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*by Robert Foster**

As alternative energy sources gain prevalence in energy markets worldwide,[1] small wind turbines have emerged as a viable alternative to their larger and more expensive counterparts. While most attention has been drawn to their domestic application in developed countries, and various low cost commercial turbines are available to consumers for several thousand dollars, they also offer great promise in electrification of developing countries.[2] However, because of the technological nature of small wind turbines, as well as the socio-political characteristics of the regions in which their use is most applicable, special care must be taken while developing policies to encourage investment as well as during implementation of construction plans. If these factors are carefully considered, small wind turbines may prove to be an environmentally conscious option for the electrification of developing countries.

Small wind turbines differ from large turbines in many important ways, demonstrating their greater versatility. While large turbines require mature power grids, small turbines have application both on and off existing power grids, as a result of their size and low energy output.[3] Their off grid application avoids the heavy cost of expanding transmission lines to rural regions of developing countries.[4] Additionally, small turbines operate on lower wind speeds than large turbines, giving them more placement options.[5] Experts also indicate that small turbines, if placed correctly in suitable locations, generate more energy per dollar than other common alternative energy sources such as photovoltaics.[6]

There are three overlapping phases in which introduction of small wind turbines must be carefully considered: investment, planning, and implementation. To encourage investment, successful policy initiatives in developed countries may offer effective models for developing countries. In developed countries, investment in small wind turbines usually originates at the individual household level.[7] Here, feed in tariffs ("FITs"), which compensate individuals per kilowatt-hour of electricity generated,[8] offer an effective method to encourage investment.[9] While there are numerous FIT models,[10] those of Germany and Spain, where individuals may be compensated at rates as much as four times the rate paid to commercial power sources, have been highly successful in encouraging installation of small-scale renewable energy systems.[11] With success and popularity, however, also comes an element of risk. Developing countries must be mindful that if too many individuals opt into FIT programs, operating costs could rise sharply as governmental compensation obligations grow.[12] Notwithstanding this risk, FIT programs are the most promising way to encourage investment in alternative energy sources in developing countries. Any nation seriously considering widespread implementation of a renewable energy scheme should also consider exemption of import tariffs on equipment.[13] Such an exemption will lower startup costs and further encourage investment.

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Rural regions of developing countries, without established power grids, face additional investment considerations. As absence of electricity often indicates lower levels of affluence, capital will be less available than in regions with established power grids.[14] While FITs may provide some encouragement for investment, the availability of credit in these regions will be crucial for the viability of any small wind project.[15] Sources of credit include international financial institutions and countries' development agencies, such as that of France (L'Agence Française de Développement), which extends environmental credit lines to local banks in developing African countries.[16] NGO subsidies are also a source of credit; however, their funding must be carefully designed to create conditions under which they will no longer be needed in order to ensure ultimate market sustainability for renewable energy.[17]

To break even, small wind projects require approximately ten to twenty years before the initial cost can be recovered.[18] If connection to an outside established grid is likely, and in-place

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FIT payments are not high enough, then a project's economic feasibility could potentially be undermined by a sudden influx of cheaper electricity. Under this scenario, individual, community, and institutional investors would never recover their construction and maintenance costs, as the market rate for electricity would now be too low.[19] For this reason, it is imperative that investment in small wind turbines be incentivized in regions of developing countries where connection to an established grid is not expected during the ten to twenty year cost-recovery period.

Once a developing country has created investment incentives, planning and implementation are the next steps for successful introduction of small wind turbines. According to the Center of Excellence for Renewable Energy, there are six critical factors at this stage of development: management, local training capacity, technical support, viability of the energy source, ownership, and political interference.[20] Dealing with these issues firsthand, Practical Action, an international charity based out of the UK whose goal is to combat poverty through the use of technology, has introduced small wind turbines to isolated villages in Sri Lanka and Peru.[21] Before choosing project locations, Practical Action assessed the demand for electricity, paying close attention to use patterns.[22] Ultimately, the distinguishing factor that made wind power in Sri Lanka more feasible than Peru was the existing demand for electricity.[23] However, to forecast energy demand purely based on current energy demand would be shortsighted; potential demand should be comparably weighted.[24] In making such determinations, relevant factors include population size, level of infrastructure, and number of viable financial institutions.[25]

Investment in human capital is the final and perhaps most critical aspect in implementing any small wind project.[26] The construction, operation, and maintenance of small wind turbines require a high degree of technical understanding.[27] For implementation to be successful, the local population must have proper training and knowledge.[28] Community involvement is pivotal, as without a sense of ownership, local populations will have no sense of commitment to their small wind turbines and these turbines could easily fall into disrepair.[29]

Community involvement, in addition to investment incentives, comprehensive planning, and adequate technical training, is just one critical factor that determines the ultimate success of any small wind turbine project. If these factors are carefully considered, small wind turbines offer promise towards electrification of developing nations in a way that is both environmentally conscious and sustainable.

Endnotes: Small Wind Turbines May Change the Future of Energy in Developing Countries

1 *See U.S. Energy Consumption by Energy Source, 2005-2009*, U.S. Energy Info. Admin. (2010), http://www.eia.doe.gov/cneaf/alternate/page/renew_energy_consump/table1.html.

2 *See Chapter 6: Small Wind Turbines*, Wind Energy, The Facts, http://www.wind-energy-the-facts.org/en/part-i-technology/chapter-6-small-wind-turbines/ (last visited Mar. 31, 2011).

3 Martin LaMonica, *In Small Wind Versus Solar, It's All About Location*, CNET News (Mar. 22, 2011), http://news.cnet.com/8301-11128_3-20045425-54.html.

4 Megan Treacy, *Small Roof-Mounted Wind Turbines Could Power Rural India*, EcoGeek.org (June 7, 2010), http://www.ecogeek.org/wind-power/3218-small-roof-mounted-wind-turbines-could-power-rural.

5 *See generally WT6500 Wind Turbine*, Wind Tronics, http://www.earthtronics.com/honeywell.aspx (last visited Mar. 31, 2011).

6 *See* LaMonica, *supra* note 3.

7 *See generally* Amy Westervelt, *Rooftop Pipe-dreams for Pint Sized Windmills?*, MSNBC (Feb. 12, 2011), http://www.msnbc.msn.com/id/41554507/ns/us_news-environment/.

8 Paul Gipe, *Electricity Feed Laws, Feed-in Laws, Feed-in Tariffs, Advanced Renewable Tariffs, and Renewable Energy Payments*, Wind-Works, http://www.wind-works.org/articles/feed_laws.html (last visited Mar. 31, 2011).

9 *See generally* Toby Couture & Yves Gagnon, *An Analysis of Feed-in Tariff Remuneration Models: Implications for Renewable Energy Investment*, Energy Policy 1 (2009), http://www.e3analytics.ca/documents/fitpolicy.pdf.

10 *Id.*

11 Kate Galbraith, *Europe's Way of Encouraging Solar Power Arrives in the U.S.*, N.Y. Times (Mar. 12, 2009), http://www.nytimes.com/2009/03/13/business/energy-environment/13solar.html.

12 *Id.* (explaining how FITs are also seen as regressive, as they promote forms of energy that are not as cost efficient, resulting in higher energy prices for the poor).

13 Masahiro Myazaki, *Renewable Energy Issues: Nedo's Experience in Southeast Asia*, New Energy & Indus. Tech. Dev. Org., http://www.apo-tokyo.org/gp/manila_conf02/resource_papers/narrative/miyazaki.pdf (last visited Apr. 18, 2011).

14 *See generally Poverty, Energy and Society*, Baker Inst. Energy Forum, http://www.rice.edu/energy/research/poverty&energy/index.html (last visited Mar. 31, 2011).

15 *See* V. Ranganathan, *Forecasting of Electricity Demand in Rural Areas*, 46 Indian J. of Statistics 333 (1984).

16 *See France to Finance Kenyan Renewable Energy Investments*, Citizen (Apr. 28, 2011), http://thecitizen.co.tz/business/14-international-business/10405-france-to-finance-kenyan-renewable-energy-investments.html.

17 Eric Martinot et al., Renewable Energy Markets in Developing Countries 10 (2003), http://www.nrel.gov/analysis/forum/pdfs/eric_martinot.pdf.

18 Myazaki, *supra* note 13, at 5.

19 *Id.*

20 *See* Teodoro Sanchez, Arthur Williams, & Nigel Smith, The Critical Factors for Success of Stand Alone Energy Schemes 14 (2006), http://www.udc.edu/cere/docs/Teo%20Conf%20Paper.pdf.

21 *See Small-Scale Wind Power*, Practical Action, http://practicalaction.org/energy/small_scale_wind_power (last visited Mar. 31, 2011).

22 In regions without established power grids, electricity may still be consumed in the form of charged automobile batteries.

23 *See* Simon Dunnett, Practical Action, Small Wind Energy Systems For Battery Charging 8, http://practicalaction.org/docs/energy/wind_energy_battery_charging.pdf (last visited Mar. 31, 2011).

24 *See generally* Ranganathan, *supra* note 15, at 341.

25 *Id*. at 337.

26 Video: Renewable Energy in Sri Lanka, Practical Action, http://practicalaction.org/energy/small_scale_wind_power (last visited Mar. 31, 2011).

27 *See* LaMonica, *supra* note 3.

28 Video: Renewable Energy in Sri Lanka, *supra* note 26.

29 *Id*.