Technology Collaboration Programme
by iea

25 YEARS OF IEA-OES

A GLOBAL VISION, A SHARED COMMITMENT

2001 – 2026

OES OCEAN ENERGY SYSTEMS
CELEBRATING 25 YEARS

2001 – 2026

25 YEARS OF IEA-OES

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Celebrating 25 years

Message from the Chair

Dr. ir. Matthijs Soede
European Commission
IEA-OES Chairman (2023 — present)

Happy Birthday!

The IEA's Ocean Energy Systems Technology Collaboration Programme is celebrating its 25th Anniversary! The day that I am writing this foreword is also my own personal birthday. Family, friends and colleagues have been sending me kind messages and best wishes the whole day, and they wish all a nice celebration. Why do I write this? It shows that you shouldn't neglect celebrating an anniversary, who is around you, and pay attention to the past years but also to look forward to the years to come.

And that is also what we want to do with this publication. Looking back to what has happened, to the results achieved, and especially to who has been behind all the great work. Family, friends and colleagues, that is also what we have in the IEA-OES.

I would like to thank all the governments from our member countries for supporting the IEA-OES. Their support is crucial!

A thank you also to all delegates, alternate delegates and task leaders in all these years. They have been bringing technical expertise and strategic thinking to the Executive Committee meetings. This has contributed to very valuable insights and concrete actions supporting the ocean energy sector.

Thank you to all the developers, researchers, scientists, and students. They are the backbone of ocean energy technology development. All the individual work has contributed to the development of the sector. Thank you for sharing valuable expertise and knowledge.

Lastly, a very special thanks to Ana Brito e Melo who has been supporting the IEA-OES for all these years by providing very professional support to the Executive Committee and helping everybody in preparing reports and their communications.

For 25 years the IEA-OES have been stimulating ocean energy innovation and deployment, supporting policy development and implementation, educating and building capacity, and this all by connecting people and stimulating collaboration. The IEA-OES is a collective achievement of its member countries and all different ocean energy family members. Let's stay connected in the years to come and continue to work and build together the future of ocean energy!

A memory of a founding Member

Dr. Kim Nielsen

Delegate from Denmark since 2001

The year is 2001, and I am in Paris with Jan Bünger from the Danish Energy Agency to sign the Implementing Agreement on Ocean Energy Systems under the umbrella of the International Energy Agency.

Jan Bünger had been the programme manager and I had been the secretary of a four-year dedicated Wave Energy Program which had generated waves of interest across Europe. Following a change of government in Denmark, the program came to an end in 2002. Jan Bünger expressed that one good way to preserve the learnings from the programme would be to join the IEA-OES group. Denmark had already had positive experience in similar collaborative frameworks for wind energy and district heating.

The Implementing Agreement on Ocean Energy had been prepared with support and advocacy from the United Kingdom, Portugal and the European Commission. The European Commission had already supported wave energy in previous decades through the Preliminary Actions on Wave Energy lead by Denmark.

The UK had since the early 1970s been frontrunner in the development of wave energy systems and had coordinated the Ocean Energy European Thematic Network on Wave Energy (WAVENET). Moreover, in 2001, the UK had opened the offshore test site EMEC in Orkney.

Portugal had also played a leading role, which was reflected in the appointment of the first Chairperson from Portugal, Teresa Pontes, and in the decision to base the OES Secretariat in Portugal. I remember a UK delegate saying that the Chairperson should inspire trust and confidence, and Teresa Pontes was the perfect candidate. She was highly respected for her work on the first European Wave Energy Atlas, published in 1996. Portugal had also built and operated the first European wave energy plant, the Pico Plant in the Azores, the home island of Ana Brito e Melo, who one year later became the dedicated Secretary of OES ever since.

In 2002, there was a trust that collaboration and sharing of efforts and knowhow could help identify the best and most efficient wave energy converters. This was demonstrated at the conference dinner of EWTEC in Denmark in 1999, where Richard Yemm, developer of Pelamis, and Tom Denniss, developer of Ocean Swell concept in Australia — both very talented musicians — played piano and guitar while singing their own version “All we need is Waves” of a well-known Beatles tune. It turned into a very amusing jam session between inventors.

Introduction

In 2026, the IEA-OES marks its 25th anniversary, offering an opportunity to reflect on how the collaboration has grown from its early beginnings into a recognised international platform for cooperation and knowledge sharing in ocean energy.

Launched in 2001 under the framework of the International Energy Agency, IEA-OES was established by its inaugural signatories — Denmark, Portugal and the United Kingdom — with Ireland and Japan joining soon afterwards. Over the years, the collaboration has continued to expand most recently with Brazil formally joining on 13 April 2026, further strengthening the programme's international reach in its anniversary year. The collaboration now has a total of 22 member countries and the European Commission.

Created to advance the research, development and demonstration of ocean energy technologies, IEA-OES has evolved alongside the sector itself, adapting to new challenges and opportunities over time.
Today, it brings countries together to share knowledge, develop joint studies and guidance, support policy and regulatory dialogue, strengthen environmental understanding, and accelerate the viability, uptake and acceptance of ocean energy in an environmentally responsible manner.
In doing so, IEA-OES continues to play an important role in supporting the global clean energy transition and in shaping the long-term development of ocean energy worldwide.

CHAPTER

02

Ocean Energy: from promise to proof

25-Year Perspective

In the early years of IEA-OES, ocean energy was still a highly exploratory field. Wave and tidal stream technologies were attracting growing attention but remained largely at concept, model or prototype stage. Other ocean energy technologies, including OTEC and salinity gradient energy, were also being explored, each following a distinct development pathway with different technical challenges and potential applications. Tidal range energy, by contrast, had already demonstrated commercial-scale electricity generation.

Across the sector, long-term potential was widely recognised, but major uncertainties remained around technical reliability, costs and the route to market. Public support and private investment were beginning to increase, although they remained limited and uneven, and only a small number of technologies had accumulated substantial experience in real-sea conditions.

Over the past 25 years, progress has not been linear. Ocean energy has advanced through cycles of ambition, experimentation, setbacks, redesign and renewed effort. Many early concepts did not continue in their original form, some companies disappeared or were restructured, and several technologies proved more difficult to develop than initially expected. Yet this process of testing, learning and adaptation has been fundamental in building the technical knowledge, operational experience and infrastructure that support the sector today.

Wave energy: diversity as a defining characteristic

Wave energy illustrates this trajectory particularly clearly. Interest in wave power accelerated after the oil crises of the 1970s, and by the 1980s and 1990s a number of shoreline plants and early demonstration concepts had emerged. By the beginning of the 2000s, a first generation of dedicated developers was helping to bring wave energy into the public and industrial spotlight.

One of the defining features of wave energy at this stage was the remarkable diversity of technological concepts under development. Devices differed not only in their location - from shoreline to nearshore and offshore settings - but also in the principles by which they captured wave energy and the power take-off systems used to convert that motion into electricity.

The technology landscape of the early 2000s reflected this diversity. Oscillating water columns, oscillating bodies and overtopping devices were being explored in different fixed, floating and submerged configurations, with numerous approaches progressing in parallel.

This wide dispersion of concepts reflected both the creativity of the sector and the complexity of the wave resource itself. At the same time, it contributed to a more fragmented and experimental development path than that followed by tidal current energy.

Some projects progressed to full-scale construction and real-sea testing, while others remained at prototype stage or were later discontinued. Even when technologies did not continue in their original form, they generated valuable knowledge in areas such as hydrodynamics, power take-off systems, moorings, materials, installation and operation in demanding marine environments.

Over time, a new generation of developers and research institutions increasingly incorporated lessons from this earlier experience. Progress has continued through sustained research, improved testing infrastructure and greater attention to survivability, reliability, maintainability and operations at sea. The diversity that characterised the early years therefore represents a period of intense experimentation, and important technical foundation for subsequent development.

Examples of the main wave energy converter concepts and devices under development in the early 2000s (Pico Plant, OE Buoy, Wavebob, AWS, Pelamis)

Tidal range energy: an established but constrained pathway

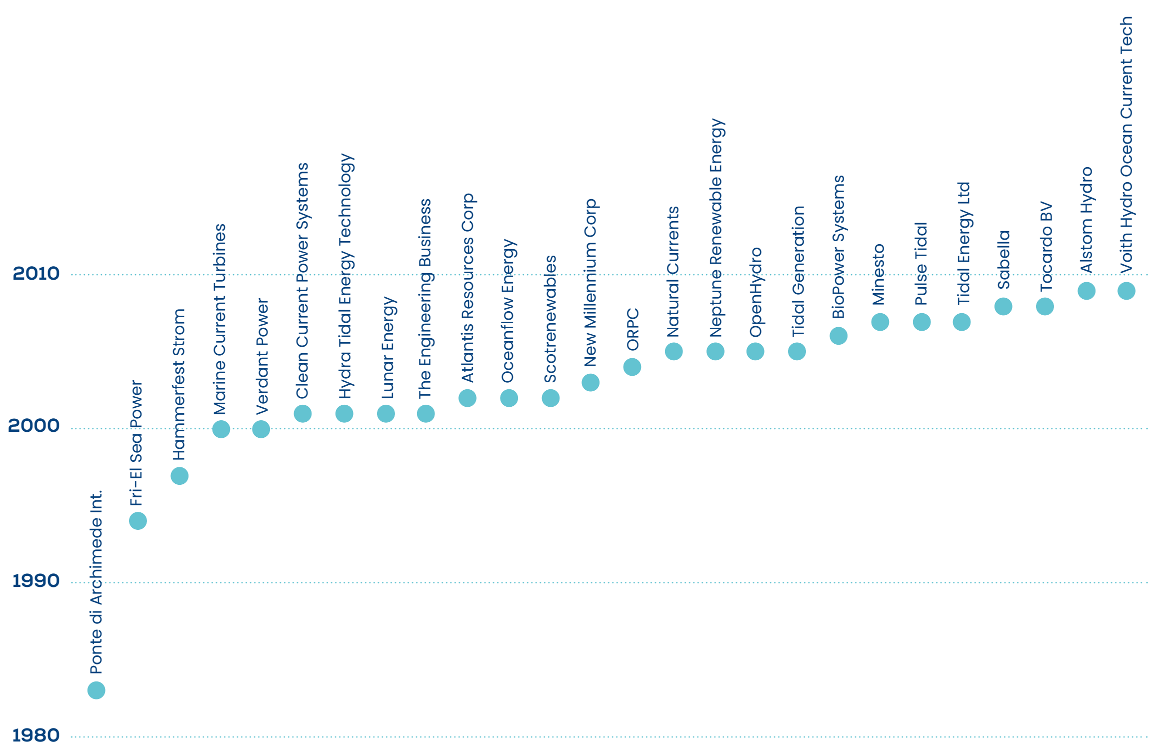
Tidal range energy followed a very different trajectory. Long before the creation of IEA-OES, it had already demonstrated the ability to generate electricity at commercial scale. The La Rance tidal power plant in France, in operation since 1966, remains one of the landmark projects in ocean energy, while the later Sihwa Lake project in Korea provided another example of large-scale electricity generation from the rise and fall of the tides.

Despite this long operational history, tidal range energy has seen relatively limited deployment. Barrage projects require suitable geographical conditions and substantial infrastructure investment, while their potential environmental and social impacts can make planning and consenting particularly complex. More recently, tidal lagoon concepts have been explored as an alternative approach, although they have not yet progressed to widespread deployment.

Tidal range therefore occupies a distinctive place within ocean energy: it demonstrated large-scale electricity generation much earlier than other ocean energy technologies, but its expansion has remained constrained by geography, capital requirements and the characteristics of large civil-engineering projects.

Tidal current energy: towards greater convergence

Tidal current energy followed a distinct development path. In the early 2000s, the technology was also largely at prototype stage, with a growing number of developers exploring different approaches to extracting energy from energetic tidal flows.



Foundation years of selected tidal current energy companies, illustrating the emergence and expansion of the sector's industrial base

Unlike wave energy, however, the sector gradually began to show greater technological convergence. Early projects demonstrated that turbines could operate in real tidal environments and deliver electricity to the grid, while a growing industrial community emerged around the technology.

The foundation years of selected tidal current energy companies illustrate this expansion, from a relatively small number of early pioneers to a broader industrial base during the 2000s.

Over time, tidal current technology increasingly converged around more standardised turbine concepts. This growing degree of convergence allowed experience to accumulate more directly across projects and supported progress towards larger-scale demonstrations.

The sector has since demonstrated that multi-device arrays can operate successfully over extended periods. This progression has made tidal current energy one of the more technically advanced areas of the ocean energy sector and provides a clear contrast with the wider variety of technological approaches that continues to characterise wave energy.

Okinawa Prefecture's OTEC demonstration facility, Japan

Ocean Thermal Energy Conversion: from long-standing concept to renewed application

Ocean Thermal Energy Conversion followed a different trajectory again. The principle had long been recognised as promising, but for many years OTEC remained largely confined to pilot-scale research and feasibility studies.

In the early years of IEA-OES, the technology had therefore not progressed towards widespread deployment, despite the continued interest in its potential. Over time, advances in engineering, increasing interest from tropical regions and island territories, and greater recognition of benefits beyond electricity production gave OTEC renewed relevance.

A notable example of this evolution is Okinawa Prefecture's OTEC demonstration facility on Kumejima Island, Japan. In operation since 2013, the facility has contributed practical experience while also demonstrating how deep seawater can support activities beyond power generation, including aquaculture and agriculture. This broader perspective is also evident in Sea Water Air Conditioning. Already a commercially proven application in several locations, it demonstrates how the thermal properties of the ocean can contribute to decarbonisation through cooling services.

The development of OTEC over the past 25 years therefore reflects a growing recognition that the ocean's thermal resource can provide value through multiple applications, particularly in island and coastal contexts.

Salinity gradient energy: from theory to practical demonstration

Salinity gradient energy was at an earlier stage of development at the beginning of the 2000s. Although the principle of generating energy from the interaction between fresh water and seawater was known, the technology remained largely within the research domain.

A major milestone came in 2009 with the opening of Statkraft's prototype osmotic power facility at Tofte, Norway, the first of its kind in the world. The project demonstrated electricity generation from the pressure difference between fresh water and seawater and provided a practical platform for testing membranes, processes and system components. Although Statkraft later discontinued further investment in the technology, the Tofte project generated valuable operational knowledge and helped demonstrate the technical feasibility of osmotic power. Research has continued since then, with attention focused on improved membrane technologies and on opportunities to integrate salinity gradient systems with industrial processes, desalination and water treatment.

Statkraft's prototype osmotic power facility, Norway

Salinity gradient energy remains at an emerging stage, but its development over the past 25 years illustrates an important aspect of ocean energy innovation: progress is not measured only by commercial deployment, but also by the accumulation of technical knowledge, the validation of new principles and the identification of new applications.

Different pathways, a shared process of learning

The evolution of wave, tidal current, OTEC and salinity gradient energy over the past 25 years shows that ocean energy is not a single technological pathway. Each resource has followed a different trajectory, due to its physical characteristics, technological requirements and potential applications.

Wave energy has been characterised by diversity and continued experimentation. Tidal current energy has moved towards greater technological convergence and more advanced real-sea deployment. OTEC has combined long-standing technical interest with renewed attention to island applications and wider uses of deep seawater. Salinity gradient energy has progressed from largely theoretical development towards practical demonstration and continued innovation in membranes.

What these pathways share is a process of learning through experience. Prototypes, unsuccessful concepts, operational challenges and repeated testing have all contributed to a better understanding of how ocean energy technologies perform in practice. Over time, this accumulated experience has strengthened the sector's engineering knowledge and increased confidence in the development and operation of these technologies.

Taking ocean energy out of the laboratory and into the sea became one of the defining challenges of the sector's early development - and it was at this crucial stage that IEA-OES began to play its role.

Mooring in tidal flow at EMEC's Fall of Warness tidal test site, Orkney, 2006. © Colin Keldie

Test Sites and Demonstration: from lab to sea

Over the past 25 years, ocean energy has evolved from a sector with few opportunities for offshore testing into one supported by an international network of real-sea demonstration facilities. A major turning point came in 2003 with the establishment of the European Marine Energy Centre (EMEC) in Orkney, Scotland, the world's first purpose-built, grid-connected marine energy test centre. EMEC provided developers with a structured environment for testing technologies at sea, combining site access, consenting support, standardised procedures and independent performance assessment.

Since then, test facilities have expanded across different regions, technologies and stages of development. They have helped build operational experience, support environmental monitoring and provide regulators and investors with stronger evidence on performance and risk. Today, as highlighted in the ***International WaTERS Lessons Learned report***, these facilities are recognised as innovation hubs that bring together technology, regulation, operations and environmental learning, helping bridge the transition from research to commercial readiness.

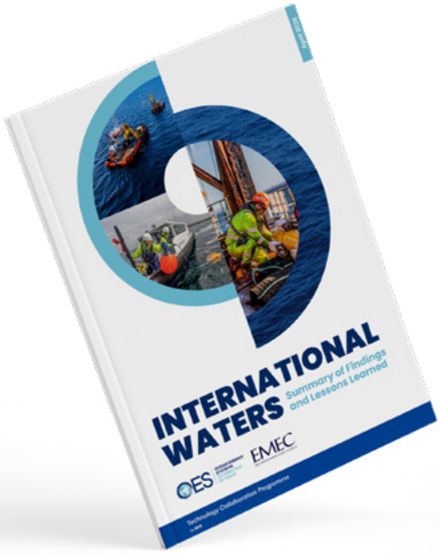
International WaTERS

70 delegates

17 countries

International WaTERS 2023, Orkney, Scotland (Courtesy Colin Keldie, EMEC)

A major driver of this progress has been the **International WaTERS network**, created by EMEC in 2013 to connect open-water marine energy test centres. Over the past decade, it has developed into a truly international platform for collaboration and mutual learning. Through this network, test centres have shared lessons learned, exchanged operational and regulatory experience, discussed common challenges, and helped strengthen more consistent approaches to testing, monitoring and consenting. Recent meetings have brought together more than 70 delegates from over 17 countries, reflecting the growing spirit of cooperation that continues to shape the ocean energy community.



Test sites have provided the sector with the conditions needed to learn from experience, refine technologies and overcome technical setbacks.

Canada

Fundy Ocean Research Centre for Energy (FORCE)
Minas Passage, Bay of Fundy, Nova Scotia

Canadian Hydrokinetic Turbine Test Centre (CHTTC)
Winnipeg River, Manitoba

USA

U.S. Navy Wave Energy Test Site
Kanohe Bay, Hawaii

Pacific Marine Energy Center, PacWave North Site
Newport, Oregon

Pacific Marine Energy Center, PacWave South Site
Newport, Oregon

Pacific Marine Energy Center, Lake Washington
Seattle, Washington

Pacific Marine Energy Center, Tanana River Hydrokinetic Test Site
Nenana, Alaska

Jennette's Pier Wave Energy Test Facility
Jennette's Pier, North Carolina

U.S. Army Corps of Engineers (USACE) Field Research Facility (FRF)
Duck, North Carolina

Center for Ocean Renewable Energy
Durham, New Hampshire

UMaine Offshore Intermediate Scale Test Site
Castine, Maine

UMaine Deepwater Offshore Renewable Energy Test Site
Monhegan Island, Maine

OTEC Test Site
Keahole Point, HI

Marine Renewable Energy Collaborative (MRECo) Bourne Tidal Test Site (BTTS)
Bourne, Massachusetts

Southeast National Renewable Energy Center — Ocean Current Test Facility
Boca Raton, Florida

United Kingdom

European Marine Energy Centre (EMEC)
Orkney, Scotland

FaBTest
Falmouth Bay in Cornwall

Marine Energy Test Area (META)
Milford Haven Waterway in Pembrokeshire

Morlais Tidal Demonstration Zone
West Anglesey

Perpetuus Tidal Energy Centre (PTEC)
South Coast of the Isle of Wight

Ireland

Galway Bay Marine and Renewable Energy Test Site
Galway Bay

AMETS
Belmullet, Co. Mayo

Portugal

Viana do Castelo test site
Viana do Castelo

Aguçadora test site
Aguçadora

Spain

BiMEP
Basque Country

Mutriku Wave Power Plant
Basque Country

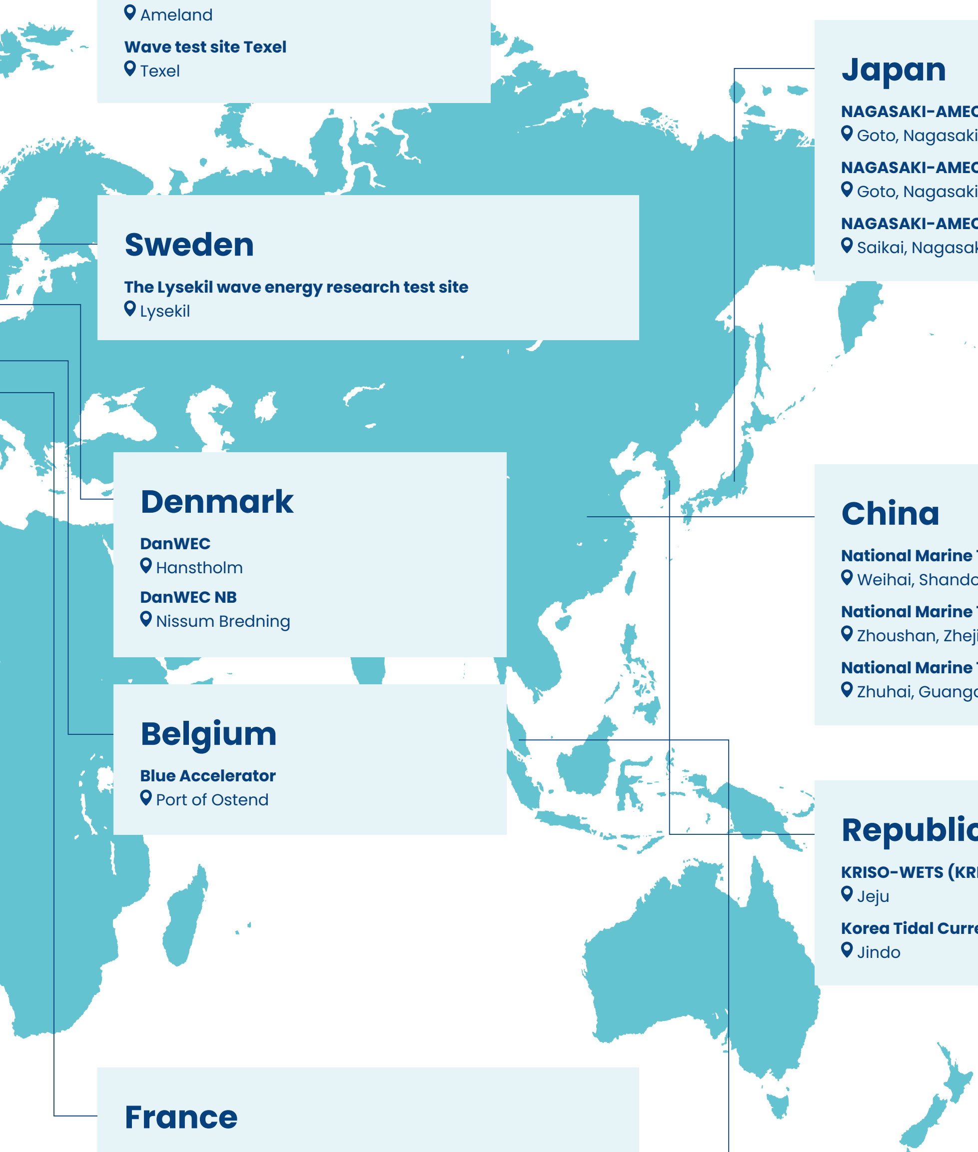
Oceanic Platform of the Canary Islands (PLOCAN)
Canary Islands

Punta Langosteira Test Site
Galician coast

Mexico

Port El Sauzal
Ensenada, Baja California

Station Puerto Morelos
Puerto Morelos, Quintana Roo



Netherlands

REDstack
Afsluitdijk

Tidal test site Ameland
Ameland

Wave test site Texel
Texel

Sweden

The Lysekil wave energy research test site
Lysekil

Denmark

DanWEC
Hanstholm

DanWEC NB
Nissum Bredning

Belgium

Blue Accelerator
Port of Ostend

France

SEM-REV, wave and floating offshore wind test-site
Le Croisic

SEENEOH estuarine and ¼ scale tidal site
Bordeaux

Paimpol-Brehat, tidal site
Bréhat

Sainte-Anne du Portzic, scaled wave and floating wind test-site
Brest

Japan

NAGASAKI-AMEC (Kabashima) floating wind Site
Goto, Nagasaki

NAGASAKI-AMEC (Naru) Tidal Site
Goto, Nagasaki

NAGASAKI-AMEC (Enoshima Hirashima) Tidal Site
Saikai, Nagasaki

China

National Marine Test Site (Wehai)
Weihai, Shandong Province

National Marine Test Site (Zhoushan)
Zhoushan, Zhejiang Province

National Marine Test Site (Zhuhai)
Zhuhai, Guangdong Province

Republic of Korea

KRISO-WETS (KRISO-Wave Energy Test Site)
Jeju

Korea Tidal Current Energy Centre (KTEC)
Jindo

Singapore

Sentosa Tidal Test Site
Sentosa island

Today's Highlights

Twenty-five years after the creation of IEA-OES, ocean energy is entering a new phase. What was once driven primarily by vision, research and early experimentation is now increasingly defined by operational evidence, larger-scale ambitions and growing investor and policy confidence. Across tidal, wave, OTEC and other ocean energy applications, the sector is demonstrating that it can move beyond promise and deliver practical value.

Today, the challenge for ocean energy goes beyond demonstrating that technologies can operate at sea. It is about showing that they can perform reliably over time, be deployed at greater scale and make a meaningful contribution to the energy transition. Recent progress also reflects the development of more robust approaches to environmental assessment, maritime spatial planning and stakeholder engagement, creating stronger conditions for deployment and real-world impact.

↑
LHD Tidal Current Power Station, China
↖
Meygen Tidal Energy Project, Scotland

Proven reliability and operational confidence

Perhaps the most important signal of progress is the growing evidence from long-term operation and cumulative electricity generation.

In Scotland, MeyGen has continued to consolidate its position as the world's reference tidal stream array, with cumulative generation approaching 75 GWh by the end of 2025 over 7 years of continuous operation. In China, the LHD Zhoushan project has demonstrated exceptional durability, with the "Endeavour" turbine surpassing 49 months of continuous operation. In Spain, the Mutriku wave power plant marked fifteen consecutive years of commercial operation in July 2026, generating electricity and delivering it to the grid. Together, these examples show that ocean energy is increasingly reliable under demanding real-sea conditions.

From single devices to multi-device deployment

Another defining characteristic of the sector today is the gradual but clear shift from isolated device demonstrations towards pre-commercial arrays and coordinated deployment strategies. This transition is essential: it signals that the industry is beginning to operate at the scale required for future market relevance.

In Portugal, CorPower Ocean advanced from the successful demonstration of its C4 unit to the fabrication phase of the 10 MW VianaWave project, marking an important milestone for wave energy scale-up. In the United Kingdom, Nova Innovation's long-running Shetland array continues to demonstrate how tidal energy can serve both local communities and wider grid applications.
In the Faroe Islands, Minesto's Dragon 12 has reinforced the commercial potential of subsea kite technology, while preparations for a 10 MW array point to the next stage of development.

↖
CorPower Ocean, Portugal
↑
Nova Innovation in Bluemull Sound, Shetland, UK
↑↑
Minesto´s Dragon 12 tidal kite, Farao Islands

Advancing engineering maturity

The sector is being shaped by technologies that are reaching increasingly high levels of engineering maturity, supported by improved design, extended operation in real-sea conditions and growing experience in installation, maintenance and performance assessment.

Orbital Marine Power's O2 is a leading example, having demonstrated the operation of a large-scale floating tidal turbine over an extended period.

↑
Three Gorges SG500AB Tidal Current Generation, China
↑↑
Orbital Marine Power O2 at EMEC, UK

Beyond electricity: supporting islands, remote communities and the blue economy

Ocean energy is also proving its value beyond conventional grid supply. In many parts of the world, it offers solutions that respond directly to local needs, including freshwater production, thermal energy services and diesel displacement in remote or islanded systems.

In India, progress on ocean thermal applications for desalination highlights the importance of ocean energy for water and energy security in island communities. In Monaco, seawater-based heating and cooling systems continue to show how marine energy can contribute to decarbonisation in dense coastal environments. In Singapore, Alaska and Canada, ocean and river current technologies are helping to shape more sustainable microgrids, reducing dependence on imported fossil fuels and supporting more resilient local energy systems.

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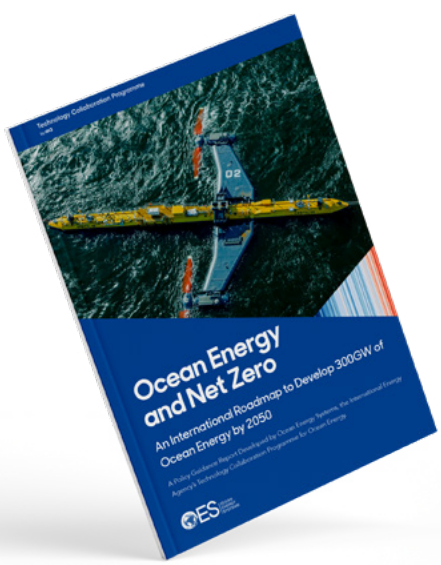
Desalination Plant in Kavaratti, India
↗
Seawater Heat Pump Systems, Monaco
↑
NIOT wave powered buoy in India
↑↑
ORPC's RivGen Power System project, Village of Igiugig, Alaska

A sector gaining strategic and policy credibility

The progress of recent years is also reflected in a broader shift in perception. Ocean energy is increasingly recognised both as a field of technical innovation and as a strategic option within the future clean energy mix.

Major public support mechanisms, including EU Innovation Fund grants and the UK's Contracts for Difference scheme, show that ocean energy is beginning to attract the kind of policy and financial backing associated with emerging investable sectors.

This shift is part of a broader policy transition that has taken place over the past 25 years. Ocean energy has moved steadily from the margins of energy policy towards a more visible place in national and regional clean energy strategies. As highlighted in the IEA-OES policy report *Technology Push & Market Pull*, governments and public funding bodies increasingly recognise that ocean energy requires dedicated and well-sequenced support, combining research and innovation funding, demonstration opportunities, and market frameworks tailored to the needs of the sector.



Across a growing number of programmes, this transition can be seen in the emergence of ringfenced support, pilot deployment schemes, and longer-term revenue mechanisms. This reflects an important change: ocean energy has transitioned from a long-term research topic into a technology with strategic economic, industrial, and decarbonisation value. The opportunity is significant. The *IEA-OES roadmap* identifies a potential contribution of 300 GW of ocean energy by 2050, with the capacity to create more than 680,000 jobs, generate over $340 billion in gross value added, and avoid more than 500 million tonnes of carbon emissions. Realising this potential will depend on policy frameworks that support the full innovation pathway, from early-stage R&D and testing infrastructure to demonstration, grid integration and commercial deployment.

This does not mean that all barriers have been overcome. But it does mean that the sector is moving into a more mature phase, where confidence is built through evidence, partnerships and delivery. The foundations laid over the past 25 years are now supporting a new chapter — one in which ocean energy is increasingly positioned not at the margins of the energy transition, but as part of its future.

680,000
jobs

$340 billion
gross value added

CHAPTER

03

IEA-OES:
25 Years of Global Collaboration

The early days of IEA-OES

Building on an existing culture of collaboration

IEA-OES was created at a time when ocean energy was still at an early stage of technological development, but international collaboration was not starting from zero. In Europe, a strong research community was already emerging around wave energy, supported by collaborative research programmes, thematic networks and regular opportunities to exchange results and experience. The European Wave Energy Conference series, which had begun in the 1990s, became an important meeting point for this community. The Fourth European Wave Energy Conference, held in Aalborg in December 2000, only a few months before the establishment of IEA-OES, provides a clear example of researchers and developers from different countries coming together to discuss emerging technologies, testing, performance and the challenges of moving wave energy beyond the experimental stage.

This collaborative spirit was also reflected in European research initiatives. The European Thematic Network on Wave Energy, WaveNet, was established in 2000 and brought together research organisations and other actors from several European countries to pool knowledge on technical, economic, environmental and planning issues. Its work covered areas ranging from R&D and generic technologies to cooperation with the power industry, financing and the promotion of wave energy. Such initiatives show that, by the time IEA-OES was established, parts of the ocean energy community were already recognising the value of sharing knowledge and addressing common challenges collectively.

What IEA-OES added was a different and complementary dimension: a long-term intergovernmental framework through which countries could exchange knowledge at global level, align priorities and build continuity beyond individual research projects or conference cycles. It also broadened the scope beyond wave energy, creating a platform for cooperation across the different forms of ocean energy and linking technical development with policy, testing, environmental issues and market conditions.

What distinguished IEA-OES from the beginning was its international character. It was founded by three countries — Denmark, Portugal and the United Kingdom — on the principle that progress in ocean energy would depend on cooperation and shared learning rather than isolated national efforts. Through this common platform, participating countries began to build a shared understanding of technical priorities, environmental challenges, testing needs and the importance of comparable evaluation methods.

The first Executive Committee meeting took place at the IEA in Paris in March 2001, with representatives from the three countries that initiated OES and establishing the programme's management structure and basis for collaborative planning. The international network soon began to expand. By 2003, Executive Committee meetings were already bringing together participants from Japan, the United States, Canada and the European Commission, alongside the founding members.

From the outset, this collaboration extended beyond Executive Committee meetings. Delegates and experts exchanged views, participated in international conferences and engaged with the wider ocean energy community. These interactions helped build relationships across countries and institutions, creating an international network through which experience could be shared, different perspectives compared and common challenges addressed collectively.

↖
5th ExCo Meeting, Cork, Ireland, September 2003
↑
Social event during the 12th ExCo Meeting in Mexico City, 2007

Technical visits to real-sea projects were an important part of the early years of IEA-OES, giving delegates direct insight into emerging technologies, operational challenges and practical experience at sea.

↖
Technical visit to Kobold tidal turbine during the ExCo Meeting in Messina, 2007
↑→
Technical Visit to Mutriku breakwater, during the ExCo Meeting in Bilbao 2009

Technical visits complemented the exchanges taking place in Executive Committee meetings, allowing delegates to connect discussion with direct operating experience.

↖
Technical Visit to Seagen during the ExCo Meeting in Dublin, 2010
↗
Technical Visit to OpenHydro during the ExCo Meeting in Dublin, 2010
↑↗
Technical visit to WaveStar during the ExCo Meeting in Denmark, 2012

Even in those early years, the ambition of IEA-OES was broad. The programme aimed to promote international collaboration across the major forms of ocean energy, including wave energy, tidal range, tidal and ocean currents, ocean thermal energy conversion and salinity gradients. Its purpose was twofold: to support technology development while also strengthening the place of ocean energy within wider sustainable energy strategies.

This broad ambition was reflected in the first Tasks launched by the Executive Committee:Task I focused on information exchange and dissemination, showing that communication and knowledge sharing were considered essential from the very beginning. Task II focused on developing recommended practices for testing ocean energy systems. It helped lay the foundations for more robust and transparent evaluation approaches, including work that would later inform frameworks such as the Stage-Gate Metrics Framework, while also contributing to the broader move towards international standardisation through initiatives such as IEC TC 114.

25 ExCo Meeting, South Africa, 2023

↖
32 ExCo Meeting, Monaco, 2017
↑
33 ExCo Meeting, Chennai, India, 2017
↗
Inaugaration of OTEC Lab during the 33 ExCo Meeting, India, 2017

THE VISION FOR OCEAN ENERGY

"Ocean Energy is recognised as being a respected and critical source of green energy. The diversity of devices available is fit for purpose and kind to the environment in which they operate. The capacity provided facilitates security of supply for Nations and a commercial return for the supplier. As a green energy of choice, Ocean Energy is recognised for its contribution to economic growth."

THE VISION OF OES

"As the ***Authoritative International Voice for Ocean Energy*** we collaborate internationally to accelerate the viability, uptake and acceptance of ocean energy systems in an environmentally acceptable manner."

OES BRAND VALUES:

- Trusted Independent Source
- Substantiated knowledge
- Inspiring action
- We care for society and the environment
- Collaborative sharing

OES ORGANISATIONAL VALUES:

- Integrity
- Outcome oriented
- Knowledgeable
- Inspirational
- Collegial

CRITICAL SUCCESS FACTOR 1: High Quality Information

CRITICAL SUCCESS FACTOR 2: A Strong and Effective Communications Capability

CRITICAL SUCCESS FACTOR 3: An Effective Organisation

CRITICAL SUCCESS FACTOR 3: Shared Capability Growth

The OES strategic framework developed around a shared international vision for ocean energy

Seen from today's perspective, many of the questions being discussed 25 years ago were remarkably forward-looking, and several of them continue to shape the sector's development. Issues such as survivability, long-term performance, testing, industrial integration and the pathway from research to deployment remain highly relevant today.

The collaborative culture that defines IEA-OES was therefore present from the outset. Joint Task development, shared reporting and collective discussion of priorities reflected an early understanding that ocean energy would advance more effectively through international cooperation. This remains one of the programme's defining strengths.

Leadership also played an important role in shaping this early direction. The first Chair, Dr Teresa Pontes, articulated a clear vision of the challenges ahead, highlighting the need to move ocean energy from research towards deployment and identifying survivability, long-term performance and industrial integration as critical priorities for the future.

As the programme matured, IEA-OES also began to develop broader strategic perspectives for the sector. In 2011, John Huckerby authored the first *International Vision for Ocean Energy*, providing a shared reference point for future development. Later, under the leadership of Eoin Sweeney, IEA-OES contributed to the OECD work on *The Ocean Economy in 2030*, helping to position ocean energy within the broader context of the emerging blue economy.

Looking back, in the early years of IEA-OES, the sector was small, the challenges were significant and the route forward was far from clear. Yet the foundations established during those first years — international cooperation, shared learning, methodological rigour and strategic vision — have endured and continue to shape the role of IEA-OES today.

IEA-OES at a glance

IEA-OES members

IEA-OES members, their current designated Contracting Parties, and the year each joined the collaboration.

2001

Denmark
Ministry of Transport and Energy, Danish Energy Authority

Portugal
Instituto Superior Técnico (IST)

United Kingdom
Department for Energy Security and Net Zero (DESNZ)

2002

Ireland
Sustainable Energy Authority of Ireland

Japan
Saga University

2003

Canada
Natural Resources Canada

2005

United States of America
United States Department of Energy (DOE)

2006

Belgium
Federal Public Service Economy

2008

Italy
Gestore dei Servizi Energetici (GSE)

New Zealand
Aotearoa Wave and Tidal Energy Association (AWATEA)

Spain
BiMEP — Biscay Marine Energy Platform

Sweden
Swedish Energy Agency

2010

Republic of Korea
Ministry of Oceans and Fisheries

2011

China
National Ocean Technology Center (NOTC)

2013

Monaco
Government of the Principality of Monaco

2014

Singapore
Nanyang Technological University

Netherlands
Netherlands Enterprise Agency

2016

India
National Institute of Ocean Technology (NIOT)

France
French Institute for Ocean Science (IFREMER)

European Commission
European Commission

2018

Australia
Blue Economy Cooperative Research Centre (Blue Economy CRC)

2026

Brazil
Instituto Nacional de Pesquisas Oceânicas (INPO)

The ICOE Journey

Since 2006, IEA-OES has proudly endorsed the International Conference on Ocean Energy (ICOE), which has become the leading global event for the ocean energy community. Over ten editions, ICOE has provided a unique platform to showcase global progress and strengthen international exchange.

2006 Bremerhaven, Germany

2008 Brest, France

2010 Bilbao, Spain

2012 Dublin, Ireland

2014 Halifax, Canada

2016 Edinburgh, United Kingdom

2018 Cherbourg, France

2020 *Washington, D.C., USA

2022 San Sebastián, Spain

2024 Melbourne, Australia

2026 The Hague, Netherlands

* ICOE 2020 was hosted virtually due to the COVID-19 pandemic.

ICOE 2024 in Melbourne marked a particularly significant moment in the conference's journey, extending its reach to Australia and reinforcing the truly global character of the ocean energy community.

↖
ICOE 2024 Chair Irene Penesis
↑
ICOE 2024 Opening Session, Melbourne
↗
ICOE Presentation of the International Vision

↑
The OES Cabinet in 2024

↖
Launch of the OES Environmental State of Science Report during ICOE 2024

↖↖
PNNL Environmental Team

↗↗
ICOE 2024 Presentation by OES Vice-Chairs - Srikanth Narasimalu and Purnima Jalihal

Global trends and how IEA-OES has responded

IEA-OES has helped position ocean energy more clearly within the wider clean energy transition by responding to emerging global trends with targeted studies, guidance and collaborative initiatives.

Trend Area	Global Trend	IEA-OES Response
1 **Clean Energy Transition**	The global push for net-zero emissions and diversified renewable energy portfolios.	Published the International Vision and Roadmap for 300 GW of Ocean Energy by 2050 to position ocean energy as a key contributor to the energy transition.
2 **Growing Need for System Integration**	Increasing complexity in integrating offshore renewables, including grid, storage, and hybrid solutions.	Launched studies on infrastructure needs and plans for new tasks on exploring synergies with offshore wind, hydrogen, and aquaculture.
3 **Environmental and Social Acceptance**	Greater attention to marine biodiversity and community consent for new ocean uses.	Released the State of the Science Report through OES-Environmental, advancing global understanding of the environmental effects of ocean energy and risk retirement strategies.
4 **Island and Coastal Resilience**	Demand from island nations and remote communities for energy independence and resilience.	Supported targeted studies on ocean energy applications in islands, desalination, and co-location with aquaculture, promoting market diversification.
5 **Global Policy and Investment Signals**	Stronger policy support and funding (e.g. UK CfD, France FloWatt, US DOE, EU Horizon Europe).	Developed policy guidance reports to help countries align incentives and accelerate adoption.
6 **Technology Credibility and Metrics**	Increasing need for transparency in innovation maturity and performance data.	Promoted the use of the Stage-Gate Metrics Framework to guide developers, funders, and regulators with consistent evaluation tools.

Over the years, IEA-OES has translated emerging sector needs into practical knowledge. Its reports, white papers and guidance documents bring together international expertise, provide evidence for policy and investment decisions, and help the ocean energy community respond to technological, environmental and market challenges.

CHAPTER

04

The Next Chapter

What ocean energy can learn

The development of offshore wind offers an interesting parallel to the ocean energy sector. Although the two sectors differ in technological maturity, deployment scale and market conditions, the offshore wind journey demonstrates how an emerging marine renewable technology can move from experimentation to industrial scale.

The development of offshore wind offers an interesting parallel to the ocean energy sector. Although the two sectors differ in technological maturity, deployment scale and market conditions, the offshore wind journey demonstrates how an emerging marine renewable technology can move from experimentation to industrial scale.

The Role of Stable Policy and Frameworks

Perhaps the most important takeaway is that technological progress alone is not enough. Offshore wind did not scale simply because the turbines improved. It scaled because innovation was accompanied by stable policy support, targeted public investment, enabling infrastructure, and the gradual development of industrial confidence. Long-term revenue mechanisms, such as feed-in tariffs and Contracts for Difference, gave developers and investors the visibility needed to commit capital, while public support for demonstration and early deployment helped bridge the gap between technical promise and commercial reality. This is equally relevant for ocean energy today. If the sector is to move from pilot projects to sustained market growth, technology development must be matched by clear and predictable frameworks for deployment.

Supply Chains and Infrastructure Integration

A second critical factor lesson concerns infrastructure. The success of offshore wind relied heavily on the simultaneous evolution of ports, vessels, installation methods, grid connections, and supply chains. Ocean energy is now entering a phase in which these enabling conditions become increasingly important. In many cases, there are valuable opportunities to build on existing maritime and offshore capabilities, including synergies with offshore wind itself. This has the potential to reduce costs, strengthen local industrial value, and accelerate learning across sectors.

Design Convergence and Standardization

The offshore wind trajectory also highlights the ultimate importance of design convergence and standardization. Over time, that industry moved towards a smaller number of dominant design approaches, which allowed for replication, cost reduction and industrial optimisation. In contrast, ocean energy remains more technologically diverse, reflecting the range of resources it seeks to harness, from waves and tidal currents to ocean thermal gradients and salinity differences. This diversity remains a strength at this stage of development. At the same time, international collaboration and shared learning can help identify which solutions are most robust, scalable and investable, allowing the sector to evolve more efficiently and with greater transparency.

Environmental Integration and Social Acceptance

Offshore wind has shown that environmental concerns, permitting complexity and stakeholder engagement are not secondary issues: they are central to successful deployment. In this respect, ocean energy has an opportunity to advance with greater awareness from the outset. Through initiatives such as OES-Environmental, the sector has invested in building a stronger evidence base on environmental effects, monitoring approaches and risk retirement. This creates an opportunity for ocean energy to progress with a more informed and responsible approach, helping projects gain credibility and public confidence as they move towards larger-scale deployment.

The Cost Curve and Commercial Reality

The broader history of modern renewables — including wind and solar photovoltaics (PV) — shows that early-stage cost barriers can be overcome through sustained innovation, policy support and deployment. However, ocean energy enters a different market context. Unlike wind and solar in their earlier years, it must develop in competition with renewable technologies that are already widely deployed and, in many cases, significantly less expensive.

For this reason, the case for ocean energy cannot rest on cost reduction alone. Its future will also depend on the distinct value it can bring to the energy system. This includes, for example, its predictability, its potential to complement variable renewables such as offshore wind and solar PV, and its possible role in improving grid stability and strengthening the performance of co-located offshore energy systems. In this sense, the path forward for ocean energy is shaped not only by engineering progress, but also by the ability to demonstrate clear system-level advantages and to deploy within targeted frameworks that reflect its unique physical characteristics and strategic value.

Looking ahead: The decade of deployment

As IEA-OES marks 25 years of collaboration, ocean energy enters a new stage in its development. The sector is no longer defined only by early experimentation or isolated demonstrations. It now benefits from a stronger technical foundation, a growing body of operational evidence, more mature testing infrastructure, and a clearer understanding of the policy and market conditions needed for progress. The challenge ahead is to translate this foundation into wider deployment, stronger market confidence, and a more visible role for ocean energy within the global clean energy transition.

What the next decade requires

The coming years will require a shift in focus from proving concepts to enabling scale. This does not mean that research and innovation become less important; on the contrary, they remain essential. But innovation must now be increasingly linked to deployment pathways, industrialisation, and long-term system value. The sector will need to continue improving reliability, survivability and performance, while also reducing costs and demonstrating that ocean energy can operate as a practical and investable part of future energy systems.

This next stage will also require stronger enabling conditions. Technologies can only progress if markets, regulations, and (research) infrastructure evolve alongside them. This needs clear policy framework with investments from the public and private side. Clearer consenting pathways, suitable grid access, port and vessel availability, and more predictable support mechanisms will all be critical. At the same time, cross-sector integration is becoming increasingly important. Ocean energy is likely to grow not only as a source of electricity, but also as part of broader marine and coastal systems, linked to desalination, hydrogen, offshore aquaculture, microgrids, and hybrid renewable developments.

Strategic priorities

In this context, three priorities stand out for the coming decade:

The first is to accelerate commercialization, cost reduction and investability. This means supporting the transition from prototype and pilot projects to early arrays and repeat deployments, where learning can be consolidated and economies of scale can begin to emerge. If the sector is to move beyond dependence on technology developers and public funding alone, it must increasingly attract private investors. That will require stronger evidence of performance, clearer progress pathways, and greater confidence in the long-term business case.

The second is to strengthen the place of ocean energy within national and regional energy strategies. For ocean energy to move beyond niche status, it must be recognised as a strategic option for decarbonisation, energy security and industrial development. This includes better integration in energy planning, climate strategies, blue economy agendas, and investment frameworks. It also means designing public support in ways that help create viable markets, including mechanisms such as Contracts for Difference, feed-in tariffs and other tools that can reduce risk and support early commercial deployment.

The third is to deepen the integration of ocean energy within the wider blue economy ecosystem. The future of the sector will be shaped also by collaboration with ports, utilities, shipyards, offshore service providers, coastal authorities, island communities and other maritime industries. Building these connections will be essential to creating viable markets, stronger deployment ecosystems and broader industrial value.

The continuing mission of IEA-OES

As the sector enters this new phase, the mission of IEA-OES remains as relevant as ever:

IEA-OES Mission

Stimulate

research, development, and deployment of ocean energy systems in an environmentally sustainable manner that generates economic value.

Support

governments, agencies, companies, and individuals in the development and deployment of ocean energy systems.

Educate and raise

global awareness of ocean energy technologies — their status, benefits, and impacts — while enhancing skills and fostering scientific excellence.

Connect

organisations and individuals for effective knowledge exchange, accelerating development and improving economic and environmental outcomes.

52 ExCo Meeting, Hangzhou, China, Technical Visit to LHD Tidal Current Power Generation Station, October 2025

Building the future of ocean energy requires more than technological progress. It also depends on the ability to communicate evidence clearly, create dialogue across different communities and ensure that the sector remains visible in wider energy, industrial and policy discussions. IEA-OES contributes to this by engaging with policymakers, industry, academia, the media and the wider public, helping to translate technical developments into messages that are relevant to different audiences and decision-making contexts.

Workshops, technical meetings and joint discussions with researchers, technology developers, industry representatives and public-sector experts provide an important space for exchanging experience, identifying common challenges and exploring emerging priorities. These interactions help connect scientific knowledge with practical deployment needs, bring different perspectives into the work of IEA-OES and strengthen links across the wider innovation ecosystem. At the same time, engagement with journalists and other communication channels helps extend these discussions beyond the specialist community, raising awareness of ocean energy and supporting a broader understanding of its potential, progress and remaining challenges.

Together, these activities can help turn international knowledge and collaboration into the visibility, partnerships and informed decision-making needed to support the next decade of ocean energy deployment.

The human future of the sector

The future of ocean energy depends as much on people as on technology. Preparing a new generation of professionals is essential to the sector's long-term development. **INORE, the International Network on Offshore Renewable Energy**, supports this transition by promoting collaboration, innovation and international exchange.

Through conferences, exchange programmes and joint projects, INORE gives early-career professionals the opportunity to work across disciplines and borders. Many of today's leading scientists and developers in marine renewables first built international connections through this network. In this way, INORE reflects the same openness, cooperation and long-term vision that have helped define IEA-OES over the past quarter century.

But building the future of ocean energy will require more than inspiration alone. It will also require investment in **education, training and skills**. As the sector moves towards wider deployment, it will need engineers, technicians, environmental specialists, offshore operators, planners and policymakers with the expertise to support a more mature industry. Strengthening links between universities, research centres, industry and training providers will therefore be essential. Developing these skills is part of creating the long-term capacity, confidence and resilience that the sector will need in the years ahead.

As ocean energy enters its next chapter, this human dimension remains fundamental. Technologies will continue to evolve, but so too must the networks, leadership and knowledge base that sustain them. The future of ocean energy will be shaped also by the ability of people and institutions to work together across borders, sectors and generations.

Looking ahead, the opportunity is clear. Ocean energy has the potential to become a valuable part of a more diversified, resilient and sustainable global energy system. Realising that potential will require persistence, coordination and long-term commitment. The progress achieved over the past 25 years shows that this journey is already well underway.

INORE at the FloWave Ocean Energy Research Facility, Edinburgh

CHAPTER

05

Voices, Memory and Acknowledgements

Reflections from Chairs

Over the past 25 years, IEA-OES has been shaped by the leadership of Chairs who helped guide the collaboration through different stages of the sector's evolution. Their reflections offer a valuable perspective on the ambitions, challenges and achievements that have marked the OES journey.

Gouri Bhuyan
Canada
2007 – 2008

When you look back at your time as Chair, what defining moment stands out most?

“Attending the meeting of the Standardisation Management Board (SMB) of IEC in Geneva in June 2007, making a commitment that IEA OES would provide necessary input to their proposed ocean energy relevant standard making activities, and recommending the SMB to establish a relevant IEC Technical Committee” was the defining moment for me.

What do you believe was OES’s most important contribution to the global ocean energy community during your tenure?

Participation in relevant global events, workshops and meetings, including IEA events, and communicating the IEA-OES strategies and the scope of ongoing tasks was the most important contribution to the global community.

What did chairing OES teach you personally?

“Lead by example, strategic thinking, and strength of collaborations at national and international level to achieve certain objectives” were my takeaways.

What message would you pass on to those who will lead the sector forward?

To focus on initiating and delivering relevant strategic tasks/projects having outputs that would be of value (and perhaps could influence) to the member countries’ policy makers working in the renewable energy/energy security portfolios.

What should be OES’s top priority for the next decade?

Quantifying socio-economic-energy security opportunities (contributions) to the OES member countries/regions, in medium and longer terms, from the utilizations of all forms of relevant ocean renewable energy resources, including ocean thermal energy, through integrated energy-economics-dynamic modelling considering various uncertainties.

José Luis Villate
Spain
2013 – 2016

When you look back at your time as Chair, what defining moment stands out most?

I keep very good memories of all the ExCo meetings I chaired, always with a very active participation of all members, but I would highlight the approval of the OES term for 2017-2022. It confirmed that, despite slower progress than many had expected, member countries still believed in the long-term value of ocean energy and in OES as a committed international family working for its future.

What do you believe was OES's most important contribution to the global ocean energy community during your tenure?

I believe OES's most important contribution was to give the sector a credible international basis for decisions: work on cost of energy, the technology roadmap, the preparatory activity to stablish a performance metrics framework later on and reports on environmental and consenting issues. In a young sector, shared evidence and a common language is as important as individual deployments.

What did chairing OES teach you personally?

Chairing OES taught me that leadership is not only about setting priorities, but about listening, building consensus for decision making and keeping confidence alive in difficult times. It also confirmed how much a committed international team can achieve when it shares the same long-term mission.

What message would you pass on to those who will lead the sector forward?

My message is to remain ambitious, but honest about the challenges. The sector will need persistence, real-sea experience, cost reduction, industrial engagement and stable public policies. Above all, keep working together: ocean energy will advance faster if we share both successes and failures.

What should be OES's top priority for the next decade?

I believe OES's top priority should be to help turn today's international vision into promote practical deployment. That means working with the aim of aligning market pull, technology push, infrastructure and regulation, while keeping environmental and social acceptance at the centre. The sector now needs not only reliable technologies, but investable projects.

Henry Jeffrey
United Kingdom
2017 – 2020

When you look back at your time as Chair, what defining moment stands out most?

I have worked in Ocean Energy sector for over 25 years and I've seen many rises and falls of both the technology progress and the political will that the sector has had to weather. A defining moment for me was the beginning of countries setting targets and ambitions for Ocean energy deployment – I am delighted that we are now very firmly in the position of accelerating from innovation to commercialization and ready to play our role in the worlds Net Zero goals.

What do you believe was OES's most important contribution to the global ocean energy community during your tenure? *(this is maybe difficult for chairs with a 2-years mandate)*

I believe OESs development of international stage gate metrics of ocean energy has had a significant contribution to sector progress. In short, it has ensured that that the sector funds only the best technologies and therefore accelerates its progress towards commercialisation. By using the stage gate process, OES has created and internationally accepted structure to enable this.

What did chairing OES teach you personally?

My biggest take away learning of my OES chairmanship was the important balance of collaboration and leadership skills required to ensure a collegiate and efficient working environment. In all of the OES meetings I led I was required to seek the most effective balance of challenging and influencing others and compromising where appropriate to ensure an evidence-based decision or policy was agreed upon.

What message would you pass on to those who will lead the sector forward?

AMBITION – Although this of course could be viewed as a technical sector. This is also a sector that is driven by people and their ambition. Ambition and disruption from businesses usual will required in all aspects of this sector from technology to policy to ensure it meets its full potential.

What should be OES's top priority for the next decade?

PEOPLE – As we move forward with this sector, we will of course continue to require technology and innovation – but it is people that will drive this sector to full commercialisation. I fully believe that it is people – predominantly new young people – that are the future of this exciting sector and will accelerate it forward from innovation to be a meaningful part of the European and International Energy Mix, ensuring it is a solution in countries Net Zero and just transition targets around the world.

Yann-Hervé De Roeck
France
2021 – 2022

When you look back at your time as Chair, what defining moment stands out most?

My time as chair occurred during the pandemic, therefore it restricted a lot the occasions to meet in person. However, as co-chair and then chair, I really enjoyed the annual OES meetings, where we could witness all the progress made by the member countries, and above, the brainstorming sessions where we came up with ways to ease and foster the endeavor of ocean energy. We ensure not to neglect any technology, for instance, we pushed hard to shed a positive light on OTEC.

What do you believe was OES's most important contribution to the global ocean energy community during your tenure?

As a group, we encouraged the teams that had stewardship in refining the TRLs, designing criteria and thresholds to pass each step, agreeing on a performance matrix, finally publishing "An International Evaluation And Guidance Framework For Ocean Energy Technology". This was made in conjunction with the US department of Energy and the European Commission, and can be considered as a significative achievement of the OES group. Such a document was long awaited by all stakeholders.

What did chairing OES teach you personally?

It was a great honor to chair this group, which I had joined around 10 years earlier. This meant that I got to know and become friends with many of the expert group members. OES is truly global, and it is possible to witness how people from different cultural backgrounds can work together smoothly. My term was short, as I had to leave the ocean energy sector less than two years after being elected. I then moved on to work in a global environment within the Argo programme of ocean in-situ observation, where international collaboration is key.

What message would you pass on to those who will lead the sector forward?

Patience and tenacity are required, since other energy production domains certainly evolve faster, but with less evidence of fundamental benefits such as true renewability and the lowest carbon footprint. Therefore, it seems that support for this or that type of energy comes and goes, but ocean energy systems are becoming steadily more efficient and reliable. While they may not offer tremendous financial returns, they remain one of the pillars of a long-term sustainable world.

What should be OES's top priority for the next decade?

It was already clear that OES should work closely with other groups to share knowledge, combine efforts and benefit from synergy, but this is even more obvious today. This has always been the case when it comes to establishing environmental impact guidelines, assessing socio-economic impacts, network integration and energy storage at all timescales… The wind sector, and especially floating wind turbines, is one of these preferred allies!

Matthijs Soede
European Comission
2023 — present

When you look back at your time as Chair, what defining moment stands out most?

A difficult question! Maybe the most defining moments for me as Chair are the moments that I hear at ICOE conferences the developers speaking about the progress they have been making with their devices and researchers speaking about their research work and what knowledge they have gained. As IEA-OES our aim is to facilitate ocean energy technology development and collaboration and it is motivating and inspiring to see the developers and researchers working so hard.

What do you believe was OES's most important contribution to the global ocean energy community during your tenure?

During my tenure I think the International Roadmap 'Ocean Energy and Net Zero' which we developed in 2023 is a very important contribution. The roadmap shows clearly that even if we set ambitious targets, it is not just a matter of successful technology development and large demonstration projects, but that action will also be needed to create a market, to build infrastructure and create the right regulatory and legislative environment.
As OES we are calling it now our MTIR framework: Market, Technology, Infrastructure and Regulatory environment. In my view this framework will be very important guidance for the whole ocean energy community for the next years.

What did chairing OES teach you personally?

It is important to listen and to be open to other opinions and ideas. For instance, with the development of the new workplan for 2027-2031 you have to consider what the interests are from all OES members. In a larger meeting, not everybody will share their personal view directly and in general there is not sufficient time to discuss everything in detail. Together with the secretariat I organized bilateral meetings with all members and that was very fruitful.

What message would you pass on to those who will lead the sector forward?

Stimulate collaboration, communication and be persistent! There is still so much to be done in the sector and collaboration between government, research and industry is ultimately important. It is still a sector in development, so stay positive, look for the positive results and communicate them.

What should be OES's top priority for the next decade?

Keep the OES International Vision and its MTIR framework as a guidance for the development of the OES workplan. We cannot neglect anything. It might be valuable to start thinking about what it would mean for each member country individually to build a large ocean energy project. Setting up a step-by-step plan for these projects and considering all possible and needed actions related to market pull, technology push, infrastructure and regulation.

From the early years of OES

The early development of IEA-OES was shaped by the vision and commitment of those who guided the collaboration in its formative years. Their contribution helped establish the foundations of international cooperation in ocean energy and remains an important part of the organisation's history and legacy.

In remembrance

Teresa Pontes, Portugal (2001–2004)
Katrina Polaski, Ireland (2005–2006)
John Huckerby, New Zealand (2009–2012)

Leadership over the years

	Chairs		Vice-Chairs
2001 – 2004	**Teresa Pontes** Portugal	2004	**Katrina Polaski** • Ireland
2005 – 2006	**Katrina Polaski** Ireland	2005 – 2006	**Teresa Pontes** • Portugal
		2006	**Gouri Bhuyan** • Canada
2007 – 2008	**Gouri Bhuyan** Canada	2007	**Katrina Polaski** • Ireland
		2007	**Gary Shanahan** • United Kingdom
		2008	**John Huckerby** • New Zealand
		2008	**Jochen Bard** • Germany
2009 – 2012	**John Huckerby** New Zealand	2009 – 2010	**Jochen Bard** • Germany
		2009 – 2012	**Jose Luis Villate** • Spain
		2011 – 2012	**Eoin Sweeney** • Ireland
2013 – 2016	**José Luis Villate** Spain	2013	**Eoin Sweeney** • Ireland
		2013	**Michael Reed** • United States
		2014 – 2016	**Keyyong Hong** • Korea
		2014 – 2016	**Henry Jeffrey** • United Kingdom
2017 – 2020	**Henry Jeffrey** United Kingdom	2017	**José Luis Villate** • Spain
		2017	**Yann-Hervé De Roeck** • France
		2017 – 2018	**Annie Dallman** • United States
		2018 – 2020	**Yann-Hervé de Roeck** • France
		2020	**Matthijs Soede** • European Commission
2021 – 2022	**Yann-Hervé De Roeck** France	2021 – 2022	**Matthijs Soede** • European Commission
		2021 – 2022	**Purnima Jalihal** • India
2023 –	**Matthijs Soede** European Commission	2023 – 2025	**Purnima Jalihal** • India
		2023 –	**Tim Ramsey** • United States
		2023 –	**Christophe Gaudin** • Australia
		2025 –	**Srikanth Narasimalu** • Singapore

Task leadership

Much of the work of IEA-OES has been carried forward through its Tasks, led by experts who have coordinated international teams, brought together knowledge from across member countries and translated collaboration into practical outputs for the sector. We gratefully acknowledge the Task Managers who have contributed their time, expertise and leadership to the programme over the past 25 years.

Kim Nielsen
Denmark (Ramboll)

Led the development of recommended practices for testing and evaluating ocean energy systems, supporting more consistent approaches to technology assessment.
Led work on modelling verification and validation for wave energy converters, supporting greater consistency and confidence in modelling approaches.

Gouri S. Bhuyan
Canada (Powertech Labs)

Led international work on the integration of ocean energy plants into electricity distribution and transmission grids.

Andrea Copping
USA (Pacific Northwest National Laboratory)

Led collaborative work on the assessment of environmental effects and monitoring approaches for ocean energy development .

Roger Bagbey
USA (Cardinal Engineering)

Robert Thresher
USA (NREL; now National Laboratory of the Rockies, NLR)

Led the exchange and assessment of information and experience from ocean energy device projects, helping make operational learning available across the international community.

José Luis Villate
Spain (Tecnalia)

Led international work on the assessment of levelised cost of energy for wave, tidal and OTEC technologies, supporting greater understanding and comparability of technology costs.

Henry Jeffrey
UK (The University of Edinburgh)

Led the development of an international ocean energy technology roadmap, providing a strategic perspective on technology development and future priorities.

Yasuyuki Ikegami
Japan (Saga University)

Purnima Jalihal
India (National Institute of Ocean Technology)

Led international collaboration on the investigation and evaluation of OTEC resources, bringing together knowledge and experience from countries active in ocean thermal energy (Task 11).

Matthijs Soede
European Commission

Jonathan Hodges
UK (Wave Energy Scotland)

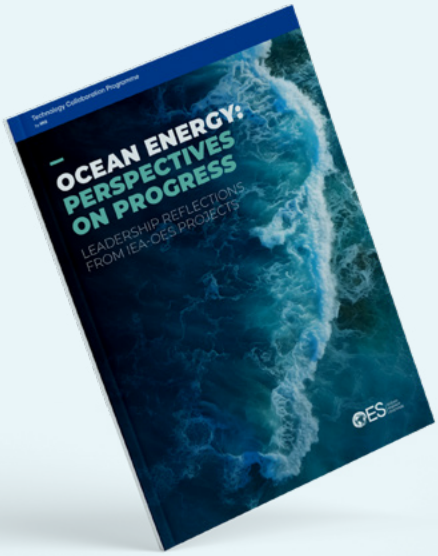
Led the development of the Stage Gate Metrics International Framework, supporting a more structured and consistent approach to evaluating the progress of ocean energy technologies (Task 12).

Srikanth Narasimalu
Singapore (Nanyang Technological University)

Led work on modelling verification and validation for tidal energy converters, contributing to more consistent approaches to technology modelling and assessment (Task 13).

Yann-Hervé De Roeck
France (France Energies Marines)

Led the development and validation of a methodology for assessing job creation in the ocean energy sector, including a first global assessment of direct employment.



Voices from the OES community

Alongside its formal work, OES has always been shaped by the experience and commitment of its members. The following reflections illustrate the value of OES as seen from across the community.

I believe it is important for member countries to cooperate in areas such as ocean energy policies and technology development, as well as the establishment of open-sea test sites and technology standardization, which have recently gained considerable momentum. Through such cooperation, countries can complement each other's strengths and address areas where further development is needed. Personally, this experience has given me the opportunity to gain broader and more diverse perspectives on ocean energy. It has helped me broaden my view of where we stand today and look further ahead toward the future. I hope to bring these perspectives and insights into the development of ocean energy in Korea.

Jin-Hak Yi, Delegate from Republic of Korea

OES delivers effective international collaboration, combining strong leadership with insightful, forward-looking analysis. It has provided me with valuable knowledge, expert engagement, and the opportunity to contribute to a highly productive and inspiring community.

Emer Dennehy, Delegate from Ireland

OES represents everything the world needs right now — a collaboration between a large number of nations that work together at pace to develop new technologies that could help in the transition from fossil fuel to clean energy. This in turn will help combat climate change and grow the economy. The reports OES has produced have been invaluable to us.

Alona Ben-Tal, Delegate from New Zealand

OES strengthens the capacity for dialogue between industry, academia and society on issues related to ocean energy. For me, it has provided access to a dedicated international network for knowledge sharing.

Christophe Maisondieu, Delegate from France

What I value most about OES is the opportunity to connect with a global community willing to share both successes and challenges, giving us practical insights, trusted relationships, and a broader perspective on advancing ocean energy together.

Jinxing Huang, Delegate from Canada

As a member of this global family since 2011, NOTC has had the privilege of participating in and witnessing the continuous evolution of this platform. Over the past decade and more, we have deeply learned from the shared knowledge, operational experiences, and collaborative spirit fostered within the OES framework. This multilateral platform has not only broadened our international perspective but also provided invaluable insights that have steadily guided and supported the development of China's ocean energy sector. We are particularly grateful for the inclusive and open environment that OES has created. As we look toward the "Decade of Deployment" outlined in the report, NOTC remains fully committed to active and constructive engagement within IEA-OES. We look forward to continuing our journey with all member nations, contributing Chinese data and experiences to the global knowledge base, and working hand in hand to advance ocean energy as a vital pillar of the global clean energy transition.

Peng Wei, Delegate from China

OES is important because it brings together experts from very different backgrounds, creating a space where knowledge, ideas and experience genuinely come together to move ocean energy forward. It has given me the chance to work closely with leading experts worldwide, something that has enriched me not only professionally, but also personally through lasting connections.

Yago Torre-Enciso, Delegate from Spain

OES brings significant value to our country, a lot of export potential and a chance to share our knowledge with others. I consider the exchange of knowledge and experiences through international collaboration to be one of the most important aspects of OES, particularly in helping the sector scale up more quickly. We look forward to continuing this collaboration.

Sjoerd van Dijk, Delegate from The Netherlands

For India, OES has brought immense value by providing a global platform for knowledge exchange on offshore and ocean energy, including OTEC, particularly relevant for our island territories. The true strength of OES lies in fostering international collaboration that converts common ocean challenges into shared opportunities.

Govindarajulu Venkatesan, Delegate from India

Singapore's Energy Research Institute @ NTU (ERI@N) joined IEA-OES in 2014 through Nanyang Technological University, bringing a tropical, island and Southeast Asian perspective to ocean energy. ERI@N has promoted ocean energy for island energy security, resilient microgrids and remote coastal communities, while advancing tropical turbine technologies and ocean-energy resource assessment. ERI@N established the SEACORE network in 2013 to support regional collaboration and adoption of ocean energy, and hosted AWTEC 2016 together with the OES ExCo meeting. Singapore has organised and contributed to OES Tasks on tidal-energy modelling and digitalisation, while participating in environmental, socio-economic, blue-economy and policy activities. Singapore values OES as a platform for regional capability building and responsible ocean-energy deployment across Southeast Asia.

Narasimalu Srikanth, Delegate from Singapore

Acknowledgements

Over the past 25 years, IEA-OES has grown through the commitment and expertise of a truly international community. This anniversary report is an opportunity to express sincere appreciation to all those who have contributed to the collaboration over the years: the Contracting Parties and Delegates, the Chairs and Vice-Chairs, the Secretariat, the Operating Agents and Task participants, and the many experts, institutions and partner organisations who have helped advance the work of IEA-OES.

IEA-OES has always benefited from the diversity of its membership and from a spirit of openness, cooperation and shared purpose.

Special thanks are also due to all those who contributed directly to this 25th anniversary publication, including those who shared reflections, photographs and editorial input. This report stands as a tribute to the collective effort of all who have helped build and sustain IEA-OES over the past quarter century.

Delegates and Alternates over the years

Alan Morgan • United Kingdom
Alejandro Moreno • United States
Alex Wonhas • Australia
Ali Baghaei • Australia
Alison LaBonte • United States
Alona Ben-Tal • New Zealand
Ana Alexandra Andrade • Portugal
Angel Chamero Ferrer • Spain
Angelica Pettersson • Sweden
Anna Gigantino • European Commission
Annie Dallman • United States
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António Fiorentino • Italy
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Benoît Augier • France
Bernard Fautrier • Monaco
Brendan Cahill • Ireland
Carlo Papa • Italy
Carlos Ortiz Gomez • Mexico
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Christophe Maisondieu • France
Craig Stevens • New Zealand
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David Bramble • United Kingdom
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