

## **Energy-saving solutions helping mobile operators meet commercial and sustainability goals worldwide**

**Energy costs account for as much as half of a mobile operators' operating expenses, so radio network solutions that improve energy-efficiency are not only good for the environment, they also make commercial sense for operators and support sustainable, profitable business. Ericsson is helping mobile operators improve the energy-efficiency of their radio networks through delivering energy-efficient products, providing optimal network design and introducing the innovative use of alternative energy sources to run these networks. While our main focus is on the use of products and services that we deliver, we also examine how the provision of telecommunications in itself can have broader benefits to society and help in reducing CO<sub>2</sub> emissions, a contributor to climate change.**

### **Ericsson's approach – Life cycle assessment and total cost of ownership**

Ericsson has a long tradition of life-cycle assessment (LCA) and has been using this methodology and in-house competence to develop environmental understanding and measure improvements in the energy-efficiency and overall environmental performance of its products and solutions for more than a decade. Ericsson's life-cycle assessment of its own products shows that the greatest environmental impact of a mobile system comes from the telecom products during their lifetime of operation. Ericsson's approach to LCA is quite unique in the industry, as we do not just look at what it takes to produce and deliver a product, but also how that product is used over its lifetime, as well as how it is disposed.

This comprehensive approach enables us to measure another key indicator, which is the annual CO<sub>2</sub> emissions per subscriber on Ericsson networks. This figure includes the phone as well as what was required to produce, deliver and operate the network to provide the service. Our LCA found that the annual CO<sub>2</sub> emissions per average GSM subscriber have reduced to about 25kg down from around 180kg for first-generation networks in 1985. The 25kg CO<sub>2</sub> equates to the same emissions created by driving an average European car on the motorway for around one hour (125km per 10.5l gasoline).

The average 3G subscriber is about 30kg CO<sub>2</sub>, however, the functionality of mobile phones has increased dramatically over the past two decades, transforming the mobile phone to a device capable of far more than simple voice calls. Subscribers can perform many more services for a reduced CO<sub>2</sub> impact compared with previous generations of mobile devices. The first GSM data services had a maximum data throughput of 9.6 Kbps. In today's 3G networks, data rates of up to 40Mbps can be achieved with the addition of HSPA. LTE has been demonstrated at 160 Mbps, and the future goal is more than 300 Mbps over mobile. A key element of the delivery of this CO<sub>2</sub> reduction is the energy-efficiency of radio base station products.

In GSM and WCDMA mobile networks, our largest volume products are Radio Base Stations (RBSs). It is the RBS products in operations that consume the most energy in a mobile network, and thus are the highest contributors of CO<sub>2</sub> emissions. RBSs account for roughly two-thirds of the

total CO<sub>2</sub> emissions in the use phase, and this product has been the primary focus for our energy improvement activities.

Ericsson has implemented a three-step process to achieving energy-efficient communications for products, sites, and networks, which include energy-optimized networks, site optimization and alternative energy sources.

### **Developing and delivering energy efficient products and features**

Ericsson has developed a number of energy optimization innovations that reduce Total Cost of Ownership, while at the same time improving the environmental performance of mobile network growth worldwide. Ericsson has committed itself to improving the energy-efficiency of its WCDMA radio base stations by up to 80 percent by the end of 2008, compared with 2001 levels. In fact, during 2007 we came very close to the 80 percent overall reduction for WCDMA, which we targeted for end 2008, almost one year ahead of schedule.

One recently introduced feature, **Base Transceiver Station Power Savings**, reduces energy consumption in mobile networks during low traffic periods by putting the radio resources of the network that are not being used into standby mode. This energy-saving feature does not disrupt existing traffic or subscriber experience.

Depending on network traffic patterns, the feature can reduce energy consumption by up to 25 percent in the radio access network. The new technology is compatible with all previously installed Ericsson GSM radio base stations: all that's needed is a software upgrade.

Vodafone Germany became the first operator to use the BTS Power Savings feature, in December 2007.

If the one million-plus installed base of Ericsson GSM base stations had this feature, CO<sub>2</sub> emissions would be reduced by one million tons per year – the equivalent emissions of 330,000 cars each traveling 16,000km per year.

The **Ericsson Tower Tube**, is an innovative radio base station site concept. The concrete tower has a lower environmental impact than traditional steel, consuming up to 40 percent less power from a life cycle perspective. This is because concrete results in less energy consumption and CO<sub>2</sub> emission than steel during production and transport, but most important is that during operation feeder losses are substantially reduced, and no active cooling is needed.

### **Creating energy efficient site solutions**

For remote sites, where the electricity grid is unavailable or unreliable, local power solutions are needed, and solar, biofuel, wind and other alternative energy sources are increasingly both economically as well as technically feasible alternatives. Ericsson's main remote GSM base station RBS 2111 has a smaller environmental footprint than a standard base station, consuming up to 50 percent less energy. The remote radio unit is placed at the top of the tower, reducing feeder loss and power use.

With this RBS, a macro coverage site only requires 50 square meters of panels, compared with 200 square meters five years ago. As well as having very low environmental impact, solar sites have the advantage of being very low-maintenance, with a technical lifetime of 20 years or so, and much more reliable than diesel generator-powered systems.

Often a site is too large for a purely solar power solution to be viable, so alternative solutions are needed to improve energy-efficiency and cut running costs. Traditionally, off-grid sites employ continuously-operated diesel generators. To secure operation, two generator sets are used, often with each working half the time. After a limited lifetime, both generators have to be replaced, which affects OPEX.

Instead of having two diesel generators working alternately, Ericsson's new **hybrid energy solution for diesel and battery** replaces one of these diesel generators with a battery bank with specially designed batteries that can handle a large amount of charges and discharges. This self-contained power solution, controlled by the Ericsson RBS, can be set to meet the batteries' optimal charging and discharging levels, so extending the lifetime of the battery and the generator, and leading to an approximately 50 percent reduction in energy-related costs.

Celtel Uganda is the first operator to install this solution. Around 50 percent of all the operator's RBS sites in Uganda are running on diesel continuously, with each one typically consuming approximately 20,000 liters of diesel annually. Celtel plans to convert all of these to Ericsson's hybrid energy solution, which will not only halve its diesel fuel bills, but also provide additional savings through reduced fuel delivery and maintenance requirements.

Today the most common solution for cooling telecom shelters containing radio equipment is air conditioning units, which typically consume between 1,200W and 2,000W. However Ericsson's latest radio base stations (such as the RBS2216) endure higher temperatures, enabling new cooling methods to be used. Ericsson has conducted trials in Indonesia that show significantly lower energy consumption can be achieved through the use of heat exchangers for the shelters and separate cooling compartments for the battery back-up. The energy used for cooling the sites can be reduced by up to 60 percent, depending on the configuration of the site.

### **Designing energy-optimized networks**

At the network level, Ericsson has worked to reduce energy use for a number of years and continues to do so, setting targets to bring down energy use in 2G and 3G networks. Network solutions and services are designed to use fewer sites and to optimize network design.

Over the past two decades, Ericsson has used site, network, climate, and traffic statistics from real operator networks to accurately pinpoint potential enhancements to energy-efficiency. Based on these, new network design methodologies, radio techniques and site technologies have been developed to reduce energy consumption across the board: from radio equipment, through climate and power systems to radio access networks with a focus on improving both new network roll-out, as well as the operation of existing networks.

### **Harnessing alternative energy sources**

Where sites are beyond the reach of an electricity grid, or where the electricity supply is unreliable – and are remote enough to make the regular maintenance and refueling of diesel generators prohibitive – there are several cost-effective alternative energy sources available.

The importance of these alternative energy sources is increasing as the costs of expanding into remote areas grow – for example, to cover road and infrastructure development, fuel transport and security. Energy-related expenditure can be as high as 50 percent of the total OPEX in some markets, and cost of fossil fuels continues to rise.

As radio sites have become more energy-efficient, it has become more economically and technically feasible to use alternative energy sources. Ericsson has several well-established and commercially operational **green site** solutions in a number of markets, including solar, biofuel, fuel cells, and battery and diesel hybrid sites.

Ericsson delivered its first solar-powered sites in the year 2000 to Maroc Telecom. To date, Ericsson has installed more than 200 photovoltaic 'Sunsites' (solar-powered base stations) in Morocco, Mexico and Ethiopia, among many other countries.

For low- and medium-capacity sites, green site solutions offer a very efficient energy source. As sites become more energy-lean, there is less need for large solar panels. By using the latest-generation RBSs – specifically Ericsson's **main remote base station GSM RBS 2111** solution – sites can be solar-powered in many of the world's emerging markets. Indonesian operator PT Telekomunikasi Selular (Telkomsel) is the first operator to deploy this energy-saving combination to provide macro coverage in Sumatra and rural areas of Indonesia.

Ericsson has also pioneered the use of **biofuels** in telecoms. For instance, Ericsson, Idea Cellular and the GSM Association Development Fund have launched several base stations powered by locally produced biofuels to extend Idea's commercial mobile network in rural India. They are being deployed at greenfield sites that have not previously had access to a mobile network and are located in areas with unreliable power supply. The biodiesel for these base stations comes from used cooking oils from restaurants. Idea currently has 23 sites running on biodiesel in India, and during 2008 hopes to expand this to 40 to 50 sites. In the long term, it is expected that locally produced jatropha oil will be used, as soon as this is available in sufficient quantities. The selected

sources for biodiesel have low environmental impact and follow responsible environmental practices for the production of biodiesel.

With Sony Ericsson, Ericsson has developed a mobile phone **Village Solar Charger**. This innovation, intended for use in villages almost anywhere in the world, is capable of recharging at least 30 mobile phone batteries per day and eight phones simultaneously. Village Solar Chargers have been deployed in all Millennium Villages in the ten countries in sub-Saharan Africa where Ericsson is working.

### **Telecom contributing to a low carbon economy**

Telecommunications have the capability to deliver societal solutions which can contribute to a transition to a global carbon lean economy. It is estimated by WWF (previously World Wildlife Fund) and ETNO (European Telecommunication Network Operators) that societal behavior changes using telecommunications could result in a reduction of energy in society that is ten times greater than the amount of energy required to produce and deliver telecoms services. Ericsson estimates that societal energy use and CO<sub>2</sub> emissions could be reduced by 5-20 percent between now and 2020. Examples of telecom applications that can support behavioral change are technologies for facilitating remote working and video conferencing that reduce travel and the need for large, energy intensive workplaces, and energy monitoring systems that remotely control heating and lighting, bringing energy efficiencies in the home and workplace.

As an example, a new study by Ericsson and Australian operator Telstra on Telstra's Next G™ network – which was supplied and installed by Ericsson – reveals that business users of the new mobile broadband service reduced their carbon footprint by typically 5–10 percent (and by as much as 17 percent), and improved their productivity. It confirms that many business users of the new HSPA-enabled 3G network are able to reduce their kilometers traveled, as well as the need to print documents, resulting in a reduced carbon footprint for their work activities.

### **Energy optimization is Ericsson's core strength**

Optimizing the energy-efficiency of mobile networks not only reduces environmental impact, it also cuts network costs and helps to make communication more affordable for everyone. Finding new efficient-energy solutions also helps spread access to communications by opening up more options for the siting of radio sites in a sustainable, low-impact way, and by reducing overall Total Cost of Ownership (TCO).

*Ericsson is the world's leading provider of technology and services to telecom operators. The market leader in 2G and 3G mobile technologies, Ericsson supplies communications services and manages networks that serve more than 195 million subscribers. The company's portfolio comprises mobile and fixed network infrastructure and broadband and multimedia solutions for operators, enterprises and developers. The Sony Ericsson joint venture provides consumers with feature-rich personal mobile devices.*

*Ericsson is advancing its vision of 'communication for all' through innovation, technology, and sustainable business solutions. Working in 175 countries, more than 70,000 employees generated revenue of USD 27.9 billion (SEK 188 billion) in 2007. Founded in 1876 and headquartered in Stockholm, Sweden, Ericsson is listed on OMX Nordic Exchange Stockholm and NASDAQ.*

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