

# TECHNOLOGY PUSH, MARKET PULL

In-Depth Analysis and Policy Guidance Report for  
the Development of Technology Push and Market Pull  
Support Mechanisms for the Ocean Energy Sector

March 2026



# Guidance for Policymakers and Public Funding Bodies to Support Ocean Energy Technologies

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This document is intended for **policy makers** and **public funding bodies** responsible for the creation of innovation programmes and market frameworks for ocean energy technologies. Based on two decades worth of case studies, evidence-led strategic guidance is derived from lessons learned from both successful and unsuccessful programme outcomes.

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The main objectives of this document are to:

- Understand **global best practice** geared towards ocean energy policy
- Provide recommendations for **technology push** to aid in the development of innovation programmes to drive commercial viability
- Provide recommendations for building a market framework to **integrate** ocean energy into the **national grid**.

# Contents

# 1

## **IEA-OES Roadmap Outcomes: Technology Push and Market Pull**

Insights from the International Roadmap targeting 300 GW of ocean energy by 2050, highlighting the need for more detailed, granular studies to address both technology push and market pull dynamics.

# 2

## **Programmes Investigated and Metric Evaluation**

Development of global case studies for comprehensive metric evaluation of existing programmes. This includes mapping initiatives focused on technology push and market pull, and assessing their strengths and weaknesses.

# 3

## **Strategic Guidance from Programmes Outcomes**

Formulation of strategic guidance based on best practices identified in global programmes, aimed at accelerating technology development and market adoption.

# 4

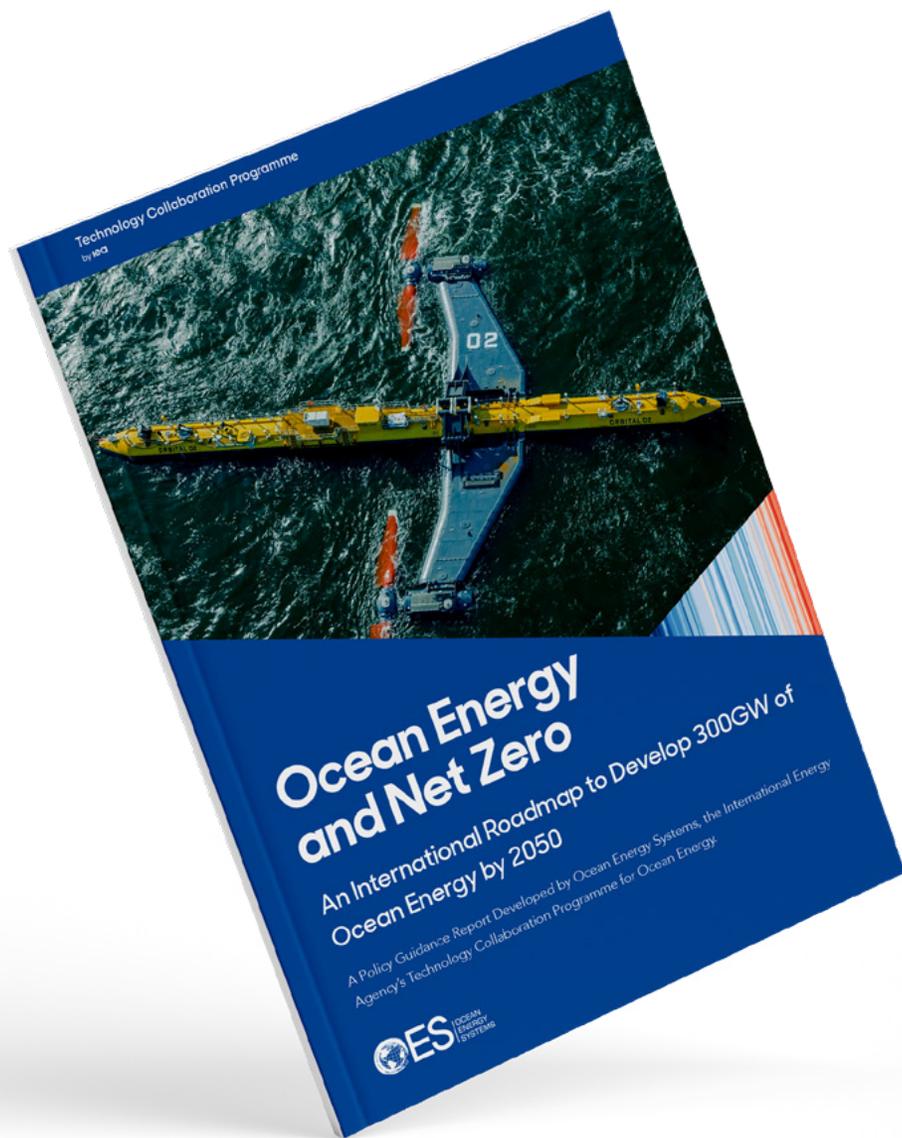
## **Technology Push Policy Analysis**

Creation of a “**Consider and Avoid**” list across **seven key technology guidance areas** to inform future policy and investment decisions for innovation.

# 5

## **Market Pull Policy Analysis**

Creation of a “**Consider and Avoid**” list for **eight market guidance areas** to support effective deployment and adoption strategies to commercialisation.



# International Roadmap to Develop 300 GW of Ocean Energy by 2050

By 2050, the OES Roadmap targets have outlined that there is the potential for wave and tidal stream technologies (referred to collectively as ocean energy technologies) to contribute **300GW of renewable energy generation capacity** to the global Net Zero transition.

This 300GW of installed capacity of ocean energy has the capability to achieve the following high-level outcomes:



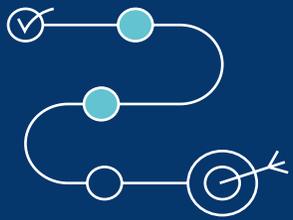
Create over **680,000 jobs**



Generate over **\$340 billion in Gross Value Added (GVA)** to national and international economies



A reduction of over **500 million tonnes** of carbon emissions



# Policy Actions to Achieve the IEA-OES Roadmap Targets

**1**

**Market pull support** is the foundation of a comprehensive policy programme

**2**

**Accelerated innovation** is key to enabling long-term cost reductions

**5**

The **regulatory and legislative framework** should help, not hinder

**4**

**Immediate action on infrastructure development** is vital

**3**

An **optimal balance of market pull and technology push funding** must be struck

# Four Key Challenge Areas for Success

Achieving these ambitious forecasted benefits will not be possible without the implementation of a comprehensive and **targeted policy support programme**.

The IEA-OES Ocean Energy and Net Zero policy guidance report identifies four key challenge areas, the overcoming of which are vital to the continued commercialisation of the ocean energy sector.

## Technology push policy requirements



Effective innovation is essential to complement and reduce the overall market pull policy investment

## Market pull policy requirements



The total cost of a global ocean energy market pull policy could cost as little as \$28 billion up until 2050

## Ocean energy infrastructure requirements



The growth of the sector could require 100 dedicated ports installing 300MW per year

## Regulation and legislation requirements



Adaptive management and third-party testing will allow safe and sustainable growth in the sector

# Technology Push and Market Pull Mechanisms

Technology push and market pull mechanisms emerged as **two out of the four** priority topics from the IEA-OES Ocean Energy and Net Zero policy guidance report.

High-level recommendations to address these challenge areas were provided. However, there is now a need for a more granular and evidence-led assessment to further inform the sector on the best practice in these challenge areas.



## Accelerating innovation through technology push

Provide incentives to reduce the overall cost of development and allow for state-of-the-art projects to be carried out at the early stage of technology development



## Long-term sustained funding through market pull

Provide revenue support that allows for long-term price stabilisation and guarantees financial returns for commercial projects

# Methodology for Understanding Best Practice

**Three key tasks were undertaken to capture global best practice** and translate them into evidence-based strategic guidance for the ocean energy sector.

This process involved a thorough literature review, benchmarking of programmes against defined metrics, and applying inductive coding to select common emerging themes. The goal was to develop strategic guidance informed by both successful and unsuccessful programmes, ideally replicating good practice while building resilience to potential pitfalls and mistakes.



## Literature Review

Reviewed past and present technology programmes from around the globe to understand best practice



## Development of Case Studies

Developed case-study examples to illustrate effective implementation of technology push and market pull policy



## Development of Strategic Guidance

Delivered evidence-led technology innovation support and market pull policy guidance for the ocean energy sector

✓ Consider / Avoid ✗

# Technology Push Data Collection

## Evaluation Areas

### Programme Governance

### Programme Structure and Scope

### Funding and Budget

### Proposal and Programme Review

### Performance and Impact Assessment

A total of **eight technology push case studies** were reviewed.

Data was collected using **twelve metrics in five evaluation areas**, with results evaluated for each funding mechanism. Findings are presented through a pros and cons analysis, accompanied by a discussion of key insights.

## Metrics

1. What body runs the funding programme; a government department or a specialist agency?
2. Does the funding programme consist of a single-stage or multiple-stage process to reach the full proposal submission stage?
3. How is funding announced; as general calls or technology and/or challenge specific?  
If the programme is directed towards a challenge area, how are such specifications decided?
4. What is the management model of the funding programme? What is the level of follow-up on projects from management-side?
5. What is the overall budget of the funding body and/or programme?
6. What is the size of the funding budget for running the programme?
7. Is there a continuity of funding; is there a sequence of continuous projects?
8. What is the intervention rate of the funding programme?
9. How are project proposals reviewed?
10. How are the funding programmes reviewed?
11. Is there a method for assessing the success of a programme?
12. Is there a method for assessing the success of a project?

# Technology Push Analysis Factsheets



# Market Pull Data Collection

A total of **eleven market pull case studies** were reviewed.

Data was collected using **nine metrics in five evaluation areas**, with results evaluated for each funding mechanism. Findings are presented through a pros and cons analysis, accompanied by a discussion of key insights.

## Evaluation Areas

### Scheme Overview

### Design and Function

### Pricing and Value

### Participation and Awards

### Financing and Integration

## Metrics

1. Who is responsible for running the scheme and how long has it been operational?
2. What is the overall aim/target/purpose of the scheme?
3. How does the scheme function? For example, through a Feed-in Tariff or through a competitive auction?
4. Is the scheme technology agnostic? Or is there a mechanism within the scheme for supporting specific technologies or different levels of technology maturity?
5. How is the value of the support set; for example, is it a market-driven price? What is the price? (Is there a cap? How much can you bid? Average value?)
6. How many projects have been awarded through this Market Pull mechanism?
7. Is there a restriction on bidders? For example, country protectionism of domestic developers?
8. How is the revenue support financed? For example, is it covered by consumers through bills or by the countries' fiscal budget?
9. Was/is the Market Pull mechanism supported by a Technology innovation programme to help provide cost reductions through continued innovation?

# Market Pull Analysis Factsheets



## Canada



Nova Scotia Developmental Tidal Feed-in-Tariff (FiT) and Power Purchase Agreement (PPA)



## United Kingdom



Contracts for Difference (CfD)  
Renewable Obligation



Marine Renewable Deployment Fund (MRDF)  
Marine Supply Obligation (MSO)



Saltire Prize



## European Union



New Entrants' Reserve 300 (NER300)

Innovation Fund



## United States



Inflation Reduction Act (IRA)



## France



France2030 and Tidal Stream Contracts for Difference



## South Korea



Renewable Energy Certificates (REC)



# Theme identification

To understand the themes emerging from each factsheet, a **step-by-step inductive coding method** was used.

Statements were grouped under common headings, which then allowed for a discussion on the “consider” and “avoid” strategies for each theme.

1

Reviewing factsheets



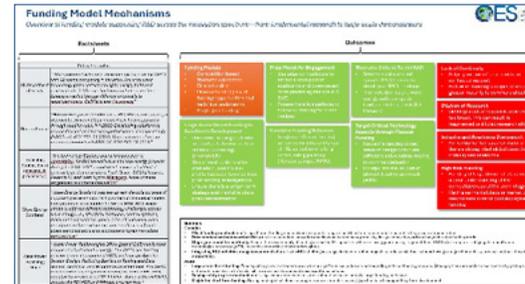
2

Grouping under common headings

Heading 1	Heading 2
Positive statements	
Negative statements	

3

Analysis of key findings



Heading 1	Heading 2
Positive statements	
Negative statements	

4

Consider / Avoid



# Technology Push Areas Identified

The resulting list from the theme identification had a total of **seven technology push areas**.

The technology push themes included programme management, supporting infrastructure, collaboration, and mechanisms for monitoring and sharing outcomes.

## Technology Push Areas

### **Programme Funding Mechanisms**

Overview of funding models supporting R&D across the innovation spectrum—from fundamental research to large-scale demonstrators

### **Overall Programme Strategy**

Overview of the strategy to guide programme structure and decision making

### **Programme Scope**

Overview of the how the programme covers the ocean energy topic

### **Collaboration and Consortia Building**

Overview of the methods to foster collaboration, to enable project co-development, and build multi-disciplinary partnerships

### **Technology Testing, Tools and Support**

Overview of the ways to support development through testing facilities, development tools and general support

### **Monitoring of Progression and TRL**

Overview of the methods to monitor progress of technology with standardised frameworks

### **Knowledge Sharing and Reporting**

Overview of the methods to disseminate project findings and communicating wider programme impacts on society

# Market Pull Areas Identified

The resulting list from the theme identification had a total of **eight market pull areas**.

The market pull topics covered the type of support instruments, technology targeting, application procedures, financing methods, and international participation.

## Market Pull Areas

### **Long-Term Revenue Certainty Mechanisms**

Overview of the long-term contracts for electricity price stabilisation

### **Fiscal Incentives**

Overview fiscal incentives for increasing renewable energy uptake

### **Delivery-Based Innovation Funding**

Overview of the competitive grant-based arrangements to fund large-scale projects

### **Moving from Technology Development to Market Adoption**

Transferring from a technology push mechanism to a market pull policy

### **Policy Targeting Approaches: Dedicated vs. Technology-Neutral**

Designing policy around specific technologies or as part of a broader technology framework

### **Application Procedures for Market Pull Instruments**

Ensuring the application process of receiving revenue support is smooth and fair to ocean energy developers

### **Mechanisms for Financing Market Pull Strategies**

Methods to finance market pull strategies to incentivise uptake in ocean energy technologies

### **Enabling International Participation in Domestic Markets**

Allowing international developers and suppliers to participate in domestic markets

# Programme Funding Mechanisms

Overview of funding models supporting R&D across the innovation spectrum—from fundamental research to large-scale demonstrators

Different mechanisms have been applied to support specific programme objectives. Competition prizes, thematic based calls, seed funding and stage-gate funding are examples of funding mechanisms. Some programmes use a hybrid approach combining a mix of these mechanisms.



## Consider

- **Mix of funding mechanisms:**  
...using different funding mechanisms to support a range of activities from fundamental research to large-scale demonstration.
- **Prize mechanism for innovation:**  
...using a prize to stimulate innovation and down-select the most promising designs to take forward to a longer duration funding model.
- **Stage-gate model for continuity:**  
...providing continuity of funding across the whole TRL range with no missing gaps which can cause fragmentation of R&D. For example, the stage-gate model is a structured funding approach aligned with TRLs, where early-stage funding supports a broad range of technologies. As projects advance, the funding per project increases with only the most promising selected to proceed.
- **Integrating R&D activities alongside demonstration:**  
...tackling R&D challenges alongside demonstration projects to reduce risk at deployment stage. For example, utilising thematic calls which address the critical areas of R&D for subsystem technologies.

## Avoid

- **Seed funding for large-scale demonstrators without due diligence:**  
...funding of large-scale demonstrators without significant evaluation or understanding of the technology maturity. While this approach can streamline development by getting devices in the water quickly, it is a high-risk strategy that may overlook critical technical challenges.
- **Relying solely on prize mechanisms:**  
...overreliance on prize mechanisms instead of using them as a tool as part of a larger funding landscape. Prizes are useful for generating ideas but without a means of continued funding this innovation can be lost.
- **Disjointed short-term funding:**  
...stop-start funding that lacks continuity which can leave gaps in support, hindering long-term technology development and progress.

# Overall Programme Strategy

Overview of the strategy to guide programme structure and decision making

An overall strategy is important to guide the programme structure. Different strategic tools such as aligning stakeholders with a prioritised set of research tasks or designing innovation programmes around R&D themes can ensure the most impactful tasks are performed.



## Consider

- **Research agenda for stakeholder alignment:**

...having a common research agenda to align different groups, e.g., academia, industry and policy makers, with a common goal. Ensure there is a strong dialogue between the researchers and industry to maintain the research agenda and to avoid disconnect.

- **Thematic calls to address critical knowledge gaps:**

...using calls that target critical knowledge gaps within the sector. Ensure the research tasks yield a high return on investment and track outcomes against the overall strategy to understand the overall impact.

- **Strong dialogue between funding bodies:**

...sharing findings between funding programmes to avoid duplication of research across jurisdictions and funding agencies. Using coordination frameworks (e.g., IEA-OES) and working groups is a method to manage multi-agency and international collaboration.

## Avoid

- **Lack of Strategy:**

...operating without a clear strategy, as this can lead to investing funds and resources into low-impact research with minimal return on investment and limited progress towards commercialisation.

- **Duplication of research:**

...having projects that are too similar or replicate the research done elsewhere. Ensure the research landscape is reviewed and there are safeguards in place through the programme strategy.

- **Unfocussed technology agnostic strategy:**

...grouping ocean energy technologies with broader technology categories unless there are clear cross-sector synergies. Otherwise, this can lead to unbalanced funding priorities, poor benchmarking against similar technologies, and an inadequate set of reviewers for evaluation of proposals.

## Programme Scope

Overview of the how the programme covers the ocean energy topic

In the overall strategy, the ocean energy component can be either broadly or narrowly focused, can be integrated with other technologies or dedicated to a specific technology. The tailoring of the topic depends on the goals of the programme and the funding resources available.



### Consider

- **Dedicated ocean energy funding stream:**  
...maintaining focus on ocean energy topics to avoid dilution within a larger programme scope.
- **Topics across the ocean energy spectrum:**  
...having topics across the ocean energy technology spectrum, covering critical subsystems with sequential funding calls/programmes.
- **Prioritising sector needs:**  
...designing a programme scope in coordination with a research agenda and using focussed funding models to ensure resources are directed to the topics needing the most development.
- **Cross-sector synergies:**  
...utilising joint-calls with other sectors to maximise funding pools and share resources, if there are subtopics that have significant overlaps between sectors.

### Avoid

- **Dilution of ocean energy topic:**  
...having a broad programme with a generic award criteria that does not distinguish between emerging ocean energy and established technologies.
- **Lack of benchmarking:**  
...having calls with only singular technology developers which reduces opportunities for comparison and benchmarking between devices and subsystems.
- **Limited understanding of ocean energy topic:**  
...having a programme designers and proposal reviewers/evaluators with limited understanding of the ocean energy topic resulting in poor technology selection and programme outcomes.

## Collaboration and Consortia Building

Overview of the methods to foster collaboration, to enable project co-development, and build multi-disciplinary partnerships

To make the most of funding, expertise, and infrastructure resources, it is important develop collaborations with key stakeholders across industry and academia. Collaboration within projects can take the form of consortium-based funding, co-funding of bilateral/multilateral programmes and domestic-led programmes with international participation.



**Consider**

- **Facilitating collaboration in multinational funding programmes:**

...building collaborative relationships with international funding bodies. The use of consortium models and bilateral/multilateral co-funding can increase funding pools and drive innovation. These large coordinated efforts are a key tool to avoiding duplication of R&D and maximising the efficient use of resources across the marine energy sector.

- **Strategic international partnerships within domestic programmes:**

...incorporating international participation within domestic programmes whilst having safeguards to ensure the national economic returns, job creation and IP retention are protected. This could be done through minimised team roles or subcontracting to international participants.

- **Knowledge exchange and sharing platforms:**

...building sharing frameworks for lessons learned and technical insights to guide future research and reduce duplication, e.g., workshops and webinars. Alongside this, having platforms to allow for equipment and facility sharing can reduce the barriers of access to new developers entering the field.



**Avoid**

- **Siloed Programmes:**

...building programmes that operate in isolation, without any international collaboration or knowledge sharing opportunities. This limits the diversity of ideas and input, which can lead to repeated mistakes.

- **Imbalanced collaboration models:**

...having an overly generous collaborative agreement within domestic programme can lead to loss of IP and overall lack of local economic benefit. This undermines the rationale from having a domestic innovation programme in the first place.

# Technology Testing, Tools and Support

Overview of the ways to support development through testing facilities, development tools and general support

Developing ocean energy technologies will require device modelling and testing, as well as resource assessment. Providing access to these facilities is essential to streamline the development pathway and accelerate progress.



## Consider

- **Embedding test access within funding programmes:**

...embedding access to open-water and tank testing facilities within structured funding programmes. This testing helps identify and resolve technical issues early, reducing risk for investors and developers nearer commercialisation.

- **Developing open-access tools:**

...utilising and developing open-access tools to aid in development. Having tools for design and resource estimation can lower effort for developers and reduce duplication across the sector.

- **Shared infrastructure and resource networks:**

...establishing infrastructure sharing networks that enable more efficient use of testing equipment and reduce barriers for smaller research and developer teams. This requires developing a sharing framework to allow for fair and effective use of limited resources, e.g., calls with proposals.

- **Cross-agency collaboration and tracking:**

...promoting cross-cutting initiatives between funding agencies to share data, track TRL and LCOE progress, and to improve coordination across programmes.

## Avoid

- **Restricted access:**

...only allowing access to researchers and developers within funding programmes. Consider having a separate track for ad-hoc access to ensure innovation outside of the programme is not lost.

- **Inefficient resource allocation:**

...allocating projects without a system in place to ensure resources are going to the most deserving applicants through calls and proposals.

- **Developing tools without user input:**

...developing tools that require significant effort with a lack of guaranteed user. Therefore, it is important to align tool development with user needs through engagement strategies from the outset.

# Monitoring of Progression and TRL

Overview of the methods to monitor progress of technology with standardised frameworks

Monitoring methods provide a means to understand the feasibility of the technology and to comprehend the wider socio-economic benefits. Strategic project assessments, technology metrics and KPIs are useful tools to aid with these evaluations.



## Consider

- **Strategic alignment and lifecycle monitoring:**

...monitoring project performance against strategic goals and a research agenda to identify gaps early on and enable corrective action. Use a stage-gate approach (e.g., IEA-OES Task 12) to ensure metrics that are relevant to each stage of development.

- **Standardised and balanced metrics:**

...applying a mix of qualitative and quantitative metrics (e.g., ACE, TPL) to assess both programme-level impact and project-level technology progress. Ensure the metrics reflect the full life cycle of the technology, e.g., balancing power capture against survivability.

- **Socio-economic KPIs for public value:**

...using KPIs to track socio-economic benefits such as job creation, patent activity, and SME growth. This helps demonstrate value for money to the wider public.

## Avoid

- **Over analysing at low TRL:**

...performing excessive analysis in the early stages of development can divert focus from core R&D and stifle innovation. Metrics at this stage should guide development, not constrain it.

- **Skewed metrics:**

...over-reliance on a single metric or focus area that can miss the broader picture and distort development priorities.

- **Overreliance on metrics:**

...developing a programme that is solely reliant on metric progression when technology uncertainty is high. Metrics should be flexible and used as tools to inform pathways, not as a strict criteria for progression.

# Knowledge Sharing and Reporting

Overview of the methods to disseminate project findings and communicating wider programme impacts on society

To ensure transparency and maximise the impact of the programme, its outputs should be made publicly accessible. This will support understanding of project progress and highlight broader economic potential. Dissemination can be achieved through communication channels ranging from high level reviews through to structured databases containing technical reports.



## Consider

- **Tailored reporting for intended audiences:**

...delivering a mix of technical reports and high-level reports which address developers, policy makers and the wider public. For developers, sharing insights into challenges, lessons learned, and recent advancements helps avoid duplication of effort and repeated mistakes. Meanwhile, high-level reports can highlight the broader economic benefits, making the case for continued support and investment.

- **Strategic alignment:**

...reporting that is linked to the long-term sector goals to track the progress against objectives.

- **Structured database for reporting:**

...having reports structured within a larger database under thematic headings to make it easily accessible.

## Avoid

- **Limited dissemination:**

...having minimal sharing of project progress and outcomes. Place some requirement for sharing high-level lessons learned and identified challenges, while maintaining IP safeguards for technology developers.

- **Poor communication methods:**

...producing reports that lack strategic framing with a poor project update frequency. Use standardised templates to address strategic aims, build these into a stage-gate series, and organise content into a thematic database to differentiate between technologies and subsystems.



## Programme Funding Mechanisms

### Mix of Funding Mechanisms:

Use a mix of funding mechanisms to support a range of activities from fundamental research to large-scale demonstration.

### Innovation Prizes:

Use innovation prize competitions to stimulate innovation and down-select the best designs for longer-term funding.

### Stage-Gate Continuity:

Provide continuity funding across the whole TRL range, through a competitive stage-gate model to avoid R&D gaps.

### Integrating R&D Activities:

Address critical R&D challenges alongside demonstration projects through targeted thematic calls to reduce deployment risk.

## Overall Programme Strategy

### Research Agenda:

Use a research agenda to align academia, industry, and policymakers with a common research roadmap. Ensure a strong dialogue between the researchers and industry needs to avoid a disconnect.

### Targeted Thematic Calls:

Use focussed funding calls to target critical knowledge gaps. Track the progress of research outcomes against the research agenda.

### Dialogue Between Funding Bodies:

Share findings across programmes to avoid duplication. Use coordination frameworks and working groups for multi-agency and international collaboration.

## Programme Scope

### Dedicated Ocean Energy Funding:

Maintain a funding focus for ocean energy topics to avoid dilution within broader programmes.

### Wide Ocean Energy Technology Coverage:

Have topics across the ocean energy spectrum, covering all critical subsystems.

### Prioritising Sector Needs:

Align programme scope with a research agenda and the needs of the sector. To ensure funding is going to the areas needing the most development.

### Cross-Sector Synergies:

Identify cross-sector synergies and where appropriate co-develop funding calls to share resources and maximise funding pools.

## Collaboration and Consortia Building

### Multinational Funding Collaboration:

Build collaborative relationships with international funding bodies using of consortium models and bilateral/multilateral co-funding to increase funding pools, avoid duplication, and drive innovation.

### Strategic International Partnerships:

Allow for international participation within domestic programmes while safeguarding national benefits, e.g., jobs, IP and economic returns, through subcontracting or minimised roles.

### Knowledge Sharing Platforms:

Build sharing frameworks for lessons learned and technical insights to guide future research and reduce duplication, e.g., workshops and webinars.

## Technology Testing, Tools and Support

### Test Access:

Integrate open-water and tank testing facilities as part of a structured funding programme to identify and resolve technical issues early-on.

### Open-Access Tools:

Develop open-access tools which can streamline development and lower the barrier to entry for new technology developers.

### Sharing Infrastructure and Resources:

Establish sharing networks for testing infrastructure to reduce barriers for smaller research/developer teams.

### Cross-Agency Collaboration:

Promote cross-cutting initiatives to share data, track TRL and LCOE progress.

## Monitoring of TRL and Progression

### Strategic Alignment and Lifecycle Monitoring:

Track project performance against strategic goals and research agenda to identify gaps early on and enable corrective action.

### Standardised and balanced metrics:

Apply a mix of qualitative and quantitative metrics (e.g., ACE, TPL) to assess both programme-level impact and project-level technology progress. Ensure the metrics reflect the full life cycle of the technology, e.g., balancing power capture against survivability

### Socio-economic KPIs for public value:

Use KPIs to track socio-economic benefits such as job creation, patent activity, and SME growth. This helps demonstrate value for money to the wider public.

## Knowledge Sharing and Reporting

### Mix of Dissemination Methods:

Use reports, webinars and social media to promote funding opportunities and share outcomes across the community.

### Tailored Reporting:

Deliver technical reports for technology developers and funders, and high-level summaries for policymakers and wider public. Share lessons learned, recent advancements to avoid duplication in the sector, and highlight economic benefits to secure continued support.

### Strategic Alignment:

Ensure that reporting is linked to the overarching long-term sector goals to track the progress against the objectives set out in the funding programme.



### Programme Funding Mechanisms

#### Seed Funding Without Due Diligence:

Fund large-scale demonstrators without assessing technology maturity. It can fast-track deployment of technologies at the expense of overlooking critical technical challenges.

#### Overreliance on Prize Mechanisms:

Overreliance on prize mechanisms instead of using them as a tool as part of a larger funding landscape.

#### Disjointed Short-Term Funding:

Stop-start funding which creates gaps in R&D landscape, hindering long-term technology development.

### Overall Programme Strategy

#### Lack of Strategy:

Investing funds in low-impact research due a lack of strategic focus, with limited return on investment and impact on commercialisation.

#### Duplication of Research:

Fund projects that replicate the research done elsewhere. This can be due to a lack of understanding of the state-of-the-art research in the review and evaluation process.

#### Unfocused Technology Agnostic Strategy:

Group ocean energy technology with other renewables in an unfocussed way, limiting benchmarking opportunities and missing potential cross-sector synergies.

### Programme Scope

#### Dilution of Ocean Energy Topic:

Design a generic programme for renewable energy development or decarbonisation which favours high TRL and near commercialisation technologies, diluting support and causing research fragmentation for ocean energy.

#### Lack of Benchmarking:

Calls with only singular technology developers reduce opportunities for comparison and benchmarking between devices and sub-technologies.

#### Limited Understanding of Ocean Energy Topic:

Programme designers and proposal reviewers/evaluators having limited understanding of the ocean energy topic resulting in poor technology selection and programme outcomes.

### Collaboration and Consortia Building

#### Siloed Programmes:

Build programmes that operate in isolation, without any international collaboration or knowledge sharing opportunities. This limits the diversity of ideas and input, which can lead to repeated mistakes.

#### Imbalanced Collaboration Models:

Have an overly generous collaborative agreement within a domestic programme can lead to loss of IP and overall lack of local economic benefit. This undermines the rationale from having a domestic innovation programme in the first place.

### Technology Testing, Tools and Support

#### Restricted Access:

Limit resources to only those within funding programmes causing potential innovation outside of programme to be lost.

#### Inefficient Resource Allocation:

Poor resource allocation due to a lack of robust resource sharing system, e.g., no review or proposal process to evaluate user access.

#### Tools Without User Input:

Develop tools without reaching out to the intended stakeholders, leading to poor alignment between the tool and user needs.

### Monitoring of TRL and Progression

#### Over Analysing At Low TRL:

Perform excessive analysis in the early stages of development which diverts focus from core R&D and stifles innovation.

#### Overreliance on Metrics:

Develop a programme that relies solely on metric progression despite high technology uncertainty, and depends on singular metrics that overlook broader development opportunities.

### Knowledge Sharing and Reporting

#### Limited Dissemination:

Minimal sharing of project progress and outcomes, such as no sharing of lessons learned or identified challenges to wider the community.

#### Poor Communication Methods:

Reports that lack strategic framing, with irregular project updates that does not include a structured thematic database to separate technologies from their subsystems.

# Long-Term Revenue Certainty Mechanisms

Overview of the long-term contracts for electricity price stabilisation

Establishing a long-term agreement between electricity generator and either the government or electricity buyer is an effective way to stabilise electricity prices. This reduces risk for the project developer while encouraging investment for the project. However, there needs to be consideration on which mechanism is right for the scale and maturity of the technology.



**Consider**

- **Long-term contracts for revenue certainty:**

...providing long-term contracts ensures financial stability for developers and encourages investment, a model that successfully drove growth and cost reductions in wind and solar. Renewable energy certificates offer supplemental income, however their reliance on volatile wholesale markets makes them less predictable than fixed contracts.

- **Tailoring contract type to scale and maturity:**

...support mechanisms should align with project objectives. Government-led or private agreements facilitate market access for emerging, small-scale technologies. In contrast, competitive auctions provide better consumer value and are better suited for mature, cost-effective technologies.

- **Budget allocation and ringfencing of specific technologies:**

...allocating a pot, ringfenced from other more mature technologies, ensures there is enough funding for fair and proportionate thresholds. The bidding or negotiations that take place are then representative for the maturity of the technology.



**Avoid**

- **Underestimating technology developer costs due to immaturity and global factors:**

...inappropriate price or tariff value setting. Limited prior deployments and scarce cost data can lead to unrealistic cost forecasting, which in turn results in inappropriate price setting. It is essential to account for engineering complexity, supply chain dynamics, and geopolitical factors affecting early deployments to avoid a lack of bids or technology developers failing to reach financial close.

- **Excluding innovation through inappropriate scheme design:**

...excluding innovation due to scheme requirements and a lack of ringfencing for ocean technologies. For example, a market-ready technology may be prohibited from participation due to a scheme that requires a minimum number of bidders or cannot meet the competitive requirements of more mature technologies.

## Fiscal Incentives

### Overview of fiscal incentives for increasing renewable energy uptake

Obligation schemes and tax incentives are effective tools for encouraging electricity buyers to adopt specific technologies. For example, a legal obligation can compel electricity suppliers to source a portion of their supply from renewables, while tax credits can reduce the tax burden for certain technologies, making them more financially attractive.



### Consider

- **Increasing demand for ocean energy through obligation:**

...using an obligation scheme to artificially increase the demand for a particular technology, e.g., supplier compliance or pay a buy-out price. Effectiveness increases when buy-out funds are redistributed to reward compliance rather than just penalizing failure, a strategy that successfully supported early offshore wind particularly when its levelised cost of energy (LCOE) was significantly higher.

- **Targeted obligation with banding:**

...using obligation to target a small share of the market can effectively incentivize emerging sectors. Furthermore, using “banding” (higher weightings for emerging technologies vs. mature ones) levels the playing field and improves the economic appeal of ocean energy.

- **Reducing cost barriers with tax credits:**

...tax credits on energy generation or upfront CAPEX directly lowers developer costs. This simple mechanism makes emerging technologies more competitive, especially when credits are differentiated to favor them over mature alternatives.



### Avoid

- **Volatile certificate market:**

...using energy certificates without safeguards. These schemes can attract early investment but lack the long-term revenue certainty of CfDs due to price fluctuations. To mitigate this risk, hybrid strategies, such as bundling certificates with stable Power Purchase Agreements (PPAs), can provide a more reliable income stream.

- **Designing a policy around a legacy marketplace:**

...using legacy systems that were designed for the conditions of their time (i.e., early renewable market adoption), and what worked then may not be effective today. These schemes, however, can be adapted and modernised to align with the current state of the renewable energy market.

- **Agnostic technology weightings when trying to increase uptake of emerging technologies:**

...designing a scheme either through certificates or tax credits that does not specifically target the technology that is trying to be incentivised. Ensure there are weightings or differentiation with respect to other technologies to reach the desired uptake.

# Delivery-Based Innovation Funding

Overview of the competitive grant-based arrangements to fund large-scale projects

Achieving commercialisation requires a level of demonstration beyond what is typically supported by technology-push mechanisms. Large grants or prize-based incentives can help projects reach the pilot stage and attract additional investment, guiding technologies toward full commercial deployment.



**Consider**

- **Integrating large capital grants/prizes into a wider funding pipeline:**

...embedding capital grants and prize mechanisms within a broader policy framework to bridge the gap between the R&D stage performed in technology push to full commercial-scale deployment. This integration ensures continuity of support across the innovation lifecycle.

- **Pilot projects to increase commercial attractiveness:**

...designing targeted funding calls for ocean energy, which can support emerging technologies through capital grants for low-capacity pilot projects. Pilot projects provide the opportunity to de-risk innovation at an intermediate scale, making technologies more attractive for future commercial deployment.

- **Pre-financing followed by milestones rewards:**

...structuring funding around performance milestones, with a proportion of upfront funding to initiate the project. This helps emerging technology developers overcome initial capital constraints while incentivising them to reach technology outputs, acting as a form of accountability.



**Avoid**

- **One-off prizes:**

...using prizes on their own without a long-term vision. While prizes are a useful incentivisation tool, they must be part of a larger framework to ensure there is transfer from technology push to market pull.

- **Over ambitious and broad performance criteria:**

...setting broad, highly ambitious energy targets as part of evaluation criteria for a grant reward can discourage smaller ocean energy SMEs from participating. Ensure the criteria is designed to be reflective of the current ocean energy marketplace.

- **Generic technology neutral approaches:**

...grouping ocean energy with other renewable technologies under a single call/prize. This fails to account for the unique technical, environmental, and development pathways of wave and tidal energy. Instead, create dedicated calls and prizes tailored to their distinct needs.

# Moving from Technology Development to Market Adoption

Transferring from a technology push mechanism to a market pull policy

A successful policy should enable smooth transition from technology development to market adoption. This follows a staged approach: an early phase focussed on technology push, a mid-stage bridging between technology push and market pull, and a late-stage market pull model.



- **Hybrid policy design (combining technology push and market pull under one framework):**

...designing programmes that use both strategies together, where there is a natural progression from push to pull. Initial R&D is supported through a mix of capital grant schemes, followed by mid-stage, low-capacity deployments backed by a tailored long-term revenue arrangement (e.g., FiTs, PPAs, negotiated CfDs) or delivery-based funding such as milestone-based grants. This approach prepares technologies for a competitive, market-driven model at later stages (e.g., competitive CfD).

- **Easing market access through engagement:**

...looking into the regulatory pathways for a particular deployment region and investigate methods to streamline these for ocean energy. This will reduce the burden placed on developers, but will require encouraging a dialogue between stakeholders, i.e., all those that operate in the region to identify and resolve challenges early on.

- **Designing market pull to reflect sector-readiness:**

...setting the criteria at a realistic level and not having overly ambitious targets, which may be impossible to achieve. Look into landscaping studies that specifically target deployment and regulatory barriers for ocean energy.



**Avoid**

- **Prematurely launching market pull:**

...launching schemes too early can do more harm than good by undermining confidence in the technology when it is not market-ready and discouraging future investment. If a scheme looks good on paper, it is important to ensure there is enough evidence to justify launching the programme instrument, which means conducting thorough landscaping studies to assess sector maturity and readiness.

- **Lack of supporting landscapes:**

...having a large gap between technology push and market pull due to a lack of development programmes to bridge the gap between the two.

## Policy Targetting: Dedicated vs. Technology-Neutral

Designing policy around specific technologies or as part of a broader technology framework

Policy design can focus on a specific technology or take a broader market-based approach. Examples include competitive, targeted programmes aimed at accelerating specific technologies; technology-neutral frameworks that allow all solutions to compete on equal terms; and large-scale programmes with defined allocation mechanisms combined with market incentives to drive deployment.



### Consider

- **Competitive targeted programmes:**

...designing programmes that are tailored specifically to ocean energy technologies, e.g., targeted revenue support and calls for delivery-based funding. These programmes should guarantee that a defined number of technology developers receive revenue support and/or funding, while incorporating a competitive down-selection process to ensure that only the most promising projects are awarded.

- **Differentiated incentives:**

...using either encouragement (tax credits) or enforcement (obligation) to apply differential weighting across technologies can effectively drive market adoption.

- **Pot allocation and ringfencing in larger programmes:**

...including a dedicated fund reserved for a specific technology within a broader policy framework. This helps prevent a disproportionate share of funds from flowing to more mature, lower-cost technologies.

### Avoid

- **One-size fits all approach to policy targeting:**

...designing programmes that have no element of incentive for selecting ocean energy technologies. This results in a lack of investment and limits the ability to close the cost gap with other more mature technologies. Therefore, targeted schemes or sub-tracks with broader programmes should be a key element of ocean energy policy.

- **Targeted programmes without competition:**

...design programmes which allow unready technologies to take part which will likely fail at later stages.

# Application Procedures for Market Pull Instruments

Ensuring the application process of receiving revenue support is smooth and fair to ocean energy developers

A successful market-pull instrument should be designed to give newer, smaller ocean energy developers a fair opportunity to receive revenue support. This requires a structured process with clear steps, transparent evaluation and eligibility criteria, and targeted support where needed to reduce the burden on applicants.



- **Streamlining application process to ocean energy:**

...designing the application process that is reflective of the bespoke challenges of ocean energy. This may include having a specific funding pot within a thematic axis, or a targeted call with specific eligibility and permitting requirements, ensuring a fair process that does not force these projects to compete directly with more mature technologies.

- **Supporting framework for permitting and grid access:**

...streamline applications by providing developers with standardized templates, checklists, and a transparent evaluation process. Where possible, align tenders with pre-consented sites and include grid connections in the tender package. If unavailable, enforce clear readiness criteria to ensure timely grid access for prepared projects.

- **Phased funding:**

...designing programmes with phased funding to incentivize progress, using pre-financing to lower entry barriers for new developers.



- **Overly rigid, strict application and complex steps:**

...designing programmes that have a high barrier to access, such as the requirement of consents and permits in place before an application to an instrument can begin. Instead, allow progress toward securing permits and consents to be tracked as milestones, ensuring flexibility while maintaining accountability.

- **Overlooking grid access challenges:**

...delaying projects due to grid accessibility challenges. For example, deployment-ready projects can become stuck behind other technologies that are not yet prepared for delivery, leading to missed milestones and increased investor uncertainty. Instead, fast-track projects that meet a defined readiness criterion such as in a 'first ready, first served' model.

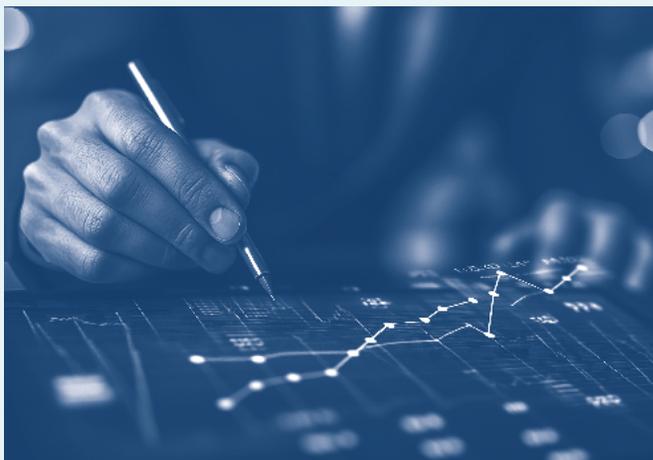
- **Lack of stakeholder engagement and regulatory pathway**

...selecting deployment locations without fully understanding environmental constraints creates heavy permitting burdens. Instead, engage stakeholders and regulators early to identify suitable areas, building consensus and accelerating the consent process.

# Mechanisms for Financing Market Pull Strategies

Methods to finance market pull strategies to incentivise uptake in ocean energy technologies

A market-pull instrument needs to be financed through either public funding, market-based instruments or a combination of the two. A key consideration of financing models is to ensure a balance between incentivisation of the technology and consumer protection to avoid political backlash.



**Consider**

- **Hybrid funding through market incentives and private investment for early market-access**

... combining market support funding through pre-financing with a required level of private investment can act as a stepping stone between fully grant-based technology push funding and market-driven financing. Pre-financing can be funded through a carbon market revenue approach such as a polluter pays principle or cap-and-trade principle for emissions allowances, avoiding direct government funding. This approach is particularly valuable during early market adoption and for pilot projects, as it helps demonstrate commercial-scale performance, reduces developer risk, and lowers the access barrier for participation.

- **Long-term revenue market support after cost reduction and maturity is established**

... introducing long-term revenue support once technologies have matured and costs have fallen. This can involve contract-based mechanisms, e.g., FiTs, PPAs, CfD or ROs, which are funded through levies or another mechanism typically passed onto consumer bills. At this stage, incremental costs borne by the consumer are modest, reducing the risk of political backlash while maintaining incentives for continued deployment.



**Avoid**

- **Government funded schemes with high performance thresholds**

...relying solely on government funded schemes when ocean energy is still at an earlier stage of maturity and unable to meet high performance benchmarks to justify a direct funded programme. This can lead to a lack of participation from technology developers, failure to achieve milestones and a poor return on investment.

- **Unstable market models**

...using market support mechanisms that are vulnerable to market volatility which can lead to investment collapse or massive costs placed on the technology developer. Any market-driven approach should include safeguards such as conservative reference pricing and stability measures to limit these risks.

# Enabling International Participation in Domestic Markets

Allowing international developers and suppliers to participate in domestic markets

To achieve climate and technology-specific targets, some level of international participation will likely be required. This could take the form of domestic registration and operations by overseas companies in revenue support schemes, open-market access for buying and selling renewable energy certificates, or collaboration through bridging programmes such as innovation funds.



## Consider

- **International participation for investment whilst retaining domestic requirements:** ...allowing for international participation that can bring valuable overseas investment. This brings capital investment but also facilitates the transfer of knowledge and best practices, which can be leveraged to strengthen the domestic market and local economy. This can be achieved by placing domestic requirements on companies such as registered offices and domestic job creation (e.g., local job content creation obligation for CfD).
- **Caps for multinational funded programmes:** ...adding caps for larger programmes that are across countries/member states to limit singular larger international technology developers from monopolising the market. Consider a cap on a number of projects per member state to limit singular market dominance and allow smaller players to emerge.
- **Subcontracting to meet programme objectives:** ...allowing subcontracting to international companies particularly when no credible domestic technology exists for specific components within larger systems. This approach ensures progress without compromising overall programme goals.

## Avoid

- **Displacing home-grown industry:** ...relying on international participation and not having a plan for home-grown domestic technology development. Push mechanisms must support the growth of home-grown industries whilst enabling them to learn and collaborate with international players where appropriate.
- **Highly complex process to navigate:** ...having an overly complicated process that can deter international investment, e.g., limiting access to tradable certificates or complex regulatory pathways. This can undermine the market pull mechanism and see limited applications, therefore having a streamlined process where possible is essential for effective participation and growth.



## Long-Term Revenue Certainty Mechanisms

**Revenue Certainty:** Long-term contracts provide predictable income and financial stability. Trading certificates can add revenue and help incentivise early adoption.

### Tailored Contract Design:

Align support with project scale and maturity: fixed/negotiated schemes (FiTs, PPAs) for small-scale deployments; competitive mechanisms (CfDs) for larger, late-stage projects.

### Allocated Funding:

Ensure there are dedicated funding pots for ocean energy, to avoid capital following solely to mature technologies in competitive bidding processes.

## Fiscal Incentives

**Increasing Demand Through Obligation:** Use obligations (ROs, RECs) to require suppliers to source a minimum share of certificates, with buy-out penalties for non-compliance.

### Increasing Demand Through Encouragement:

Use tax credits to lower entry barriers for project developers by lowering upfront costs or reducing tax paid on electricity generated.

### Targeted Banding and Weighting:

To ensure emerging technologies are being targeted, use banding or weightings to separate technologies. This gives emerging technologies a competitive advantage against maturer technologies which would be favoured otherwise.

## Delivery-Based Funding

**Capital Grants for Early-Market Adaptation:** Use capital grants and prizes into a broader funding pipeline to bridge the gap from R&D/demonstration to full-scale deployment.

### Pilot Projects:

Design the funding calls to target low-capacity pilot projects as a means of derisking ocean energy technologies to prepare them for fully market-driven schemes.

### Milestone-Based Funding:

Use pre-financing to aid with the initiation of the project, followed by milestone-based rewards throughout project development to incentivise technology developers to reach deployment targets.

## Moving from Technology Development to Market Adoption

**Hybrid Policy Design:** Combine technology push and market pull under one framework working as a three-stage process: early stage R&D through to demonstrators, mid-stage low-capacity deployments, and late-stage market-driven models which depends on the deployment targets (CfDs).

### Easing Market Access:

Streamline regulatory pathways in priority regions and use targeted pilots to de-risk projects for fully market-driven schemes.

### Policy to Reflect Sector Readiness:

Set the instrument criteria at a realistic level that is not overly ambitious. Look into landscaping studies that specifically target deployment and regulatory barriers.

## Policy Targetting: Dedicated vs. Technology-Neutral

**Competitive Targeted Programmes:** Create ocean energy-specific schemes (revenue support, delivery-based funding) with competitive evaluation and down-selection so only the best technologies progress.

### Differentiated Incentives:

Apply differential technology weightings to either encourage or enforce ocean energy take-up through tax credits or obligation schemes, respectively.

### Pot Allocation and Ringfenced Funding:

Reserve funds for ocean energy technologies within larger programmes to avoid a bias towards more mature technology which are currently more cost effective.

## Application Procedures for Market Pull Instruments

**Tailored Application Process:** Design ocean energy-specific eligibility and permitting criteria, with streamlined procedures for first-of-a-kind and lower-resourced developers.

### Supporting Framework:

Provide clear guidance, templates, and transparent evaluation. Where possible, bundle grid access or set readiness criteria to ensure timely connection.

### Phased Funding for First-of-a-Kind Deployments:

Design programmes with phased funding deployment milestones with pre-financing to lower entry barrier.

## Mechanisms for Financing Market Pull Strategies

**Hybrid Funding for Early Market Access:** Combine grant funding (e.g., carbon revenues, cap-and-trade) with private investment to bridge the gap between R&D grants and market-based finance, supporting early adoption and pilots without relying solely on public budgets.

### Long-Term Revenue Support Post-Maturity

Once technologies have matured and costs have fallen, introduce contract-based revenue support (FiTs, PPAs, CfDs, ROs) funded by consumer levies or similar mechanisms. At this stage, incremental costs borne by the consumer are minimal, reducing the risk of political backlash while maintaining incentives for continued deployment.

## Enabling International Participation in Domestic Markets

**International Participation with Domestic Requirements:** Allow international participation to attract investment and expertise, while applying domestic requirements (e.g., local content, job creation).

### Caps to Prevent Monopolisation:

Add caps per country within multinational programmes to prevent market dominance and enable smaller players to compete.

### Subcontracting to Meet Objectives:

Allow for subcontracting to international firms within programmes when no domestic subsystem technology exists to meet programme deployment objectives.



### Long-Term Revenue Certainty Mechanisms

#### Underestimating Costs:

Emerging technologies have limited deployments and scarce data leading to an underestimation of cost forecasts and inappropriate price and tariff setting. When engineering complexity, supply-chain dynamics, and geopolitical factors are added, the result can be a lack of bids or project developers failing to reach financial close.

#### Excluding Innovation:

Poor scheme design and lack of ringfencing of technologies can cause new innovative technologies to lose out when they are ready for deployment, e.g., highly competitive thresholds to favour more mature technologies.

### Fiscal Incentives

#### Open-Market Volatility:

Trading certificates without safeguards can lead to large price fluctuations, posing a risk to project developers.

#### Relying on Legacy Schemes:

Legacy schemes were designed for the market conditions at their inception and may no longer fit today's saturated renewable energy landscape.

#### Agnostic Technology Banding /Weighting:

Designing a scheme (e.g., no weightings, or means to differentiate technologies) which does not target the technology that it aims to incentivise.

### Delivery-Based Funding

#### One-Off Prizes/ Grants:

Use prizes without a long-term vision, such as singular prizes or grants that are not part of a larger stage-gate framework.

#### Overly High Performance Criteria:

Set broad, highly ambitious energy targets as part of the evaluation criteria for receiving grant funding. This discourages participation from smaller SMEs which lack resources.

#### Generic Technology Neutral Approach:

Group ocean energy under a single agnostic prize/grant which fails to account for unique technical, environmental, and development pathways of wave and tidal energy.

### Moving from Technology Development to Market Adoption

#### Prematurely Launching Market Pull:

Launch a scheme too early when the beneficiary technology is not ready. This can undermine confidence in the technology and damage future investment.

#### Lack of Supporting Landscape:

Have a large gap between technology push and market pull with no bridging mechanism between the two, such as the lack of mid-stage programmes that enable small-scale deployments.

### Policy Targetting: Dedicated vs. Technology-Neutral

#### One-Size Fits All:

Design programmes which have no means to incentivise uptake of emerging technologies, resulting in a lack of investment and limiting the ability to close the gap with other more mature technologies.

#### Lack of Competition:

Allow for technologies which are not ready or lack potential to achieve programme targets which will likely fail at later stages. This can be caused by a lack of a robust evaluation or selection process for technologies to proceed.

### Application Procedures for Market Pull Instruments

#### Overly Rigid

**Application Process:** High entry barriers such as requiring consents and permits in place before an application can even begin.

#### Grid Access Bottleneck:

Projects can become stuck behind others in grid access queues, causing missed milestones and increased investor uncertainty.

#### Limited Early Stakeholder Engagement:

Lack of stakeholder engagement for pre-selected deployment locations, leading to a lack of understanding of the environmental constraints, placing a heavy permitting burden on project developers.

### Mechanisms for Financing Market Pull Strategies

#### Government Funded Schemes With High Performance Thresholds:

Rely on government funded schemes which require high performance thresholds to justify direct funding when ocean energy is still at an earlier stage of maturity. This can lead to a lack of participation from technology developers that are not ready to meet these benchmarks.

#### Unstable Market Models:

Use certificate-based market support mechanisms without safeguards can expose projects to volatile pricing, which can trigger investment collapse and drive-up developer costs.

### Enabling International Participation in Domestic Markets

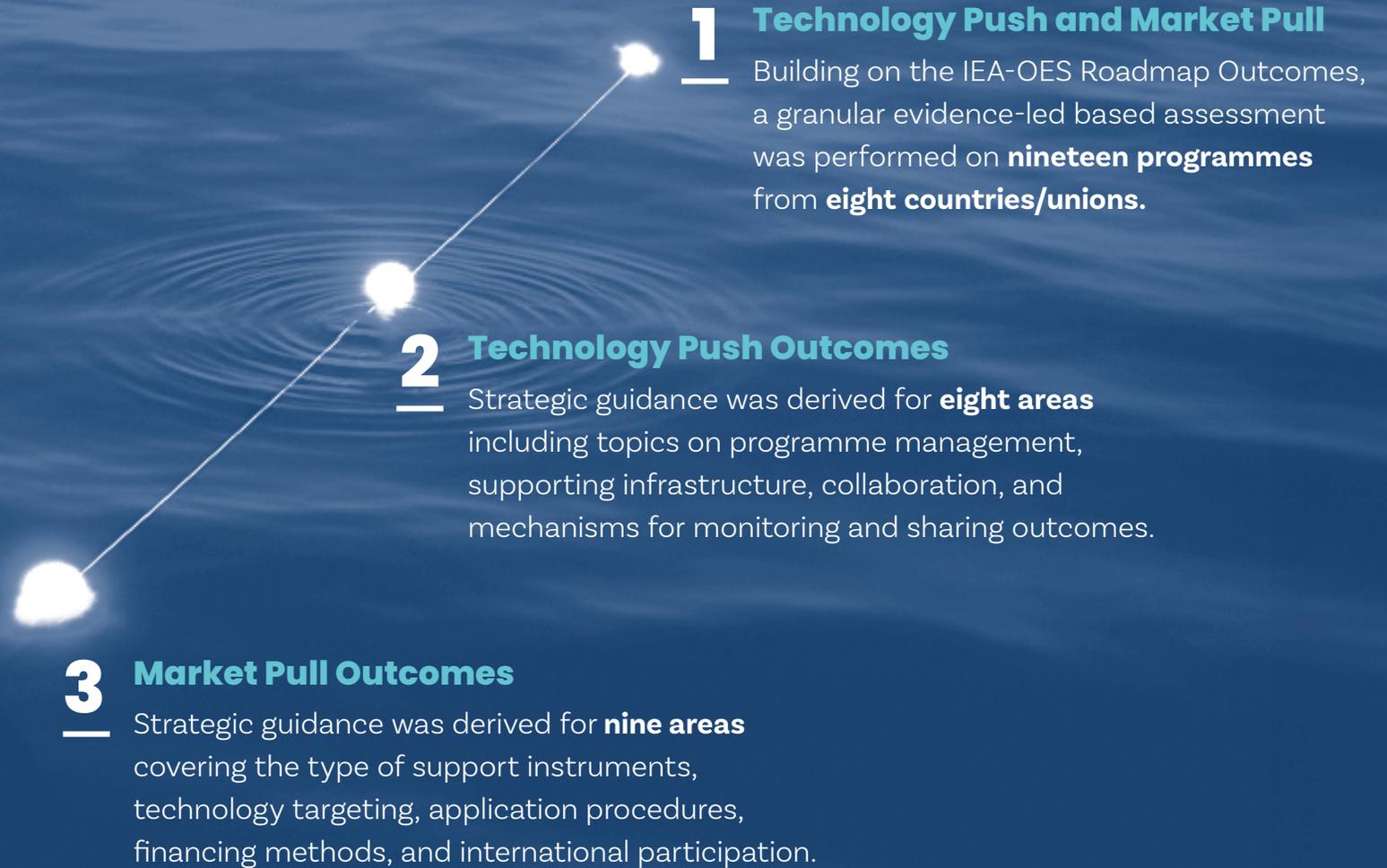
#### Displace Home-Grown Industry:

Over-rely on intentional players without a plan for home-grown domestic technology development. Push mechanisms must support the growth of home-grown industry to market pull where then they can learn and collaborate with international players.

#### Complex Process for Registration:

Have an overly complicated process to register as an international company. This can deter investment and undermine the market pull mechanism by having limited applications, therefore having a streamlined process where possible is essential for effective participation and growth.

# Summary



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**Published by:**

IEA Ocean Energy Systems

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**Design:**

Formas do Possível | [www.formasdopossivel.com](http://www.formasdopossivel.com)

**Citation:**

Collins, I., Schia, M., & Jeffrey, H. (2026). Technology Push, Market Pull–In-Depth Analysis and Policy Guidance for the Ocean Energy Sector. IEA Ocean Energy Systems (IEA-OES).

**Disclaimer:**

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