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ICE
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ICE REPORT 2.8.1

ICE STUDIES FOLLOW UP AND IMPACT ASSESSMENT

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Pôle Mer Bretagne Atlantique

About ICE

Supported by Interreg VA France (Channel) England, the Intelligent Community Energy (ICE) project, aims to design and implement innovative smart energy solutions for isolated territories in the Channel area. Islands and isolated communities face unique energy challenges. Many islands have no connection to wider electricity distribution systems and are dependent on imported energy supplies, typically fossil fuel driven. The energy systems that isolated communities depend on tend to be less reliable, more expensive and have more associated greenhouse gas (GHG) emissions than mainland grid systems. In response to these problems, the ICE project considers the entire energy cycle, from production to consumption, and integrates new and established technologies in order to deliver innovative energy system solutions. These solutions will be implemented and tested at our unique pilot demonstration sites (Ushant island and the University of East Anglia's campus), to demonstrate their feasibility and to develop a general model for isolated smart energy systems elsewhere. The ICE consortium brings together researcher and business support organisations in France and the UK, and engagement with SMEs will support project rollout and promote European cooperation.

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1. Introduction

The ICE business model based on the methodology above **aims to promote employment, support labour mobility and enhance competitiveness of SMEs in the channel area and in other island or peripheral communities.** It is against that background that ICE partners launched a Call for Expression of Interest (CEI) lead by PMBA, which identified **26 companies** capable of providing innovative solutions for the energy transition of isolated territories. They were therefore labelled "ICE companies" **(find out the list of ICE compagnies)**.

This was a key phase of the ICE approach, as it helped identify and/or develop the local capacity for skills needed.

Then, a call for projects was launched side, thus allowing SME's to get a financial opportunity to develop their innovative projects and helped develop innovative solutions in favor of isolated territories within the framework of the project.

Four companies were thus awarded, with four innovative projects:

Table 3: List of the winning projects

Compagnie	Short project description
ENAG company	Development of an algorithm for the optimization of the battery storage of the Saint Nicolas des Glénan island power plant.
FARWIND Energy company	Feasibility study for the exploitation of mobile offshore wind energy in Marie-Galante in Guadeloupe (French overseas territory).
Guinard Energies Nouvelles company.	Site characterization, implementation and technical-economic study on the island of Molène
Swanbarton company	A study to identifying potential benefits from adding battery storage and commodity renewable generation to existing diesel electricity generation on Alderney with the goals of reducing costs for all residents and reducing emissions.

This document reviews the progress of the various projects, the impact of the call for projects, in particular the financial support, on the winning SMEs, as well as the benefits of the projects selected in isolated territories.

2. ENAG

2.1 Presentation of the company

ENAG is an industrial SME based in Quimper (France), it develops, design and manufacture equipment or energy conversion systems. Equipment such as battery chargers, backup power supplies, inverters, propulsion systems, smart grids.

ENAG includes about 100 employees including 1/3 in the design office, and 1/3 in manufacturing. Its markets are the marine, professional marine, recreational marine, military marine, renewable marine energies, offshore, rail and industry markets in general.

2.2 Presentation of the winning project

The awarded project is named: "**Development of an algorithm for the optimization of the battery storage of the Saint Nicolas des Glénan island power plant"**. Its goal is to Improve the Saint-Nicolas des Glenan power thanks to the creation of a second battery park and the design of a new algorithm for charge and discharge of batteries. To achieve this goal there are few key points to fulfil:

- Upgrade of capacity and autonomy range
- Allows suitable cycles of charge and discharge
- Improves lifespan of batteries
- Improves reliability of electric network by redundancy
- Easier maintenance
- Minimizes the use of gensets = saves fuel, pollution and money

To optimize the battery cycles, it is necessary to combine different modes piloted by the algorithm:

1. **STOP:** batteries and converters switched off
2. **CHARGING** only
3. **DISCHARGING** only
4. **CHARGING / DISCHARGING**
5. **BOOST CHARGING**

3. FARWIND

3.1 Presentation of the company

FARWIND is a technology development company that aims to develop energy ships, to produce energy from the wind on the high seas. It is a company / technology that develops sailboats that will capture the energy of the wind and deliver it to decarbonize islands, in particular … which will not be interconnected with the territory.

3.2 Presentation of the awarded project

FARWIND has benefited from the ICE funding in order to develop its project: "**Feasibility study for the exploitation of mobile offshore wind energy in Marie-Galante in Guadeloupe (French overseas territory)".** it is a project that is being integrated within the French multi-year energy plan (PPE) in Guadeloupe, aiming at increasing the renewable energy penetration in Guadeloupe. Renewable energy share is evaluated at 23% in 2020 in Guadeloupe. The project has been developed in collaboration with Grand Port Maritime de Guadeloupe and in discussion with grid operator EDF SEI.

FARWIND energy production allows the penetration of other renewable sources in the grid via 2 grid services provision: load displacement and frequency reserve. The renewable energy production is stored in batteries (10 to 40MWh per ship and 24h-cycle). The energy is offloaded on the network at the most appropriate timing (notably during peak consumption between 6 and 10pm). All or part of the battery set standing on the quayside is put to profit to store energy in case of surplus on the grid (e.g. at noon – peak solar PV production). FARWIND solution is therefore complementary to already identified and implemented solutions within the Guadeloupe roadmap to energy autonomy.

The energy delivery profile aims at matching the following objectives:
- Grid services maximisation
- Production cost of energy minimisation
- Energy production maximisation

Therefore, the project objectives have been diverse:

1- Assess the complementarities between FARWIND solution and a consistent existing roadmap (cost reduced thanks to storage mutualisation, grid stability and job creation)
2- Plan the deployment and grid connection of FARWIND Energy solution in Guadeloupe in 2024
3- Prepare an action plan for a successful commissioning in Guadeloupe

In conjunction with the agreements in place, 2 missions in Guadeloupe have been performed in November and December 2021. The strategy was to carry on with local stakeholders' collaborations and in particular Grand Port Maritime de Guadeloupe avec EDF SEI.

4. GUINARD

4.1 Presentation of the company

Guinard Energies Nouvelles is a Brest-based start-up that has developed a tidal turbine technology that it markets today. it develops small and medium-power tidal turbines which are mainly linked to non-interconnected zones. They are suitable for installation in coastal, estuarine and river areas, which in fact makes it possible to be close to the consumer and who precisely to be able to address the market in those places which are not interconnected to the network or which are isolated.

4.2 Presentation of the awarded project

GUINARD carried out a study: **"Site characterisation, implementation and technical-economic study on the island of Molène".** It consisted of evaluating the tidal power resources around Molène Island located in French Brittany. This island, like other islands in France, is not interconnected to national grid and its electricity is produced by using diesel generators which consumes around 1000 litres per day.
Tidal power resources assessment documented the following analyses, was carried out with Telemac-2D and GuiHome softwares:

- High resolution numerical model computation,
- Identification and classification of interesting areas,
- Definition of tidal turbines configuration and installation site
- Power production of the configuration selected

This study has enabled the identification of areas suitable for the installation of turbines, considering the hydrokinetic potential and the installation constraints.

Three areas were selected and analysed, and power production calculations were made for the most suitable area. A preliminary tidal turbines configuration was proposed. Thus, a system consisting of three 20kW P154 tidal turbines would produce 66MWh of electricity per year, or 5.5% of the island's consumption. It would also save 22,000 litres of diesel per year, i.e. 440,000 litres over 20 years, and avoid the emission of 1,140 tons of CO^2.
This approach which consist to install medium size (coastal) tidal current turbine close to the shore and consumers can be extend to others French Islands (Sein, Chausey) or overseas territories (Guyana, French Polynesia) and for any isolated territories.

5. SWANBARTON

5.1 Presentation of the company:

SWANBARTON is an expert in energy storage, who has developed a portfolio of patented products which offer cost benefits from better control of energy use, exchange, and storage. Based in the UK, its team of engineers and analysts offer skills in

storage technologies, control systems, commercial analysis, energy industry regulation, innovation, product development, and project management.

5.2 Presentation of the awarded project

The AWANBARTON awarded project is: **"A study to identifying potential benefits from adding battery storage and commodity renewable generation to existing diesel electricity generation on Alderney with the goals of reducing costs for all residents and reducing emissions".**

This study focused on identifying potential benefits from adding battery storage and commodity renewable generation to existing diesel electricity generation on Alderney with the goals of reducing costs for all residents and reducing emissions.
average electricity demand is ~0.76 MW, with a peak of less than 1.5 MW. Alderney residents pay ~45 p/kWh, of which ~15 p/kWh covers the cost of the diesel. If the levelized cost of energy from renewable sources is lower than 15 p/kWh, there is scope to reduce diesel generation utilisation, reducing costs and emissions. Deploying renewable generation also diversifies the energy mix, reducing consumers exposure to volatile fossil fuel prices. The study indicates that it is viable to deploy PV and wind turbine generation on Alderney for less than 15 p/kWh.

6. Projects follow up

As part of the monitoring of projects funded by ICE, Pôle Mer Bretagne Atlantique interviewed the 3 French SMEs that had received funding. this made it possible to have their perception of the problem of isolated territories in general, their feedback on the ICE funding initiative and their involvement in the framework of a European project. The results of these interviews will be presented in the form of Q&A.

6.1 ENAG: "Development of an algorithm for the optimization of the battery storage of the Saint Nicolas des Glénan island power plant"

- **<u>On which isolated territory you have already been able to install products? What are your criteria of interest for having these isolated territories in particular?</u>**

Systems have now been installed in Saint Nicolas des Glénan, and then on the Ile de Sein. And then ENAG have installed equipment on dozens of offshore platforms around the world.
The criteria is the know-how where ENAG manufacture equipment that lasts a long time, that is reliable, that is designed to withstand harsh environments, that is designed to be redundant, to be sometimes controlled remotely.
So, these equipments, these systems are particularly suitable for isolated networks, which by definition are difficult to access, and in which it is quite difficult to troubleshoot.

- **Regarding the island Saint Nicolas des Glénan, since when have you had to work with the island and install products?**

ENAG have initiated the project in Saint Nicolas 3 to 4 years ago. When ENEDIS and the townhall of Fouesnant decided to retrofit the smart grid of Glénan. And that's when ENAG started working together with Enedis, with the town hall of Fouesnant. The project lasted 1 year, 1 year and a half, and we congratulate it today it is a real success.

- **How, according to you, can we accelerate the implementation of this type of proposed solutions in other territories to make other territories independent?**

First, this type of project, this type of solution, is technically quite mature, quite derisked. Therefore, there is no technical risk, little execution risk. Ecologically, it definitely makes sense, as it helps reduce the consumption of oil, the use of generators drastically,
So, there aren't really many questions either. The real issue is economic, that we do not necessarily have projects that are economically viable, or local authorities do not necessarily have the resources to finance this type of project today. So public intervention remains necessary for this type of project today and I think that the accelerator is there, it is really in the financial means that will be put behind the construction of these infrastructures.

- **Regarding ICE, how was your company involved in this project?**

ICE funded a study that aimed to model and then develop an algorithm to study what the consequences would be. the saving of diesel consumption precisely in Glénan if we went to two battery parks rather than one.
With a result that seems to us extremely significant since today we think that we would manage to save 7 tons of diesel per year if we set up a solution with a second battery park. It is not only a question of putting a second battery park, it is a question of setting up a second battery park but also of modifying the operating rules to optimize the use of battery parks.
Both the charge and the discharge, and we also optimize at the same time the aging of the battery park that is already there.

Did you know that European projects can offer an opportunity like this, even if it is small financing? Do you already have any other experience of a European project in which you would have benefited from such assistance?

Yes, ENAG has already been involved in several European projects such as OceanQuest, which allowed to build a tidal turbine that was installed in Paimpol Bréhat. And, the ARPEGE project, an innovative fishing vessel project. These two examples are only ones with physical achievements.

So globally to be able to participate in these European projects, even if it is on a smaller scale, what are the advantages for you?

In fact, European projects can be an accelerator for an SME like ours. It can also advance the state of the art. What we did on Saint Nicolas is typically that, we set up the smart grid which works extremely well, the second battery park it was not set up for budgetary reasons. We, intuitively, given what we know about our job, we said to ourselves, surely there is an

interest, the European project he said: well try to quantify this, is it worth it? And indeed, it was an accelerator otherwise this study would not have done it, we would not have gone to the end.

What is your opinion on initiatives such as the one that the ICE project has initiated to provide local companies with European aid?

I think that this is the right approach to have organizations such as the Pôle Mer Bretagne Atlantique (as a project partner and a maritime cluster) that have a good knowledge of the local industrial fabric and that are actually able to launch European projects and distribute European subsidies to advance research, innovation, technology and tomorrow's solutions, we are typically in what needs to be done. It's a really good initiative and in my opinion, there should be a lot more.
Applying to European projects is a really long process for a SME, and when a cluster such as PMBA intervenes and suggests to you to make a study on this or that subject, we have European funds, tell us what you are able to do and then we will place an order with you. We are on a process that is extremely fast, this is what gives us confidence on which we say, "it makes sense".

What will make it possible today to accelerate the energy independence of isolated territories?

First, energy independence is not an objective in itself. The goal is to decarbonize as much as possible, now if to decarbonize you must pull a cable and well pull a cable. That there is energy independence is not the subject. So that's the first point, we really have to say, the problem is not energy independence, the problem is decarbonization.
Today, in my opinion, the objective is much more ecological and economic efficiency, and then risk management. That's really the point. If we take the example of Saint-Nicolas, the use of generators means that we handle diesel, it means that we have diesel that is on a boat, that after we have to unload on land, the manipulations, so not only is there an ecological problem, there is an economic problem, and there is a risk management problem.
And I think the solution for that is to leave the hand to local actors. Local actors, solutions most of the time they have in mind. They have them in mind, they imagined them, they designed them, they found partners to do it. So, we must leave the hand to local actors on the one hand and then on the other hand that have its projects carried out by companies or organizations in which SMEs can trust, and with which SMEs will not be too afraid to work.
At Glénan, we worked with ENEDIS, the collaboration with ENEDIS was remarkable. It is easier for us to collaborate with a company like ENEDIS that is used to doing work, which is used to carrying out projects rather than finding itself in a kind of pulse with a consortium, with a client who is an administration with which we SMEs do not necessarily know how to work very well. And so there will be a risk to apprehend. That is what I can say about accelerating the energy efficiency of these isolated territories.

6.2 FARWIND: “Feasibility study for the exploitation of mobile offshore wind energy in Marie-Galante in Guadeloupe (French overseas territory)”

Can FARWIND develop in several territories?

Yes, so the FARWIND energy technology is versatile in fact it will target island territories, typically around 200 megawatts of peak power on the grid and we will suddenly develop one to ten ships per territory, which we will be able to connect either directly to the quay, or via an unloading buoy.

How can FARWIND be deployed in isolated territories?

the FARWIND technology in fact is compatible with many different territories on a global scale, the electricity market on the islands is valued at 30 billion euros annually, so it is really a colossal market and we will have hundreds of islands that we will be able to address. The islands that we will be able to address bring together three different characteristics: the first is a strong policy to decarbonize energy, land constraints that are strong in particular to deploy solar or wind, and the third is a need for storage. Technology will bring these three added values for island networks.

How was FARWIND involved in the I.C.E. project and what did you get out of it?

So we heard about the I.C.E. project since we are a member actually of Pôle Mer Bretagne Atlantique (partner of the project), so therefore we had access to that tender, and through the award we were able to do two different things on the Guadeloupe territory in the Caribbean, with first a year production analysis so how much an energy ship could produce in this territory, and on top of that we did a consumption analysis to see if there is a match between the time we produce and the time they consume.

What do you think of the ICE initiative that involves the SMEs in European projects?

The Pole Mer Bretagne Atlantique initiative is great because it provides direct funding access and quite oftenly feasibility study funding typically 30k€ to small innovation company and they can leverage that direct access to members through that funding.

What is FARWIND's long term vision on the energy independence of the islands?

The islands have a very important challenge to take up on energy independence, already there are two different aspects: the first is electrical independence, succeed in producing electricity on the territory and the second is energy independence, especially on all fuels that will be used. One of the major challenges is obviously to produce enough power and energy on the territory but the second challenge is really the issue of storage, to succeed in storing the energy that is produced because obviously we are isolated from other territories.

6.3 GUINARD: "Site characterisation, implementation and technical-economic study on the island of Molène"

Who is the target audience for your tidal turbines?

we really address the non-interconnected market, so it can be the inhabitants of the islands, even in metropolitan France as on the archipelago of the Ponant Islands, there are still islands that are not interconnected, which are powered by generators, it can be the inhabitants also of the Polynesian atolls to stay in France, there, overseas, and also it will address the African market, with villages that are close to rivers, the South American market also and we also have contacts in the Philippines, everything that is Asia Pacific.

How did GUINARD get involved in the ICE project?

We saw the call for projects through Pôle Mer Bretagne Atlantique which therefore proposed to energy specialized companies to apply for this call for projects. And precisely in relation to our field of activity, i.e. interconnected areas and renewable energy production from marine resources, we were in line with this call for projects.

What the benefits were for your company and this call for projects: what did it bring you?

This call for projects allowed us to carry out a study at the level of the potential at the level of the island of Molène, to be able to make known our company and our products, our solutions, our skills to local actors, so the officials of the town hall of Molène, the Syndicat D'Energie du Finistère, the SDEF, also discuss with the Marine Park of Iroise and actually promote our products, show our solutions which, we hope, one day will also find a market in metropolitan France.

In relation to this study, are there already benefits for your company?

So following this study and the presentation of the results, there is a project developer who contacted us and who expressed an interest in this study, so we really Guinard Energies Nouvelles are suppliers of expertise and technology, so we must rely on a project leader and after, If he decides to go further, it is what financial leverage we can try to find together to carry this project to an industrial realization.

Could you give us your opinion on the ICE initiative launched by Pôle Mer Bretagne Atlantique to allow local companies to benefit from European aid, via its European projects?

I think the initiative is very good, for various reasons: on the one hand, a competitiveness cluster like the Pôle Mer is there to support companies. When you are a small or medium-sized company like you are at Guinard Energies Nouvelles, it is sometimes difficult to access European aid to develop our projects and technologies and continue our innovation, and therefore to have the relay of the Sea Pole to help us achieve these projects, it is entirely beneficial for us, it could not have been done alone or even through a consortium of SME-type companies.

According to you, what would accelerate the energy independence of isolated territories?

I think that on the one hand, there is a real involvement of local actors and decision-makers. Today, we have technical solutions, we Guinard or others for other technologies, of course. There is an economic lever, on the one hand, which is that it is still technologies that need to be industrialized in a greater way to reduce their costs. So for me the biggest factor

is real support, a real will at the regional, local level, at the national level, to say this is where we want to go, we are making the effort to go because we know that this is the future.

6.4 SWANBARTON: "A study to identifying potential benefits from adding battery storage and commodity renewable generation to existing diesel electricity generation on Alderney with the goals of reducing costs for all residents and reducing emissions".

The Alderney study found that there are some immediate actions that could be done to help decarbonise the island, but that an over-arching strategy was difficult to define because of important areas of uncertainty. The main one was that the future construction of the proposed interconnector would have a significant influence on the kind of Alderney energy infrastructure that would be optimal. This is largely a political uncertainty not a technical one, and similar areas of uncertainty are likely to also be present on other islands.

Nonetheless there are incremental improvements that could be made, particularly in terms of deployment of local renewable generation assets (PV solar, wind turbines and possibly small-scale marine current turbines) independently of more major infrastructure investment. The addition of battery storage was also analysed: whilst such energy storage is certainly feasible and could be environmentally beneficial, it is not possible at present to determine the return on investment without more data on load profiles.

Other important factors present on Alderney (and which might also be present on other islands) are the diesel generators used for back-up and peaking plant are relatively new and therefore there is little appetite at present in replacing them. However, there could be interest and benefit in replacing the diesel fuel with bio-based alternatives that would reduce pollution emissions and net carbon emissions.

A further factor that affects what is realistic on Alderney is the current power supply business model and pricing arrangement. A market-based solution to this issue is difficult to identify, and it seems likely that a much stronger political intervention would be needed to drive change.

7. Survey of the French awarded companies

in order to assess the relevance of the ICE Call for projects, Pôle Mer Bretagne Atlantique sent a survey to the 3 French companies that had received funding. This has allowed to evaluate the relevance and the efficiency of this action.

The survey was done and sent via "SurveyMonkey" platform, from which the results were directly collected:

ICE- Call for SME projects: Supporting the energy transition of isolated territories

#1 ENAG

Q1

Please complete the following information

Company	**ENAG**
Project title	**Development of an algorithm for the optimization of the battery storage at the Saint power station Nicolas des Glénan**
Subsidized amount	**25000**

Q2 **Very interesting**

How would you qualify this initiative?

Q3 **Entirely**

The ICE grant funded your project

What was the role of ICE funding in the realization of your project?

Q4

Funding contributed to implementation but was not essential

Q5

What were the main results of your project? you can send one (or more) file(s) to illustrate your answer to the address: europe@polemer-ba.com

Demonstration of the economic, energy and environmental benefits of the architecture of an isolated network with 2 battery banks.

Q6

Overall and as an SME, how would you rate this initiative? **excellent**

Q7

Finally, do you have any comments, suggestions or remarks?

The lead batteries of the Saint Nicolas des Glénan power plant will be replaced by Lithium Iron Phosphate batteries in 2023.

#2 FARWIND

Q1

Please complete the following information

Company	**FARWIND Energy**
Project title	**Opportunity study of the exploitation of ship-energy in Guadeloupe**
Subsidized amount	**25000€ excluding tax**

Q2 **Very interesting**

How would you qualify this initiative?

Q3 **Partially**

The ICE grant funded your project

Q4

The project could not have been implemented without this funding

What was the role of ICE funding in the realization of your project?

Q5

What were the main results of your project? you can send one (or more) file(s) to illustrate your answer to the address: europe@polemer-ba.com

Opportunity study for the deployment of an energy ship in Guadeloupe

Contacting key stakeholders in Guadeloupe

Constitution of a crucial database for the project

Q6

Overall and as an SME, how would you rate this initiative? **excellent**

Q7

Finally, do you have any comments, suggestions or remarks?

There are few initiatives such as the calls for initiatives of the ECI INTERREG to contribute to the advancement of sustainable energy projects for island territories. It is a really useful choice, with a simpler instruction and audit process than other support measures, at national and European level. ECI INTERREG is very suitable for SMEs.

Thank you again for the organization and the excellent communication that was made around.

#3 GUINARD

Q1

Please complete the following information

Company	**Guinard Energies Nouvelles**
Project title	**POHMO (Molénais hydroelectric potential)**

Q2

How would you qualify this initiative?

Very interesting

Q3

The ICE grant funded your project

Entirely

Q4

What was the role of ICE funding in the realization of your project?

The project could not have been implemented without this funding

Q5

What were the main results of your project? you can send one (or more) file(s) to illustrate your answer to the address: europe@polemer-ba.com

A pre-study of the tidal stream potential of the island of Molène allowing many actors of Molène (Municipality, Marine Park, EDF) to have data on the interest or not of launching an in-depth study for the installation of tidal stream turbines near the island of Molène.

This project also enabled Guinard to develop and test its tools for tidal stream potential simulation and study applied to its technology.

Finally, the POHMO project enabled many players in the energy, oceanography, environment and local authorities to meet during the presentation of the results in Molène. This had the effect of initiating discussions around potential other studies on the Breton islands.

The POHMO project, financed by the ICE funds, is the highlighting of the know-how of Breton companies in the development of renewable marine energies for the islands of the territory.

Q6

Overall and as an SME, how would you rate this initiative? **excellent**

Q7

Finally, do you have any comments, suggestions or remarks?

Continue to offer small-scale budgets to allow small structures to carry out studies similar to POHMO, allowing both to develop SMEs and to promote the know-how of these companies around the environment, the sea and the energy.

8. Conclusion:

There is a diversity in the awarded projects. In fact, were selected: **a feasibility study, a site characterization study via modeling and two storage optimization related projects, based on existing technologies.**

Also, the four projects **address urgent energy independence issues** in isolated territories. They make it possible to **respond to actual needs** reported by the territories in question.

The Call for Projects also made it possible for these SME's to **benefit from European funding in a more simplified** way than usually possible, since they all have been funded through ICE project.

In order to evaluate the relevance of this call for projects in favor of SMEs, a survey was launched among the 3 awarded French SMEs.

All SMEs considered the initiative "very interesting". 2 out of the 3 SMEs estimated that their projects could not have been implemented without the ICE funding since it allowed them to finance their projects entirely.

To support growth and innovation, **access to finance is crucial,** especially considering the high level of risk attached to the sector of earlier stage renewables, renewables and its smart technology enablers.

In parallel with the call for projects on the French side, the ICE partners carried out an **inventory of possible funds** on both sides of the Channel in order to help SME's overcome the barrier of access to finance.

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