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Subject: Energy Transition for the Ocean – Contributing Thought Leadership

Powering Water, Securing Nations: Ocean-Based Energy Systems for a Resilient, Decarbonised Blue Economy

Executive Summary

As well documented by Ocean Decade Australia (ODA), Australia and the Pacific face a converging set of challenges: increasing water scarcity, rising energy costs, exposure to fuel supply volatility, and escalating climate impacts. These pressures are particularly acute in remote, coastal, and island communities where infrastructure is constrained and resilience is critical.

Many of these regions remain heavily dependent on imported diesel for electricity and water production, creating economic vulnerability, energy insecurity, and ongoing emissions exposure.

Ocean-based energy systems, integrated with offshore services such as at-sea desalination and/or onshore microgrids, offer a pathway to deliver essential energy and water support without increasing emissions, overloading electricity grids, or expanding land-based infrastructure footprints.

Despite their significant potential to deliver the benefits previously described, ocean energy technologies are still often perceived as 'disruptive' emerging solutions. Lingering negative perceptions continue to hinder broader sector development and investment. However, as an increasing number of ocean energy companies push forward and demonstrate real-world performance and commercial viability, the focus is shifting from proving the value of ocean energy to accelerating its practical deployment, commercial adoption, and integration into existing energy and water infrastructure systems to support global decarbonisation and energy resilience goals.

It is important to acknowledge that practical deployment and commercial adoption of ocean energy will not succeed through technology innovation alone. Success will depend on aligning technologies with clearly defined customer and community needs, supported by coordinated policy, investment, regulation, and leadership.

Energy Security

Energy security is no longer defined solely by access to fuel. It is increasingly defined by resilience, diversification, affordability, and independence. Ocean-based energy systems contribute to all.

Decentralisation. By shifting critical services such as water generation offshore, or supplying electricity through localised microgrids, communities can reduce dependence on centralised infrastructure and avoid costly transmission expansion. Distributed systems also improve resilience during natural disasters, grid outages, or fuel supply disruptions.

Reduced fuel dependency. Many island and coastal communities remain dependent on imported diesel, exposing them to fuel price volatility, logistics risks, environmental impacts, and public health concerns. Ocean energy systems can directly displace fossil fuel consumption for electricity generation and water production, improving long-term independence.

System optimization. Ocean energy's forecastable and perpetual resource characteristics provide operational and cost stability advantages over fuel-based systems. In the case of at-sea desalination, removing large electricity loads from existing grids, required for onshore desalination plants, can free capacity for housing, industry, and community growth without major network upgrades.

Socio-economic Opportunities

Ocean energy is not simply an energy solution; it is also an economic development opportunity. Ocean-based infrastructure can enable broader blue economy applications, such as:

- Desalination and water security
- Maritime decarbonisation
- Offshore aquaculture support
- Autonomous marine systems
- Remote island resilience
- Hydrogen and e-fuels production
- Coastal defence
- Climate adaptation infrastructure

These applications can result in long-term job creation across marine engineering, fabrication, vessel operations, installation, maintenance, environmental services, digital systems, project development, amongst others. In this context, ocean energy systems become enabling platforms for regional economic support and sovereign capability development.

Decarbonisation

Many countries, including Australia and Pacific nations, have committed to ambitious emissions reduction targets while simultaneously strengthening climate resilience. Ocean-based energy systems can support both objectives.

Replacing diesel-powered electricity and water systems with ocean-powered alternatives can deliver immediate and measurable emissions reductions. This opportunity was demonstrated through initiatives such as the Australian Fisheries Research and Development Corporation-funded Ocean Energy Microgrid Project.

Achieving Successful Energy and/or Water Transition

Ocean-based energy systems represent a fundamentally different infrastructure model: decentralised, resource-aligned, modular, and geographically adaptable. Unlike conventional centralised utilities, these systems can be deployed incrementally and tailored to the environmental, social, and economic conditions of individual coastal and island communities. This flexibility creates new opportunities and benefits.

However, despite their positive benefits, the reality is ocean-based energy and/or water systems are considered disruptive emerging technologies. There remains limited understanding of how these systems can be integrated into existing communities, how they may interact with or replace conventional infrastructure, and how the transition can be financed, governed, and maintained over the long term. This uncertainty often slows investment, policy support, and practical implementation.

From "Technology Push" to "Market Pull"

Another hinderance to ocean energy development has been the industry's historical "technology push" model. That is, developing devices first and seeking markets later.

This approach has slowed the industry's ability to achieve commercial scale and deliver benefits because technologies have been insufficiently aligned with customer requirements, operational realities, financing structures, and defined offtake commitments.

The industry needs to transition toward a "market pull" approach. Ocean energy systems need to be developed as solutions to clearly identified customer and community "pain points", including water scarcity, fuel dependency, energy resilience, and high infrastructure costs. This will require ocean energy companies to evolve from device developers into integrated solution providers.

The added value from market-led deployment is creation of stronger incentives for governments and regulators to streamline consenting and investment frameworks around defined customer and community needs and/or national priorities. This will result in increased engagement and support by stakeholders, and policymakers who facilitate deployment at scale in context of the blue economy.

Recommendations for ODA

Achieving the benefits of ocean-based energy systems within the context of ODA's goals, will require coordinated leadership across government, industry, finance, and communities.

1. **Provide coordinated leadership or help establish that leadership role.** Strong leadership is needed to align stakeholders, reduce fragmentation, maintain momentum and achieve tangible results.

2. **Co-Design with Communities.** Projects must be developed in partnership with local communities, Traditional Owners, industry users, and regional stakeholders. Co-designed initiatives improve long-term viability, social acceptance, local participation, and operational success.

3. **Integrate Ocean Energy into National Strategy.** Governments, at all levels, should formally incorporate ocean energy into:
   - Energy transition plans and strategies
   - Water security planning
   - Regional development frameworks
   - Climate resilience programs
   - Blue economy policy initiatives

4. **Prioritise Commercial Demonstration Projects.** The ocean energy sector does not need more isolated technology R&D stand-alone projects. Demonstration projects should be designed to solve real-world problems for defined customers and communities. These projects need to validate:
   - Operational performance that meets the customer's needs
   - Documents a positive business case for the customer
   - Identifies financing strategies that benefit both technology providers and create market incentives to pursue innovative solutions
   - Regulatory pathways
   - Stakeholder engagement leading to community acceptance
   - Risk reduction

5. **Streamline Regulatory Frameworks.** Nationally consistent and regulatory consistency across geographic boundaries is essential. "One-stop-shops" or coordinated approval processes could significantly reduce development uncertainty and investment risk. This issue has already been well documented by many organisations, including ODA.

6. **Mobilise Blended Finance.** Realistic and supportive funding for early deployments, such as commercial demonstration projects described in #3 above, is critical to reducing perceived risk and accelerating market confidence.

Conclusion

The decisions made now about how energy is produced, water is secured, and how infrastructure is developed, will shape regional resilience and prosperity for the future.

The opportunity now is not simply to develop ocean energy technologies, but to deploy integrated ocean-based systems that solve practical problems for communities, industries, and nations.

Successful adoption of ocean energy systems will depend on integrated planning approaches that combine engineering, community participation, financing models, and governance frameworks. Building local capability, strengthening stakeholder engagement, and developing scalable demonstration projects will be critical to enabling ocean-based systems to move from emerging concepts to practical infrastructure solutions.