GREBE

Northern Periphery and Arctic Programme 2014–2020

EUROPEAN UNION
Investing in your future
European Regional Development Fund

IceWind

Extreme Energy

Introduction

IceWind designs and manufactures small vertical axis wind turbines for telecom towers and residential applications such as homes, cabins and farms.

The IceWind vertical axis wind technology has been designed in response to the growing demand for renewable technologies. It demonstrates that turbines can be an elegant, quiet, durable, cost effective and nearly maintenance free solution for energy production.

The company was founded in 2012 but development goes back to 2008, when Anemometer was designed as a final project in University of Iceland, where it all started.

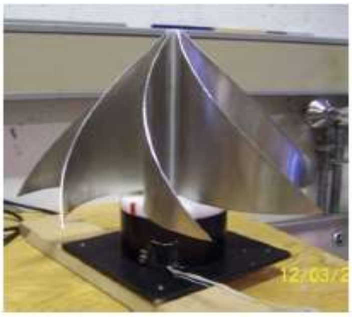
Case Study Approach

The data on the market access of renewable energy technologies were collected both from the case studies in different renewable energy technology projects and from the secondary sources. To collect specific project data, a template was established with following subsections:

- **Technology description and a project summary**
  - Innovative characteristics
  - Technology readiness level
  - Available product / service supports from the manufacturer
  - Any standard procedures / requirements for integrating the technology into existing electricity networks, buildings and/or mainstream energy appliances / systems
- **Commercialisation of the technology**
  - Is the technology already a commercial solution?
  - Are there re-sellers of the technology, or is the technology available only from the manufacturer?
  - Identified main market area
- **Cooperation partners and networks**
  - Description of the roles of the co-operation partners and networks in the RE technology project.
  - How have they supported the market access of the technology?
- **Assessment of the technical and economic risks**
  - What kind of procedures have been made for assessing the technical and economic risks of the project
  - Who is bearing the risk of the investment (manufacturer, client, shared between them)?
  - Is the public sector involved in risk sharing? (e.g. co-financing, or platform for technology demonstration)
- **Drivers and barriers in the RE technology project**
  - Main drivers in carrying out the RE technology project
  - Barriers, and how they have been overcome (such as price of energy, availability of resource, specific expertise, policy enabling the technology)
- **Funding and support mechanisms**
  - The financial support received by the project: amount/support rate, type and purpose of the support, agency providing the support, significance of the support for the project
  - Types of soft support/advisories received during the project: the use of soft supports (advisory, training, mentoring etc.) during the technology development or implementation, and how successful these have been
- **Monitoring the performance**
  - How are the technical/non-technical aspects of the RE technology case monitored?
  - Information on the design, installation requirements and procedures, operational performance, and costs/financial arrangements
- **Conditions for the technology transfer & adaptation in different partner regions**
  - What are the main requirements/preconditions for transferring the technology and applying it in other partner regions?
  - Description of the main drivers and barriers for the technology transfer (such as. Energy price, resource needs, certain support etc.)
- **Project results**
  - Benefits & lessons learnt
  - Post- project benefits

Technology Description

IceWind designs and manufactures small vertical axis wind turbines for telecom towers and residential applications such as homes, cabins and farms. The turbines produced by IceWind Ehf range from 2m-2.5m high and 1m-2.2m wide. They are made from carbon fibre, stainless steel and aircraft grade aluminium. They are mounted vertically and are a low rpm system, silent, do not affect bird life, low wind production, self-starting, wide production range and high survival speed. The turbines are based on a known technology but have been upgraded with modern day materials and electronics. This makes them extra strong and light with increased efficiency.



In 2008, anemometer was designed as a final project in University of Iceland.

In 2009, the first IceWind wind turbine concept was built with fibreglass and tested without a load. The quality of low start-up speed was discovered.

In 2010, the turbine got bigger and now made from aluminium and steel. Fixed with a generator and installed on a cabin.

In 2012, emphasis is on bolts and general strengthening for the turbine to be able to withstand more pressure.

In 2013, the focus was on optimizing choice of materials and stainless steel selected to minimize corrosion. Stainless steel bearings were added and experimented with custom-made generator.

In 2014, the first 1000W turbine built and installed on IceWind HQ for stress tests. The turbine got weight reduction as well as strengthening with carbon fibre.

Figure 1. Evolution of IceWind[1]

In 2015, the residential application was named 'CW'. The blades were redesigned for blending even better into the environment. Various colours and texture tested.

[1] Innovation Center Iceland 2017.

TRL and Technology Scale

The technologies developed are considered to represent TRL 6 (technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies).

The turbines split into two categories. The RW for Telecom towers and CW for residential. The RW is a stackable 300W turbine and the CW is a 1000W standalone turbine.

Figure 2. RW turbine and CW turbine[2]

Cooperation partners and networks

The company has been in active cooperation with the University of Iceland for technology development and testing. The Rannís (the Icelandic Centre for Research) has provided grants for the technology development, and private partners have the opportunity to invest in the company.

In addition, there has been active collaboration with international universities, including internships for the design and development of the technology. IceWind recently partnered with Deloitte in the fields of tax, legal, finance and accounting, allowing them to focus better on core business and to benefit of partner's international experience.

Risk assessments and supports received

Start-up has been funded with grants from Rannís (the Icelandic Centre for Research) 2013 14 million ISK and 2016 from the fund Vöxtur (growth funding) in Rannís, government and private, as well as investors. Therefore, the technology development risk is shared between the public and private.

Drivers and barriers

The technology is developed for harnessing extreme winds, as well as low winds, providing for niche markets.

[2] Innovation Center Iceland 2017.

The products designed are suitable for residential use (visual appearance, blending well to the environment, quietness).

The low cost is a driver as well, as one turbine used for testing is $6.5 USD/Watt. Mass manufacturing will reduce the price to about $4USD/Watt. Payback time depends on location (average wind speed) and government support (local Feed-in tariffs).

The technology is developed in Iceland as there are very favourable wind conditions. However, the market in Iceland is more limited and the potential market is in exports.

The potential barriers are related to the cost-efficiency of the production and establishing the international cooperation networks for product manufacture and marketing. Barrier in the technology development is finding the appropriate electrical equipment that can withstand challenging environment.

Conditions for the technology transfer, adaptation and new market deployment

IceWind Ehf has been developing the technology over the last 10 years. There has been long testing period and testing the technology to different wind speeds, and weather conditions, supporting the technology transfer activities later on.

They are accessing markets with a product portfolio of micro- to small-scale wind power technologies. There is seemingly high interest for internationalization, as their target is to bring the products to all continents.

The project is ongoing and has had significant support from government and private funding. Plan is to go to market in middle of 2017. Currently seeking partners all over the world in marketing, manufacturing and distribution. Multiple test sites are up and running.

Project Results

Benefits

With changing climate all over the world, extreme weather is becoming the norm. Most normal small scale wind turbines are not designed for extreme weather and that makes them vulnerable. The IceWind turbines are designed for extreme weather but at the same time they are also suitable for low wind areas.

Much development has also gone into the visual aspect of the turbines. They blend well into the environment and look more like a sculpture than an electricity producing wind turbine.
The turbines can significantly reduce the carbon emissions from a residential system and do so in a quiet, affordable and in a discreet way.

Lessons Learnt

Harnessing extreme wind is possible and the IceWind turbines have proved it. The challenges are to do it in a cost effective manner without compromising ruggedness and durability of the system.

Different designs have been tested with different results. This method can be expensive and continuous funding to the project is a crucial prerequisite for further development of the technology.

Finding appropriate electrical equipment that can withstand demanding environment has been difficult. Competition on the market is very high which makes cost a crucial factor.

Post Project Benefits

The project is ongoing and has had significant support from government and private funding.

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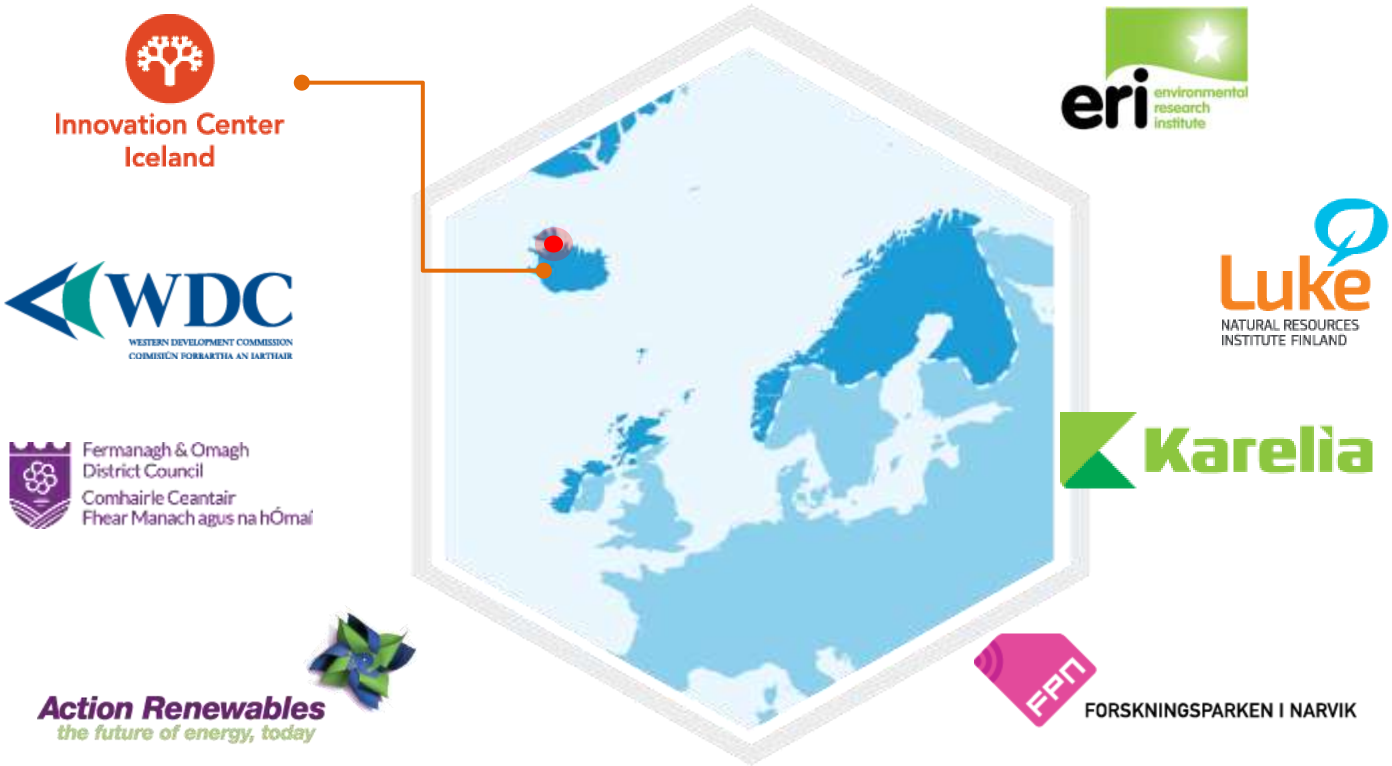
PARTNERS

GREBE will be operated by eight partner organisations across six regions:

Innovation Center Iceland



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