New Energy Quarterly:

The Way of Water

Summer 2023/24

Hamilton Locke

Contents

Editorial

Water is a fundamental resource to sustain and enrich the lives of all living things. It is integral for healthy ecosystems which sustain multiple plant and animal species, as well as regulate climate and water quality. Additionally, in many societies, water has cultural and recreational significance by providing opportunities for relaxation, tourism, and various forms of outdoor recreation, contributing to the quality of life of many people.

Due to its multiple applications, water is considered a critical resource for maintaining social, economic and national security. Accordingly, several measures from legislation and regulations to water allocation policies have been implemented in Australia and worldwide to ensure our water reserves are sustainable, reliable and resilient. Most recently in Australia, discussions are underway to incorporate the recommendations of the Australian Competition and Consumer Commission's Murray-Darling Basin water markets inquiry into domestic legislation. Each State and Territory also has ongoing strategic water plans for the responsible use of water resources. Yet, the free availability of water is under increasing stress due to population growth, drought, climate change and pollution. This has led to concerns about water scarcity and competition for limited water supplies, making sustainable water management a critical issue for the future.

The responsible use and management of water is even more relevant as recently, water plays a major role in the renewable energy sector. Key to renewable technologies such as hydropower, offshore wind and floating photovoltaic (**FPV**) farms and to facilitating the transport, supply and extraction of fuels such as hydrogen, water is an important player in progressing and sustaining the new energy transition.

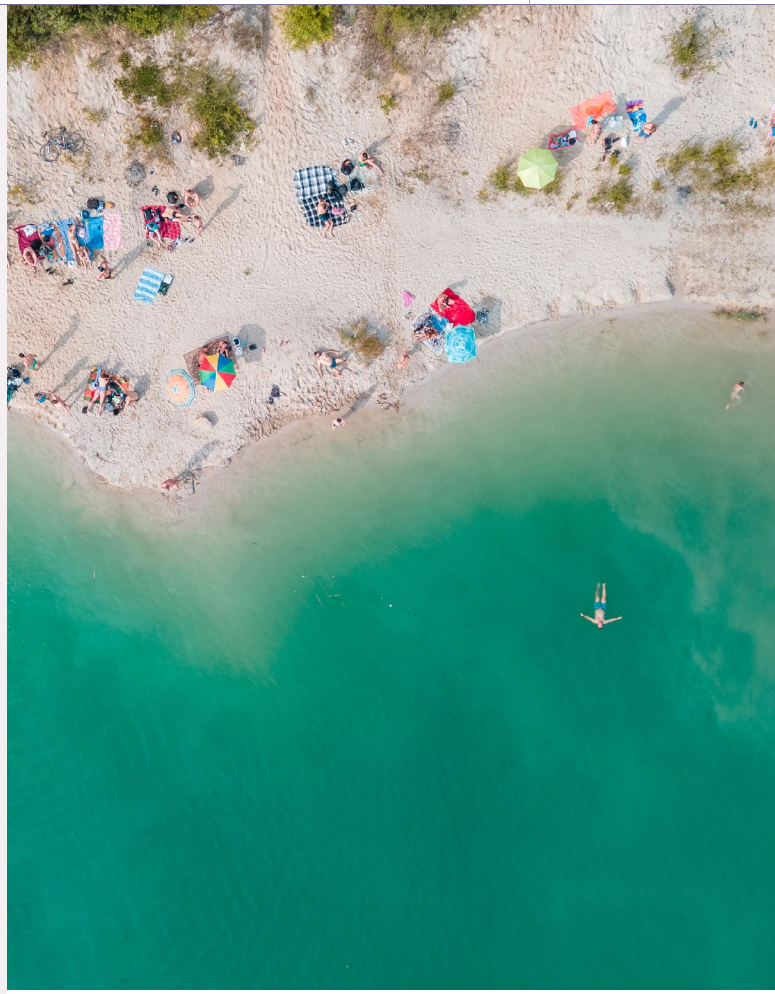
In this Quarterly

We explore the multiple applications of water with a focus on the renewable energy space.

To start off, we look at offshore wind farms, a concept once believed to be "technologically impossible", that is quickly proving itself as a viable renewable energy source. We first observe how offshore wind farms are built and operate in practice, followed by examining the relationship and issues that arise between offshore wind farms and community. This includes examining the impact on local towns and industries to coexisting with the rights of First Nations People. In both cases, it is critical to engage with and empower these communities to acquire a valid social licence and free, prior and informed consent to any potential projects. Finally, we end this section with a three-part series setting out key considerations in planning and developing an offshore wind project, including the relevant regulatory regime, establishing an appropriate group or company structure and how to increase project bankability.

Next, we explore the process of decommissioning end-of-life projects and specifically, its effect on company ESG performance. Early intervention and preemption of decommissioning requirements help to promote sustainable and ethical practices during the entire lifetime of a project, including the management of offshore energy assets post-operation. We also explore the financial, environmental and regulatory challenges which are shaping current decommissioning considerations and their impact on specific project proponents.

The final part of this Quarterly explores FPV systems and pumped hydro energy storage, both representing innovative solutions that boast economic and environmental benefits. Particularly in Australia, we expect to see a greater uptake of both FPV and pumped hydro since these systems are compatible with the country's warm, sunny climate and have the potential to work together to cater to energy demand throughout different parts of the day. Enervest's Ross Warby and Craig Jones also join us in this Quarterly's Expert Insights to discuss the viability of FPV systems in Australia and the challenges that still stand in the way of its further uptake. We finish off with a 2023 update on the production of hydrogen, for which water is a key piece to extraction process known as electrolysis, as well as the use of hydrogen as an alternative source of fuel.



Looking Forward

All life as we know it relies on the availability of clean water – not only for consumption and sanitation but also for keeping our most vital industries in operation, in particular the renewable energy sector. Through creative applications of water, we have discovered new and innovative opportunities such as floating wind and solar farms and pumped hydropower energy storage systems. Where other more variable sources of energy generation – such as wind and solar – fluctuate depending on the time of day and season, water can be utilised to supplement the loss. It also has a key role to play as a reliable resource to cool down and maintain other renewable energy projects. For this reason, water has quickly come to the forefront of the renewable energy transition. It is no doubt one of our most critical and versatile resources that must be protected to ensure a rich and sustainable future.

Watt's happened at Hamilton Locke

- Announcing the Winners of the 2023 Australian Growth Company Awards. Hamilton Locke has again partnered with the Australian Growth Company Awards in 2023, proudly supporting the innovation, excellence and superb business leaders that are achieving great things in their respective industries.
  Read more
- Hamilton Locke and MA Financial Group host 2023 'Introduction to Capital' Speed Networking Event with Leading Sources of Capital and High Growth Companies
  Read more
- Hamilton Locke continues NZ expansion with hire of Corin Maberly
  Read more
- Hamilton Locke attracts Michael Tooma and Kiri Jervis as partners, boosting ESG and WHS client offering.
  Read more
- Five new partners join Hamilton Locke in Melbourne and Brisbane
  Read more

Market Insights

- The Clean Energy Council has released the Power Playbook – Accelerating Australia's Clean Energy Transformation, a strategic package of 45 recommendations to assist Australia achieve its goal of 82% renewables by 2030.
  Read more
- The Australian Energy Regulator released the State of the Energy Market 2023 report.
  Read more
- ARENA released its annual report 2022-23, indicating a record amount of funding since its inception in 2012.
  Read more
- Public consultation opened for proposed offshore wind and other renewable projects in the Bass Strait until 31 January 2024.
  Read more
- Registrations are open for the South Australia and Victoria Capacity Investment Scheme tender for renewable energy generation and storage projects, closing in February 2024.
  Read more
- CIS announcement: Federal Government announces expansion of Capacity Investment Scheme, aiming to secure 32 GW of renewable generation and storage by 2030
  Read more

Market Recognition

Hamilton Locke Ranks #1 in Refinitiv Global Capital Markets League Tables
Read more

Hamilton Locke Secures Top 10 Rank in Mergermarket M&A League Tables
Read more

5 Hamilton Locke Lawyers announced as finalists for Lawyers Weekly 30 under 30, including New Energy Lawyer, William Ryan, for Energy & Resources.
Read more

Michele Levine and Jo Ruitenberg Listed as Australasian Lawyer's Elite Women of 2023.
Read more

Hamilton Locke Lawyers Rank in IFLR1000. New Energy Lead, Matt Baumgurtel, ranked as 'Highly Regarded'.
Read more

Hamilton Locke Selected as a Finalist in Blockchain Australia's 2023 Blockies Awards
Read more

Australasian Lawyer Recognises Hamilton Locke in its 2023 Fast Firms Report
Read more

Hamilton Locke Partner, Jo Ruitenberg, Finalist for the Lawyers Weekly Women in Law Awards 2023
Read more

Hamilton Locke Recognised in Australasian Lawyer's 2023 5-Star Employer of Choice for Four Consecutive Years
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Hamilton Locke Partner Zina Edwards Named Finalist in the 2023 Women in Finance Awards
Read more

New Starters

New Starters and Promotions:

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Michael Tooma
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Special Counsel
Melissa Doran
Laura Driscoll
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Ben Fisher

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Paul Thompson
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Lawyer, Associates and Solicitors
Mariam Dib
Matthew Dean
Keenan Smith
Lucy Masters
Nicola Irwin-Faulks
Miriam Asar
Samantha Ryu
Isabel Harrison
Anish Prakash
Ho Yan Ko

Lawyer, Associates and Solicitors cont.
Emily Taylor
Georgie Chard
Jorja Sumner
Dulip Don
Elena Martino
Kyle Venter
Christopher Simpson

Graduates
Ryan Steele

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Amy Seedsman
Annie Micallef
Charlotte Coakes-Jenkins
Emily Burton
Isabelle Honey
Sarah Sekandar

Watt's next?
The next New Energy Quarterly – Whose Line is it Anyway? Distributed Energy Networks and Transmission

SPOTLIGHT

James Simpson

James Simpson
Partner
+61 407 061 641
james.simpson@hamiltonlocke.com.au

By taking a practical and strategic approach to his practice, James focuses on solving complex problems for clients.

As a workplace and employment expert, James is driven by his curiosity and strives to deliver efficient solutions. He enjoys examining and evaluating matters to find the best outcome for clients.

What is your journey to becoming a lawyer?

I was the first person in five paternal generations to not go into the coal mining industry. Primarily, this was because I disliked maths, and that meant mining engineering was certainly out. However, growing up I had a front row seat to the very robust and colourful industrial relations environment of the coal mining industry in the 1980's. I was entirely fascinated by the complexity, the intense skirmishes and the particularly interesting characters who seemed to find themselves on the battlefield. Law was a natural choice to at least get in on some of the fun. Of course, employment law was my natural destination once I commenced practise.

What is your specialisation?

Workplace and Employment Law. It is a highly specialised area of law, but within that there are many unique and technical areas of practise – spanning employment law, industrial relations, discrimination, and work health and safety. We also traverse advisory work, corporate transactions, and litigation. One of the many great benefits of working in our area is that we regularly work closely with other practice groups across the firm in creating opportunities or solving problems for clients.

The employment lawyers in our group can be involved in contested discussions with a union one day, be in a Supreme Court pursuing or defending a restraint of trade matter the next and following that be working closely with a client on a sensitive and complex workplace investigation.

Our area is also known as the "emergency room" of a corporate law firm. By their nature, many of our matters are treated as urgent, and many of them are complex and nuanced. There is rarely a boring day as an employment lawyer.

What are your career highlights?

Most of my highlight's centre around winning difficult cases that go to trial. Some that stand out include: stopping the unions from closing down the construction of a brewery via the Supreme Court of Victoria; successfully defending a high profile Fair Work Ombudsman prosecution relating to international employment in the air transport industry; and ensuring a client was not prosecuted under WHS laws relating to a workplace fatality.

Why did you join Hamilton Locke?

The people. Hamilton Locke has so many sharp, deft, interesting practitioners and support crew across all levels of the organisation. Everyone is heavily invested in the service and solutions they provide and are an absolute delight to work with.

RISING STAR

David Wan

David Wan
Paralegal, New Energy
+61 410 801 469
david.wan@hamiltonlocke.com.au

What are you most proud of in your career to date?

I am proud of my transition from engineering to law. Transitioning from a quantitative discipline based on mathematics to the qualitative realm of law was challenging, yet deeply rewarding intellectually.

My journey has been marked by the steadfast commitment to adapting and learning without being deterred by the ups-and-downs of a steep learning curve.

Furthermore, I'm grateful for being able to join Hamilton Locke's New Energy team, merging my engineering interest with newfound legal skills passionately in a supportive team environment.

What do you enjoy about working in the legal industry?

The legal industry presents a unique blend of intellectual rigour and societal impact. I relish the opportunity to engage in complex problem-solving that is people-centric and has a direct influence on clients and communities.

If you have taken part in the Da Vinci program, what activity did you undertake and why?

I've chosen learning Japanese for my Da Vinci program this year. I've always enjoyed travelling in Japan, from appreciating its food and culture to skiing in Hokkaido. The Da Vinci program has been a great opportunity for me to enhance my language skills. I look forward to using this new language skill during my future trips to Japan and enriching my travel experiences.

What do you like most about Hamilton Locke?

I greatly appreciate the encouragement and mentoring provided at all levels within Hamilton Locke. Everyone in the firm, from paralegals to partners, and from lawyers to the support, HR and marketing teams, is fostering this encouraging, caring, inclusive and supportive environment. I cherish how Hamilton Locke prioritises the people experience and the client experience, echoing my own belief that the heart of legal work is about people and relationships.

In your opinion, how does the HPX Group empower communities?

I'm impressed by HPX Group's dedication to going above and beyond, not just in terms of legal outcomes, but also in fostering dynamic and strong relationships within the firm and between clients and legal professionals. It's a reminder that the essence of any success is rooted in trust and support.

Being part of this group signifies being amongst professionals who not only strive for excellence but also nurture a collaborative collegial environment. This represents a collective commitment to progress and empowerment, both within the workplace and in the broader communities we serve.

Favourite movie and why?

The Lion King. (1994)

A beautiful story of the vicissitudes of life, farewells and renewal. And a lot of animals. And great music too. What more could you ask for in a movie?

Favourite cuisine/meal?

Poke bowl. A wonderful balance of protein, carbohydrates, and vegetables. Flexible to have various add-ons too.

Watt is ARENA funding?

Program	Summary	Funding available	Closing Date
Advancing Renewables Program (ARP)	The ARP awards grants to a range of projects that seek to: - Optimise the transition to renewable electricity - Commercialise clean hydrogen - Support the transition to low emission metals	Up to AUD $50 million	Ongoing
Powering the Regions Industrial Transformation Stream	The Industrial Transformation Stream seeks to support existing industrial facilities, and new clean energy developments, in regional areas to reduce their emissions, in line with Australia's 2030 targets and in support of reaching net zero by 2050.	AUD $400 million	Register your interest – initial funding expected to open to applications by late 2023.
Industrial Energy Transformation Studies Program (IETS)	IETS looks to assist large energy users in undertaking engineering and feasibility to identify ways to lower energy costs and reduce carbon emissions. Funding is available to companies and organisations in agriculture, mining, manufacturing, gas supply, water supply, waste services and data centre sectors. Funding will be provided in two Streams: - Feasibility Studies: to provide an independent assessment that examines all aspects of a project - Engineering Studies: to determine whether a EPC contract could be executed	AUD $43 Million	Ongoing Key assessment dates are located here.
Hydrogen Headstart	Hydrogen Headstart will underwrite the biggest green hydrogen projects to be built in Australia through a competitive process which will provide revenue support for ongoing operational costs in the form of a production credit.	AUD $2 billion	EOIs closed in November 2023. Applicants to be notified of EOI outcome in January 2024.

Program	Summary	Funding available	Closing Date
Regional Microgrids Program (RMP)	The Regional Microgrids Program (**RMP**) aims to support the development and deployment of renewable energy microgrids across regional Australia that contribute to the Program Outcomes. Funding has been allocated across two Streams under the Program, each with its own Outcomes: 1. Stream A – Regional Australia Microgrid Pilots – to fund Projects that contribute to the innovation and/or acceleration of developing and deploying equipment that enables the coordinated use of distributed renewable energy technologies, improving the resilience and reliability of electricity supply in regional areas and addressing barriers to deployment of microgrid solutions. 2. Stream B – First Nations Community Microgrids – to fund Projects that contribute to the provision of cleaner, cost effective and reliable energy in First Nations Communities and empowering these Communities to participate in electricity supply arrangements and the development of energy infrastructure.	Total AUD $125 million **Stream A** $50 million **Stream B** $75 million	19 December 2025
Sustainable Aviation Fuel Funding Initiative	Following market developments since this time, the scope of this initiative is targeted towards the development of a sustainable aviation fuel (**SAF**) industry in Australia with production from renewable sources. Expressions of Interest are expected to open in mid-2023.	Up to AUD $30 million	EOIs closed on 1 November 2023 ARENA will invite key applicants to submit a full application. Dates TBC.
Driving the Nation Program	The Program is focused on accelerating the uptake of Zero Emission Vehicles (**ZEVs**). ZEVs include Battery Electric Vehicles, Hydrogen Fuel Cell Vehicles and biofuel vehicles.	AUD $500 million	Ongoing
Clean Energy Innovation Fund (CEIF)	Seeks to fund emerging Australian technologies and businesses to speed the nation's transition to a renewable economy.	Up to $5 million	Ongoing

Check your eligibility here

If one of the programs sparked your interest you can check your eligibility **here**.

Hamilton Locke New Energy Team

Partners


Matt Baumgurtel
Partner


Veno Panicker
Partner


Brit Ibanez
Partner


Michael Boyce
Partner


Tricia Moloney
Partner


Margot King
Partner


James Simpson
Partner


Adam Jeffrey
Partner


Andrew Vincent
Partner


Jo Ruitenberg
Partner

Special Counsel


Adriaan van der Merwe
Special Counsel


Sandra Taran
Special Counsel


Timothy Zahara
Special Counsel


Eliza Buchanan
Special Counsel


Kaday Conteh
Special Counsel

Senior Associates


David O'Carroll
Senior Associate


Hannah Jones
Senior Associate


Gareth Howard
Senior Associate


Cormac Foley
Senior Associate

Lawyers


William Ryan
Lawyer


Megan Chau
Lawyer


Ally Frizelle
Lawyer


Tariq Alardah
Lawyer


Jorja Sumner
Lawyer


Raymond Deng
Lawyer

Paralegals


Rahul Tijoriwala
Paralegal


Dhanushka Rajaratnam
Paralegal


Kusum K C
Paralegal


David Wan
Paralegal

Where the Wind Blows: Offshore Wind Farm Site Considerations

Authors: William Ryan & Matt Baumgurtel
First published: 29 September 2023

The decision of where to develop an offshore wind farm (**Project**) is complex and governed by many factors. The location of Projects in the sea distinguishes this form of renewable energy from other sources because the Commonwealth of Australia does not have exclusive sovereignty over the use and control of oceans.

In this article, we consider the critical question of "where" to construct a Project and how domestic (state and Commonwealth) legislation as well as public international law can influence Project location.

Who owns the sea?

Maritime boundaries are complex and governed by a mix of domestic and international legal considerations. Maritime boundaries include:

- **Coastal waters** (3 nautical miles (5.556 km) from the territorial sea baseline (**TSB**));
- **Territorial Sea** (12 nautical miles (22.224 km) from the TSB);
- **Contiguous Zone** (24 nautical miles (44.448 km) from the TSB);
- **Exclusive Economic Zone** (**EEZ**) (200 nautical miles (370.4 km) from the TSB);
- **Australian Fishing Zone** (same as the EEZ, with exceptions); and
- **Continental Shelf** (extends to 200 nautical miles from the TSB and beyond to the outer edge of continental margin).

The Offshore Electricity Infrastructure Act 2021 (Cth) (**OEI Act**) introduced the legal framework for Projects in the Commonwealth offshore area. The Commonwealth offshore area includes the territory, seabed and subsoil beneath the territorial sea and Australia's EEZ and excludes Coastal waters1. The provisions of the OEI Act must be applied with existing legislation relating to the sea (for example, Seas and Submerged Lands Act 1973 (Cth) and the Coastal Waters (State Powers) Act 1980 (Cth)) and is also subject to Australia's obligations under international law both within and outside of the Commonwealth offshore area.

Location & Size of Projects

Projects can be located up to 200 nautical miles from the shoreline. However, in practice, Project positioning is governed by:

1. **Technology**: for example, the decision whether offshore wind should be fixed and floating (see more here);
2. **Proximity to natural resources:** including high and consistent wind speeds and suitable water depths;
3. **Proximity to end users:** including proximity to urban areas as well as existing electricity and maritime infrastructure (including ports);
4. **Proximity to existing sea users**: including shipping routes and navigation, communication and hydrocarbon cabling, the maritime industry (such as fishing, aquaculture and tourism), coastal towns (frequently concerned about visual amenity)
5. **Environmental impact:** including impact of maritime species[2].

As a result of these factors, Projects are presently best placed between 5km and 35km from the coastline. Under the Offshore Electricity Infrastructure Regulations[3] up to 700 km^2 (approximately the land area of Singapore) can be licensed for the development of a Project.

The Australian Experience

The OEI Act empowers the Commonwealth to declare areas which are suitable for offshore infrastructure activities. To date, the Commonwealth has flagged its intention to declare the following offshore wind priority regions:

Priority region	Status
Bass Strait off Gippsland in Victoria	Declared suitable on 19 December 2022[4]
Pacific Ocean region off the Hunter in NSW	Declared suitable on 12 July 2023[5]
Southern Ocean region off Portland in Victoria	Consultation closed 31 August 2023[6]
Pacific Ocean region off the Illawarra in NSW	Consultation ongoing (August to October 2023)[7]
Bass Strait region off Northern Tasmania	Consultation commences in October 2023[8]
Indian Ocean region off Perth/Bunbury in Western Australia	Consultation commences in November 2023[9]

Proposed sites for Australia's offshore wind farms

Source: Ecogeneration: Australian offshore wind farms get green light in landmark announcement[10]

What are the Australia's obligations under international law in respect of Projects?

While wind is a non-living, non-extractive, renewable, and non-exhaustible resource, the conversion of wind into an energy resource has a unique spatial footprint which affects the water column, seabed, subsoil, and even the airspace above. This characteristic has significant implications the exercise of Australia's sovereign rights in its territorial waters and EEZ.

Australia's obligations under international law, particularly within the framework of the United Nations Convention on the Law of the Sea (**UNCLOS**) will impact Projects (particularly project location and design).

While Australia has sovereign rights over its EEZ, it must have due regard and consider the rights and duties of other countries[11], and other countries must do the same in respect of Australia's rights[12]. This general principle under UNCLOS is designed to balance the rights and interests of coastal countries with those of other countries, Projects introduce unique challenges and considerations to the application of these principles.

For instance, the following UNCLOS obligations may having bearing on a Project's design and location:

- a coastal country must not unreasonably obstruct or interfere with a foreign vessel's right of innocent passage or sea approaches and shipping routes.[13] The establishment of safety zones around Projects, the potential increase in maritime traffic resulting from Project activities, and the specific placement of the Projects themselves all have the potential to impact this obligation. The extent and nature of such interference will be contingent upon Project design and geopolitical factors which will evolve as the industry matures and for which businesses must be prepared;
- freedom of overflight, the right to lay submarine cables and pipelines, and the freedom of navigation.[14] This obligation has national security implications which must be considered in Project risk analyses; and
- the obligation to protect and preserve the marine environment,[15] and take measures to minimise pollution from the installation of infrastructure used in the exploitation of natural resources or operating in the marine environment.[16]

It is evident from even a cursory evaluation of these obligations that a Project's location and design have complex, far reaching implications.

Conclusion

Understanding the intricacies of the "where" aspect of Projects is essential for businesses seeking success in this industry that involves a careful of both domestic and international regulatory requirements and obligations to enable informed decision-making, risk mitigation, and collaborative ventures.

For more information, please contact:

Matt Baumgurtel
Partner
+61 459 900 080
matt.baumgurtel@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/matt-baumgurtel

William Ryan
Lawyer
+61 402 655 538
william.ryan@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/william-ryan

[1] s8

[2] Camille Goodman (2023), 'Harnessing the Wind Down Under: Applying the UNCLOS Framework to the Regulation of Offshore Wind by Australia and New Zealand, Ocean Development & International Law'.

[3] s7

[4] The Hon Chris Bowen MP, Minister for Climate Change and Energy, Joint media release: Unlocking the power of offshore wind in Gippsland

[5] The Hon Chris Bowen MP, Minister for Climate Change and Energy, Area in the Pacific Ocean off the Hunter declared suitable for offshore wind

[6] The Hon Chris Bowen MP, Minister for Climate Change and Energy, Offshore wind industry to power regional jobs across the Southern Ocean region

[7] The Hon Chris Bowen MP, Minister for Climate Change and Energy, Consultation Opens for Offshore Wind Zone in the Illawarra, Driving Regional Jobs and Investment

[8] The Hon Chris Bowen MP, Minister for Climate Change and Energy, Speech to Asia Pacific Offshore Wind and Green Hydrogen Summit.

[9] The Hon Chris Bowen MP, Minister for Climate Change and Energy, Speech to Asia Pacific Offshore Wind and Green Hydrogen Summit.

[10] Ecogeneration, Australian offshore wind farms get green light in landmark announcement

[11] Article 56(1)a

[12] Article 58(3)

[13] Articles 17 and 45

[14] Article 58(1)

[15] Article 192

[16] Article 194(3)

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Australia's Offshore Wind Regulatory Regime

Authors: William Ryan, David Wan and Matt Baumgurtel

The Australian offshore wind sector is burgeoning. Australia is on track to have six offshore wind areas declared by the first half of 2024,[1] . To better harness Australia's huge offshore wind potential, estimated at 4,963GW,[2] in 2021 Australia enacted the Offshore Electricity Infrastructure Act 2021 (Cth) (**OEI Act**). The OEI Act provides a regulatory framework for offshore renewable energy and electricity transmission infrastructure.[3]

This article provides an overview of the licencing and approvals regimes pursuant to the OEIA Act and the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (**EPBC Act**).

Obtaining a licence under the OEI Act

The OEI Act sets four categories of licences for offshore electricity infrastructure:

To obtain a licence, the applicant must meet the merit criteria, which assess the following:[4]

Category	Purpose
Feasibility licences	To assess the feasibility of an offshore wind project. A feasibility licence is required to apply for a commercial licence.
Commercial licences	To operate offshore renewable energy projects.
Transmission and infrastructure licences	To install and operate undersea connectors to transmit electricity.
Research and demonstration licences	To enable short-term projects trial and test new offshore renewable energy technologies.

1. applicant's technical and financial capability to carry out the project;
2. likely viability of the project;
3. suitability of the applicant to hold a licence; and
4. national interest.

Applicants will also be required to provide an 'approved management plan' (setting out how the proponent will provide for the offshore electricity infrastructure and manage risks and impacts of the activities to be carried out under the licence) as well as financial security (to cover the cost of decommissioning the proposed infrastructure).

As competition is expected to be strong for a spot in the offshore wind declared areas,[5] if two or more applications for a feasibility licence overlap (ie. wholly or partly cover the same area), the Registrar will assess the applications and advise the Minister, who may refuse the application that is of lesser merit. If the applications are of equal merits, the Minister may invite these applicants to submit revised financial offers.[6]

Licence holders will have continuing obligations, such as providing the Registrar with annual reports and paying annual levies (for example, the total annual levy for a commercial licence will be at least $745,186).[7]

Obtaining approval under the EPBC Act

The EPBC Act set out the approval regime for any action (**Controlled Action**) that 'has, will have or is likely to have a significant impact on the environment' in the Commonwealth Marine Area. This includes offshore wind farms.[8] Under the EPBC Act, the Minister is empowered to assess the impacts of the Controlled Action and make a decision about whether the project should proceed (including conditions).[9]

To guide offshore wind projects' assessment process under EPBC Act, in July 2023, the Department of Climate Change, Energy, the Environment and Water (**DCCEEW**) published the 'Guidance – Key environmental factors for offshore windfarm environmental impact assessment under the Environmental Protection and Biodiversity Conservation Act 1999 (Cth)'(**Key Factors Guidance**). The Key Factors Guidance identifies 13 key impacts to be assessed by offshore wind proponents for the purposes of the EPBC Act, including underwater noise, turbine interactions, electromagnetic fields, disturbance of underwater cultural heritage, vessel interactions and invasive marine species.

Interaction between the OEI Act and EPBC Act

The OEI Act and the EPBC Act interact in complex ways. Depending on the stream, the environmental assessment under the EPBC Act may occur at different stages. The overall process of assessment under both the OEI Act and the EPBC Act is time consuming and may take approximately 2-3 years.[10]

Please contact our office if you have any questions about the interaction between the OEI Act and the EPBC Act in respect of each licence category identified in the above table.

Relevant regulatory bodies

Proponents will interact with different relevant bodies at various stages of the application process, including:

- The Offshore Infrastructure Registrar (**Registrar**), with assigned staff from National Offshore Petroleum Titles Administrator (**NOPTA**), will assess licence applications and advise the Minister for Climate Change and Energy on licence-related decisions;

- the Offshore Infrastructure Regulator (**Regulator**), under National Offshore Petroleum Safety and Environmental Management Authority (**NOPSEMA**), will assess activities under OEI Act licences (including management plans and lodgement of financial securities), and monitor and enforce compliance against OEI Act requirements; and
- if the project referral indicates potential environmental impacts on Australian Marine Parks (**AMPs**), DCCEEW will consult with the Director of National Parks (**DNP**) during the assessment process.

Conclusion

The statutory and common law backdrop for offshore wind is emerging. Offshore wind project proponents must familiarise themselves with the requirements under both the OEI Act and the EPBC Act from project initiation.

[1] Will Kenton, 'Social License to Operate (SLO): Definition and Standards' (31 May 2021): https://www.investopedia.com/terms/s/social-license-slo.asp#:~:text=What%20Is%20the%20Social%20License,stakeholders%2C%20and%20the%20general%20public.

[2] Australian Renewable Energy Agency, 'Establishing the Social Licence to Operate Large Scale Solar Facilities in Australia' (19 November 2020): https://arena.gov.au/knowledge-bank/establishing-the-social-licence-to-operate-large-scale-solar-facilities-in-australia/

[3] EnergyCo, 'Renewable Energy Zones' (2023): https://www.energyco.nsw.gov.au/renewable-energy-zones

[4] BSR, 'Building a Social License to Operate in the Renewable Energy Sector' (7 April 2016): https://www.bsr.org/en/blog/building-a-social-license-to-operate-in-the-renewable-energy-sector

[5] RenewEconomy, Hunter offshore wind zone opens to bids as Bowen urges media to focus on 'the facts'

[6] OEI Regulations rr15, 16.

[7] the Offshore Electricity Infrastructure (Regulatory Levies) Regulations 2022 (Cth) r 6.

[8] EPBC Act s 23.

[9] EPBC Act Part 9.

[10] DCCEEW - Guidance on Offshore Renewables Environmental Approvals

For more information, please contact:

Matt Baumgurtel
Partner
+61 459 900 080
matt.baumgurtel@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/matt-baumgurtel

William Ryan
Lawyer
+61 402 655 538
william.ryan@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/william-ryan

To fix or not to fix? Offshore wind and community impact

Authors: William Ryan, Megan Chau and Matt Baumgurtel
First published: 23 August 2023

On 12 July 2023, the federal government announced the Hunter Coast as Australia's second offshore wind zone. The announcement of a second offshore wind zone (alongside the Bass Straight off Gippsland) demonstrates that offshore wind – formerly believed to be 'technologically impossible'[1] – is now a viable renewable energy source. As community acceptance of offshore wind (as an alternative to onshore wind) has grown, a secondary debate has arisen: to fix or not to fix?

It is a pressing question. According to the Global Wind Energy Council, approximately 80% of the world's offshore wind is found in waters deeper than 60m.[2] However, the technical capacity and bankability of floating wind farms lag significantly behind its fixed-bottom counterparts. For example, the world's first fixed-bottom wind farm (Ørsted's 'Vindeby Offshore Wind Farm') was commissioned in 1991. By contrast, the first floating wind farm (Equinor's 'Hywind Scotland') was only commissioned in 2017.

This article compares the key differences between fixed-bottom and floating wind farms, and discusses the impact of each on the marine ecosystems and coastal communities.

When to fix and when to float?

The below table sets out the key characteristics and differences between fixed bottom and floating wind farms.

Characteristic	Fixed-bottom	Floating
Description	Monopiles are drilled into the seafloor and operate from a 'fixed' location.	Monopiles are constructed on floating structures which are anchored to the seafloor by anchors, chains and sea cables. Designs vary – see **Diagram 1** for examples.
Location	Depths up to 60m. Accordingly, fixed-bottom wind farms are located much closer to the coast.	In theory, capable of installation up to 1km above the seabed, and therefore has greater flexibility to be installed further out to sea in areas of stronger consistent wind.
Construction	Requires specialised installation vessels to install fixed foundations (for example, jack-up and dynamic positioning vessels).	Can be constructed onshore then transported to the offshore location using tugboats and cable-laying vessels, reducing installation costs.
Cost	Less expensive to construct.	Presently, more expensive to construct (however forecasts estimate this gap will significantly decrease over the next decade).

Diagram 1: Floating offshore wind designs

Figure 1 Example of a semi-submersible floating substructure. Photo of the WindFloat Atlantic project courtesy of Principle Power/Ocean Winds.

Figure 2 Example of a barge floating substructure. Image courtesy of BW Ideol. All rights reserved.

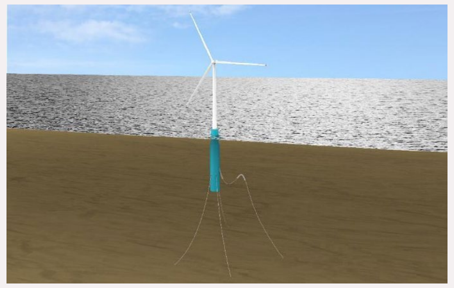

Figure 3 Example of a spar floating substructure. Image courtesy of ORE Catapult. All rights reserved.

Source: As compiled in BVG Associates, 'Guide to a Floating Offshore Wind Farm' (May 2023): https://guidetofloatingoffshorewind.com/wp-content/uploads/2023/06/BVGA-16444-Floating-Guide-r1.pdf

Impact on coastal communities

Coastal communities frequently resist the construction of offshore wind farms on the basis that the construction and operation would disrupt the livelihoods of fisherman and those operating in the tourism sector. For example, Blue Float Energy's recent proposal to construct an offshore wind farm off the coast of Port MacDonnell, South Australia, was met with resistance by some within the 800-strong local community. The pushback was centered around concerns that the offshore wind farm would disrupt the natural ecosystem during the process of installation and operation, and affect visual amenity.

Public dissatisfaction with any new developments may be a deciding factor in the progress or termination of any renewable energy project, and offshore wind projects are no exception. Consider the Cape Wind project, a proposed wind farm off the coast of Massachusetts in the U.S.. While the project received the necessary federal government approvals to progress with development in 2010, the Cape Wind project faced strong opposition from a variety of stakeholders, including environmental groups, nearby local townspeople and indigenous communities. Among others, concerns have included the size and unsightly appearance of the project (alleged to affect tourism and property values), wildlife and historic conservation issues, and a lack of transparency surrounding the cost of the project in terms of development and whether consumers would be entitled to a subsidy scheme for any energy generated by the project.[3] Eventually, the protest lead to the termination of the entire project in 2017.

While these concerns are applicable to floating wind farms, it is notable that, when constructed onshore and installed further to sea, the impacts on fishing communities and visual and aural amenities are significantly reduced.

Relevance of offshore wind farms for developing nations

In 2019 the World Bank Group announced a limited but notable program, the WBG Offshore Wind Development Program, to fast-track the adoption of offshore wind in developing nations with significant offshore wind resources (including Brazil, India and the Philippines).[4] Notwithstanding the present high upfront costs, floating wind farms have been touted as a partial solution to the energy crises faced by many of these countries. Floating wind farms will be particularly relevant to countries like the Philippines and South Africa, which have deeper seafloors.[5]

Conclusion

The Cape Wind project – and the current conflict with Port MacDonnell – provides us with the following key takeaways on how to move forward with offshore wind projects while maximising stakeholder satisfaction and minimising controversy:

1. emphasise the need for open communication, transparency and public consultation, particularly for affected industries such as fishing and hospitality industries, prior to the planning and development of any floating wind farm projects;
2. thoroughly evaluate the suitability of the proposed wind farm site, taking into account potential impacts on the environment from both a practical and visual perspective. This can be done through scientific research and consulting with local communities and other stakeholders; and
3. at a governmental level, there must be further consideration on how to regulate the operation and development of floating wind farms and how these new regulations interact with existing legislation, ultimately to ensure that each relevant party's interests are adequately protected.

For more information, please contact:

Matt Baumgurtel
Partner
+61 459 900 080
matt.baumgurtel@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/matt-baumgurtel

William Ryan
Lawyer
+61 402 655 538
william.ryan@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/william-ryan

Megan Chau
Lawyer
+61 427 079 625
megan.chau@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/megan-chau

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Finding Common Ground Between Offshore Wind Farms and the Rights of Aboriginal and Torres Strait Islander People

Authors: Matt Baumgurtel, David O'Carroll and Dhanushka Rajaratnam
First published: 23 August 2023

As Australia's offshore wind sector shifts into high gear to accelerate the clean energy transition, project developers and investors will be required to consider the rights of Aboriginal and Torres Strait Islander people (**First Nations People**).

Balancing the rights and aspirations of First Nations People and the advancement of offshore wind farms presents significant hurdles for those in the development of offshore renewable energy projects.

Unique circumstances

First Nations People hold a holistic view that rejects the division between Sea Country and Land Country or the protection of practices and sites of historical or cultural significance in isolation. This arises from the profound, holistic connection that First Nations People have with space, time, and the environment compared to the extreme compartmentalisation prevalent throughout the country and most of the world[1]. It is useful to remember that for First Nations People, their culture and heritage is not something of the past but that it is an ongoing, living relationship with the planet and its people.

The fact that First Nations People's socio-economic relationship with Country, and in this case, Sea Country, begins well before the current coastal ecosystems were established and that heritage sites include tangible and intangible aspects adds another layer of complexity to this situation. The Sea Country, where offshore wind zones and projects will be established and developed, have many areas of historical and cultural significance that still form an integral part of the socio-economic and legal system of First Nations People.

Another distinction unique to offshore wind project development compared with other development projects is the difference between Anglo-Australian legal traditions and the legal traditions of First Nations People. The legal tradition of First Nations People is strongly characterised by oral accounts of conduct and history and by restrictions on the transfer and possession of knowledge.[2] For example, some information may be sacred, kept secret and only shared under strict preconditions set by customary laws that are often unique to each group.

These restrictions on public access to information, particularly in respect of sites of significant cultural or ritualistic value can result in the fragmentation of knowledge across communities. This also affects the success of laws and policies aimed at protecting the property rights of First Nations People.

Native Title

These differences become apparent and somewhat problematic within the framework of the Native Title Act 1993 (Cth) (**NTA**). The NTA acknowledges that First Nations People possess rights and interests in waters based on their traditional laws and customs. These water-related native title rights encompass fishing, hunting, resource extraction from water bodies, access to water and the use of water for cultural or spiritual purposes.

However, the limitation of restricted information sharing present in the socio-legal systems of First Nations People hinders the comprehensive recognition of coastal areas and water rights and usage practices.

This challenge could be exacerbated by the voluntary and involuntary displacement of coastal communities of First Nations People, who possess vital knowledge about significant locations and cultural practices. Consequently, there is a risk that the scope of traditional rights over coastal land or waters may exceed the recognition provided under the NTA framework.

While there have been a handful of cases where exclusive native title has been recognised, native title in tidal and sea areas can only be of a non-exclusive nature, as exclusive native title is considered inconsistent with other common law rights regarding marine access and navigation. This non-exclusivity makes it even more important to balance the interests of First Nations People and offshore wind project proponents.

Faced with these difficulties, how can proponents of offshore wind projects guarantee the preservation of First Nations People's rights over Sea Country while meeting their commercial objectives?

These restrictions on public access to information, particularly in respect of sites of significant cultural or ritualistic value can result in the fragmentation of knowledge across communities. This also affects the success of laws and policies aimed at protecting the property rights of First Nations People.

Impact and Regulatory Response

As discussed above, strict compliance with the law may be insufficient to ensure conflict-free project operations. Many project proponents are often unaware of the application of the NTA to offshore areas or coastal lands. The NTA does indeed operate in the waters where projects may be implemented. Further, the Offshore Electricity Infrastructure Act 2021 (Cth), makes it an offence for a license holder to carry out activities in the Commonwealth offshore area that interfere with the exercise of native title rights and interests (within the meaning of the NTA), even if that purpose was in the exercise of licensed activities.

Even though the Offshore Electricity Infrastructure Act 2021 (Cth) links the recognition of the right of First Nations People to the coastal areas and waters to the NTA, this area of the law is a dynamic space as stakeholders become more aware of the nuances of sustainable social and economic development.

The Protecting the Spirit of Sea Country Bill 2023 (**Bill**) is currently before the Australian Senate and was introduced earlier this month to amend the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth) (**OPGGSA**) and the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

The Bill is a consequence of the cases of Tipakalippa v National Offshore Petroleum Safety and Environmental Management Authority (No 2)[3] and the subsequent appeal in Santos NA Barossa Pty Ltd v Tipakalippa.[4] It is centered around the principle of Free, Prior and Informed Consent (**FPIC**). FPIC is a right recognised for Indigenous People, and in this case, First Nations People, and allows First Nations People to provide or withhold / withdraw consent, regarding projects impacting their territories and to engage to shape the design, implementation, monitoring, and evaluation of projects. The Bill seeks to address the following issues faced by First Nations People:

1. the absence of standards of consultation;
2. the absence of statutory requirements to consult with Traditional Owners and knowledge holders within First Nations communities; and
3. the absence of a requirement to identify underwater cultural heritage that may be impacted by offshore projects.

While it is arguable that the impact of offshore wind projects is smaller than the impact of offshore petroleum and gas projects, the impact of offshore wind projects on the rights of First Nations People is not insignificant and will profoundly influence both the customary use of coastal regions and waterways and the rights of First Nations People.

Management

Offshore wind proponents should adopt a proactive approach by initiating engagement with First Nations People during the project's design phases and ensuring that the participants representing the proponent's interests understand the importance of adhering to FPIC so as to avoid the risk of engaging in practices that are exploitative or could be construed as unethical business practices.

Proponents should consider establishing Indigenous land use agreements or similar agreements that address the interests of First Nations People and which create community ownership in the offshore wind projects whilst also respecting and protecting the property rights and cultural rights of First Nations People.

These proactive measures align with enhanced ESG (Environmental, Social, and Governance) compliance for offshore wind projects, serving to reduce the likelihood of legal disputes and unfavourable publicity. This strategic alignment is crucial in safeguarding the broader clean energy transition's trajectory and to establish a strong social license for the nascent industry.

Conclusion

Discussions that are sensitive to the unique proprietary and cultural customs of First Nations People are therefore essential to creating stakeholder value through the implementation of offshore wind projects and accelerating the clean energy transition.

For more information, please contact:

Matt Baumgurtel
Partner
+61 459 900 080
matt.baumgurtel@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/matt-baumgurtel

David O'Carroll
Senior Associate
+61 421 497 311
david.ocarroll@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/david.ocarroll

DhanushkaRajaratnam
Paralegal
dhanushka.rajaratnam@hamiltonlocke.com.au

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Offshore Transmission: Learnings from Europe

Authors: William Ryan, David Wan, Amy Seedsman and Matt Baumgurtel

Australia's nascent offshore wind industry is decades behind the UK and other European countries that have been operating offshore wind for more than 30 years.[1] Europe's first offshore wind farm, Ørsted's Vindeby, was commissioned in 1991. Nowadays, Europe's extensive (but still growing) offshore wind sector includes projects such as the Lond Array, which consists of 175 wind turbines.[2]

Development in offshore windfarms is critical to providing reliable, clean, and secure energy in Australia. Studies have shown Australia's offshore wind technical potential is the fourth greatest in the world; we have the potential to generate 4963GW from these resources.[3]

However, to achieve climate ambitions, close attention needs to be paid not just to the development of offshore wind farms, but also to the offshore transmission lines which connect offshore projects to the grid. This article considers what Australia can learn from the European approach to offshore transmission (including ownership of transmission infrastructure).

Offshore transmission owner (OFTO) models

In Australia currently, the transmission elements from central onshore nodes to windfarms are largely being left to the developers to cost into their own project feasibility estimates. Leaving such funding to developers has resulted in the application of 'developer/generator' capital costs to transmission links, driving up production costs, and stifling growth in offshore wind.

However, since 2009 the UK has successfully operated an alternative model, with its offshore transmission assets being separately owned by investors under long-term transmission licences.[4] Under this model, wind farm developers construct and commission offshore transmission lines, then 18 months later sell them at cost (plus regulated interest), to an offshore transmission owner who becomes responsible for owning and operating the transmission assets.[5]

Under this regime, UK government regulators have taken care to ensure risk lies where it is best managed, including:

- developers assume construction risks;
- offshore transmission owners assume operational risks; and
- the UK government assumes risk of high-impact, low probability events (for example, terrorism or acts of war) under their exceptional event and income adjustment protections.[6]

The government assumption of risk for high-impact, low probability event means that construction and operation pricing is reduced and more amendable to financiers.

An Offshore Grid?

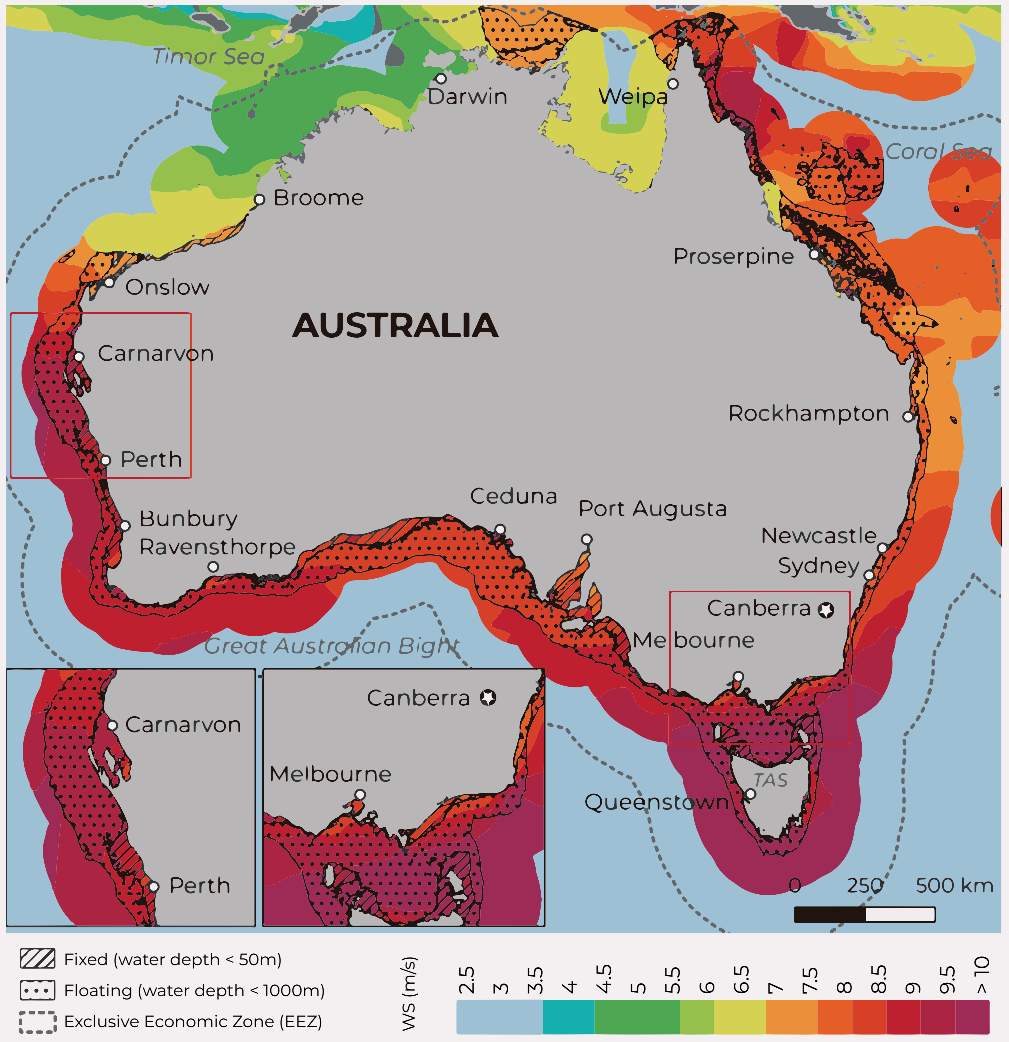
The transmission of offshore electricity to onshore grids has proven difficult for traditional transmission network service providers.[7] In particular, uncoordinated developments between offshore developers seeking to establish their own transmission lines to the onshore grids should be avoided.[8] However, coordinated transmission has been successfully managed by national transmission system operators in countries such as Germany, the Netherlands and Belgium.[9] Their approach has optimised development and construction timelines, and the national transmission system operator and offshore wind developers work in parallel to each other.[10] Under this model, the national transmission system operator carries out all planning and works regarding transmission and offshore wind developers are able to develop and construct their offshore windfarm.

Germany and the Netherlands specifically utilise offshore substations as connection points[11] while Belgium has developed an energy island platform — Princess Elisabeth Island — which 'connects wind farms from the sea to the mainland and creates new connections with neighbouring countries' such as the UK and Denmark.[12] In Victoria, Australia, VicGrid is developing a similar model, testing applicability to Australian offshore wind by coordinating the transmission from Gippsland and Portland through common connection points regulated by the state government.[13] This follows the popular European model of government-led transmission solutions, helping to minimise community concerns regarding impact, as reduce consumer costs.

Conclusion

Government support for offshore wind is growing. *The Offshore Electricity Infrastructure Act* 2021 suggests the federal government is applying learnings from its UK counterparty, in particular because it has established a national licensing framework for offshore generation and transmission in Commonwealth waters.[14] Australia should continue to learn from such established offshore markets, including by implementing a centralised government intermediary between wind farm developers and offshore transmission owners. Doing so may result in lower costs of ownership for offshore transmission, and by reducing risk make offshore wind more attractive to investors.

Offshore Win Technical Potential in Australia



RISE RE
Score: 83
Fixed: 1,572 GW
Floating: 3,391 GW
Total: 4,963 GW

For more information, please contact:

Matt Baumgurtel
Partner
+61 459 900 080
matt.baumgurtel@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/matt-baumgurtel

William Ryan
Lawyer
+61 402 655 538
william.ryan@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/william-ryan

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Navigating the Finance Seas: Bankability of Offshore Wind Projects

Authors: Matt Baumgurtel, Adriaan van der Merwe, Rahul Tijoriwala and Dhanushka Rajaratnam

The term 'bankability' in project evaluation refers to the comprehensive assessment of a project's risk and return attributes based on criteria set by potential investors. This assessment aims to determine whether the project aligns with investors' standards and can attract the necessary funding for successful execution.

Factors considered in this evaluation include the project's profitability, the creditworthiness of the overseeing entity, and its overall operational viability. Key criteria used to determine bankability involve evaluating the project's ability to meet financial, environmental, and social objectives, ensuring sufficient cash flows to cover costs while meeting investor return expectations. These criteria collectively contribute to the project's perceived feasibility, influencing its appeal to investors and its capability to secure essential financial backing.

Unique characteristics affecting bankability

While offshore wind projects share many of the same characteristics as their onshore counterparts, there are some, set out below, which are unique to offshore wind, and influence the bankability of the project.

Unique Feature	Impact on bankability
1. Location	The saying "location, location, location" holds truer in the context of offshore wind than in the onshore context because of the regulatory vacuum for offshore areas, and the need to connect to onshore grid infrastructure to generate revenue streams. Furthermore, location in relation to access points for resources and supply chains could require the establishment of a local manufacturing footprint or maritime fleet to service the offshore asset. This vertical integration of the supply chain raises the financial risk profile of the offshore wind project due to the need for onshore supporting infrastructure, which requires a higher capital expenditure compared to onshore wind projects.
2. Unique mechanical and technological requirements	Compared to onshore wind projects, offshore wind ventures present significantly greater technical complexities. Offshore wind turbines, towering up to 250 meters, gravity foundations weighing around 1,000 tons and subsea cables exceeding 100 km connecting offshore electrical substations to onshore grid infrastructure are essential components in an offshore wind project. In addition to this, the lack of established maritime infrastructure limits the technological or mechanical options that can be utilised by the project. The transportation and installation of these components requires specialist infrastructure, equipment, and expertise. These requirements may vary based on each project's environmental conditions, and such specialist components may in themselves be the subject of connected or separate investment projects with their own financing obligations. These specializations, therefore, require meticulous planning and integration within the offshore wind project's lifecycle to instil confidence in investors.
3. Regulatory framework	The absence of established regulatory frameworks in offshore environments, unlike onshore settings, poses compliance challenges due to competing interests or regulatory breaches being less apparent. The untested regulatory framework in Australia can significantly affect bankability as regulatory certainty plays a pivotal role in predicting revenue generation, directly impacting project viability through stable and predictable financial conditions.

Mitigating the risks posed by these unique characteristics on the bankability of offshore wind projects requires a dynamic approach to meet planning obligations while simultaneously offering investors enough certainty that the anticipated returns will surpass perceived risks.

Macro factors impacting bankability

In July 2023, Vattenfall, a state-owned Swedish energy company, made the decision to suspend its ambitious 1.4GW Norfolk Boreas offshore wind project in the United Kingdom due to the project's escalating expenses because of rising interest and inflation rates, coupled with concerns about the current global geopolitical environment, which rendered the project's supply chain vulnerable.[1]

This illustrates that even though an offshore project may be able to address bankability concerns arising from its unique characteristics, socio economic factors external to the project can erode its bankability. Economic conditions, including interest rates and overall market stability, influence the cost of capital and investment appeal, while Government policies and regulatory frameworks play a pivotal role, offering incentives or creating barriers for project development.

Other macro factors impacting bankability include technological advancements and supply chain dynamics that affect project costs and operational efficiencies. Additionally, global energy demand, geopolitical tensions, and environmental concerns influence the market's perception of, and the long-term viability of renewable energy sources like offshore wind.

However, these concerns are not unique to offshore wind projects.

Mitigatory measures

The following factors often result in favourable bankability outcomes:

1. Clear strategy
Developing or investing in offshore wind is a high-stakes, high capital-expense endeavour replete with clustered risks. Acquiring competitive intelligence shapes a clear strategy, enabling risk compartmentalisation, synergy identification, improved communication, and focused direction to mitigate risks and optimise opportunities in this dynamic market environment.

2. Engaging reputable sponsors
Engaging reputable sponsors with robust financial strength fosters confidence in project continuity and facilitates access to further funding. Sponsors with proven track records act as a safety net, ensuring stability in offshore wind projects.

For instance, Norges Bank Investment Management, Norway's $ 1.4 trillion sovereign wealth fund, has reiterated its commitment to offshore wind investments despite project cancellations around the world. Its reliance on non-borrowed financing shields it from the adverse impacts of increasing borrowing costs, highlighting the necessity of financially resilient project sponsors capable of weathering market fluctuations. This underscores the pivotal role of such sponsors in maintaining the bankability and success of offshore wind ventures.

3. Proven technologies
Lenders will show a preference for well-established technologies with prototypes already deployed in the water, particularly those developed by reputable counterparties. This practice ties in with the engagement of reputable sponsors. A rigorous assessment of suppliers' experiences and supply chain management practices mitigates supply chain risks while providing a certain degree of credibility.

4. Flexibility in financial obligations
Offshore wind financing may look to incorporate a degree of flexibility within the parameters of the agreed-upon offtake structure. This includes options to delay or stagger initial debt repayments and/or restructure the debt with obligatory prepayments to safeguard the baseline financial projections. Additionally, it is common practice, not limited to offshore wind projects, to incorporate 'equity-cure' rights.

5. Community engagement
Stakeholder management is key for an offshore project to progress from bankable to blockbuster, creating value to all stakeholders. Local community involvement can unearth crucial information for a project while also contributing towards social acceptance and overall success.

For example, the joint venture between by Ørsted and Eversource, sought feedback from the local fishing community while obtaining their services in assessing and overseeing sites along Rhode Island's coastline. Additionally, these companies enhanced the safety standards of a group of local fishing boats to mitigate the potential risks of incidents while at sea . Such actions improve the social license of offshore wind projects while also benefiting from synergies.

Conclusion

Even though interest and investment in offshore wind projects in Australia is at a healthy level, the bankability of offshore wind projects faces hurdles due to location complexities, regulatory uncertainties, and macroeconomic influences. Mitigating these challenges requires dynamic strategies involving competitive intelligence, reputable sponsors, proven technologies, financial flexibility, and community engagement. Embracing these measures bolsters project viability, enabling the advancement of sustainable and resilient energy solutions.

For more information, please contact:

Matt Baumgurtel
Partner
+61 459 900 080
matt.baumgurtel@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/matt-baumgurtel

Adriaan van der Merwe
Special Counsel
+61 40 312 0410
adriaan.vandermerwe@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/Adriaan-van-der-Merwe

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A Collective Breeze: Joint Ventures in Offshore Wind Projects

Authors: Matt Baumgurtel, Hannah Jones, Adriaan van der Merwe, Kusum KC and Rahul Tijoriwala

Joint ventures (JVs) are common in the offshore wind industry due to the scale, complexity, and capital required for such projects. This is because JVs enable players to pool their resources, share risks and leverage complementary expertise to enter this high barrier market.[1]

There has been a whirlwind of activity in Australia following the incumbent Government's policy commitment to net zero targets[2] and the Minister for Climate Change and Energy's announcement of six offshore wind priority areas in August 2022.[3] The Gippsland (VIC) and Hunter (NSW) regions have already been declared offshore wind areas while the Southern Ocean (VIC & SA), Illawara (NSW) and Bass Strait (Tas) regions are at various stages of public consultation.[4]

Strategic JVs are especially important in the Australian context, as the offshore wind industry is in its infancy. There are currently no operational offshore windfarms in Australia despite Australia having abundant offshore wind resources.

As expected, many of the feasibility licence applications currently under assessment for the Gippsland declared area (covering 15,000 square kilometres) have been received from JVs.[5] Feasibility licences allow the licence holder to assess the feasibility of an offshore infrastructure project and in the future apply for a commercial licence "to construct, install, commission, operate, maintain and decommission offshore renewable energy infrastructure in the licence area".[6]

JV Examples

Examples of recent JVs include:

- **Ocean Winds**, a 50-50 JV between Engie (French energy giant) and EDP (Spanish renewables company)[7] with projects located in 7 countries; and
- **Poseidon** a JV between SSE (UK energy giant) and Equis Developments (Singapore based, Australian managed). Notably, SSE is already engaged to build one of the world's largest offshore wind farms in England (3.6GW Dogger Bank). 'Poseidon' has been reported as applying for a feasibility licence to build a wind project in Victoria's Gippsland region.[8]

Why use a JV?

JVs typically take the form of a special purpose vehicle, known as a project company. This entity is formed with the specific purpose of entering the main contracts for the project and retaining ownership of the JV's assets. Companies often seek JV opportunities to gain a competitive advantage by capitalising on the value that comes from leveraging complementary capabilities to enter new markets.

In addition to intensive capital financing, the offshore wind industry requires expertise in renewables technologies, local regulatory requirements, offshore deep-water operations, and floating structures. Collaboration with partners are therefore more appealing than embarking on solo ventures.

While the initial high costs may deter new entrants, the current market demand for offshore wind projects underscores the potential for substantial returns on investment. Oil and gas companies (especially those with offshore operations) are uniquely positioned to collaborate with partners to provide specialised expertise and financial support, all the while protecting their market share in the energy sector.

Phases of a JV

The composition of a JV will largely depend on the project's maturity and scale. Typically, one party bears the responsibility for the operations, allowing financial investors or new entrants to participate without needing the full skillset and resources for the wind farm's development, commissioning, and maintenance.

The success of the JV will depend on the companies' ability to address weaknesses, the capability gap, strategy and financials during the different phases of the JV.

In the initial phases of the project, the involved parties may consist of a developer scouting potential sites, accompanied by either a financial investor or a larger developer seeking to broaden its renewable energy portfolio.

As projects grow in scale and complexity, multinational utilities are integrated to combine financial and operational resources and jointly manage substantial project risks. The financials of the participants will become pivotal in securing project finance upon reaching financial close.

In some jurisdictions, subsidy regimes may require local participation in the JV, while in regions with less advanced renewable technology, partnering with experienced developers can accelerate technology adoption and advancement.

Key considerations in JVs

While JVs are a useful vehicle for realising new market opportunities, there is a tendency for JVs to fail where there is a strategic misalignment between parties, as parties also need to cater to their own goals, market pressures and shareholders.

To ensure the success of a JV it is critical for companies to be strategically and financially aligned and establish clear protocols for decision making and conflict resolution at the outset.

Key considerations include:

- **Composition** – carefully selecting the JV participants to ensure the correct mix of complementary capabilities are obtained;
- **Control** - establishing clear control provisions for the day-to-day management of the project and giving the JV decision making authority to meet objectives;
- **Organisation** - creating a strong value proposition to retain key employees and manage cross-cultural differences in cross-border projects;
- **Economics** - specifying the services the JV will provide and establish clear and fair transfer-pricing schemes whilst establishing good risk and performance management systems;
- **Selling interest** - addressing transfer rights and minimum financial criteria for new JV members and contemplating extenuating circumstances where the project requires additional funding;
- **Timeframe** - negotiating the commitment period for finance given the discord with financial entities preferences for short term investment and the long operational life of offshore wind projects;
- **Exit Provisions** - contemplating exit provisions for both investors and minority owners due to potential issues with retaining specialised knowledge brought by the departing party; and
- **Jurisdiction** - carefully determining the most suitable jurisdiction for the JV as local laws and regulations and tax considerations can make certain jurisdictions more attractive.

Offshore wind is an established industry in many regions around the world and is rapidly gaining momentum due to advancements in technology, favourable regulatory frameworks and the increasing role of renewable energy in addressing climate change.

Australia needs to urgently attract global energy giants and renewable companies to develop its offshore wind resources, and JVs (especially those involving Australian based companies) are the perfect vehicle to ensure the transfer of specialised skills and knowledge to help build Australia's future renewable workforce and commitment to net zero targets.

For more information, please contact:

Matt Baumgurtel
Partner
+61 459 900 080
matt.baumgurtel@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/matt-baumgurtel

Hannah Jones
Senior Associate
+61 450 584 149
hannah.jones@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/hannah-jones

Adriaan van der Merwe
Special Counsel
+61 40 312 0410
adriaan.vandermerwe@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/Adriaan-van-der-Merwe

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Sailing into the sunset

Authors: Matt Baumgurtel, David O'Carroll and Dhanushka Rajaratnam

Australia's increasing focus on establishing offshore wind farms to acheive its net-zero targets raises the very interesting question of what happens to offshore energy assets (**OEA**) at the end of an energy project's lifecycle.

This question is relevant for both offshore nonrenewable energy assets such as offshore petroleum and LNG projects and, renewable energy assets such as offshore wind and tidal or thermal energy projects. Over the next 50 years, the cost of decommissioning non-renewable OEAs is estimated at US$40.5 billion[1]. However, the decommissioning stage in project lifecycle management is usually not considered a critical step as it is incorrectly assumed that OEAs have little financial value and do not incur significant financial liabilities at this late stage in their lifecycle.

End-of-project life operations of OEAs are complicated by challenges associated with planning over long time frames, environmental impacts, regulatory requirements, vessel availability[2], and statutory liability regimes Statutory liability regimes in particular could affect the financial considerations associated with OEAs by putting more onus on banks and investors to take into account decommissioning in their project financing plans.

Information and proactive planning are critical tools in determining whether the decommissioning obligations of OEAs will be a financial liability or a revenue generating asset for the savvy owner or investor. This article examines some key themes emerging in the decommissioning space.

Circular Economy

The Australian Government's recently published issues paper to establish an Australian decommissioning industry recognizes the potential for creating a complementary relationship between commissioning new activities, decommissioning existing OEAs and, the creation of non-linear approaches to asset lifecycles to support the net-zero transition.

The momentum behind transforming the current linear economy into an economy that is restorative and regenerative by design is growing. Utility-scale energy project decommissioning has the potential to transform from an expensive liability at the end of a project's lifecycle into a cash generating asset within a circular supply chain.

ESG considerations, particularly in relation to decarbonization targets and measuring Scope 3 emissions, are also driving this evolution. Lenders are now starting to consider the overall ESG credentials of project proponents instead of only evaluating the ESG considerations of the final product or output being generated by an OEA.

Project proponents must start to proactively consider and adopt circular economy principles to adapt to this evolving landscape.

Statutory decommissioning liability regime

The Offshore Electricity Infrastructure Act 2021 requires that the impacts of decommissioning OEAs are considered by the Minister for Energy when deciding to issue a license[3] for OEAs. License holders are also required to have a management plan for decommissioning activities.

Additionally, the provision of financial security sufficient to cover the following is required:

(a) costs, expenses and liabilities arising from the decommissioning of infrastructure; and

(b) the remediation of the areas affected by the relevant renewable and non-renewable facilities and activities[4].

The financial security provided can also be used to recover outstanding costs, expenses or liabilities incurred by the Commonwealth of Australia or the Offshore Electricity Regulator in relation to licenses[5].

The statutory liability regime is also a feature under the Offshore Petroleum and Greenhouse Gas Storage Act 2006 and its 2021 amendment[6] (together **OPGGSA**). Under the OPGGSA, the responsibility for decommissioning offshore petroleum and gas installations lies with the title holder[7] to prevent decommissioning liabilities from becoming the responsibility of the Government or the Australian public. Registered title holders for the relevant project must also provide financial assurances to meet the obligations and duties required under the OPGSSA.[8]

The OPGSSA also includes trailing liability provisions where a former titleholder can be called back to undertake remediation activities at the OEA site. For more information on the trailing liability regime, please refer to the Guidelines: Trailing Liability for Decommissioning of Offshore Petroleum Property.

Statutory offshore decommissioning liability provisions ensure that the costs and responsibilities associated with OEAs are borne by those who can influence such activities and who have gained significant financial benefits from them. Such regulatory regimes aim to accurately reflect the social costs of energy generation, requiring project proponents to absorb the indirect consequences of OEAs and thus reduce the burden on taxpayers[9].

Contractual and financing arrangements

The increasing consideration of circular economy opportunities requires that asset and project lifecycle management is reconsidered. The adoption of new technologies to drive the clean energy transition also creates a changing risk profile. As such, innovative and robust approaches to financial planning and risk assessment are required.

For example, deciding the right time for disconnection and decommissioning due to rising operating costs and technological obsolescence is a critical point in any energy project. Resource requirements and risk allocation for the decommissioning process must be identified well in advance to ensure the most environmentally effective, financially efficient strategy.

OEA decommissioning costs are influenced by environmental conditions, the choice of decommissioning technology, and high variability between projects making standardization difficult. Periodic reviews of the initial decommissioning plans to incorporate any project modifications are vital to ensure that risks are appropriately managed and that responsibility for those risks are assigned to the most qualified party. Split contracting arrangements can prove to be a useful tool in allocating such decommissioning risks and responsibilities.

The prevailing short-term focus of financiers and project proponents currently overlooks long-term decommissioning obligations but also misses the opportunity to engage with the opportunities afforded by a strategic management of decommissioning obligations and the end-of-life OEAs.

Conclusion

Offshore decommissioning processes face significant uncertainties due to project variability and a lack of experience, which can make planning and risk identification challenging. Closely monitoring technological changes and updates, early engagement with experts, continuous stakeholder engagement and contingency planning could result in better risk mitigation.

We predict that decommissioning will soon drive the 'renew' aspect in future renewable energy projects. It remains to be seen how fast project proponents and regulators will act to proactively manage this evolution.

For more information, please contact:

Matt Baumgurtel
Partner
+61 459 900 080
matt.baumgurtel@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/matt-baumgurtel

David O'Carroll
Senior Associate
+61 421 497 311
daivd.ocarroll@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/david.ocarroll

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Floating towards a sustainable future – Floating Solar Photovoltaics (FPV)

Authors: Matt Baumgurtel, William Ryan and Kusum K C.

Figure 1: Floating solar panels on the surface of the Hapcheon Dam in South Korea. The project can generate enough to power 20,000 homes, according to Hanwha Solutions. Source: Bloomberg Photographer: SeongJoon Cho/Bloomberg

Solar floating photovoltaic (**FPV**) or Flotovoltaic technology is an innovative deployment of traditional solar photovoltaic (**PV**) systems where PV modules are mounted on floats and anchored on water bodies such as ponds, reservoirs, lakes, and even the open sea.[1] The potential application of FPV technology is huge: a recent study found that FPV has the potential to generate 9,434 TWh of electricity per year by covering 30 per cent of the surface of 115,000 global reservoirs.[2] In this study, Australia was ranked 8th of all nations in terms of suitability to generate electricity via FPV.

While FPVs have been in the market since 2007, it is only recently that the uptake has grown, especially in the Southeast Asian market. The scalability of FPV installations makes them a versatile option for countries seeking to expand their renewable energy capacity while addressing land scarcity and water conservation concerns. The table below highlights the key advantages FPV has over traditional (ground-mounted) PV.

Comparison of FPV and PV

Characteristic	Ground-mounted photovoltaics	Floating photovoltaics
Cost	High land cost. Cost of PV modules are decreasing.	More expensive due to need for floats, anchoring, mooring and plant design. However, costs may be offset by a better performance ratio. Installing FPV on existing reservoirs preserves land for other uses and as reservoirs are often located close to existing grid systems, this may result in additional savings.
Soiling	Amount of soiling depends on surrounding landscape. In 2018, soiling reduced power production by 3 to 4 per cent and cost revenue loss of EUR 3 – 5 billion.[3]	Less likely to experience soiling. In some circumstances, water on site may be used to clean panels.
Shading	Amount of shading depends on surrounding landscape.	Limited shading and higher sun exposure.

In 2016, Singapore launched the 1-megawatt peak (MWp) FPV testbed at Tengeh Reservoir to study the economic and technological feasibility of deploying large-scale FPV systems. They found FPV performed 5 to 15 per cent better than traditional solar PV systems and attributed it to the cooling effect of the water on the panels. The optimal temperature for solar panel performance is 25°C and variances in temperature affects overall energy production. Given the high temperatures experienced during Australian summers there is clear benefit of installing FPV to optimise energy production and minimise water evaporation.

Interestingly, researchers at the Tengeh Reservoir concluded that there was no observable change in water quality or significant impact on wildlife resulting from FPV. That said, they noted that further research is required to understand the long-term impacts of FPV on water quality and organisms living in associated bodies of water.

Outlook for FPV in Australia

The outlook for FPV is generally positive, despite potential vulnerability due to climate variability as low radiation, high temperatures or clouds can result in reduced PV power output in the future.[7]

Two key uses of FPVs in Australia are on farm dams and in connection with Pumped Hydrogen Energy Storage (**PHES**) Systems.

Farm dams

To date, the adoption of FPV in Australia has been limited. This may be attributed to the availability of land to install ground-mounted PVs, as well as the fact that ground-mounted PV technologies are more developed. However, there are emerging issues with competing land uses between ground-mounted PVs and agriculture. FPV provides a more efficient alternative to ground-mounted PVs and frees up agricultural land. By contrast, oversized farm dams ((larger than 0.01 km2) are ideal sites for the installation of FPV and will rarely conflict with existing land use.[8]

More than 3000 reservoirs in Australia have been identified as suitable for FPVs. Accordingly, developers and investors may be selective by developing FPV projects on farms which are located close to existing grid infrastructure, thus minimising project costs.[9]

FPVs also relatively less expensive to install on farm dams compared to other water bodies. The minimal water movements allow for a simpler anchoring design that is adapted to suit Australian weather conditions, and the panels can be designed to rest on the floor of the dam during periods of drought, and rise and float in instances of flooding.

Complementarity of FPV and PHES Systems

Sites at which two large farm dams are situated at least 200 – 300 metres altitude difference from each other have been identified as ideal sites for PHES projects.[10] By integrating PHES and FPV systems, investors can leverage the strengths of both technologies to create a highly efficient and sustainable energy ecosystem. The combined setup ensures a continuous and stable energy supply, mitigating the intermittent nature of solar power.

Given PHES systems require an energy input (ideally from a renewable source), installing FPV on the site maximises the utilisation of the water body (for both energy generation and storage) and the reduction in water evaporation can boost hydropower generation. Further, a hybrid system enables a more optimal use of the transmission network and reduces the need for fossil fuel-based backup power. As technological advancements, falling costs, and supportive policies continue to converge, hybrid energy solutions will continue to play a pivotal role in creating stable and resilient national energy market.

For more information, please contact:

Matt Baumgurtel
Partner
+61 459 900 080
matt.baumgurtel@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/matt-baumgurtel

William Ryan
Lawyer
+61 402 655 538
william.ryan@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/william-ryan

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Insights: From mine site to pumped hydro energy storage – the risk and challenges for owners and proponents

Author: Jorja Sumner and Matt Baumgurtel
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Meeting Australia's need for more energy storage capacity, whilst presenting several challenges, is also creating opportunities which could help answer the question on "what to do next" with mine pits that are being decommissioned or nearing the end of operational life.

The future of the Australian mining industry is dependent on the environmental, social, and economic legacy it leaves. To that end, it has been actively embracing the concept that completion and relinquishment of operations incorporates delivery of defined post-mining land uses, rather than just closure when the operational (or profitability) stage of a mine eventuates. Openpit mining has also long been one of the main exploiting methods for solid mineral resources, resulting in many abandoned open pit mines and related mining relics across Australia.

One such opportunity that has emerged in this context, and which is proving to be an attractive alternative opportunity for both mine owners and governments, is the utilisation of former or abandoned mine pits for Pumped Hydro Energy Storage (**PHES**) – although, as this article explores, this too looks to come with its own set of challenges and risks.

Overview of the potential for PHES opportunities

With the national electricity grid requiring significant changes to allow Australia to deliver on its commitments under the Paris Agreement and achieve net zero emissions by 2050,[1] these changes invariably require the construction of new renewable energy generation facilities (i.e., wind power and solar photovoltaic), which in turn will need to be supported by energy storage infrastructure, namely in the form of big batteries and PHES.

The future development of PHES focuses on the repurposing of mine pits created through traditional gold, coal, copper, or other mineral open cut mining. Repurposing such mine pits into PHES presents an attractive mine-closure alternative for mine owners, in particular because it may allow offset, deferral or mitigation of the responsibility and substantial costs of rehabilitating a mine site at the end of operational life.

Projects involving the repurposing of mine pits to PHES may also present as a viable opportunity for mine owners to present to potential PHES development proponents. This is because, in addition to the mine pits being 'ready-made' storage reservoirs suitable for PHES, there is the potential to leverage the 'social licence' already attached to the former mining operations to get buy-in from relevant stakeholders. Factors such as pre-existing access, transportation, availability of infrastructure servicing the broader site and the location being within ideal proximity to electricity transmission infrastructure are also seen as positives. Furthermore, these existing factors may potentially reduce some of the significant impacts and costs inherent in project designs for developments of this nature.

However, not all mines that are closed or nearing end of life will be amenable to repurposing, and the development of PHES projects on former mine sites will likely present a myriad of unique and sitespecific challenges and risks for both miners and proponents for PHES developments alike.

Identifying optimal characteristics

Broadly, PHES projects store the electricity generated by viable forms of renewable generation (such as solar photovoltaic and wind power), by using it to pump water to the upper storage and releasing it back into the grid by release to the lower storage at times of high electricity demand or low renewable electricity generation.

Generally, at least two reservoirs (i.e., repurposed mine pits) at different altitudes, typically within areas of a few hundred hectares, in hilly terrain, and joined by a pipe or tunnel with a pump and turbine will be required to make the development feasible. As such, not all mine sites will be suitable to repurpose into PHES.

Overview of potential challenges and risks with repurposing old mine pits

The International Council of Mining and Metal's Integrated "Mine Closure Good Practice Guide",[2] is a useful resource for guidance on mine management, sustainable development, and best closure practice in the global mining sector, including in relation to the repurposing options mine owners may be contemplating.

In this context, the Good Practice Guide notably highlights that stakeholder involvement in the processes surrounding mine closures and the degree to which mine owners should be held responsible for long-term environmental and economic development outcomes are key considerations.

Specific closure-related obligations in nearly all Australian jurisdictions involve mine closure planning as part of the approval process regime, particularly those pursuant to environment, planning, and mining related legislation. These regimes set minimum industry standards for rehabilitation and mine closure, which typically need to be planned for and evidenced befor approvals can be obtained.

Regulators are generally provided significant enforcement powers over the closure commitments for mine owners, which may also link to the financial securities. Therefore, the closure-related obligations specific to the particular mine operations should be carefully considered in terms of ensuring all rehabilitation and closure requirements are either met, or in the case of alternative land uses and repurposing, appropriately identified and re-allocated as part of any mine-closure plans or repurposing arrangements.

In terms of potential challenges or risks in the repurposing of old mining pits into PHES projects, some relevant considerations may include the following:

(a) Ownership and rehabilitation responsibilities and approvals

One of the key appeals in repurposing former or abandoned mine pits into a PHES project is the opportunity to offset or defer some or all of the costs associated with the final rehabilitation of the site. However, if the mine owner is not the proponent for the PHES project, a key issue may be clarifying which party ultimately bears responsibility for the site – both on an on-going basis (e.g. for matters that may stem from mining operations, such as contamination or pollution) and at the end of the PHES operations (e.g. if there are any voids created by mining operation and used by the PHEs project which may require remediation).

Where the mine owner is not the proponent for the PHES project, negotiation between the parties with respect to matters such as: (a) the price the proponent will be willing to pay for the acquisition of the PHES project rights; and (b) the extent of rehabilitation liability the mine owner passes to the proponent, will likely be required. Consideration as to whether and to what extent these requirements are tied to the approvals for the mine itself may also need to be addressed.

Generally, closure-related obligations will fall on the holder of an approval, the occupier of the land or premises, or the party undertaking the activity. Accordingly, if mine owners are contemplating repurposing activities, it is important to clearly identify and allocate all closure and repurposing obligations to eliminate and / or manage legal risk and ensure that all obligations are met by the entity to whom those obligations attach.

Interaction of ongoing operation requirements and obtaining new approvals

The ability of a proponent to obtain all required approvals for the repurposing of mine pits for a PHES project may also present certain regulatory challenges and issues – in particular because such projects are being packaged as a rehabilitation solution for the former mine.

Where proponents for a PHES project seek to ensure it has sufficient lead time to obtain all required approvals to allow construction to commence as scheduled, the mine operator may equally require the continuation of the approvals relating to its own activities. As such, consideration and consultation for any concurrent or progressive consents and approvals, and the appropriate timing for the surrender of any miningrelated approvals (as the case may be), should be addressed to minimise exposure to either party.

The construction of new or standalone PHES projects (i.e., which do not have ongoing mining operations attached) may be subject to the availability of funds from government, private sector investors, or multiple financing sources. Securing such funding in itself can be a challenging and complex task. Moreover, for PHES projects, there is some additional uncertainty as to whether organisations or private investors will agree to finance such long-term projects due to factors such as licencing timeframes and long payback periods.

(b) Continuing to source or prioritise mining v repurposing use of area for energy storage

Mining has several distinctive characteristics and may be differentiated from other industries by the fact that the primary activity is concentrated in a specific site or sites, for a limited period that is usually known prior to commencement. It is also acknowledged as being a temporary land use (notwithstanding the longevity of some projects or the enduring impact it may have on the local environment and economy). Each mine is also distinct in its location, configuration, resource base, potential environmental impact, rehabilitation options and prospects for repurposing.

The mine pits that may potentially be repurposed for PHES projects are also inevitably located on land that contained economic mineral deposits, such that if conditions and circumstances change, it may be preferential (or more profitable) to reprioritise the continuation of mining any remaining minerals concurrently across the same site.

Accordingly, the competing interests between continuing to progress mining operations against the development of a PHES project may present a number of challenges. This includes matters such as the partial surrender of mining leases, allocation of risk and responsibility, ensuring adequate infrastructure access and allocation of power and water supplies to both the mining operations and the PHES project, and work, health and safety liability considerations. Notably, these tensions were something that was recently grappled with in as part of a proposed PHES project at the Kanmantoo copper mine in South Australia which has since been abandoned.

Further, and depending on the tenements overlapping the project site, this may also pose a risk to the viability of the project, particularly if construction is nearing or has commenced, or after substantial costs have been committed to the development.

In view of these challenges, the PHES proponent may seek to mitigate this risk by entering into agreements with holders of overlapping or adjacent mining interests. Notwithstanding, and assuming these can be successfully negotiated, the proponent will still not be absolutely protected as third parties with whom the proponent has no contractual relationship with may still be permitted to acquire a mining interest over the project site in the future.

The current landscape in Australia

In terms of potential sites across Australia that may be suitable for pumped hydro energy storage, a well-cited audit completed by the Australian National University identified some 22,000 sites that may be suitable for development of PHES projects.

While most of these sites comprised of naturally occurring landforms, more recently there has been reports on the planning towards several PHES project developments on former mines sites containing pits or voids capable of conversation into reservoirs suitable for PHES, including in Northern Queensland (Kidston gold mine), New South Wales (Muswellbrook coal mine) and in Western Australia (Collie Muja coal mines).[3]

Way Forward

The risks associated with any new project that contemplates the use of developing technologies and alternative and innovative solutions is apparent, let alone those associated with developing PHES on former mine sites or as part of an existing mine sites. Careful consideration of the known risks and challenges, prior to an investment decision being made, is therefore critical in assessing the rehabilitation options and prospects of mine repurposing.

For more information, please contact:

Matt Baumgurtel
Partner
+61 459 900 080
matt.baumgurtel@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/matt-baumgurtel

Jorja Sumner
Lawyer
+61 8 6311 9160
jorja.sumner@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/jorja-sumner

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The progress of Pumped Hydro in Australia

Authors: Matt Baumgurtel, William Ryan and Kusum K C

There has been a resurgence of Pumped Hydro Energy Storage (**PHES**) projects in Australia due to the need for large scale energy storage solutions to bridge the gap between intermittent renewable energy generation and consistent energy supply. The high penetration of wind and solar energy has led to renewable energy being more affordable than ever. However, the intermittency of renewable energy production and a lack of convergence in demand and supply during peak times has undermined the stability of the national grid network this issue is discussed further in our 'There's a New Duck in Town – Part I' article).[1]

How do PHES systems works?

PHES systems convert gravitational energy into electrical energy by leveraging the geographical features of water reservoirs (ideally 10 – 100 hectares in size) that are situated at a minimum 200 – 300 metres altitude difference from each other.[2] In contrast to traditional hydroelectric plants located on flowing water bodies like rivers, a closed loop system is created by connecting the two reservoirs. The upper reservoirs function as a giant battery, and surplus wind and solar power may be used to pump water from the lower reservoir to the upper reservoir through tunnels (containing pipes and turbine). The water is then stored in the upper reservoir until there is a spike in energy demand, after which the water is released through a turbine to generate electricity and dispatched to the national grid within minutes.

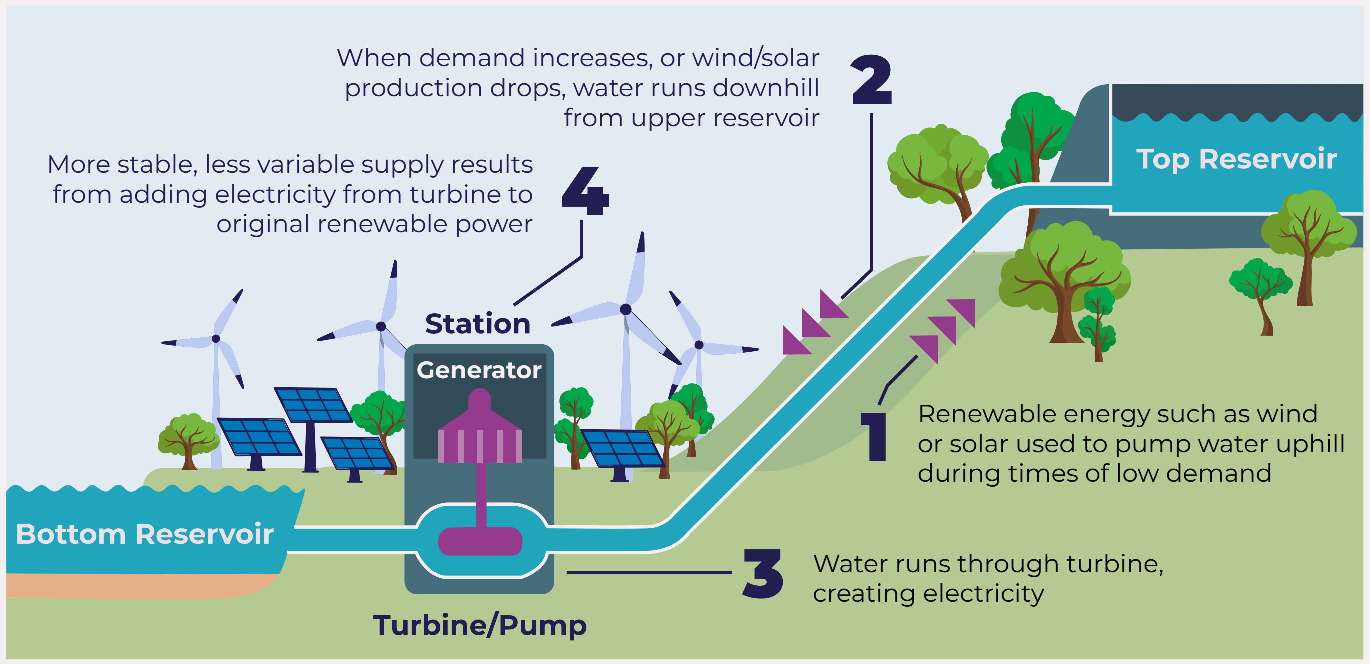
Depending on size, a PHES system may take 3-4 years to build and have an operational life beyond 50 years, with low operational costs.[3]

Stabilising the Grid through PHES systems

The attractiveness of PHES systems is enhanced because of the stabilisation potential of PHES systems on the grid. PHES systems have stabilisation potential because they can (1) absorb excess electricity from the grid and (2) feed energy back into the grid during periods of peak demand.

The use of surplus electricity has a stabilisation effect as it minimises the risk of power surges which can result in backouts. Further, the fast dispatch time (idle to full capacity in 2 minutes) and ability to restore collapsed grids (black start capability) strengthens the overall resilience of the grid.

Pumped hydro storage - hot it works



Source: Austalian Renewable Energy Agency (ARENA), Winning the uphill battle. How pumped hydro could solve the storage problem, ARENA website, 20 August 2017

PHES Project	Capacity	Cost	Expected Completion	State
Snowy 2.0	2,200 MW (enough to power 3 m homes for one week)	$ 12 b	2028 (initially 2024)	NSW
Kidston Pumped Storage Hydro Project	250 MW (enough to power 143, 000 homes for 8 hours)	$ 777 m	2024 (initially 2022)	QLD

Current investment in PHES systems

PHES currently has a 97% share of the global storage market as it a reliable and mature technology with a relatively long storage capacity compared to other technologies in the market.

In Australia, there are three major river-based PHES systems operating: Wivenhoe, Shoalhaven and Tumut[3]. These PHES systems are connected to the national grid and maintain a combined energy capacity of 1.34 GWh.[4] According to researchers at ANU, Australia requires about 500 GWh energy storage capacity to operate at 100% renewable electricity.[5] That same report found that Australia's PHES system potential is 300 times this amount.

Both State and Federal government policies are aligned in expanding Australia's pumped hydroelectric capacity, as demonstrated by their recent investments in key PHES infrastructure projects. There are currently 2 large PHES infrastructure projects underway.[6]

The Kidston project in Queensland is on track for completion in 2024 and is unique in that it is a repurposed goldmine. Snowy 2.0 in NSW is an expansion of the original Snowy Mountains Hydroelectric scheme. However, the project is experiencing controversy due to a budget blowout that is 6 times the original estimate and a four-year delay.

Tasmania is also surveying locations to build the island's hydro capacity to support the National Electricity Market (NEM) through their 'Battery of the Nation' initiative, with a target to generate 2,500 MW electrical energy. With support from ARENA, Hydro Tasmania have identified 14 locations with a total general capacity of 4,800 MW which are being further shortlisted. In addition to Snowy 2.0, the NSW government has shortlisted 24 potential PHES system sites. The NSW government has also expressed support for private development of off-river closed-loop PHES system infrastructure.[7]

While the projects highlighted above are large nation building infrastructure projects, the Pumped Hydro energy storage Atlas created by researchers at ANU identified 3,000 low-cost potential sites around Australia.[8] Short term energy storage solutions (around 20 hours) are equally important to cover a range of scenarios (hot summer afternoons, cold winter morning and evenings, and plant and transmission failure) in rural regions.[9] Oversized farm dams have been identified as potential locations for PHES systems, as they are ideally located away from rivers and national parks in hilly country.[10] These sites represent an opportunity for private investors and farmers to leverage existing infrastructure for a financial return, with the added benefit of improving grid connectivity to rural regions.

UNSW researchers have also identified 30,000 farm dams for micro-PHES system sites (out of 1.7 million farm dams) to support individual household energy needs.[11] Regardless of the scale of PHES projects, they contribute directly to supporting the uptake of reliable, low-carbon power systems and have a stabilising effect on the national grid. As more intermittent renewables come online, there is a strong rationale for investing in PHES systems in Australia.

For more information, please contact:

Matt Baumgurtel
Partner
+61 459 900 080
matt.baumgurtel@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/matt-baumgurtel

William Ryan
Lawyer
+61 402 655 538
william.ryan@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/william-ryan

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Production and Application of Hydrogen as a Transport Fuel – 2023 Update

Authors: Matt Baumgurtel, Adriaan van der Merwe and Megan Chau

We have previously written about the production and application of hydrogen as a fuel for heavy-duty commercial transport, including international shipping. In 2022, key issues included the safe production, storage and transport of hydrogen.

Now, in 2023, we recap the process of hydrogen production with a focus on electrolysis in which water is a key player. We also explore some of the challenges preventing the widespread use of electrolysers and how such challenges are being addressed. Finally, we review the current progress on using hydrogen as a fuel to decarbonise traditionally hard-to-abate sectors.

Producing Hydrogen – Electrolysis and its Challenges

Hydrogen may be produced onsite for facilities such as petrol and power stations via the use of an electrolyser and a process known as 'electrolysis'. Electrolysis occurs when an electric current from electrodes is passed through water, splitting the water into its component parts – hydrogen and oxygen. The electrolyser then releases oxygen but retains and stores hydrogen for future use.

Whilst effective at splitting the water and extracting the hydrogen within, there are two main downsides of using electrolysers: energy inefficiency and high cost.

Firstly, due to its use of electric currents, the process of electrolysis logically requires a significant amount of electricity. As the electric currents run constantly, the electrolyser produces heat which in turn must be cooled down. Consequently, both the heating and cooling processes burn through substantial amounts of energy in addition to that being expended to actually carry out the electrolysis process.

The second challenge for hydrogen produced via electrolysis is cost. According to the International Energy Agency's (**IEA**) 2021 Global Hydrogen Review, a key barrier for low-carbon hydrogen is the cost gap with hydrogen produced using fossil fuels. At the time of the report, the levelised cost of producing low-carbon hydrogen using renewable electricity was more than double the levelised cost of producing hydrogen produced using natural gas.[1]

In 2023 the IEA's Global Hydrogen Review found that not only does the cost gap remain, but the overall capital and financial cost of projects across the entire hydrogen value chain increased due to inflationary pressure. For projects producing hydrogen using renewable electricity, the cost was projected to increase by nearly one-third. Meanwhile, in parallel to the inflation, the price of natural gas has fallen, further increasing the cost difference between hydrogen produced using renewable energy versus fossil fuels. The 2023 report concludes that greater investment is needed to close the cost gap.[2]

Moving forward, it is necessary to both optimise efficient electrolyser functions, as well as promote greater investment in hydrogen generated via renewable energy to offset the impact of inflation-boosted financial costs. An example of this is ARENA's recent funding of $20.9 million into Hysata to facilitate the development of new electrolyser technology that is both energy efficient and cost effective. The project purports to produce hydrogen at a target price of $2 per kilogram, well below current competitive target prices in the market.

Additionally, ARENA received $2 billion in funding from the 2023-24 Federal Budget for its Hydrogen Headstart initiative. The initiative aims to support two to three flagship projects capable of providing up to 1 gigawatt of hydrogen electrolyser capacity. Expressions of interest for funding opened in October 2023 and closed on 10 November 2023 with successful proponents to be announced at time of writing.

Application of Hydrogen as a Transport Fuel

In its 2022 Annual Climate Change Statement, Australia committed to developing a plan for reducing its greenhouse gas emissions by 43% below 2005 levels by 2030; and achieving net zero by 2050. With these goals in mind, it is crucial for Australia to decarbonise its transport sector which, according to the CSIRO, currently accounts for 18.6% of the country's overall greenhouse gas emissions. Within the transport sector, heavy vehicles are the key contributors to emissions.[3]

Decarbonisation of the transport sector within Australia is largely spearheaded by two main types of vehicles: battery electric vehicles (**BEVs**) and hydrogen-fueled vehicles, including both fuel cell electric vehicles (**FCEVs**) and hydrogen internal combustion engine vehicles (**HICEVs**). However, while BEVs are popular for light vehicles, FCEVs are preferred for heavy duty and linehaul vehicles for the following reasons:

- **Shorter refueling times and longer fuel life** – both may be crucial for freight and linehaul transport where time-cost is a key commercial consideration; and

- **No battery** – compared to BEVs which require vehicles to carry physical batteries, FCEVs can refuel and go with no additional components required.

Promoting the use of hydrogen as an alternative form of fuel will encourage demand for the development of reliable refueling networks, greater investment into the development of large-scale hydrogen production infrastructure and stimulate the domestic production of hydrogen – all presenting excellent opportunities for proponents in the industry. This will also help to reduce Australia's dependence on foreign supply for its transport fuel[4] and bolster its own fuel security.

Conclusion

A year on from Australia declaring its net zero commitments, hydrogen has emerged as a notable player in decarbonising the transport industry – traditionally one of the hardest to abate sectors in the transition to renewable energy. The production of hydrogen via electrolysis is, as of yet, an expensive and energy intensive endeavour, but significant steps are being taken not only to optimise the process, but to make the hydrogen generated via this method a competitive product on the market. Furthermore, with financial backing readily available from 2023-24, it is only a matter of time before we see hydrogen become a main resource to support Australia's transport and wider industries.

For more information, please contact:

Matt Baumgurtel
Partner
+61 459 900 080
matt.baumgurtel@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/matt-baumgurtel

Adriaan van der Merwe
Special Counsel
+61 40 312 0410
adriaan.vandermerwe@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/Adriaan-van-der-Merwe

Megan Chau
Lawyer
+61 427 079 625
megan.chau@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/megan-chau

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New Energy Associates Network – NEAN

NEAN is a network for New Energy industry professionals from graduate to senior associate level, aimed at building connections and sharing industry knowledge among members. NEAN seeks to foster and grow relationships between industry stakeholders at the earlier stages of their careers.

Recent Events

Fireside Chat with Lucas Sadler of Energy Vault

On 27 July 2023, the New Energy Associates Network hosted a further fireside chat with Lucas Sadler of Energy Vault and David O'Carroll of Hamilton Locke's New Energy team.

With over 30 years of sales leadership experience across the renewable energy, power generation and rapidly evolving energy storage sectors, Lucas is responsible for driving sales, business development and demand generation for Energy Vault's energy storage software and infrastructure technologies across the Asia Pacific Region. Lucas has a wealth of expertise from his senior sales, business development and management roles in renowned companies such as Schneider Electric, Powerark Solar, Origin Energy, Yingli Green Energy, EnergyAustralia and Samsung.

For this Quarter's NEAN, Lucas discussed all things energy storage. Lucas explored the sustainable and circular economic benefits associated with energy storage technologies and solutions and will shed light on the challenges that come with implementing these technologies on a large scale as part of Australia's renewable energy transition. Drawing from his experience at Energy Vault in scaling its pioneering storage technologies across markets, Lucas also shared his insights into what the future holds for Australia's emerging energy storage landscape.

To join NEAN and to stay up to date with upcoming events and industry insights, join the NEAN LinkedIn group here.

New Energy Expert Insights: Floatovolatics

Authors: Matt Baumgurtel, Megan Chau and Dhanushka Rajaratnam

In this latest edition of Expert Insights, we discussed the opportunities and potential for the widespread rollout of FPV systems in Australia with Ross Warby, Founder and Managing Director, and Craig Jones, Chief Operating Officer, of Enervest.

Enervest is an Australian-owned and operated company specialising in the design, construction and operation of energy generation and storage assets with over 15 years' industry experience. Its proven track record is driven by the development of solutions that bolster energy resilience and facilitate the shift to low-carbon emissions and net-zero goals.

What do Singapore, China, India, France, Indonesia, the U.A.E and the U.S.A have in common?

They all have utility-scale floating solar power plants.

A floating solar farm or a floating photovoltaic (**FPV**) system is a renewable energy generation system that is installed on bodies of water including dams, lakes, reservoirs, ponds and in some instances, the sea. The technology involves mounting solar panels on floating or fixed structures on bodies of water which keep the panels afloat while also exposed to sunlight.

Of the numerous benefits generated by FPV systems, land conservation, improved efficiency and water loss reduction rank the highest. Water scarcity is a persistent issue in Australia and an exceptionally valuable commodity with the annual water market turnover for 2020-2021 estimated at $6 billion[1]. However, it is estimated that 40% of the capacity of Australia's total open water reservoirs is lost annually due to high rates of evaporation[2] with climate change threatening to exacerbate this loss even further[3].

Depending on their location, FPV systems provide other benefits such as reducing algae bloom and producing higher energy yields due to the regulation of solar panel temperature. It is estimated that with just 30% FPV coverage on the 114,555 global reservoirs the potential for electricity generation is 9,434 TWh per year[4].

When asked about the prospects of widescale FPV deployment in Australia, Ross says, *"The deployment of large floating solar farms in Australia is quite an obvious step in the country's clean energy transition. Everyone knows Australia has a water issue, so why aren't solutions combining water conservation and climate change objectives?"*

While FPV installations in Australia are limited, known projects such as the project at the wastewater treatment facility in Jamestown, South Australia, the 100kW system at Happy Valley Reservoir, Adelaide, the 99kW installation in Lismore, New South Wales and the 500-kW project under construction at Warrnambool's Brierly Basin[5] in Victoria showcase the growing interest and potential for FPV systems.

Commenting on the important technical considerations in relation to FPV, Craig says, *"Key considerations are anchorage of the FPV system and dam safety. There are many unique characteristics present in water bodies depending on whether they are natural or artificially built, their economic and cultural uses. Existing regulations can vary from state to state and water resource to water resource. This also affects the type of technology that can be used."*

According to Ross, while in many respects FPV projects relate closely to ground mounted solar power projects, the issue of anchorage can result in long delays – particularly if the FPV system will affect the integrity of the structure of the dam, pond, or waterway. *"One way to balance this risk is through de-scoping the anchorage risk from the other construction risks. Even if this is done, the poor management of anchorage risk affects overall implementation of the project. You just cannot start construction without resolving anchoring first."*

"Early engagement with key stakeholders such as the regulatory authorities and the design and engineering teams is vital", adds Craig. *"It's easier to predict where issues will arise if the key players are engaged at the earlier stages so that everyone can brainstorm and come up with a workable solution that helps the project progress. Prevention is always better than the cure, right?"*

Both Ross and Craig agree that what FPV projects require is a 'stakeholder manager' or someone who can connect the parties who will benefit the most from FPV projects such as water corporations and agricultural producers, with developers and financiers. This is because FPV systems are yet to become part of mainstream discussions making it unlikely that parties will actively seek each other out.

This is also in part due to a lack of information and information asymmetry. For example, in order to design anchorage and floatation systems, extensive data about the relevant body of water and the movement of water is required. Bathymetric studies would provide helpful information, but such studies and surveys are expensive and not performed in the ordinary course of running, for instance, a farm. Fractured control and ownership over viable bodies of water complicate this issue further.

"The information asymmetry issue becomes critical at this juncture because financiers need financial data. While some parties who own or control viable water bodies will have this data, most will not," says Craig highlighting a 'chicken-and-egg situation' hindering the financing and roll-out of FPV projects.

In respect of costs, anchoring and floatation equipment design and installation expenses can drive up capital expenditure making it more expensive than ground mounted solar projects. However, it is important to highlight that project revenue is not limited to the sale or use of the electricity generated. Savings from lower water evaporation, higher yields from the water protecting the solar panels from extreme temperature variations and lower maintenance costs are additional, quantifiable returns on the investment in the FPV systems.

"You're probably thinking, 'Who will cover the costs of these tests?'. In the long-term, the cost of testing will be absorbed by the project's revenue and contribute to the overall success of the project. [In the short term], it's a risk requiring the right project sponsor/s that either have belief or experience in FPV systems.

Ensuring that we have enough skilled personnel to deliver reliable services is another vital component. Such challenges present a wonderful opportunity for engineers, analysts, scientists and project managers who want to use their skills in new and exciting ways," says Ross.

In principle, however, the primary element of FPV systems is solar energy generation which has proved its bankability and technological reliability. It is the technical consideration relating to anchorage and floatation that is unique. Even a complex regulatory framework does not necessarily sound the death knell for FPV projects. Ultimately, it appears to be a lack of awareness about the benefits and the transferability of technology.

"Right now, we need a few sponsors to help mainstream the technology and validate its potential. The experience from just a couple of large projects will trigger scalability and network effects after which it's just a matter of natural progression. The Government is best positioned to help de-risk FPV projects and to coordinate data and information gathering," observes Ross while adding that Government initiatives, especially in highly regulated industries like water can catalyze exploration into FPV projects and eventually, their widespread deployment.

The opportunities created by the clean energy transition will be wasted if industries fail to recognize that new-energy technologies can be adapted to overcome traditional boundaries maintained between the industries. Inter-sector collaboration and cooperation is the need of the hour; and those with the risk appetite and ability to allocate appropriate time and resources to this end may stand to benefit.

"The ingredients for success are there, someone just needs to go into the 'kitchen' and put them all together," concludes Ross.

For more information, please contact:

Matt Baumgurtel
Partner
+61 459 900 080
matt.baumgurtel@hamiltonlocke.com.au
hamiltonlocke.com.au/our-team/matt-baumgurtel

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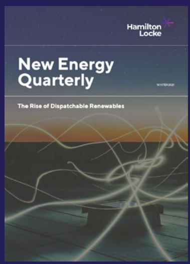

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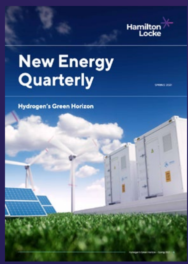

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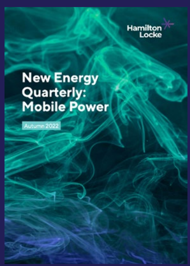

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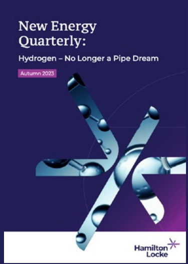

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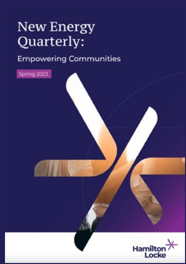

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