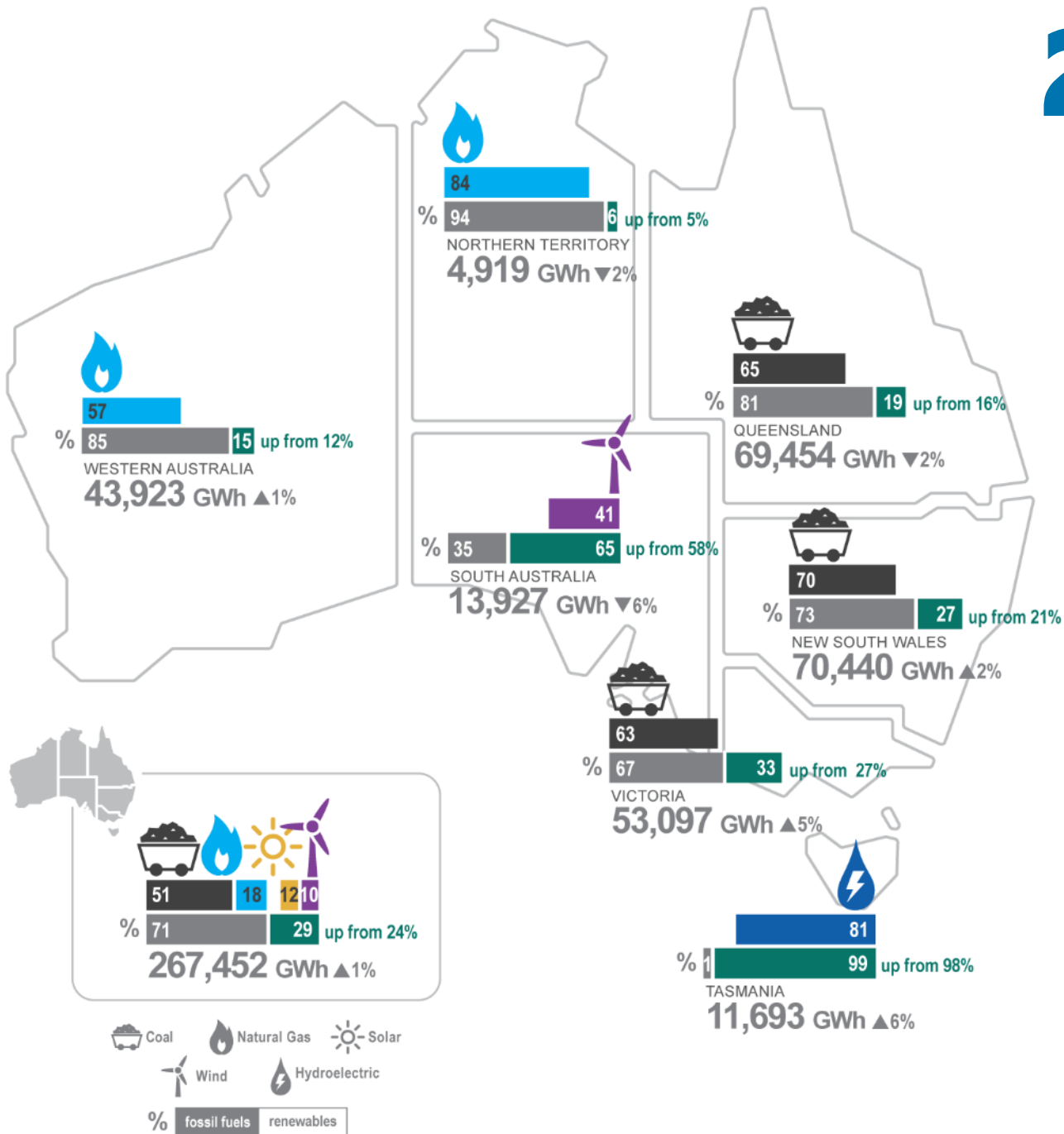
Photo by Joey Csunyo on Unsplash



1 Australia Offshore Wind

- The **offshore wind energy industry is thriving globally** thanks to lower project costs, increased policy support, the development of the size of turbines and the advancements in fixed and specially in floating offshore wind technologies.
- **Australia has very high quality and abundant offshore wind resources** in a range of locations.
- Australia is considering **offshore wind as a key energy transition vector to reach Net-Zero emission targets.**
- **Australia's national regulatory framework for offshore energy came into effect in June 2022**, laying the legislative foundations for ocean-based renewable energy generation.
- At the end of 2022, there are **40+ offshore wind projects with a total capacity of more than 80 GW** at different stages of application/development process in Australia, clustered mainly in Victoria, New South Wales and Western Australia.
- In January 2023 opened **the invitation period for feasibility license applications for the "Gippsland Declared Area" in Victoria**, the country's first offshore wind area.

2 Australia Power Statistics



- **Population of Australia: ~25.74 million people (IEA 2020)**
- **Total electricity generation: ~267,452 GWh (year 2021)**
- **Coal accounted for the majority (51%) of electricity generation**
- **Renewable sources contribution: ~ 77,716 GWh, 29% of Australia's total electricity generation**
- **The largest source of renewable generation was solar (12% of total generation) followed by wind (10%) and hydro (6%).**

3 Emissions Reduction Plan

The Australian Government has legislated **emissions reductions targets of 43% by 2030 (on 2005 levels) and net-zero by 2050.**

The Australian Government's "Powering Australia Plan" is focused on creating jobs, cutting power bills and reducing emissions by boosting renewable energy. The Plan includes a national renewable electricity target of 82% by 2030 supported by "Rewiring the Nation".

Net Zero 2050-Australia's Long Term Emissions Reduction Plan

- ✓ The **Plan aims at reaching a net-zero economy through a technology based approach** while protecting relevant industries, regions and jobs.
- ✓ Solar, wind and other renewables are being installed at a world-leading rate. Led by ultra low-cost solar, an **increased share of renewables will be the foundation for near-zero emissions grid by 2050.**

Renewable Energy Target (RET) scheme is designed to reduce emissions of greenhouse gases in the electricity sector by encouraging the additional renewable electricity generation.

- ✓ The **Large-scale Renewable Energy Target (LRET)** incentivizes investment in renewable power (hydro, wind and solar farms) and **aims to deliver 33,000 GWh of extra renewable electricity each year.**

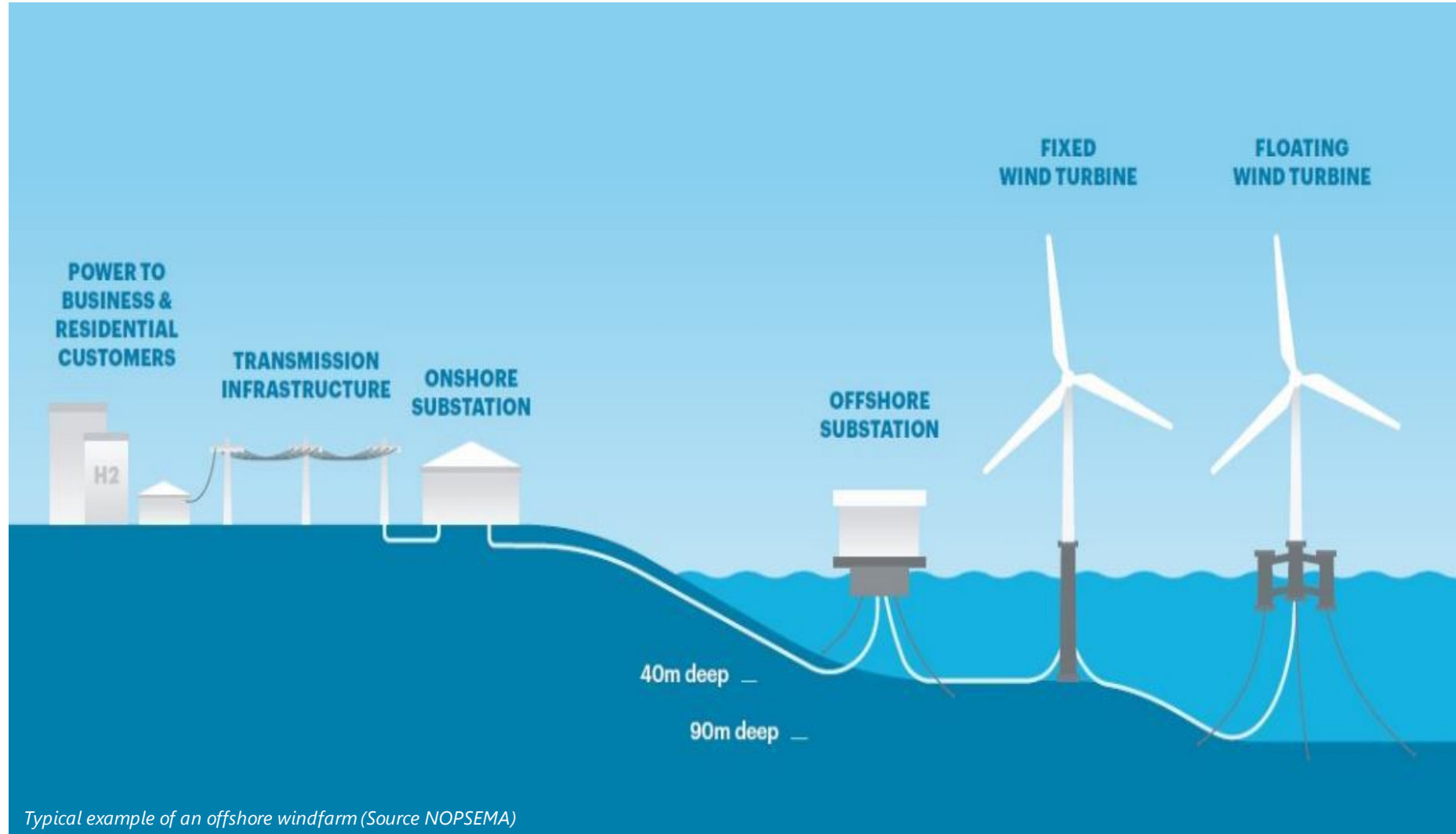


4 Offshore Wind Farms – How Do They Work?

An offshore wind farm consists of a group of wind turbines that are spread out in a formation (or array) over a wide area of the ocean.

Offshore wind farms capture the energy from reliable and strong winds that occur in ocean waters and transform it into electricity via the large wind turbines.

This renewable power is then transported onshore via seaborne cables and fed into the electricity transmission network to power homes and businesses.



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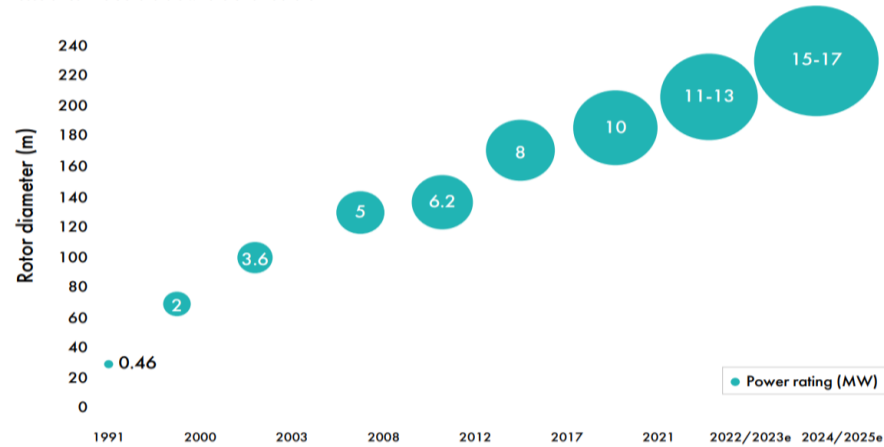
Offshore Wind Technology

Evolution of Offshore Wind Turbine Technology.

Rotor size and power rating continue to increase.

The global average turbine rating for new installations (excluding China and Vietnam) **reached 8.1 MW in 2021** and is **expected to pass the 12 MW mark in 2025** (Source GWEC 2022)

Rotor size and power rating continue to increase
Based on commercial offshore wind turbine installation



Source: GWEC Market Intelligence, June 2022

Types of Offshore Wind Farms.

- **Fixed foundation** (secured directly to the seabed) limited to water depths of up to 50-60 metres.
- **Floating platforms** (turbines mounted on a floating structure which is secured by anchored cables to the seabed), projected to be deployed in greater numbers over the next decade as it can be installed farther offshore in deeper waters.

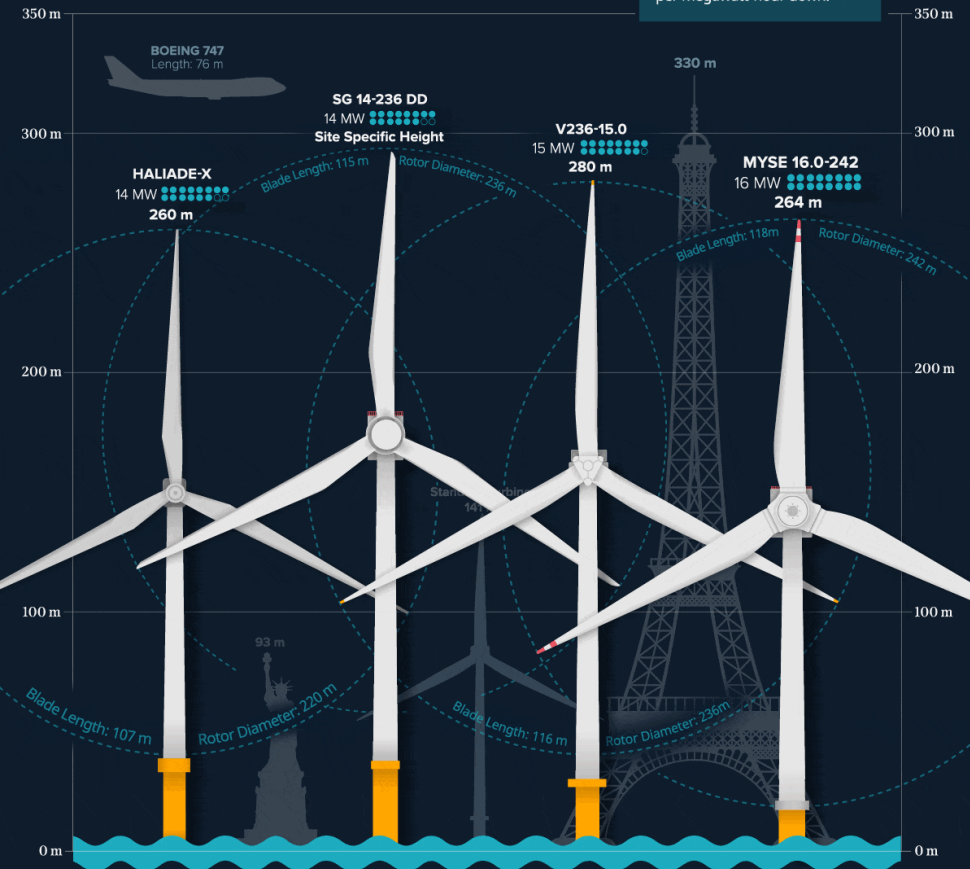
The World's Biggest WIND TURBINES

Since the early 2000s, wind turbines have grown in size—in both height and blade lengths—to generate more energy.

Today, the tallest turbines can reach over 200 meters and cost more than \$12 million. They are all offshore—located over water.

WHY DO THEY KEEP GETTING BIGGER?

To reduce costs. Huge turbines increase energy capacity, creating economies of scale that drive the cost of energy per megawatt-hour down.



GENERAL ELECTRIC
Prototype started operation in October 2021

The first company to operate a turbine at this power output.

SIEMENS Gamesa
The first prototype will be installed in 2022

The nacelle—that houses all of the generating components—weighs 500 tons.

Vestas
Prototype installation is scheduled for H2 2022

It has the industry's largest swept area—43,742 m², equivalent to 6 soccer fields.

MINGYANG SMART ENERGY
Under construction. Expected to be online by 2025.

Smaller prototype version is running at the company's test center.

Source: Vestas, General Electric, MingYang Smart Energy, Siemens Gamesa Electrek

Typical Fixed Foundation Offshore Wind

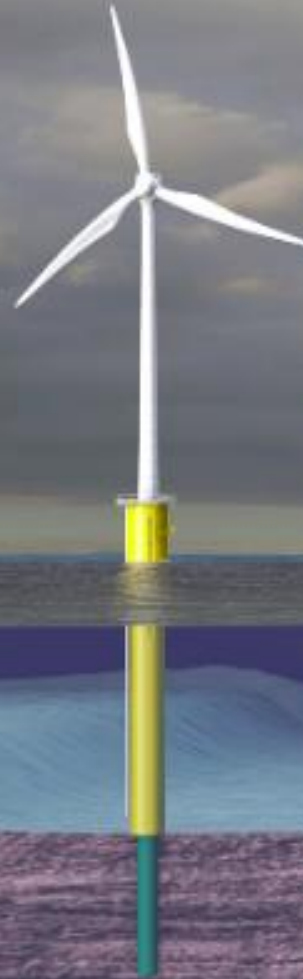
Gravity Base



Suction Bucket
Monopile



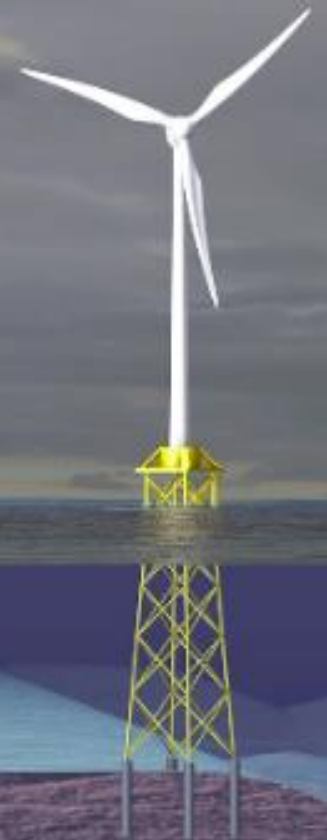
Monopile



Tripod



Jacket



Typical Floating Platform Offshore Wind

Tension Leg



Barge



Semi-submersible



Spar





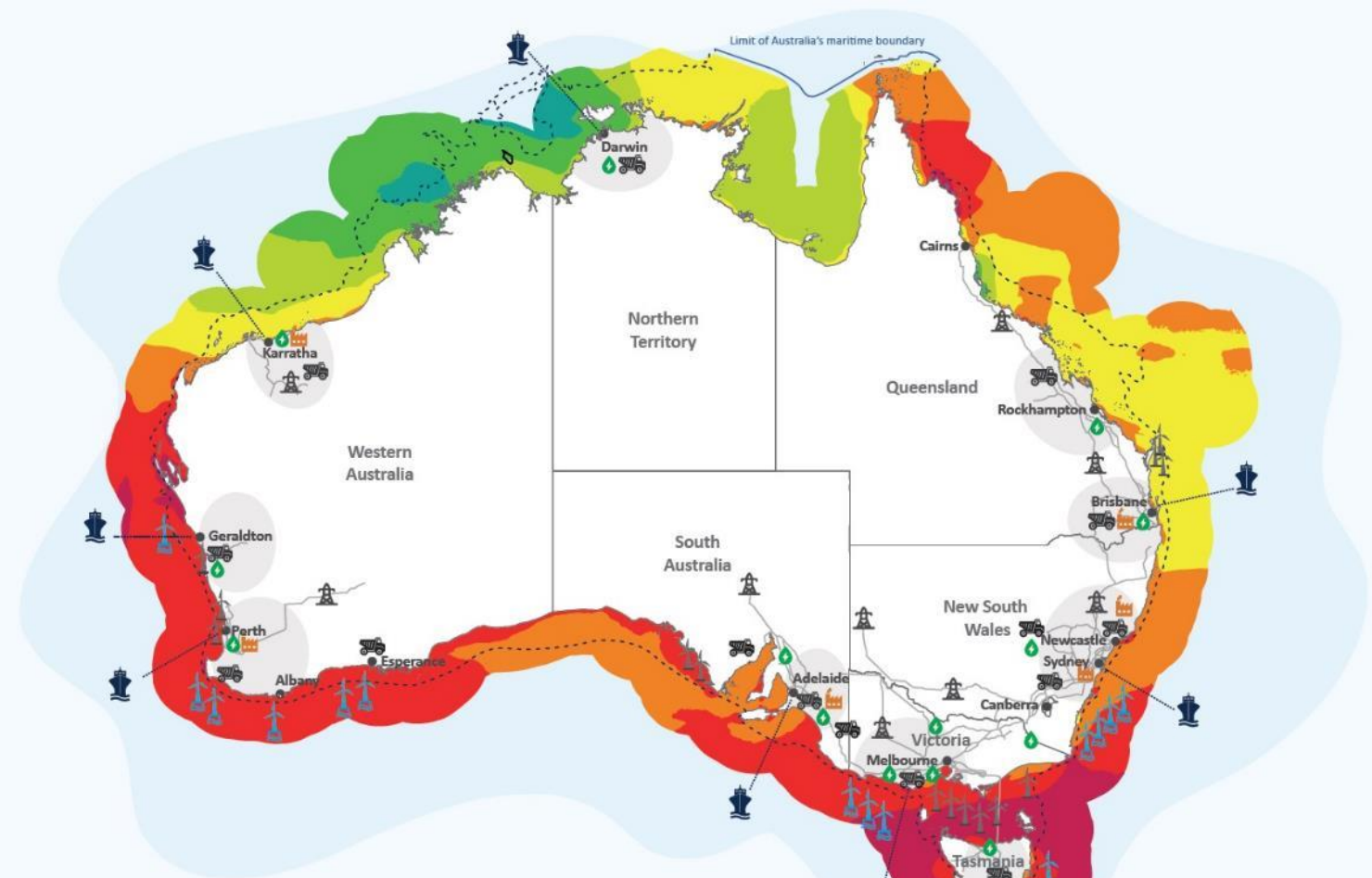
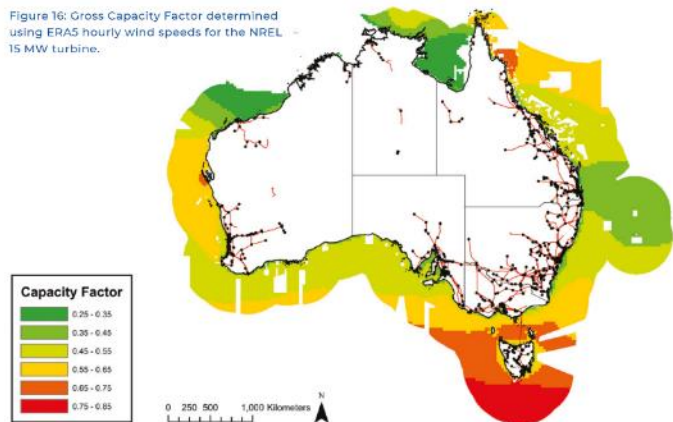
Photo by Nicholas Doherty on Unsplash

6 Australia's Offshore Wind Resource

Australia's highest quality offshore wind resources are generally in the southern half of the continent adjacent to large population centres, industrial hubs and mining projects

In terms of estimated **Capacity Factor**, the best sites are in the **south of Tasmania**. The next-best sites are in **Bass Strait and off Western Australia and North Queensland** (55%), followed by **South Australia and New South Wales** (45%).

Figure 16: Gross Capacity Factor determined using ERA5 hourly wind speeds for the NREL 15 MW turbine.



KEY: SUPPLY

Wind Speed (Metre/Second)



Wind speed data is sourced from the Global Wind Atlas and depicts wind speed at 100 metre hub height at 250 metre resolution.

-- 90 metre mark

Fixed wind turbines
Suitable for water depths of up to 90 metres.

Floating wind turbines
Suitable for water depths greater than 90 metres.

KEY: DEMAND

- Mining
- Green hydrogen potential
- Heavy industry
- Transmission infrastructure
- Ports
- High electricity demand

7 Australia's Offshore Wind Potential

Australia possesses world class offshore wind resources.

The Global Wind Energy Council (GWEC) estimated Australia has the potential up to 5,000 GW of offshore wind power using a combination of fixed and floating infrastructure.

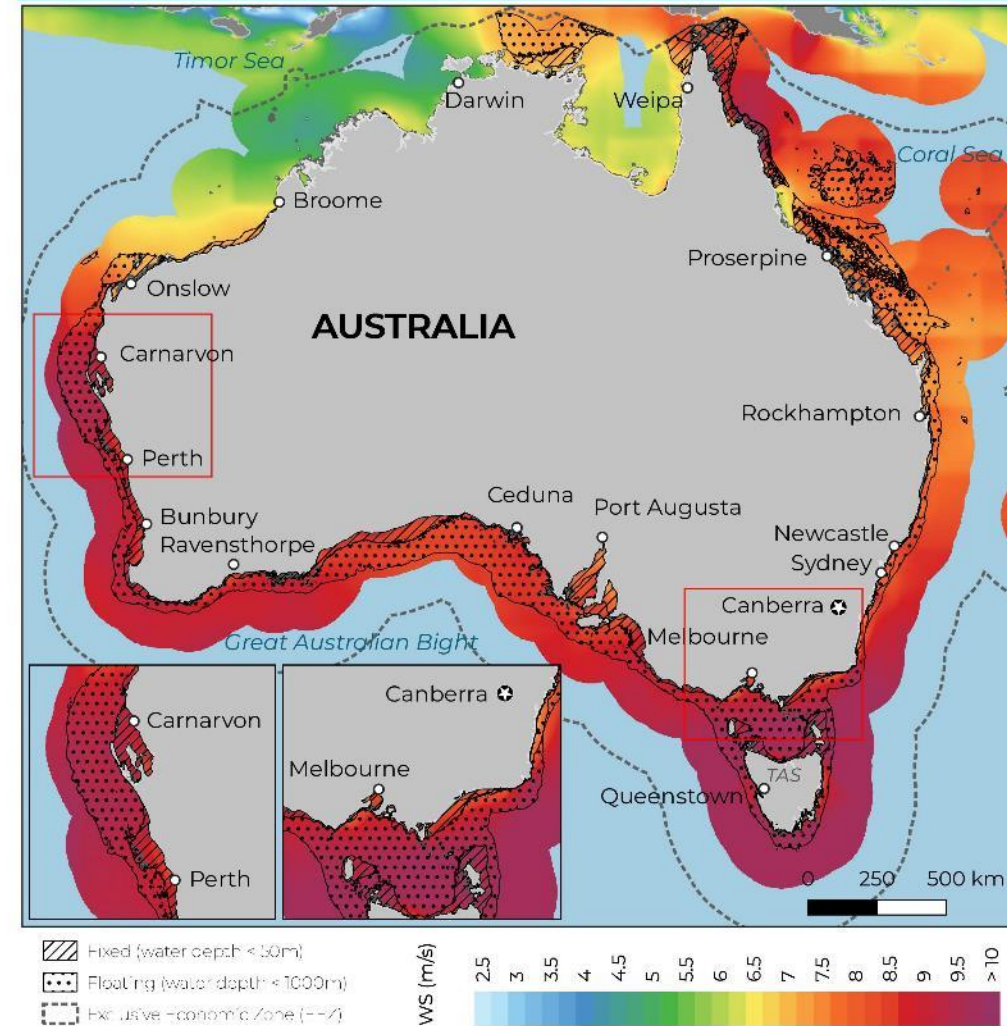
According to the analysis by the Blue Economy CRC, the "technically accessible offshore wind energy resource" was estimated to be **2,233 GW** which included:

- Areas less than 100 km from shore
- In water depths less than 1000m
- Within 100 km of sub-stations and transmission lines and excluding environmentally restricted areas.

Offshore Wind Technical Potential in Australia

RISE RE
Score: 83

Fixed: 1,572 GW || Floating: 3,391 GW || Total: 4,963 GW



This map shows the estimated technical potential for fixed and floating offshore wind in Australia in terms of installed power capacity in megawatts (MW) within 200 kilometers of the shore line. It is provided by the Global Wind Energy Council (GWEC) with funding from the Ocean Renewable Energy Action Coalition (OREAC), to support the UN High Level Panel of Experts (HLPE) for a Sustainable Ocean Economy (Ocean Panel). For more information on visit: <https://gwec.net/oreac/>. Fixed and floating foundation datasets and methodology was developed by the Energy Sector Management Assistance Program (ESMAP), a donor trust fund administered by the World Bank Group. For more information and to obtain maps for WBC client countries please visit: <https://esmap.org/offshore-wind/>. The wind resource data is sourced from the Global Wind Atlas and depicts the wind resource at 100m hub height at 250m resolution based on the latest input datasets and modelling methodologies. For more information visit: <https://globalwindatlas.info/>. For further details on the RISE RE score provided please visit: <https://rise.esmap.org/>. GWEC, OREAC, The World Bank Group and ESMAP do not guarantee the accuracy of this data and accept no responsibility whatsoever for any consequences of their use.



Photo by Nicholas Doherty on Unsplash

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National Regulatory Framework for Offshore Wind

June 2022

The Australian Government's Offshore Energy Infrastructure (OEI) Framework.

Offshore renewable energy infrastructure is regulated in Australian Commonwealth waters under the:

- **Offshore Electricity Infrastructure Act 2021 (OEI Act)**
- **Offshore Electricity Infrastructure Regulations 2022**

And the associated :

- Offshore Electricity Infrastructure (Regulatory Levies) Act 2021; and
- Offshore Electricity Infrastructure (Regulatory Levies) Regulations 2022
- Offshore Electricity Infrastructure (Consequential Amendments) Act 2021

Australian Commonwealth waters start 3 nautical miles from the coastline and extend to the boundary of Australia's exclusive economic zone.

05 August
2022

The **Federal Minister for Climate Change and Energy announced six proposed regions for offshore wind developments** around Australia:

- ✓ The **Bass Strait off Gippsland area in VIC**
- ✓ The **Pacific Ocean region off the Hunter in NSW**
- ✓ The **Pacific Ocean region off the Illawarra in NSW**
- ✓ The **Southern Ocean region off Portland in Victoria**
- ✓ The **Bass Strait region off Northern Tasmania**
- ✓ The **Indian Ocean region off Perth/Bunbury, WA.**

19 Dec 2022

Offshore Electricity Infrastructure (Declared Area OEI-01-2022) Declaration 2022.

Minister for Climate Change and Energy declared an area in the Bass Strait off Gippsland, Victoria, as suitable for offshore renewable energy infrastructure. The declared area covers approximately 15,000 square kilometres, and runs from offshore of Lakes Entrance in the east, to south of Wilsons Promontory in the west.

23 January
2023

Minister released an invitation **to apply for Feasibility Licence Applications in the Gippsland Declared Area from 23 January 2023 to 27 April 2023.**

Victoria State - Policies & Targets Offshore Wind

November
2021

Victorian Government made Australia's largest single offshore wind announcement.

Three offshore wind projects secured ~\$40 million in funding through Round 1 of the Energy Innovation Fund:

- **Star of the South** Offshore Wind Project 2.2GW
- **Great Southern Offshore** Wind Farm 1.5GW
- **Seadragon** Offshore Wind Farm 1.5GW

Together these projects could generate more than 40% of Victoria's electricity consumption, 5500 jobs and \$18 billion in investment.

March 2022

- The **Victorian Offshore Wind Policy Directions Paper** outlines the Victoria State's vision for offshore wind.
- **Victoria is the first region to set targets for offshore wind.** To reach at least:



- The policy is aligned with **Victoria's renewable energy target of 40% power generated from renewables** by 2025, 50% by 2030 and 50%+ from 2030 to achieve net zero by 2050.

October
2022

Victorian Government released **Offshore Wind Implementation Statement 1**, outlining the Government's plans for the establishment of an offshore wind industry.

January
2023

Victoria has received the highest amount of offshore wind applications, with more than 30GW of combined capacity, exceeding the Government's targets.

Note: Studies commissioned by the Victorian Government found that the waters near Gippsland and Portland have the potential to support at least 13GW of offshore wind capacity.

Offshore Wind

ESTABLISHING A SECTOR FOR VICTORIA

To achieve
**NET ZERO
EMISSIONS
2050**

15x TODAY'S INSTALLED
RENEWABLE ENERGY
CAPACITY IS REQUIRED

Victoria's coastline is a world class
offshore wind resource

20% OF OUR 2050 ENERGY CAPACITY
COULD COME FROM 13GW
OF OFFSHORE WIND

**Local jobs
+ supply chain
opportunities**



13GW

3,100

DEVELOPMENT AND
CONSTRUCTION JOBS*

3,000

ONGOING
OPERATIONS JOBS*

A pathway

For offshore wind to help secure our energy future



Regulatory process development



Port infrastructure solutions



Transmission access solutions



Transaction business case development



Workforce training and supply chain
development

A partnership approach

Working with community and stakeholders
to ensure benefits are shared and risks mitigated



Traditional Owners



Developers and investors



Industry associations,
regional organisations and unions



Local government, environment
and community groups



Commonwealth Government and AEMO

10 NSW State - Policies & Targets Offshore Wind

2020

Renewable Energy Zones (REZs)

- In NSW, the pathway for renewable projects has been lit by the ***Electricity Infrastructure Investment Act 2020 (NSW) (EII Act)*** and the **NSW's Electricity Infrastructure Roadmap**.
- The Roadmap will deliver **five REZs: Central-West Orana, Illawarra, New England, South-West and Hunter-Central Coast regions of NSW**.
- **Renewable Energy Zones (REZs) will group new wind and solar power generation** into locations where it can be efficiently stored and transmitted across NSW, and will keep NSW electricity reliable as coal-fired power stations retire.
- The REZs will deliver an **intended network capacity of 12GW**, while providing reliable clean energy.

09 Dec 2022

The formal declaration of the Hunter-Central Coast Renewable Energy Zone (REZ)

- **The NSW Government declared its fourth REZ renewable energy zone** after similar declarations for the Central-West Orana, New England and South-West zones)
- **The Hunter zone is the first to include offshore wind**, although the development of that technology will be developed in Commonwealth waters.
- **The Hunter zone is interesting because it includes much of the infrastructure put in place for most of these coal fired power stations** – Liddell, Bayswater, Eraring and Vales Point – expected to close within the decade.

February
2023

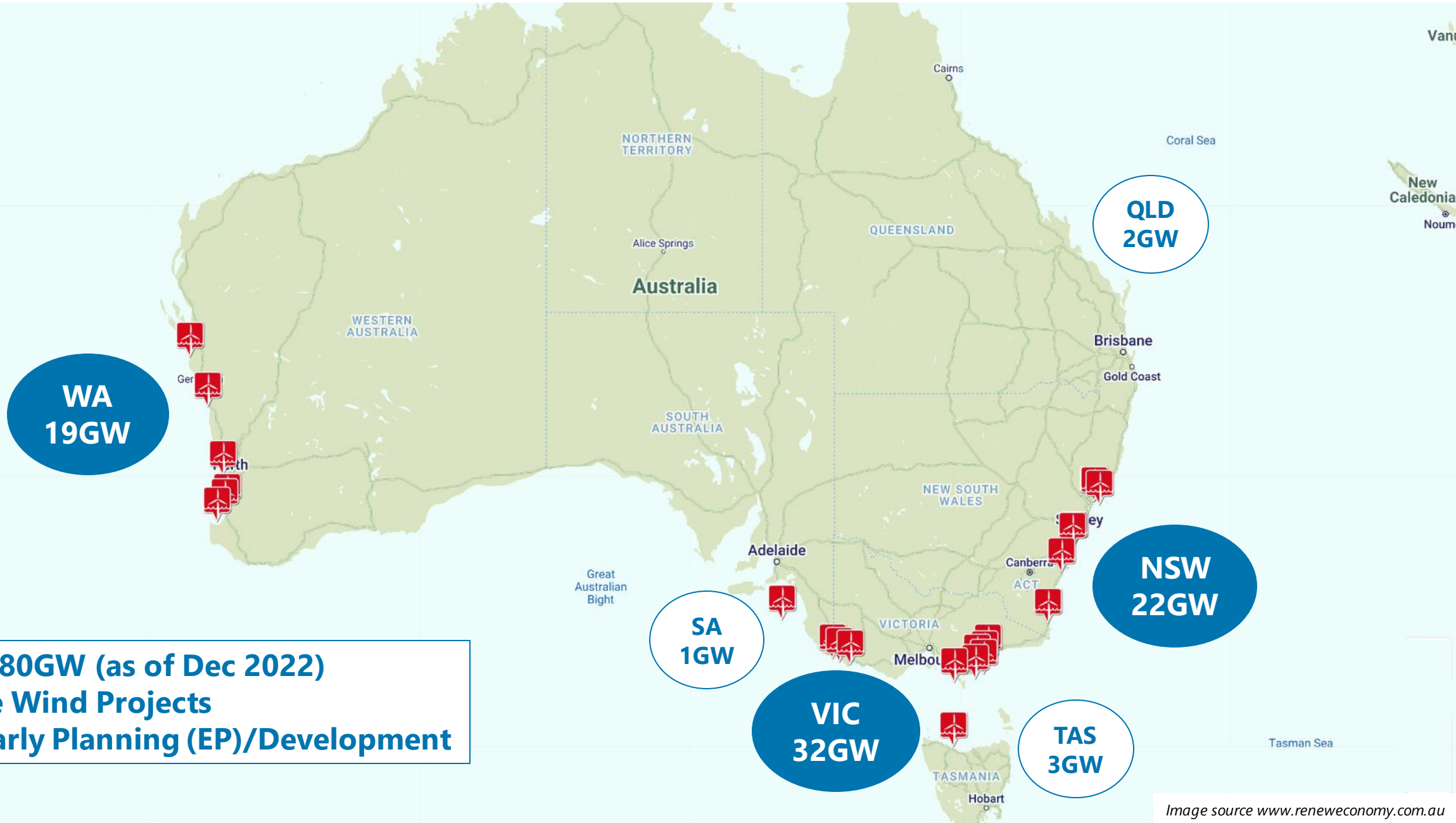
NSW has promising offshore wind zones with more than 22.25GW of total combined capacity of offshore wind project under application.

No official offshore wind energy targets have been announced yet.



Photo by Nicholas Doherty on Unsplash

Map of Australia Offshore Wind Projects



12.a List of Australia's Main Offshore Wind Projects (I)

No	Project Name	Region	Developer/Owner	Capacity (MW)	Development Status	Foundation	Commissioning
1	Power Platform	VIC	Global Renewable Solutions(formerly Marine Power Technologies Pty Ltd)	7	Dormant	Grounded (Gravity base)	
2	Start of the South	VIC	Offshore Energy Pty Ltd/ Copenhagen Infrastructure Partners	2200	Concept/EP	Grounded	2030
3	Seadragon	VIC	Flotation Energy plc	1500	Concept/EP	Grounded	2030
4	Great Southern Offshore	VIC	Corio Generation Limited	1500	Concept/EP	Grounded	
5	Cape Winds/Australis VIC (and extension)	VIC	Skyborn Renewables GmbH (formerly wpd)/Australis Energy Ltd/VIC Offshore Windfarm Pty Ltd	495-1600	Concept/EP	Grounded (Monopile)	2027
6	Bass Strait	VIC	Green Energy Partners	4000	Concept/EP	Grounded	
7	Western Victoria	VIC	Green Energy Partners	1000	Concept/EP	Grounded	
8	Greater Gippsland	VIC	BlueFloat Energy/ Energy Estate	2085	Concept/EP	Grounded	
9	Southern Winds	VIC	BlueFloat Energy/ Energy Estate	1200	Concept/EP	Grounded	
10	Portland	VIC	Flotation Energy plc	750	Concept/EP		
11	Bass Strait 1 - Mistral	VIC	Clough/Deloitte Australia/Mistral Energy	4000	Concept/EP	Floating	
12	Bass Strait 2 - Mistral	VIC	Clough/Deloitte Australia/Mistral Energy	4000	Concept/EP	Floating	
13	Bass Strait 3 - Mistral	VIC	Clough/Deloitte Australia/Mistral Energy	3000	Concept/EP	Floating	

12.b List of Australia's Main Offshore Wind Projects (II)

No	Project Name	Region	Developer/Owner	Capacity (MW)	Development Status	Foundation	Commissioning
14	Spinifex	VIC	Alinta Energy	1000	Concept/EP	Grounded	2027
15	Great Eastern Offshore Wind	VIC	Corio Generation Limited	2500	Concept/EP	Grounded	
16	Gippsland Proposed Area	VIC		10000	Development Zone		
17	Blue Marlin	VIC	Vena Energy Holdings Ltd	2000	Concept/EP	Grounded	
18	Novocastrian	NSW	OCEANEX ENERGY PTY LTD	2000	Concept/EP	Floating	2031
19	Illawarra	NSW	OCEANEX ENERGY PTY LTD	2000	Concept/EP	Floating	2031
20	Eden	NSW	OCEANEX ENERGY PTY LTD	2000	Concept/EP	Floating	2034
21	Ulladulla	NSW	OCEANEX ENERGY PTY LTD	2000	Concept/EP	Floating	2035
22	Newcastle Offshore Wind (NOW)	NSW	Newcastle Offshore Wind (NOWE) Energy PTY LTD / EDF	3000-10000	Concept/EP	Floating	
23	Port Kembla (Wollongong)	NSW	Green Energy Partners	8000	Concept/EP		
24	Hunter Coast	NSW	BlueFloat Energy/ Energy Estate	1650	Concept/EP	Floating	
25	South Pacific (Wollongong)	NSW	BlueFloat Energy/ Energy Estate	1575	Concept/EP	Floating	
26	Indigo, Lattitude 36, Azure, Bass Coast North & South, Barwon	VIC, NSW	DP Energy	+1000	Concept/EP		

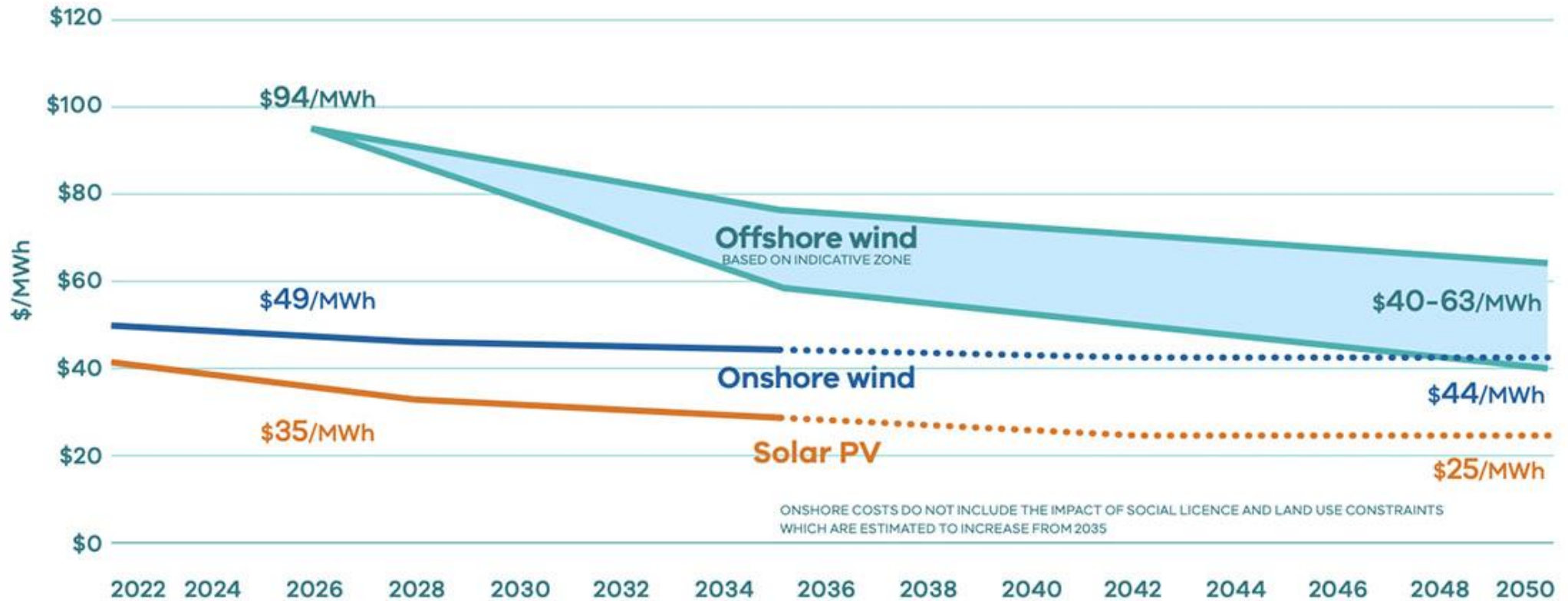
12.c List of Australia's Main Offshore Wind Projects (III)

No	Project Name	Region	Developer/Owner	Capacity (MW)	Development Status	Foundation	Commissioning
27	Western Australia	WA	Green Energy Partners	1000	Concept/EP	Grounded	
28	Mid-West	WA	Cliff Head Wind and Solar Project JV/Triangle Energy/Pilot Energy Ltd.	1100	Concept/EP	Grounded	
29	The Myalup Offshore	WA	Skyborn Renewables GmbH (formerly wpd)/Australis Energy Ltd	300	Concept/EP	Grounded (Monopile)	
30	Verella Offshore Wind Farm	WA	Copenhagen Energy A/S	3000	Concept/EP		
31	Perth Array	WA	Flotation Energy plc	1000	Concept/EP	Grounded	
32	Bunbury	WA	OCEANEX ENERGY PTY LTD	2000	Concept/EP	Grounded	2036
33	Samphire Offshore Wind	WA	Copenhagen Energy A/S	3000	Concept/EP	Grounded	
34	Midwest Offshore Wind	WA	Copenhagen Energy A/S	3000	Concept/EP	Grounded	
35	The Myalup Offshore Extension	WA	Skyborn Renewables GmbH (formerly wpd)/Australis Energy Ltd	1600	Concept/EP	Grounded	
36	Leeuwin	WA	Copenhagen Energy A/S	3000	Concept/EP	Grounded	2028
37	Kingston/Australis SA (and extension)	SA	Skyborn Renewables GmbH (formerly wpd)/Australis Energy Ltd/SA Offshore Windfarm Pty Ltd	600-1000	Concept/EP	Grounded	2027
38	Southern Queensland	QLD	Green Energy Partners	2000	Concept/EP	Grounded	
39	Bass - 1A (BOWE)	TAS	Nexsphere/Brookvale Energy	500	Concept/EP	Grounded	2026
40	Bass - 1B (BOWE)	TAS	Nexsphere/Brookvale Energy	500	Concept/EP	Grounded	2026
41	Bass - 2	TAS	Nexsphere	2000	Concept/EP	Grounded	



Indicative Levelized Cost of Energy (LCOE) Projection of Offshore Wind in Victoria

Onshore wind and solar will continue to be more economical than offshore wind in Victoria, but the gap is projected to narrow over time



14 Opportunities Offshore Wind

Australia has excellent offshore wind resources which can be complementary to utility scale solar and onshore wind, as per the location

Good strategic locations for offshore wind include sites where coal-fired power stations are scheduled for closure (e.g., near Newcastle), near major coal export ports (e.g., Gladstone, Port Kembla and Newcastle), and in centres for offshore oil & gas industry (e.g., Perth).

Offshore wind can be developed in proximity to existing electricity demand (e.g., Australia's east coast) and then reduce the need for major grid transmission expansions further inland.

Offshore wind may deliver consumer price benefits due to greater resource diversity while offering additional benefits to security of supply.

Offshore wind offers immense opportunity for green hydrogen production for export (e.g., in the proximity of NSW Government's Hydrogen Hubs in both the Hunter and Illawarra regions)

Offshore wind projects in Australia provides an additional source of new electricity generation to support net-zero emission targets and energy export opportunities.

Offshore wind may provide economies of scale with the potential for very large project developments, while delivering economic and employment opportunities to communities affected by the energy transition





Photo by Cassie Boca on Unsplash

- DCCEEW - Department of Climate Change, Energy, the Environment and Water www.dcceew.gov.au/energy/renewable/establishing-offshore-infrastructure
- DCCEEW “**Offshore Electricity Infrastructure (Declared Area OEI-01-2022) Declaration 2022**” www.legislation.gov.au/Details/F2022L01736
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- <https://reneweconomy.com.au/offshore-wind-farm-map-of-australia/>

THANK YOU

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