

# 1. PUBLISHABLE SUMMARY

## **Summary of the context and overall objectives of the project (For the final period, include the conclusions of the action)**

The world is suffering from the double impact of a climate crisis and an energy crisis. With the intensity and frequency of extreme climate events rising, Governments around the world are setting up net zero goals and policies to decarbonise their economies and mitigate the risks posed by climate change.

The Russian invasion of Ukraine in 2022 has caused devastation in the region and an energy crisis. In response, Governments and businesses are urgently trying to diversify away from fossil fuels to protect their security of energy supply.

Day and night, the tide carries huge volumes of water across our seas and oceans. This tremendous source of clean energy has long been admired, but the ability to harness this immense power has been challenging – until now. Nova's tidal turbines have been generating electricity from the tide for more than seven years. With the tidal turbines sitting underwater on the seabed, the beauty of the landscape is preserved. There are no dams or barriers and the turbines work in harmony with marine wildlife.

Unlike wind and solar, the tide's predictability days, months and years ahead, enables it to deliver many energy system benefits. Tidal energy can play a key role in helping us to combat climate change, achieve our net zero targets, improve our security of energy supply, and create a new industry delivering many economic benefits.

Marine energy could contribute billions to the European economy by 2050, offering strong business growth and job creation opportunities. The ability to generate electricity from our tides is now proven; the challenge faced by the sector is to lower the cost of tidal energy.

The EnFAIT project focused on accelerating the development of the tidal energy industry by building on the success of the world's first offshore tidal array. Led by Nova Innovation, the project involved a consortium of world leading partners and quickly established itself as Europe's flagship tidal energy project. The primary aim of the six-year project was to reduce the cost of tidal energy by at least 40%.

EnFAIT embarked on achieving this in two key ways. Firstly, by improving the technology and doubling the capacity of the array from three to six turbines. Secondly, by expanding our knowledge and understanding of this natural resource and how we can harness the mighty power the tide to produce clean predictable energy.

Basing the project on an existing array minimised development risk and allowed the project to generate real-world results from day one. Key project objectives included:

- demonstrating a step change in the lifetime cost of energy for tidal power;
- capturing and disseminating substantial learning on fundamental issues for the ocean energy industry;
- taking a significant step towards creating a commercial, bankable tidal energy sector.

The EnFAIT project has been successful in delivering a major step change in the development of tidal energy and in strengthening Nova's world leading credentials in the sector .

## **Work performed from the beginning of the project to the end of the period covered by the report and main results achieved so far (For the final period please include an overview of the results and their exploitation and dissemination)**

EnFAIT has been a very successful flagship project that has lowered the cost of tidal energy and advanced the industry. The €20m project has delivered industry-leading results and demonstrated the scalability of tidal energy.

Key outputs, benefits and learnings include:

- Tidal Energy Lifetime Cost of Energy (LCOE) Reduction – financial modelling indicates that the LCOE for tidal stream energy has been reduced to €237/MWh: a 40.7% reduction from the €400/MWh baseline at the start of the EnFAIT project (in constant 2016 prices).
- Doubling the Size of the World’s First Offshore Tidal Array – the EnFAIT project doubled the size of the Shetland Tidal Array from three to six turbines, making it the array with the largest number of turbines in the world.
- Record-breaking Output of the Array – EnFAIT enabled the Shetland Tidal Array to set new records for generating hours, output and availability. Turbines T5 and T6 demonstrated 95% availability.
- 100% European Content – the EnFAIT turbines were delivered with 100% European content and 38% within the Scottish Highlands and Islands Region – delivering strong benefits to the local economy.
- Proven and Improved Performance of Turbines – Nova has used the learnings from EnFAIT to deliver an enhanced direct drive turbine, the M100-D. It has shown a capacity factor of around 30% at Bluemull Sound and the potential for 50% at more energetic sites.
- Proven Subsea Cable Hub Reliability – the project delivered a pioneering subsea hub for turbines T5 and T6, which enables the two turbines to send power to shore by a single export cable. This innovation reduces the cost of tidal energy and eases consenting.
- Reduced Operation and Maintenance costs – Nova slashed maintenance costs by 50% by undertaking annual maintenance on three turbines at the same time, recovering and redeploying the turbines within three weeks.
- Extended Service Intervals – EnFAIT smashed its service interval target of 6 months. The longest period of operation of a turbine without requiring maintenance was 29 months. The newer M100-D turbines are set to exceed this.
- Understanding Impacts of Array Layout on Turbine Performance – the project studied array layout impacts turbine performance in the array. This was successfully completed, with this industry enabling result improving the performance of future arrays.
- Environmental Datasets – the comprehensive monitoring programme enabled industry regulator, Marine Scotland, to independently ascertain that there have been no adverse environmental effects from the Shetland Tidal Array.

These results demonstrate the significant impact of the EnFAIT project. The project has delivered industry-leading results and demonstrated the scalability of tidal energy. The cost reductions and improvements in reliability and performance achieved are helping to demonstrate the bankability of this untapped and abundant source of predictable renewable energy.

**Progress beyond the state of the art, expected results until the end of the project and potential impacts (including the socio-economic impact and the wider societal implications of the project so far)**

Financial modelling utilising the results has demonstrated that the EnFAIT project has reduced the cost of tidal energy by 40.7% – exceeding the overarching project objective.

This significant reduction in the Lifetime Cost of Energy (LCOE) demonstrates the positive impact EnFAIT has had on advancing the industry, moving the European tidal stream sector towards sustainable and commercial multi-turbine arrays.

**Address (URL) of the project's public website**

<https://www.enfait.eu/>



# EnFAIT interactive stand at Science is Wonderful event in Brussels



ova Innovation M100D - T5 & T6 - community engagement: local school children chose the turbine name



University of Edinburgh students visit Nova Innovation's facility in Edinburgh



Nova Innovation M100D - T5 & T6 deployment activities



Nova Innovation M100D - T4 - Eunice - with the Northern Lights





Nova Innovation M100 turbine being deployed in Shetland



Nova Innovation M100D - T4 - Eunice - made in the EU



Nova Innovation M100D - T4 - Eunice - prior to deployment at the Shetland Tidal Array



EnFAIT impact on the European supply chain, growing from 4 EU countries in 2017 to 20 by 2023.



**Bluemull Sound, Shetland, with the tidal abundant tidal resource visible.**



**Nova Innovation M100 turbine operating in Bluemull Sound**



Nova Innovation M100D - T4 - Eunice - on Belmont pier, Shetland, prior to deployment.



**Bluemull Sound, Shetland, the location of the EnFAIT project, invisibly powering the grid**





**Nova Innovation M100 pre-deployment in Cullivoe, Shetland**

