Power Problems? An answer is blowing in the wind

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Successful experiments with alternative energy could provide more durable solutions to India's chronic shortages

Aralvoimozhy, a little-known village in Nagercoil district of Tamil Nadu is finding its place on the energy map of the world. A few kilometers north of Kanyakumari, against the backdrop of the rugged hills, the landscape is dotted as far as the eye can see with three-bladed wind turbines rising above the coconut plantations. A spectacular jungle of thousands of wind turbines, turn away silently, as the wind whistles through the coconut trees, pumping nearly 450 MW of electricity into the southern grid. It's an out-of-the-world experience in a world of centralised power generation with large coal-based power plants. No pollution, no noise, no displacement! Nearly three thousand wind turbines work in unison (with grid frequency) to generate millions of units of electricity.

One of the largest wind farms in the world, Aralvoimozhy is a major success story today of not only renewable energy technologies but also the manner in which distributed generation can transform the economy of a place. Indeed between 1990 and now, an investment of nearly Rs 2,000 crores can be seen in the form of economic development that has taken place in Aralvoimozhy, Nagercoil district and the Tirunelvelli district. A small sleepy place has been transformed in a short period of ten years. Gone are the hutments and kachcha dwellings. In their place are fine bungalows and several colleges and institutions offering professional courses in engineering and medicine.

The residents of Aralvoimozhy benefited immensely by the wind rush as they got employed, took up subcontracts and sold land at good prices to industrial units that set up the windmills. And it shows. It all began way back in 1985-86 with successful experimentation of modern grid connected wind turbines in the country. The first of these machines were set up on a demonstration basis by the ministry of non-conventional energy sources (MNES) as wind farms at Tuticorin (Tamil Nadu), Okha (Gujarat) and Ratnagiri (Maharashtra).

The technical and economic feasibility of these wind farms was established by 1987. The search for locations suitable for wind energy exploitation began and by 1989, Aralvoimozhy as well as many other places, including Kayathar and Palghat in Tamil Nadu and Chitradurga in Karnataka, were identified as potentially windy areas. The government of India and the state government of Tamil Nadu came up with investor-friendly policies for the wheeling and banking of electricity generated from wind farms (which essentially means that electricity can be "banked" with the electricity board for six months to be used in peak season) set up by a privately owned industrial unit.

At the same time, 100 per cent depreciation was allowed on the investments made in wind farms. A demonstration wind farm at Aralvoimozhy and Kayathar totalling 10 MW, set up by Danida, the Danish International Development Agency, with 200 kW Danish machines in 1989-90 did the trick.The performance of this wind farm convinced the private sector of the viability of a venture in wind energy. The corporate sector rushed to set up wind farm in the vicinity of Aralvoimozhy. The rest is history. Madras Cements, one of the investors, set up more than 100 wind turbines totaling 33 MW. Other investors include Dalmia Cements, TNPL and Mohan Meakins. Electricity generated from the wind farms is being wheeled to the energy-intensive industrial units of these investors in Tamil Nadu.

Due to the high average annual wind speeds and high energy content in the wind, land for setting up wind farms in Aralvoimozhy became a prized commodity and in addition to that came opportunities of income generation and employment in the projects, transforming the life and lifestyles in this village. Interestingly in these 450 MWs, each windmill or a cluster of windmills is an independent project, each of them set up by private developers and each

achieving its financial close independently.

Consider this against another backdrop, the backdrop of the policies in the mainstream power sector, which in its attempt to attract investments, seems to have run out of steam. Over the years, the Independent Power Producers (IPP) movement struggled through issues of payment security, fuel linkages, bankrupt state electricity boards (SEBs), escrow accounts and so on.Innumerable policies just haven't taken off — the hydro policy, the liquid fuel policy, the fast track projects, the mega power policy....

The list of things that haven't worked seems endless — chronic power shortages, poor quality of electricity, poor rural access, high costs, cross subsidisation and so on and so forth. In this rugged landscape the wind turbines of Aralvoimozhy stand out as something that worked. And like Aralvoimozhy, many more success stories based on many more technologies in many more towns, cities and villages stand out as success stories.

In terms of cost per MW, the investment in a wind farm is comparable and almost similar to that in a conventional IPP at Rs. 4.5 crore. But in the case of a wind farm, there are no fuel costs and no investments required towards fuel infrastructure. The cost per kWh varies from Rs 1.5 per kWh to Rs. 4.5 depending upon how good the site is.

Over the last few years a multitude of economical and viable distributed generation technologies have emerged, each of them posing a challenge to the centralised power generation approach, each suitable for meeting the energy requirements either directly at the end-use or close to the load centre. Unlike centralised power generation, in which electricity has to be transmitted over huge distances, sometimes hundreds of kilometers, the distributed generation plant is set up close to the load centre. It usually runs on a locally available resource such as crop residues, cow dung, sunlight, solar radiation, wind or small hydro.

The technologies are diverse and many, ranging from a very simple box type solar cooker to intelligent wind turbines with sophisticated power electronics. This vast range of technologies includes micro turbines (up to 100 kW), biogas plants, dual fuel engines, gas

engines, solar photovoltaic cell, solar concentrators, water wheels, water turbines, windmills for water pumping, modern wind turbines, hybrid energy systems, renewable energy systems in grid connected and off-grid mode and many more. Slowly but surely, these technologies are making their presence felt. They can be found in the cities (solar water heating systems) or in remote villages (biogas plants and solar PV lanterns). The strength of these new technologies lies in their diversity, flexibility, modular construction, small investments, local resources and local employment. The diverse range of technology products now available has enabled tailoring technologies to suit various needs.

The end-users too are varied. We have households, hospitals, dairies and breweries using solar water heating systems; vegetable vendors using a solar lantern to enhance their productive hours, small power producers selling electricity generated from biomass to industry and large heat treatment plants using gasifiers to fuel furnaces. There are island communities like Sagar Islands and Sunderbans where the entire electricity supply system is being based on renewables. Increasingly, the financial institutions and lending agencies such as the World Bank and USAID are also becoming interested in distributed generation.

There are many stories. Some are already success stories and some are in the making. These are stories in Ratnagiri, parts of Rajasthan, Saurashtra, Satara, Coimbatore, Sagar islands and Sunderbans. There are similar developments and equally successful stories emerging from other countries — Bangladesh (the household PV Systems), Sri Lanka (village, micro hydro and PV systems), China (micro and village hydro), Nepal, Vietnam, and the Philippines.

Across the world, the momentum seems to be picking up. Germany today has 8,000 MW of electricity generation capacity based on wind. All these stories flow into one story of the success of renewable energy-based distributed generation posing a challenge to the established approach of large centralised power plants based on fossil fuel. It is as if a million mutinies are taking place across the world