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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.

Summary

This document presents the ICE Call for Projects which follows the deliverable outlining the ICE network of ICE-certified businesses. This Call for Projects targets enterprises supplying innovative solutions for the energy transition of isolated territories. The three 25k€ selected projects are helping these territories achieve energy independence using low-carbon facilities, as well as contributing to a renewable energy mix.

This document sets out the context of the Call, the evaluation process and the winning projects. This Call offers the opportunity for French firms to launch feasibility studies, market surveys, territorial acceptance surveys, or proof-of-concept and prototypes. It also provides an opportunity to extend their market to a specific non-interconnected area (ZNI).

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1. Introduction

The main goal of this Work Package is to design the business model for the energy transition of isolated territories using smarter energy system, integrating low carbon electricity generation and demand reduction. In this way, ICE will promote employment, support labour mobility and enhance competitiveness of SMEs in the channel area.

Previously, a Call for Expression of Interest (CEI) identified 26 firms capable of supplying innovative solutions for the energy transition of isolated territories. The survey also illustrated the firms' needs, expectations and the barriers to the implementation of their systems in hard-to-reach areas. This firms have been 'ICE certified', which give them access to a database of isolated territories case studies, offers an increased market exposure, facilitates collaboration between labelled companies and provides support in identifying possible sources of funding.

Further to the CEI, the ICE partners implemented a call for projects. Eligible businesses must be able to provide solutions or services within the framework of low carbon energy models for isolated territories. This action is conducted by the Pôle Mer Bretagne Atlantique with support from Bretagne Development Innovation and Marine South East. This document first introduces the Call for Projects with a description of the implementation method including the aim and objectives and all the necessary stages to launch the call. In a second step, the selection criteria is detailed and the three selected companies by PMBA are described their projects and the results they get. To end, the project financed through MSE is outlined.

2. Method: PMBA Call for Projects and selection

2.1 Context and goal

PMBA had launched a Call for Projects with the aim of qualifying French firms, allowing them to get a financial opportunity which is an important aspect of the ICE approach. The purpose of this call was to pinpoint companies capable of bringing innovative solutions to energy transition for isolated territories.

Extending the national network to these areas is extremely costly and difficult. By contrast, off-grid systems are flexible, easy to use, cheaper to implement and adaptable to local needs and conditions. They may also integrate local sources of renewable energy to supply electricity. The idea is to achieve a 100% renewable energy mix by 2030 by acting on demand management, production and network management. There are several areas with market opportunities in energy transition: the supply and storage of renewable energy, smart technology to manage electricity, data analysis, installation and maintenance.

2.2 Eligibility criteria

This Call for projects is focusing on French SMEs working in the smart energy solutions sector. Eligible type of projects includes feasibility studies, market surveys, surveys to determine territorial acceptance or proof-of-concept and prototypes. Projects must focus specifically on the needs of isolated territories and/or specific islands.

SMEs had to complete an application form and be able to explain on which problem of energy isolation they are focused. They had to specify the innovative nature of the solution and its implementation in a Non-Interconnected Area (energy production, storage and distribution). It was required to show how the more difficult access conditions of island territories are considered and to describe the technological, usage and technical-economic barriers to be removed.

In addition, the SMEs have to list the positive long-term socio-economic impacts, such as the number of jobs maintained or created, the strategic challenges for the company, the expected value added in terms of patents or scientific publications, the impact on users and behaviours.

2.3 Funding

They had to suggest innovative projects, within a budget range of 15 to 25k€, and lasting up to four months (starting in July 2021). SMEs should not be in a situation where they cannot receive public support. The total cost of the project may slightly exceed €25k, the difference being charged to the company.

R&D costs are considered eligible expenditure and it includes payroll, out-sourcing costs and hardware and software costs. Travelling/mission expenses are not considered eligible. Funding must be declared as “minimis” government aid. A single payment is made at the end of the project based on a recap of expenditure; all expenses must come with proof.

2.4 Launch of the Call

Figure 1 : Communication design of the call for projects

This call for projects followed the following schedule of milestones: Launch of the call for projects (4th May 2021 – 11th June 2021)

- Setting up a panel (May 2021)
- Selection of winners and subsidy agreement (25 June 2021)
- Implementation of winners’ projects (as from July 2021)
- Reports on the winners’ projects (October-December 2021)

3. Results of the Call for Projects

3.1 Selection process

In order to select the winning projects, a selection committee has been put together, involving 2 Partners of ICE project: PMBA and BDI, a representative of an isolated area from SMILO (Small Islands Organisation) and an expert in energy transition from SDEF.

This committee examined the projects and gave them a score from 1 to 5 on each of the following criteria:

- Suitability of the solution to the energy needs of isolated territories
- Contribution to reducing the territory's CO2 emissions
- Innovative nature of the solution
- Level of benefit and added value of the service
- Potential economic impact
- Viability and growth potential of the project
- Respect of the maximum duration of 4 months and the budget
- Involvement of an isolated territory

3.2 Winning Project n°1

ENAG company

Company activity: Design and manufacture of energy conversion systems (battery chargers, inverters, converters), electric rotating machines (motors and generators).

Project description: Development of an algorithm for the optimization of the battery storage of the Saint Nicolas des Glénan island power plant.

Overview:

The target of the project is to Improve of 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**

This work on an adjusted algorithm enables to edit some estimated fuel savings and conclusions. The new architecture with 2 battery packs allows at least +96kwh capacity (higher DOD). With +96kWh, 2 battery parks of 320 kWh allow an average fuel saving of approx. 64 liters/day in June, July, August (high period of energy consumption) and approx. 50 liters/day from May to September (estimation of 7650 L of fuel savings).

3.3 Winning Project n°2

FARWIND Energy company

Company activity: Development of a sailboat with a tidal turbine technology. Feasibility studies, design, production, operation, maintenance. Sale of energy production systems, sale of spare parts, sale of energy produced by these systems. Consulting and engineering in innovation, environment and sustainable development.

Project description: Feasibility study for the exploitation of mobile offshore wind energy in Marie-Galante in Guadeloupe (French overseas territory).

Overview:

The project is currently 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.

Guadeloupe is a Caribbean archipelago with 380 000 inhabitants. Its electricity production is about 1700GWh/year. Second to the 2015 French energy law (LTECV), France requires its overseas territories to become energy autonomous by 2030. Region Guadeloupe currently negotiates its own PPE and anticipates a burst in solar PV deployment as well as its excellent wind potential, due notably to trade winds which provide regular average wind speed. Nevertheless, the potential by 2030 is constrained by electrical grid stability, the social acceptance and the time to market of these projects. Besides, the limited local content hinders the proper integration of these projects in the territory.

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 project has studied the opportunity of a FARWIND Energy ship deployment on Basse-Terre port.

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.

3.4 Winning Project n°3

Guinard Energies Nouvelles company:

Company activity: Designer and installer of tidal turbines and hybrid production systems for the Non-Interconnected Areas.

Project description: Site characterisation, implementation and technical-economic study on the island of Molène.

Overview:

This study, carried out within the framework of the ICE Interreg project, 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, taking into account 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.

4. MSE Project: SWANBARTON

Following the French Call for projects, MSE has also contributed to financing an innovative project from Swanbarton company:

Company activity: 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.

Project description: 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.

Overview:

Alderney's 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.

We have assumed that:

- If the France-Alderney-Britain 1,400 MW interconnector (FABlink) and/or the 2,000-3,000 MW tidal array in Raz Blanchard (Normandie Hydrolienne, Simec Atlantis) proceeds, it will not be financially viable to bring the cable ashore and 'tap off' a small supply for Alderney.
- Diesel generation will remain in place for backup and peaking purposes: no cost savings have been considered from reducing diesel generation capacity.
- Electricity distribution or supply cost will remain unchanged.

The study also observes that:

- There are established green finance mechanism for investor/community funding renewable generation deployment in-front-of-the-meter. New tariff structures may be appropriate for behind-the-meter renewable generation.
- Any displacement of diesel or gas with biofuels would improve CO2 emission metrics.
- Harvesting waste heat from combustion generation would reduce emissions and potentially provide additional revenue to reduce costs.
- Electrification of heat might reduce emissions, with a high efficiency heat pumps and sufficiently high renewable generation.
- The current electricity supply business model does not lend itself to local energy trading.
- We considered adding BESS to the current diesel gensets to modulate the load, minimise the requirement for a genset to be operating in a spinning reserve mode. As we have no data on second-by-second power variations, we cannot assess this element of the potential efficiency saving. Therefore, an accurate estimate of the required BESS capacity cannot be made, or an accurate estimate of the diesel generation efficiency improvement.
- A key consideration is the BESS controller, which must effectively manage State of Charge with respect to the round trip loses. Swanbarton has previous experience of controllers as part of the Port Energy Systems Optimisation (PESO) project at Portsmouth International Port (PIP)

Swanbarton recommends that the energy stakeholders on Alderney consider steps that can be taken in the near future to deploy on-island commodity renewable generation (wind, PV, small local tidal), rather than waiting for large infrastructure projects (FABlink and Raz Blanchard tidal) that might not supply Alderney's electricity customers at an attractive price, or at all. This could be facilitated through a small trial of local, distributed, domestic renewable generators, such as solar PV. We recommend that a parallel trial of a small local P2P market is also established – in the first instance using proxy financial tokens, to illustrate and learn from trading without penalising the early adopters. This methodology has been used on Iona, 2018, to illustrate the benefits to consumers in a financially risk free environment.

5. Conclusion

These four examples of SMEs funded through the ICE project address urgent issues of energy independence in isolated territories. They make it possible to respond to real needs reported by these territories and to build a close collaboration to carry out larger projects. As they are locally based, they can operate quickly on site and adapt to specifications that may change over time, depending on the demand. It is also a chance for this SMEs to benefit from European funding in a way that is simplified by the ICE partners.