

Review of funding supports to the Ocean Energy Sector

SEAI Ocean Energy Development Unit - January 2020



Prototype Development Fund Review

Action 26 of the All of Government Action Plan on Climate

January 2020

Sustainable Energy Authority of Ireland

SEAI is Ireland's national energy authority investing in, and delivering, appropriate, effective and sustainable solutions to help Ireland's transition to a clean energy future. We work with the public, businesses, communities and the Government to achieve this, through expertise, funding, educational programmes, policy advice, research and the development of new technologies.

SEAI is funded by the Government of Ireland through the Department of Communications, Climate Action and Environment.

© Sustainable Energy Authority of Ireland

Reproduction of the contents is permissible provided the source is acknowledged.

SEAI has supported Ocean Energy research and development since 2003 with over €20m in Government funded grant support to Irish SME's to develop their technologies. As the needs of the sector grew, so did SEAI's commitment funding this emerging technology and in 2009 SEAI launched the Prototype Development Fund (fund). The fund was the first grant programme solely dedicated to offshore renewable energy in Ireland.

Through the fund, SEAI has assisted the ocean energy sector to grow and develop making Ireland one of the leaders in the ocean energy sector. The aim was to advance ocean energy technology closer to a commercialisation. The fund has helped enhance the sector through research and deployment of test wave and tidal energy capture devices, systems and sites. However, we recognise that the needs of the industry have matured and shifted to a point where the fund as currently structured is no longer always suitable for many of the developers.

This report provides quantitative analysis on the fund outcomes and achievements to date.

Scope of this Report

This review captures the following information:

1. Grants awarded by SEAI
2. Grant drawdown by applicant
3. A review of trends
4. A review of return applicants
5. Lessons learned
6. Conclusions

Introduction and Context

This report provides an internal review of the Sustainable Energy Authority of Ireland's (SEAI) Ocean Energy Prototype Development Fund. The review has been undertaken to inform requirements set out in Action 26 of the All of Government Action Plan on Climate. In particular:

- Review of impact of Prototype Development Fund and recommendations for enhanced scheme (Q3 2019)

The review also takes into consideration an industry survey that was completed in 2016 and an audit undertaken by Mazars in 2017 and updated in 2019.

The Prototype Development Fund is currently closed pending this internal review. The fund was open and accepting applications from 2009 to 2018. However, the scheme was closed in January 2019 to allow SEAI to:

1. Take stock of the direction of the programme to ensure that it remained fit for purpose
2. Move the scheme towards a model which encourages a more competitive and collaborative approach.
3. Update Terms & Conditions to align with other SEAI programmes and in particular the Research Development and Demonstration (RD&D)

When the fund was closed, SEAI provided support for projects in the industry through the RD&D research call. This call was open in January 2019 and 18 applications relevant to ocean energy projects were received. Of these, nine applications were selected for grant funding in round one and four were shortlisted for funding in case where funding became available. The fund is also currently servicing any applications received prior to closure in January 2019. There were 14 projects active in 2019 and given the multi-annual nature of these projects eight will continue to be managed into 2020 and 2021.

SEAI also ran a call in 2019 for projects in the ocean energy sector under the OCEANERA-NET COFUND. OCEANERA-NET COFUND is a five-year action, operating from 2017 – 2021 supported by H2020. The project co-ordinates activity between European countries and regions to support research and innovation in the ocean energy sector. SEAI is a partner in the OCEANERA-NET COFUND and will continue support Irish developers over the lifecycle of this project.

In addition, at the time of completing this report, there were three EUOCEANERA-NET COFUND projects under evaluation for funding.

1. Background to the Prototype Development Fund

Since 2003 SEAI has funded 125 ocean projects; 113 of these were through the prototype development fund. A total sum of €20,301,085 has been awarded to SMEs for industry led projects in the offshore renewable energy sector.

The fund was established in 2009 to accelerate and enhance support for the research, development, testing and deployment of wave and tidal energy devices. Through this fund, SEAI encouraged innovative solutions for ocean energy technologies such as wave, tidal and floating wind.

Prior to 2009 SEAI funded ocean energy projects via general research grant mechanisms. However, it was felt that a scheme more targeted to ocean energy was required to encourage larger multi-annual projects.

2. Grants awarded by SEAI

Figure 1 shows the total grants and number of projects awarded per year for ocean energy projects since 2003. There have been two peaks, one in 2009 and one in 2015. The peak in 2009 can largely be linked to the establishment of the Ocean Energy Development Unit (OEDU) and the fund. During the years that followed, resources from the OEDU team were lost and could not be replaced because of the public sector employment embargo. This affected the ongoing success of the programme as SEAI struggled to maintain support in all areas of activity.

The next peak in activity can be seen in 2015 and can be attributed to the publication of the Offshore Renewable Energy Development Plan (ORED) in 2014. This plan provided clarity and in turn confidence to the industry on a long-term framework for development of ocean energy. It also allowed SEAI to put in place resources to support the framework and the fund.

In more recent years both the value and number of applications has fallen. It is not clear why this has happened but anecdotally it is understood that developers are struggling with the grant levels offered, which are limited by EU State Aid rules.

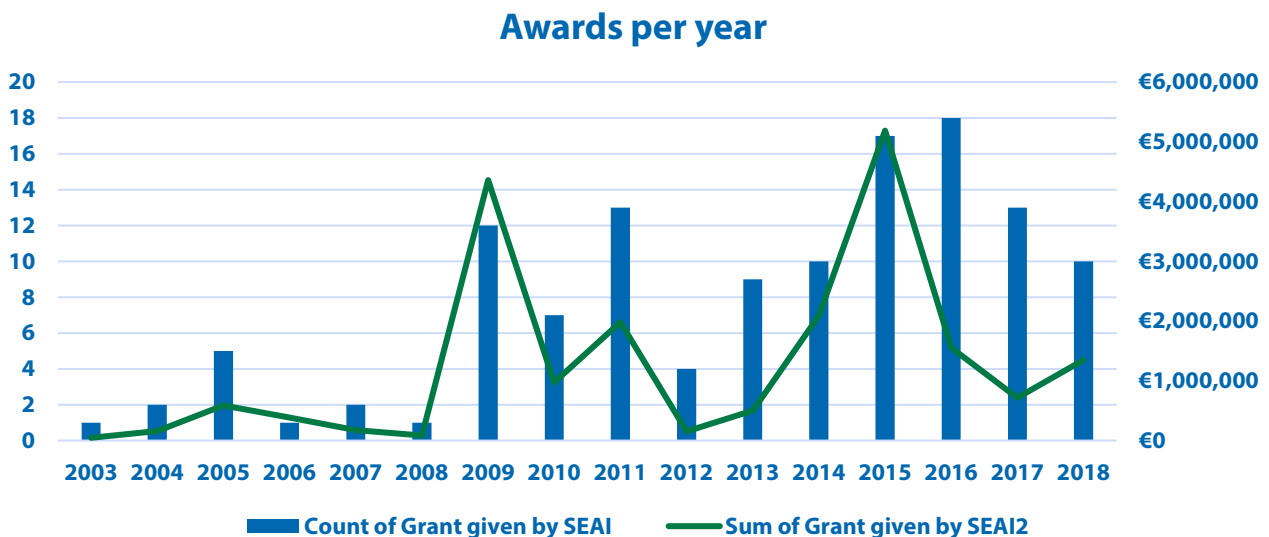


Figure 1 Grant awarded per year to Ocean Energy projects

Figure 2 below gives a breakdown of projects per technology type. In summary of the 125 projects:

- Almost 50% (61) of projects were for wave energy technologies. This is no surprise considering Ireland's abundant wave resources as well as access to test sites for developers.
- Tidal projects make up 15% (19) of all projects funded under the fund. Again, this is expected, given the limited tidal resource in Ireland.
- 34% (other) of projects are labelled as 'other' and this category tends to include projects which support the industry but may not be directly related to one specific technology type, generally they can be grouped as: feasibility studies; software development and industry guidance.

Breakdown of projects per technology type

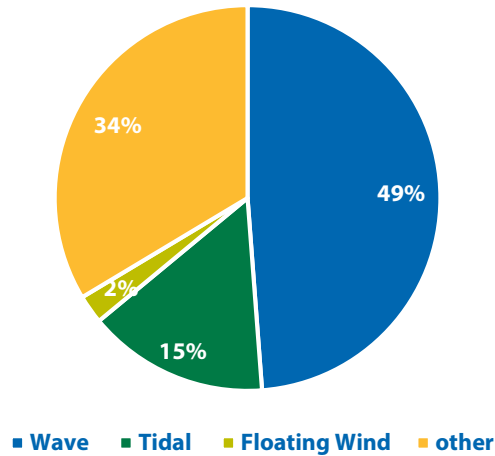


Figure 2 Type of project funded

Figure 3 below gives a breakdown of total grant per technology type. In summary of the €20.3m spent on the 125 projects:

- Wave projects received over €10m (51%) in grant funds
- Tidal projects received €4.8m (24%) in grant funds
- Floating wind accounted for 1% of funding received with €280,000 in grant funds received
- 24% of other projects are labelled as 'other' and this category tends to include projects which support the industry but may not be directly related to one specific technology type, generally they can be grouped as: feasibility studies; software development and industry guidance

Total Grant given per Project Type

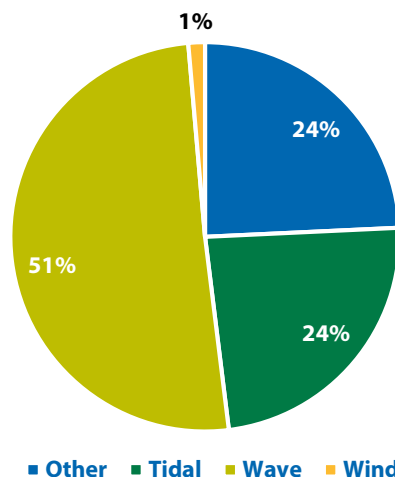


Figure 3 Total Grant given per technology type

Ocean Energy Funding Review

The fund began to support floating offshore wind projects on foot of the interim OREDP review published in May 2018. Three such projects were funded by the programme. Floating wind is now expected to surpass wave and tidal development due to the fact that offshore wind is now commercialised, and pre-commercial floating projects can now deliver 6MW+ per unit.

While the fund had flexibility to support floating wind, it was unable to meet the levels of support expected to get technologies to commercialisation. As an example, the AFLOWT project planned for the full-scale wave energy test site in Belmullet, Co. Mayo is classed as pre-commercial and costs for deployment are currently exceeding €31M and is co-funded by North West Europe Interreg. Given the level of support required for this sector, larger funds such as H2020, Interreg etc make more sense as technologies approach commercialisation.

Investment of ocean funding per area

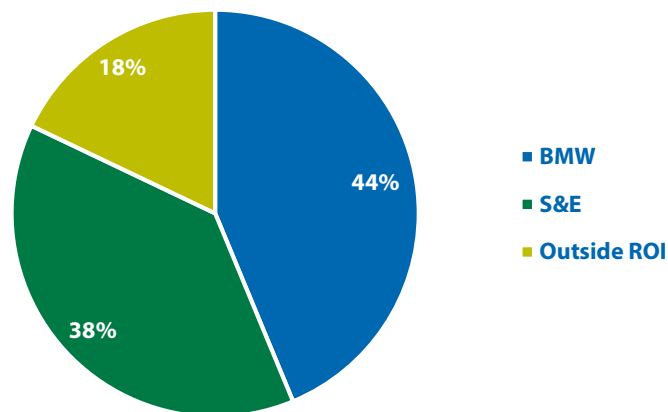


Figure 4 Investment per area

Figure 3 shows the investment per location of project with investment split per NDP region: Border Midlands and Western (BMW) and South and East (S&E). Investment in the two areas has been relatively equal. However, it is worth noting that significantly more projects were carried out in the South and East. This is to be expected as the lower technology readiness level projects and desk-based exercises have tended to focus in companies and universities in Dublin and Cork; with larger scale more expensive projects testing off the west coast; primarily in Galway.

Table 1 Breakdown of funding per area

Area	Value	Number
Boarders Midlands and Western	€8,881,392.09	36
South and East	€7,780,817.31	86
Outside Republic of Ireland	€3,638,876.00	3
	€20,301,085.40	125

Grant drawdown by Applicant

SEAI awarded over €20M in grant offers since 2003 to the ocean energy sector. However, not all this funding has been drawn down. Of the projects that have completed between 2013 and 2018 an average of 70% of grants awarded, have been drawn down. The rate of grant drawdown has improved over the years. In 2013, on average only 32% of the grant awarded was drawn down. More recently this has increased to nearly 90%. This increase can be attributed to the direct support provided through the programme as additional resources were assigned in the ocean team. The graph below shows the average percentage that grantees claimed after the project completed. As ocean grants are multiannual, we have taken the start date of the project to capture this information.

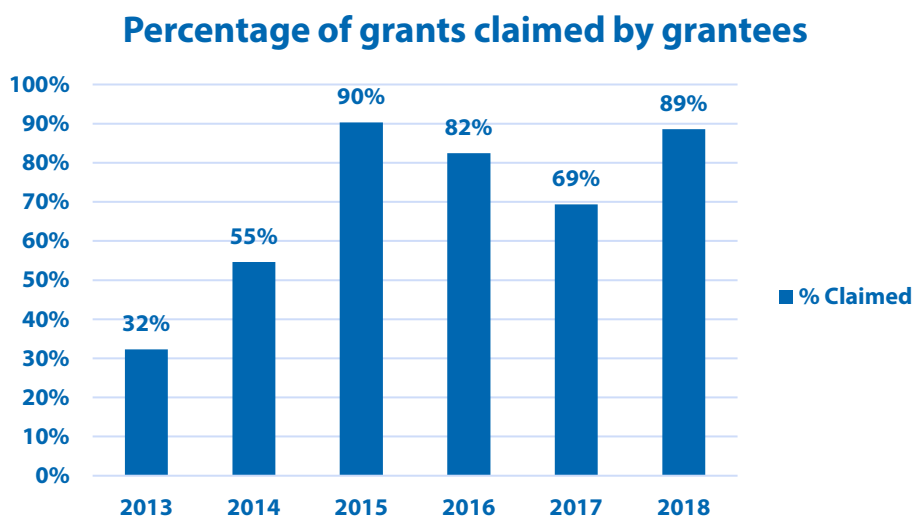


Figure 5 Percentage of grants claimed by grantees

Return applicants

A review of return applicants over the 125 projects was carried out. SEAI promotes a stepwise approach with all technologies up the technology readiness level scale and encourages applicants to re-apply once they have successfully completed a technology readiness levels step, so a high rate of return of applicants in the scheme is expected. Of the 125 projects, 94 of the projects; or 75% were returning applications.

57 companies in total have benefited from the fund. Of these, 25 companies have made two or more applications and 16 companies have made 3 or more. €17.6M of the €20M has been invested in return applicants.

Table 2 Return Applicants

Return Applicants	%	Number
Return applicants (>1 grant received)	46%	26 of 57
Projects from return applicants	75%	94 of 125 projects
Funding given to all return applicants projects	87%	€17.6m

Ocean Energy Funding Review

Most of the projects have focused on technology readiness levels lower than 4. However, four projects have been tested at sea and progressed to technology readiness levels 6+. These grantees are listed below:

- Ocean Energy Ltd
- Seapower Ltd
- Open Hydro
- Wavebob

Finally, to note, due to the iterative nature of the scheme and the support provided by SEAI for applications the success rate of awards was high with almost 70% of applicants being successful for funding.

Lessons Learned

Many of these lessons learned are gleaned from experience in running the programme and feedback from industry in the survey from 2016 and are summarised in this section.

Funding Gap

The intention of the fund was to assist the industry in progressing technology through a stepwise approach or technology readiness levels. To an extent the scheme has managed to do this, and several technologies have received funding over a series of projects, bringing them from concept stage to modelling and to tank testing and in four cases to at sea testing. The highest level of technology readiness levels achieved under the fund is 7 and this was achieved with co-funding from the Department of Energy in the US.

Several technologies have also used the fund as a launch pad for further applications for larger grant awards such as H2020 and or as a complementary mechanism to assist in progressing their technology for other non-grant funding schemes i.e. WES¹ and US Prize².

The amount of private investment required increases as a technology moves towards commercialisation. Technology developers have noted that there is a significant challenge in progressing technologies under this funding scheme beyond technology readiness levels 6/7 as the funding gap, between public funding awarded and private investment required, widens too much. This is primarily due to EU State Aid stipulations. The theory is that as the technology becomes more commercial the risk for private investment should be less and so public funding should be reduced. However, in the ocean sector, a complicating challenge is that the cost of development increases exponentially as a technology moves up the technology readiness levels since the environment that it is tested in becomes less regulated i.e. moving away from controlled models; to controlled tanks; to open sea conditions.

Developers find themselves in the position of seeking higher amounts of private investment. A wave energy developer will probably afford the co-investment in the early stages of their technology development (up to technology readiness level 4) where costs are around €100,000-€150,000 per project and an SME is required to finance 20% of the project. Once we move to open sea testing (technology readiness level 5+) the developer is looking at projects of €1 million plus and is required to finance at least 40% of the project. Projects at higher technology readiness levels (7+) escalate to the tens of millions.

While it is appropriate that the main benefactor of a grant should invest in the project, it is also important that investment is appropriate to the scale of the business. This significant challenge is often impeding Irish developers at these technology readiness levels.

¹ <https://www.waveenergyscotland.co.uk/>

² <https://www.energy.gov/eere/water/wave-energy-prize-home>

Among the possible approaches to reduce these challenges include:

- Introducing a scheme for these levels of technology readiness levels which are not based on State Aid Rules schemes (e.g. those which are based on procurement rules such as Small Business Innovation and Research (SBIR)³ and/or competition)
- Brokering direct access to private investment. SEAI negotiated an agreement with Apple to co-fund projects in Galway bay, which they did in 2015-2017. A similar arrangement could be considered with other large companies or utilities that have corporate requirements to support low carbon technologies and or have community funds
- Focusing support to leverage funds from other schemes. SEAI funds could be used primarily as a mechanism to prepare companies for more extensive and appropriate funds e.g. H2020 or Innovfin⁴
- Developing an integrated programme which considers support for all technologies above technology readiness levels 6 in conjunction with investment agencies such as Enterprise Ireland or IDA and which is supported/co-funded by industry.

Project Management:

The fund was designed to support technology development companies which are often comprised of 1 or 2 people companies working part-time on projects. These companies focussed primarily on the development of the technology with less attention paid to the administration of the project and the finances.

The focus was primarily on the technology and how to get it tested at the current technology readiness levels. While it is not SEAI's remit to focus on business development, it was noted that return grantees struggled with progression due to their lack of business strategy and development. Given the nature of these companies' progression up the technology readiness levels's often led to a high dependency on external consultants and inflated project costs. The lack of business strategy amongst grantees, also led to grantees becoming dependent on SEAI prototype grants for their business to continue and progress. In some cases, there were significant problems with cashflow with projects grounding to a halt while they awaited funding.

SEAI recognise that the research and demonstration projects can have unexpected delays and challenges, and we try to accommodate these changes via our grant amendment process. However, aside from this, project management was a real challenge for many of the projects, timelines often slipped, milestones and claims were not adhered to, and the scope of the projects often changed. In many cases where projects struggled to deliver on original planned programme, the project budget was not spent.

The following are among options to help reduce these challenges in the future:

- Provide support to improve business development of applicants. This could be achieved through joint programmes with other agencies such as Enterprise Ireland or NDRC⁵ or via EU funded projects such as OPIN⁶
- Include requirements for collaboration in projects with larger companies and/or research agencies with capacity and know how on project management
- Include representatives from Enterprise Ireland in project evaluation and support teams

Scheme Administration:

Given the nature of businesses fund supported through the fund, the scheme operated as an open call throughout the year. This was to accommodate small businesses making applications at a stage that was suitable for them. What became apparent was that it was difficult to administer the scheme efficiently as applications could be made at any stage throughout the year.

³ <https://www.enterprise-ireland.com/en/Research-Innovation/SBIR-Ireland/>

⁴ <https://www.eib.org/en/products/blending/innovfin/index.htm>

⁵ <https://www.ndrc.ie/looking-for-investment/what-we-offer-startups/dublin>

⁶ <https://www.nweurope.eu/OPIN>

Ocean Energy Funding Review

In addition, SEAI became too involved in the application process. The lack of deadline resulted in an iterative process developing, whereby applicants would submit documentation, SEAI would provide feedback as part of the rejection of the project and then the project would be re-submitted including the feedback. As a result of this there were often significant time delays in completing the proposal and for some projects it took 1-2 years for a successful application to be submitted.

Furthermore, applicants would submit only some of the documentation and SEAI would be required to chase for outstanding documentation.

Finally, managing payment claims became challenging, as different applicants would be at different project stages in the year and would set their own milestones. This meant that staff would be managing single payments and would be trying to move them individually through a system designed for bulk payments. This was a hugely inefficient use of resources and staff often found it difficult to get payments processed on time. Leading to frustrations for both the companies and SEAI.

Many of the complaints coming from the industry in the 2016 survey were relevant to time delays in applications and payment and these were often as a result of the approach as described above.

The following could help reduce these challenges in a future iteration of the scheme:

- Align with the RDD programme and have deadlines for calls and set milestone payments
- Introduce competitive calls and/or topics to focus the applications

Eligible Costs

Over the course of the scheme applicants have also provided feedback on the following elements:

- **Internal staff costs:** These were set at €350 per day. It was felt that this figure was lower than industry norm and was not aligned to RD&D.
- **Overheads:** The inability for overheads was cited as a significant challenge by many of the applicants. It is a norm for many funding schemes to have an overhead rate for SMEs and applicants have requested it a number of times to align with other support mechanisms (e.g. Horizon 2020; EPA; Marine Institute and Interreg).
- **Staff costs:** Our requirement for proof relevant to salary information was challenging for many of the companies and may need to be considered in relation to GDPR requirements.

For any future scheme the above points should be considered as appropriate.

Conclusion

It is evident from the above information that the fund has achieved its objectives to accelerate and enhance support for the research, development, testing and deployment of wave and tidal energy devices. Examples of this include the progression of return applicants through the technology readiness levels scale, the supply chain that has been created within Ireland in the ocean energy testing sector, and the increase in non-Irish developers setting up in Ireland and bringing their knowledge and expertise to Ireland to avail of this fund.

However, there are many parts of the fund that require improvement and it is abundantly clear is that technologies cannot move beyond technology readiness levels 6 with the fund.

In conclusion there is valid reasons to consider a change to the current system to permit a mechanism of support for more pre-commercial technologies and to ensure continued support the development of this sector.

Annex 1: All Applicants awarded 2003-2019

Applicant Name	Total Grant awarded by SEAI	Number of grants awarded	Technology Type
Benson Engineering Ltd	€98,792	3	Wave
BirdWatch Ireland	€99,961	1	Other
Black & Veatch	€12,316	1	Other
Blue Power Energy Ltd	€162,261	3	Wave
BluWind	€71,960	2	Wind
Bri Toinne Teoranta	€14,000	1	Tidal
CADFEM	€124,172	2	Other
Ceto Wave Energy Ireland Limited	€74,718	1	Wave
CONSUB	€32,499	1	Other
Cyan Technologies Ltd	€155,693	4	Wave
DGD Geo	€35,980	1	Other
DP Energy	€48,402	1	Other
Eirecomposites	€268,656	1	Other
ESB	€1,669,030	3	Other
Exceedence	€95,293	1	Other
Gaelectric	€208,180	1	Wind
GDGeo	€77,287	1	Other
Gkinetic	€501,765	5	Tidal
GRSI	€126,062	2	Wave
Hydam Technology Ltd	€19,219	1	Wave
IBM	€848,547	3	Other
Impact9 Energy and Marine Limited	€67,900	1	Wave
JJ Campbell	€112,513	2	Wave
Jospa	€240,780	4	Wave
Key Engineering Services Ltd	€29,288	1	Wave
Limerick Wave Ltd	€57,050	2	Wave
MaREI	€117,228	1	Wave
Martin Houston and Sons Ltd	€14,991	1	Wave
MRIA	€383,835	10	Other
Nimbus	€101,774	2	Other
NMCI	€82,582	1	Other
NSAI	€84,600	2	Other

Ocean Energy Funding Review

Ocean Energy Ltd	€3,799,376	4	Wave
Ocean Renewables	€58,366	1	Wave
Oceans of Clear Renewable Energy Ltd	€11,795	1	Wave
Omey	€114,760	2	Other
Open Ocean Energy	€118,736	2	Tidal
OpenHydro Technology Ltd	€3,539,400	5	Tidal
OPRC	€256,587	2	Tidal
PureMarine Gen	€36,640	1	Wave
Sea Power Ltd	€1,470,973	5	Wave
SeaEnergies	€107,317	3	Wave
Simply Blue	€99,750	1	Wave
SmartBay	€448,123	4	Other*
Swirl	€448,396	5	Wave
Technology from Ideas Ltd	€566,797	6	Other
TechWorks	€82,209	1	Other
Tidal Energy Ltd	€31,920	1	Tidal
Tocado	€243,069	1	Tidal
University College Dublin	€29,606	1	Tidal
Verdant Isles	€94,073	1	Tidal
Wave Energy Ireland Ltd	€131,833	1	Wave
Waveberg Ireland	€30,750	1	Wave
Wavebob Ltd	€1,924,045	6	Wave
Waveworks	€42,400	1	Wave
Wood	€93,730	1	Other
Rockall Solutions	€392,032	1	Wave
TCD	€91,070	1	Wave
Grand Total	€20,301,085	125	



Riailas na hÉireann
Government of Ireland

Sustainable Energy Authority of Ireland

Three Park Place
Hatch Street Upper
Dublin 2
Ireland
D02 FX65

e info@seai.ie
w www.seai.ie
t +353 1 808 2100

