



TIGER

Tidal Stream Technology and Project Development (WP T1) Interim Lessons Learnt

V1

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1 Introduction

1.1 The TIGER project

The TIGER project was launched in October 2019 and will be completed in 2023.

The TIGER project will build cross-border partnerships to develop new tidal stream energy (TSE) technologies, test and demonstrate them at a number of project locations (mainly around the Channel region), and use the learning from these developments to make a stronger case for cost-effective TSE deployments as part of the France/UK energy mix.

The aims of TIGER include the leveraging in of other funding for the actual installation of future TSE arrays at TIGER project locations, as important as obtaining the necessary consents within TIGER, which has been supported by the design work within TIGER.

The project will deliver new designs for turbines with improved performance and lower cost, as well as for associated infrastructure and ancillary equipment. TIGER will demonstrate that TSE is a maturing industry, capable of achieving an accelerated cost reduction pathway. The project will position the Channel region at the heart of the sector by:

- addressing technology challenges;
- building the supply chain;
- switching on new sites; and
- installing new turbines.

For more details of the TIGER project, see: <https://interregtiger.com>.

1.2 Work package T1 – project and technology development, and turbine and associated infrastructure deployment

Work package T1 is focussed on:

- Obtaining the necessary consents and licences for potential future TSE projects, either for completely new sites or for sites where a previous consent and/or licence needs updating (e.g., to allow the application of different technologies or project scale or approaches):
 - Updated consents/licences for two sites at Raz Blanchard, France, with project partners (a) Normandie Hydroliennes (formed of project and technology developer SIMEC Atlantis Energy (SAE), AD Normandie and EFINOR) and (b) project and technology developer HydroQuest.

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- Updated consent/licence at Perpetuus Tidal Energy Centre (PTEC, 2.5km south of Isle of Wight), England, with project partner European Marine Energy Centre (test and demonstration centre, EMEC).
 - Updated consent/licence at Paimpol Bréhat (test and demonstration centre), Brittany, France, with project partners Electricité de France (EDF) and SEENEOH (test and demonstration centre).
 - Updated consent/licence at Ramsey Sound, Wales, with project partner Cambrian Offshore South West (project developer).
 - New consent/licences at Gulf of Morbihan, France, with project partner Morbihan Hydro Energies (formed of project developer 56 Energies and project and technology developer Sabella).
 - New consent/licence at Yarmouth, Isle of Wight, England, with project partner QED Naval (project and technology developer).
 - Project development activities, including one or more of financing, design, fabrication, onshore testing, offshore installation, and operation of TSE turbines. This includes:
 - Planned offshore installation and operation of turbines within the TIGER project timescales at Paimpol Bréhat (HydroQuest, 2020-2021), Ushant Island, France (Sabella, 2022), Yarmouth (QED Naval, 2022), and MeyGen, Scotland (SAE, 2023).
 - Design activities for the projects planned to be installed after TIGER at Raz Blanchard (up to 30MW), PTEC (up to 30MW), and Morbihan (0.5MW).
 - Fabrication and onshore testing of the turbines for Morbihan (0.5MW).
 - Industry learning and dissemination, including this lessons learnt report and two “Guidelines for development of tidal energy projects” – one on consenting, and the other on site selection and development. The latter are accessible at: <https://interregtiger.com/resources/>.

1.3 This report

The aim of this report is to disseminate the lessons learnt from the activities within work package T1 for the first half of the TIGER project (to the end of 2021). It is intended that there will be an update to this report issued in Q2 2023 which will disseminate the lessons learnt from the remainder of the TIGER project.

The information within this report was compiled from information held by, and internal discussions between, OREC, Baldock Energy Limited, and the T1 project partners.

The value to the wider industry of any lessons learnt report is often in the detail of the experiences, rather than in any overall generic conclusions which may appear abstract or obvious. This report (and it is anticipated particularly the one to be issued in Q2 2023) therefore includes a number of the detailed experiences, to allow the wider industry to draw parallels between the experiences of TIGER and their own projects, even if wider industry participants face somewhat different circumstances. The project partners that experienced the lessons learnt are not named in this report, to protect confidentiality, and in many cases the experiences were common to multiple partners. Likewise, to protect confidentiality, the full details of the experiences are not provided.

Some of the experiences within TIGER form intellectual property that has commercial value to TIGER project partners and/or their suppliers. The sharing of lessons learnt has to balance the benefits of building a strong TSE industry with protecting the interests of TIGER project partners and/or suppliers and their investors. The internal process followed in developing this report has been open; however, there are some experiences and lessons discussed internally that are not included in this report.

1.4 T1 project partners

Details of all the TIGER project partners can be found here:

<https://interregtiger.com/about-tiger/project-partners/>.

Work package T1 project partners are those TIGER project partners with project and technology development and deployment activities: Cambrian Offshore South West, EDF, EMEC, HydroQuest, Minesto, Morbihan Hydro Energies, Normandie Hydroliennes, QED Naval, and SEENEOH. ORE Catapult is the lead partner for TIGER and hence involved in work package T1 as well as all other work packages.

European Regional Development Fund (ERDF)

The Interreg VA France (Channel) England programme is an EU programme that funds projects that benefit the Channel area in the south of the UK and the north of France, using ERDF funds. The programme provides funding for projects where partners work together to find solutions to common challenges in the Channel area.



2 Lessons Learnt

2.1 Collaboration

- It may be important for the lead project partner to promote collaboration and lead difficult discussions between other partners even where those partners are naturally required to collaborate on the project to achieve their project objectives. Project partners should request assistance from the lead project partner where necessary.



- Legal agreements always take significant time to agree, particularly where the partners operate in different languages.



Treating such items as a mini-project in themselves and using standard project management techniques such as setting out the required activities and milestones with deadlines may help avoid such agreements taking significantly longer than expected.

- Lead partners should outline the requirements of the project (including information provision) more clearly at the application stage.
- All parties need to be clear on what commitments universities can make, when these commitments can be made, and for how long, given the different funding models.
- Collaboration between partners, including between project developers or technology developers that are (to some extent) in competition, and between partners based in different countries (UK/FR), is possible. This can help reduce project timescales and costs, as well as promote a better general understanding of the sector with stakeholders and regulators. However, collaboration does not happen naturally and needs promotion by the project funder and/or lead partner.

2.2 Consents & licences

- Ensure changes in regulations, processes and stakeholders are understood when working on sites with existing consents.
 - Previously accepted approaches may change over time.
 - Grid capacity availability changes all the time.
 - Previous data (e.g., environmental baselines) may not be re-useable if too old or if it does not meet latest requirements.



- There have been relatively few TSE projects consented in France.
 - Projects therefore need to include significant contingency to allow for an extended consent approval period until more historical data is available.



- Particularly for environmentally sensitive sites, it may be better to plan for a worst-case consenting approach/regime than to have to switch the approach during the consent process (either due to regulatory requirements or changes in the project design envelope).

2.3 Design

- Design processes should have an integrated mass and dimensions requirements and management approach from early concept design, which is linked to key logistical step changes in approach or cost (e.g., use of certain vessels).



- Inaccurate cost estimating at the concept and outline design stages may lead to later delays at the detailed design and/or procurement stage, and can be mitigated by more detailed engagement with others and/or third-party review and/or higher contingency budgets.

2.4 Grid connection

- Grid connection agreements may be delayed due to lack of understanding of the process and/or a lack of information available on the new generating asset(s).
 - Sometimes, more information than is strictly necessary is sought by the DNO.
 - Expert advice and support should be sought for this work if internal expertise on the process and requirements is unavailable.

2.5 Local infrastructure

- Project partners need to ensure they have local knowledge or partners relevant to local infrastructure. Lead or other project partners may be able to assist.



2.6 Management



- Although there are resource implications, it is important to have a balanced representation during meetings – technical, commercial, policy etc. as different viewpoints can facilitate better discussion and/or decision making.
- Site developers (whether by design or necessity) need to ensure they have a good understanding of the overall site development process and timings, either internally or from partners or subcontractors, particularly for seabed leasing and environmental consenting, site data requirements and collection, and grid connection.
 - See TIGER 'Site Development' reports (T1.1.2 & T1.1.3) for further detailed information. These can be found at: <https://interregtiger.com/resources/>.
- Project funders and/or lead partners can assist through undertaking due diligence assessments of projects early in the project lifecycle and then providing follow-up project support and mentoring activities on project and technology development - which can be especially beneficial in bringing experience of multiple industry projects and so highlighting blind spots and the importance of 'knowing what you don't know'.



2.7 Marine operations



- Robust cost estimates are needed when considering project options and/or changes, as initial cost estimates often suffer from optimism bias. Marine operation costs in particular are often significantly underestimated.
- Relevant vessel availability, cost and cost variability are all known to be key for TSE turbine deployments.
 - However, external events (in this case COVID-19 and Brexit) can change these factors even more than is generally expected. Brexit has affected the requirements for UK-flagged vessels to operate in the EU.
- Have a credible O&M plan with associated vessel costs, which supports the LCoE requirements of the project. DP vessels designed or modified specifically for TSE operations may be suited to smaller turbines.

2.8 Objectives

- Lead partners should seek to understand all partners' motivations and details for their aspects of the project more clearly at the application stage.



Projects may be more successful if the project objectives and plans are more defined at the application stage than is possible in the application form (e.g., in work package execution plans), to enable a more focussed project implementation.

2.9 Operations

- Subsea cables may suffer degradation when abandoned (unused) underwater for (even relatively short) periods of time.
 - Cable testing is a complex task requiring specialist equipment and may need access to both ends of the cable. Expert advice and support should be sought to assist with decisions if internal expertise unavailable.
- Reuse and/or re-purposing of existing equipment is often more difficult than first envisaged. Quantifying the condition of existing subsea assets (foundation structures, cables, connectors, mooring equipment etc.) is difficult and a conservative approach to potential re-use is needed.
- Ensure the usability of legacy equipment (technically and commercially) is understood and take appropriate action to maintain and/or replace it as necessary.



2.10 Procurement and contracting

- Public funding body's and/or lead project partner's ability to guide project partners on public procurement requirements is invaluable.
- TIGER delivered a series of 6 themed supply chain webinars which looked into different areas of challenge for the TSE sector. Recordings can be found by filtering for "supply chain webinars" at: <https://interregtiger.com/resources/>.
 - Delivered together with technology developers, these webinars attracted over 500 individual participants and have since had a further 3,477 views online.
 - This is clear evidence of significant interest from the supply chain in becoming involved in the TSE sector.



2.11 Programme & budget

- Lead partners should set out their expectations for programme and budget forecast updates more clearly at the application stage.



Project partners should ensure they create and maintain a well-developed project programme and budget which can be used to actively manage the project.

Having a well-developed project programme and setting deadlines helps ensure activities that may become critical path do not.

- Even well-planned and well-managed programmes and budgets, with reasonable levels of contingency, can be affected by major external events (e.g., Brexit and COVID-19).



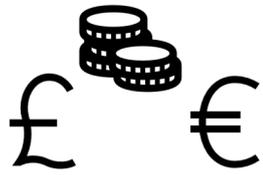
Although best practice programme and budgeting can assist with identifying issues earlier than otherwise, major changes to project objectives or funding requirements may still be required.

2.12 Programme

- There is a need for all project partners to understand the significant level of administrative requirements when planning for and resourcing large and complex EU funded projects.
- Make robust estimates of the time required for design work and its iterative nature together with internal approvals, and allow sufficient contingency to mitigate uncertainties.



2.13 Resources (funding)



- Project objectives and plans need to be well developed at the application stage to ensure robust budgeting. Opportunities may be needed to allow suitable project adjustments and identifying such opportunities as early as possible can help significantly.
- Ensure match funding is in place before starting a project; have an alternative project plan if funding does not materialise, which can be implemented in sufficient time to recover situation.
- Raising further investment in TSE technology and projects remains challenging, not helped by the more recent uncertainties due to COVID-19 and Brexit. The lack of clarity around support mechanisms in UK/France has been a major barrier, which was partially resolved for the UK only in November 2021.

2.14 Resources (people)

- The resources required need to be robustly estimated.
 - Even just the PM on grant-funded projects can be significant.
 - Project partners need to ensure sufficient resources and/or mitigations for cross-project delays if implementing multiple projects at similar times.
 - A more focussed, better planned and better resourced, approach may ultimately be more successful overall.



- Ensure project teams have access to the necessary project management and technical skills and experience to be able to effectively identify project requirements and to manage partners and subcontractors.

2.15 Site data

- The timescales and budget needed to agree access to data previously gathered by others can be much more significant than expected. As the seller and the buyer often have differing opinions on the value of the previous data, it may be prudent to plan to gather new data rather than rely on purchasing previous data.

3 Conclusions

- Undertaking large, collaborative, publicly funded projects requires significant planning by all parties, and all parties should be clear on their commitments and how they will be achieved.
- Projects may be more successful if the project objectives and plans are more defined at application stage than is possible in the application form (e.g., in work package execution plans), to enable a more focussed project implementation.
- There can be a significant period of time between a project application and funding award leading to project implementation. A short review at the project kick-off stage can assess whether project content remains 'current' or whether the project should be re-baselined if there have been significant approval delays. Alternatively, in some cases a much faster assessment and approvals process is possible and would mitigate the need for such an early review of the project.
- Site developers need to ensure they have a good understanding of the overall site development process and timings, either internally or from partners or subcontractors, particularly for seabed leasing and environmental consenting, site data requirements and collection, and grid connection. See TIGER 'Site Development' reports (T1.1.2 & T1.1.3) for further detailed information. These can be found at: <https://interregtiger.com/resources/>.
- Project funders and/or lead partners should undertake due diligence assessments of projects early in the project lifecycle and then provide follow-up project support/mentoring activities on project and technology development.
- Rigid funding criteria makes supporting dynamic project plans difficult but early and continuous assessment of possible issues can provide sufficient visibility to allow good change management.
- All project plans should be risk assessed or stress tested regularly – internally and externally to the project.
- Influences outside a partner's control can have a significant impact.
- Do not be over-optimistic when developing and committing to project programmes (even if 'fast track' options exist) and ensure sufficient contingencies are available for when 'best case' scenarios fail to occur.