Promoting Small Wind in Developing Markets

BRUSSELS -- By 2015 the global market for small and medium wind turbines (SMWT) is forecast to double, especially in developing and emerging markets, reaching U.S.$634 million. These technologies already have a track record of success in rural electrification projects. For instance, in China, SMWT started to be implemented in 1980, and by 2010 there were some 400,000 systems reported.

Turbines with a diameter of less than 15 meters and a power output below 50 kW are classified as small. However, most small wind turbines have a diameter of around 7 meters or less and a power output ranging between 1 kW and 10 kW. For very small installations, such as a remote household, wind turbines can have a diameter smaller than 2 meters and an output of 1 kW or less. Medium size wind turbines have a rotor diameter of 15-30 meters, and a maximum output of 50-250 kW.

According to the Alliance for Rural Electrification (ARE), the price of power from small wind turbine lies between $0.15/kWh and $0.35/kWh over the lifetime of the system, making it, under favorable conditions, cheaper than small PV, small hydro and other renewable and non-renewable solutions, such as diesel or kerosene. Furthermore, small wind can be easily integrated into hybrid systems with solar energy or diesel. Such hybrid systems offer a more sustainable and lower cost solution than diesel-only systems.

In general, average wind speed over 5 meters per second is strong enough to ensure economically sound operations. At this speed, a decent SMWT produces 350 kWh per square meter of rotor surface area annually.

For example, an SMWT rated at 5 kW with a rotor diameter of 5 meters (20 m² rotor swept area) generates around 6 MWh per year. At an average of 6 meters per second wind speed, the same turbine will generate up to 8.5 MWh per year. Countries like Morocco, Egypt, Kenya, Ethiopia and Madagascar have already been noted as very suitable regions for small wind, but many additional places around the world (especially above a certain altitude and/or on the coast) would also present an ideal setting.

Costs of Small Wind Turbines

Prices of SMWT depend on the type of the turbine and its size. The costs of a small wind turbine vary as much as from €2500 to €7500 per kW installed. For example, a complete SMWT battery charging system of 5 kW (turbine, pole and electronics) will cost around €8000-12,000 (uninstalled). Adding batteries and a stand-alone inverter, as well as the installation cost, would include another 20-40 percent in the overall costs. It is important to make the cost calculations and breakdown before starting a project in order to determine electricity prices compared to alternatives.

The costs also vary significantly in different parts of the world, based on production expenses. For example, a similar turbine could cost about U.S.$3000 in the U.S., $1500 in China and more than $5000 in Taiwan. With prices between 15-35 U.S. cents/kWh over the lifetime of the system, small wind is, in these conditions, cheaper than small-scale PV, and even cheaper than some small-scale hydropower solutions. In remote rural areas, it is common to find very high diesel prices (integrating the cost of the diesel itself, as well as of its transportation) and an inefficient genset that generates at a cost between €1-3/kWh.

In Europe or other mature markets, private clients pay cash for their SMWT or use credit schemes. In contrast, many 'development' projects in remote areas of developing countries are often at least partly financed by an external organization due to the high initial investment required. But even in these developing and emerging economies, it is possible to find SMWT paid for in cash, largely for projects built by private stakeholders such as mobile phone operators for telecom towers, which require a substantial amount of power. In these cases, if the natural conditions are favorable and wind measurements have been carried out correctly, it is not rare to have a high return on investment, with full cost recovery only after several years. At the same time, the payback period can vary greatly depending on factors such as the technology chosen, location, available financing options and other incentives.

For example, in Madagascar, a European small turbine manufacturer has sold 30 wind turbines of 5 kW each which have been installed in different locations by a European project developer and installer. The SWT was installed next to a GSM tower located at a remote site which is especially difficult to reach, making the transport of diesel and maintenance of the genset very expensive. A 5 kW wind turbine and a 48 V 1000 Ah battery system were installed in 2008 on this site. Based on the average wind speed of 7 meters per second in this location, the expected average daily electricity production is some 32 kWh.

Prior to the installation of the SWT, electricity prices with all diesel expenses involved were as high as €1.2/kWh. Moreover, some €350 monthly maintenance costs had to be added to the high electricity prices. With the total installation costs of the wind turbine and the battery bank at around €18,000, a potential return on investment is expected within two years.

ARE's Survey

SMWT often offer the most environmentally friendly and cost-competitive technology for rural electrification in developing countries, yet they are even more often left out of the energy solutions options by decision-makers and project developers.

Despite the lack of market information on SMWT in these areas, there is the general agreement that they are only a small percentage of the off-grid market. Why aren't these technologies more widely used, especially in developing countries where cost is such a big issue?

With this question in mind, at the beginning of 2012 the Alliance for Rural Electrification (ARE) asked its members to identify barriers they have faced in developing countries.

First, ARE found that SMWT remains relatively unknown to decision-makers in developing countries. Through regulation, governments are directly responsible for the growth of the market and the performance and safety of the systems, but they are not fully aware of the potential of wind (as demonstrated by the very limited number of countries with a well established policy and regulatory framework covering SMWT). Knowledge of and level of experience with small wind remain rare amongst practitioners from the public and private sectors.

Second, the production of SMWT is highly concentrated in developed countries. Today there are about 250 companies in 26 countries manufacturing small wind turbines. More than a third of these, and the largest, are based in the U.S., but the U.K. and the Netherlands are also home to other big manufacturers.

Third, determining a proper setting and location for small wind systems is essential to maximizing their energy production, so an exhaustive on-site wind resource assessment is key. Unfortunately, collecting this data is often too expensive for developing countries to invest in, especially in such small-scale projects.

And fourth, there is a widespread lack of quality standards and certifications for both the technologies and the installation process, which would guarantee the reliability and safety of the systems and avoid the production of low-quality products that damage the image of the technology.

Addressing Barriers to Small Wind Uptake

One of the common elements in the barriers identified was the lack of information/awareness on the part of energy decision-makers. Without proper knowledge and with such a small number of small wind systems installed in developing countries, it is very difficult for those responsible to create a suitable legal framework for fostering SMWT. Therefore, the first step of was to pass on reliable, transparent, relevant and tailored information about SMWT.

The approach favored mainly small groups and personal meetings, and the content focused on real-life projects with challenges that the audience could relate to and apply in their own communities.

The challenge of the initiative was to create opportunities for contact in a market that remains an extremely fragmented sector.

From very early on in was clear that a step back needed to be taken in order to fill basic gaps in information. Aspects such as how to evaluate the technology's suitability for a specific area, how to maintain it in the long term, how to choose the most suitable product and, most importantly, how to make realistic expectations became fundamental to the campaign.

A Long Way To Go

The good news is that decision-makers in developing countries have shown interest and curiosity about renewable energies in general and wind in particular. Renewables seem to tick all the boxes of their particular energy needs: decreasing renewables costs and the rising price of fossil fuels, increasing electricity needs in off-grid areas and even increasing international financing for renewable energies, environment and climate change as well as energy access.

With the Alliance's Small Wind Campaign the foot is in the door - so how to move forward and what challenge to approach next? Balthasar Klimbie, Director of Dutch Small Wind and one of the participating members, suggests: “In my opinion, this first step was quite good for raising awareness. Next we should try to work on training and capacity building. Only through passing on knowledge to the local communities can we ensure the sustainability of the systems. We need to make sure that decision-makers know how to deal with this issue. There is a long way to go.”

Taking into consideration the conclusions and information needs detected, new efforts will also address the financial side of projects.

Simon Rolland is former secretary general of the Alliance for Rural Electrification.

The source:http://www.renewableenergyworld.com/