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# SERVE Micro Generation Survey

# SERVE Deliverable D7.3

## CONCERTO INITIATIVE
## SERVE

## Sustainable Energy for the Rural Village Environment

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Author: Seamus Hoyne

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# 1 Introduction

As well as the 6kW wind turbine supported by the SERVE project a number of micro-generation plants have been installed in the SERVE region as part of a national support scheme (outside the SERVE project). A survey of these installations has been carried out with the specific aim to analyse the actual performance of the plants against the original expectations of the plants' owners. This will include a review of their operational data and interviews of owners to judge their experience with the plants.

This assessment highlighted a number of key issues

- A significant number of the installations are no not operating due to technical faults
- Performance of the plants has been lower than expected in a number of cases
- The system installed as part of the SERVE Project is operating very effectively and performance is in line with expectations.

The majority of the systems had limited data available on energy performance. The survey highlighted a significant issue in relation to quality assurance in the Irish market in relation to micro-generation, and in particular wind energy.

# 2 SERVE Supported Installation

## 2.1 Clive Gillespie, Glenard, Cloughjordan.

Mr Gillespie originally had a turbine installed but this went on fire due to a technical fault. The turbine was replaced by a proven 6KW mounted on a 15 meter mask. Total cost of installation was €30,000.00 and was installed by renewable energy system based in Baltinglass. Windy boy SMA solar technology is used to rectifying and inverting the DC current to AC. The reason for installing a wind turbine was to reduce their ESB bill on their dairy farm. Electricity bills were approximately €1000 every two months. The main contribution to this high bill was the use of an ice bank for the cooling of milk and other dairy products.

The Proven 6 was put into operation in June 2011, the following reading were taking a year later in June 2012.

Total power produced 7,809KWh for an operation time of 6840 hours (285 days). Since the turbine has been installed for a full year there is 80 days the machine has not been running. These days can be accounted for when the wind has not been strong enough to turn the blades of the blades. The wind speed was below 2 meters per second, the cut in speed for the proven 6 is 2.5 m/sec. Other factors for down time are maintenance to machine or if the was a power cut in the area. If the Windy Boy doesn't detect voltage on the ESB side it will not allow power from the turbine to pass on to the consumer side. This is a safety feature built into the Windy Boy system.

The Gillespie electricity bills have been reduced from €1000 every two months to between €630 and €720 every two months. This will give an average savings of nearly €2000 a year on imported power. Readings taking from the import/export metre shows that 2,397KW were exported. This currently is sold at €0.19/kWh[1] to give an export income of €455.43. This will give an annual saving of €2455 a year if the turbine was to continue performing. This indicates a 13 year payback for the turbine. The average daily output from the proven 6 turbine is 28.4kWh.

[1] This is based on the current support structure in Ireland for micro generation which is €0.10/kWh for export plus €0.09/kWh for the first 4,000kWh exported.

## 2.2 Non SERVE Installations

### 2.2.1 Hugh Maher Windows, Rathnaleen, Nenagh.

A wind turbine was installed on site of Hugh Maher PVC windows. As the site owners had become ill the required information need upon the site visited was not at hand. Staff at premises was able to provide the following information:

- The turbine was installed in 2006. It is mounted on a 10 meter mask which is located at the back left hand side boundary of the factory site. The boundary is surrounded by 6 meter high hedge and high trees to the fair right boundary proximally 30 meters away. Because of the surrounding buildings and trees clean wind flow is restricted which cause turbulence and leads to the turbine to search for the wind causing the rotor to lose energy.
- There is no visible marking on the turbine so manufacture and model is unknown. A staff member recalls the turbine to be rated at 3kW. The turbine ran satisfactorily for the first year but after a storm on a particular night two of the blades broke on the turbine and were found in the adjacent field. The blades were replaced but the failure was repeated again a number of months later. Customer was unhappy with performance of turbine and due to safety concerns the machine was not repaired.

### 2.2.2 Residential Dwelling, Knock, Roscrea

A 1.8Kw turbine on an 8 meter mask was installed at the back of a bungalow. It is used for direct heating and is connected directly to a hot water cylinder. The turbine was installed in 2009 and worked fine for two and half years until a problem with the rectifier occur. The rectifier to date had not been fixed.

Cost of installation was €1,800.00. The owner could not provide data but believes they were saving about €150.00 year.

### 2.2.3 Demonstration Turbine, RES Installer, Templemore.

A 1.4Kw Fortis Passaat turbine was erected on the boundary of the site in 2008. The turbine is mounted on a 10 meter mask and is connected to the ESB grid through an import and export meter. Windy boy rectifiers and inverters are used to convert the DC supply to AC supply.

Fully cost of installation was not disclosed as turbine was given at cost as a demo. No other data was available but the machine was running without any difficulty. The site location is appropriate for the turbine and wind flow is not restricted.

### 2.2.4 Residential Dwelling, Thurles.

A 1kW Braun mounted on a 10 meter pole, connected to the grid using a Windy Boy inverters. The turbine was installed in March 2010 at a cost of €7, 000.00 to generate hot water. The location of turbine is not in an ideal location as it is situated at the lowest point of site with a number of tall trees located to one side of the turbine.

This machine did not operate satisfactorily due to a fault in the Windy Boy inverter. The installer has been unable to correct the fault and is now unwilling to replaced inverter. The turbine has generated 300kWh in total.

### 2.2.5 Shanahan Tyres, Rathelty, Thurles.

A 3.5 kW Brawn wind turbine mounted on a 12 meter pole. The cost of installation was € 12,000.00, and it was installed in 2009.

To date it has generated 4,375kWh with a running time of 11,210 hours. A meter was installed and it reads a total of 4,269 Kwh a difference of 106Kwh between the Windy Boy and external meter. Its location is in the rear of storage yard with a number of trees either side of turbine. Clean wind flow is restricted. Customer was very unhappy with performance and is currently looking to have turbine removed and money back from installer.

Based on the output to date and assuming it displaces imported electricity at a rate of €0.19/kWh the total income is approximately €831.25, indicating a payback period of 14 years.

### 2.2.6 Residential Site, Nenagh.

Two 450W turbines were each mounted on 10 meter poles, turbines model are unknown. Six 100W PV panel are mounted on garden shed given a total of 1.5 kW.

The turbines and PV panels are fed into a battery bank and are not connected to the grid. Total cost came to a total of €12,000.00 and it was installed in 2004. Surface Power inverters are used. Customer was happy with installation as the system was producing enough power to run lights in house. However does find that money paid out will not return a profit quit a number of years. Currently the turbines are not in operation for some unknown reason and the owner is looking to sell on the turbines. There was not production data available for the site.

### 2.2.7 Residential Site, Templemore.

A Proven 2.8kW turbine on a 15 meter mast was installed in May 2009 by Southern Wind Solar. Cost of installation was €18,000.

Readings taking from the Windy Boy were total power produced 2,416kW for a running time of 6700 hours (280 days). It is producing on average 1.78kW per day. The turbine had a down time of nine months due to lighting strike and causing damage to the Windy Boy inverter. The electricity bill has been reducing by €80 per bill which gives a saving of €480 a year. 726Kw had been exported to date which would give a return of €138. Based on this income the payback period for the installation is approximately 34 years.

### 2.2.8 Residential Site, Cloughjordan.

C+F 6Kw (CF6e) turbine on a 15 meter mast was installed in 2011. The estimated cost of the installation was €40,000 but no further information was available for the site.

Other sites with limited data

| Site Type | Location | Turbine Details | Data |
|---|---|---|---|
| Residential Site | Cloughjordan. | 3Kw turbine, windy boy inverters used | Turbine not in action |
| Residential Site | Thurles | 1Kw turbine | No data available |
| Residential Site | Borriskane | C+F 6Kw (CF6e) turbine. | No data available |
| Residential Site | Birr | C+F 6Kw (CF6e) turbine. | No data available |
| Garage,. | Upperchurch | Evince ISKRA R9000 5KW. Installed March 2012 | No data available |

# 3 Conclusion

All of sites had wind turbine installed in a range from 450W to 6KW all showing different results in operation. The majority of the machines were poorly installed which resulted in bad performance and poor return of power for the customer.

There are a number of issues affecting the uptake of the installation of micro generation and these are outlined in this document. The following is a list of the few issues that I came across.

## 3.1 Financial

If a wind turbine is to be installed a significant investment is need. During site visits the one common factor was that the wind turbine on the lower price scale did not operate to their full potential. A lot of turbines were of poor design, situated in a poor location and inefficient back up support from manufacturer and installer. An investment in the region between €25,000 and €30,000 would be needed to install a 6KW turbine for domestic use and for commercial/agricultural use up to €40,000 plus would be required for a turbine of the size of 15 KW.

At present there are no grants a viable for the domestic or commercial/agricultural installation for wind generation or any micro generation. At present the electricity supplier will pay a fed in tariff of 0.19 cents for the first 3000 units produced and then 0.09 cents per unit thereafter .The ESB is the only supplier that will offer the fed in tariff. Compared to other European countries they have a fed in tariff of between 0.44 cents to 0.58 cents with no cap on power produced.

- Germany € 0.57
- Portugal € 0.45
- Spain € 0.44
- France € 0.58
- Italy € 0.44
- UK/NI £0.241 - 0.345

These incentives in Europe showed a significant up take in wind installation compared to a low level of installations here in Ireland.

The very low feed in tariff rate in Ireland has a detrimental effect on the overall payback term for such an installation. A typical 6KW small wind turbine system which is of suitable quality, reliability, and longevity of operation, installed at a typical house has a current payback term of approximately 12 – 20 years when based on power units generated. Such a long term payback period is a very unattractive financial proposition even if the householder has real commitment to environmental sustainability and carbon footprint reduction. The same wind turbine system with a feed in tariff such as the UK/NI rate (£0.241 - 0.345) would have a payback period of approximately 6-8 years, and as such becomes a far more realistic and attractive proposition.

## 3.2 Site location

Many sites were unsuitable for turbine installation or type of turbine installed. A site should be clear of any obstruction such as tall buildings and trees. This is to allow clean air flow to the turbine as such objects can cause turbulence effect to happen. This will lead to a poor operation of the turbine. A location should be surveyed for about a year to detect the average wind speed. A home weather station can be used to access the site for the proposed installation. An improper site will result in poor performance can ultimately tarnish the name of the wind industry. Soil type should be taken into consideration as a good foundation at the required depth is very important for the support of the tower for the turbine.

A good site would require an average wind speed of 3 to 6 meter per second.

## 3.3 Quality of Equipment

Standards of various types of equipment installed do not seem appropriate. A number of the turbines are not in operation as some part of the installation has malfunctioned and the backup services from the installer or manufacture is not there to support the equipment. Installation quality will impact on wind turbine performance and safety. A number safety features were not adhered to during the installation process. Installers should have good back ground knowable of the equipment they are installing and have done the required installation course for micro generation that are recognised.