Eco-sustainable Wireless Networks: Ready for Prime Time

Summary

In communities without a stable communications infrastructure, wireless networks open significant possibilities for economic and social development. These networks require a reliable power source to reach their full potential, and, up to now, costly and environmentally unsound generators have been the only viable option. However, developments in alternative energy technology are creating solutions that meet the needs of remote, rural communities in developing countries and also provide network operators in more established markets with the ability to reduce their energy costs and carbon footprint.

In this article, Rich Garafola, Director of Sustainable Power Solutions at Alcatel-Lucent, explains how to respond to the growing demand for alternative energy solutions by converting pioneering programs into industrial-scale strategies. Many of these strategies come from the Alcatel-Lucent Alternative Energy Program, which includes the world's first alternative energy laboratory and pilot site dedicated to providing mass-produced alternative energy-powered solutions for wireless network operators.

For communities in emerging countries, wireless communications networks create important economic development prospects. Studies have shown that access to telephone and Internet services provides an impetus for both economic and social development. However, finding reliable electricity sources to power the base stations — the capillaries of wireless networks — has been a substantial obstacle in developing these critical communications systems. It is estimated that 2.6 billion people in the world live in communities with no reliable electricity source — or no electricity at all.

The use of alternative energy sources such as solar and wind-based power, combined with more energy-efficient equipment and networks, makes it possible for communities without access to electricity to enjoy the far-reaching benefits of wireless communications networks. And this model is not limited solely to emerging markets. Wireless network operators in developed regions also find compelling reasons to use renewable energy sources and streamline their networks, from reducing their carbon footprint to controlling rising energy costs.

Wireless networks foster economic and social development

Over the past few years, numerous pioneering projects have allowed suppliers and operators to evaluate the feasibility and understand the economic and environmental implications of powering wireless base stations with alternative energy sources. These programs have also demonstrated the economic and social benefits that result. For example, the 2008 launch of an Alcatel-Lucent solar-powered wireless base station in Dagadji, Cote d'Ivoire, had a profound and positive impact on the community. Over the 12 months following the launch, the population of Dagadji tripled as people from surrounding areas resettled to take advantage of the improved economic and social opportunities.

In recent years, Alcatel-Lucent has installed more than 300 such solar-powered wireless base stations in sub-Saharan Africa. The success of these early projects has attracted the attention of network operators elsewhere — and not just in areas without a reliable electricity grid. Several leading operators in Europe and other highly developed areas, seeking to reap environmental benefits while lowering their energy costs, are currently evaluating proposals to introduce renewable energy-powered base stations.

Diesel is dirty and expensive

Until now, diesel generators have been the main source of power for wireless network base stations lacking access to a reliable electricity grid. These so-called 'gen-sets' have significant drawbacks. Diesel fuel is expensive to begin with, and fuel transportation and storage can increase its cost substantially, especially in remote areas. Wireless network

operators in some parts of Africa report that diesel-related costs come to more than two-thirds of their total operating expenses. And as a non-renewable fossil fuel, diesel fuel causes environmental damage.

These problems are not limited to developing regions. For network operators around the world, power costs are the least controllable operating expense. Research suggests that electricity costs will rise faster than the savings gained through more efficient equipment and networks. According to one study, global power consumption for wireless network base stations will decline by three percent annually over the coming years, while the cost of the electricity powering those stations will increase by nine percent annually.

When evaluating the environmental impact of gen-sets, it is worth noting that wireless networks account for a relatively tiny portion of global CO_2 emissions. Data from the International Energy Agency suggests that wireless networks produce about 0.3 to 0.6 percent of global CO_2 emissions, compared with an estimated 17 percent for the transportation industry and about 13 percent for manufacturing. The comparative benefits wireless networks provide are substantial. As they enable long-distance communication and information transfer, wireless networks actually help reduce carbon emissions from transportation and other sources. In fact, it is estimated that the information and communications technology (ICT) industries could potentially reduce global greenhouse gas emissions by 15% by 2020. The adoption of alternative energy-powered base stations can only increase these benefits.

Now is the time for mass-produced alternative energy solutions

Even though the 300+ solar-powered base stations installed by Alcatel-Lucent represent an industry-leading volume, that total pales in comparison to the 900,000 traditionally powered stations currently operating worldwide. If the shift from costly, environmentally unsound gen-sets to stations powered by alternative energy is to occur, the transition requires wide-scale commitment in several key areas:

- partnerships between network equipment suppliers, alternative energy specialists and service providers who can offer network operators integrated, easy-to-install, turnkey solutions. Advanced energy controllers and expert consulting services are vital ingredients here.
- energy-efficient base station equipment and network configurations to achieve lower energy use per subscriber. This involves minimizing energy losses within each base station and eliminating energy-hungry components such as cooling units wherever possible
- a pragmatic approach that takes into account all climatic and network operating conditions by judiciously combining solar- and wind-powered energy sources with the occasional use of diesel generators, back-up batteries, and even electricity grid access to accommodate each operator's specific options and constraints. A solution offering an 80/20 balance between alternative energy and diesel, for example, represents an 80 percent reduction in diesel fuel, maintenance and transport costs.

The Alcatel-Lucent Alternative Energy Program bridges two worlds

Responding to growing demand for alternative energy solutions requires network equipment suppliers to leverage the lessons learned through pioneering programs in order to provide mass-produced, industrial-scale solutions. To that end, Alcatel-Lucent has launched an ambitious Alternative Energy Program. Its goal: to meet the worldwide demand for 100,000 alternative energy-powered base stations by 2012, including both new installations and retrofits of existing wireless base stations.

As part of this program, the company opened the world's first alternative energy laboratory and pilot site earlier this year. Located on the Bell Labs research campus in Villarceaux, France, the facility includes a wireless base station powered solely by a combination of solar panels and wind turbines, and includes a lab section researching emerging alternative energy sources such as fuel cells and bio-fuels. The initiative is designed to spur development of a complete ecosystem of industrial, institutional and academic partners, bridging the worlds of alternative energy and telecom. It enables Alcatel-Lucent teams to develop unprecedented levels of integration between alternative energy systems and telecom base stations, optimizing overall system efficiency.

By developing unique cross-disciplinary expertise in alternative energy and telecommunications, the Alcatel-Lucent Alternative Energy Program allows the company to provide energy-autonomous wireless base stations that offer unprecedented efficiency. It also helps Alcatel-Lucent understand and meet the specific challenges of solar, wind and other alternative energy sources — smoothly incorporating them into wireless network planning, design and deployment. The resulting industrial-scale products and services will help network operators everywhere meet their environmental goals while improving overall energy efficiency and lowering costs — ensuring a profitable, responsible future for the industry and the communities it serves.

For more information, visit Alcatel-Lucent's Caring for the Environment web site: http://www.alcatel-lucent.com/csr/htm/en/caringForEnvironment.html

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