



Helping Carriers Go Green

How a Revolution in DC Power Systems Can Reduce Electricity Usage and Carbon Emissions

Thinking green is becoming a global phenomenon. Countries, municipalities, businesses, and consumers worldwide are focusing more attention on energy conservation and environmental responsibility. The green movement is driven by a number of factors. Energy demands are continuing to rise, despite energy prices that have reached historically high levels. There is growing concern over the security of the world's energy supply and the increasing dependence upon it. The impact of air pollution and global climate change are becoming increasingly important topics throughout the world. And there is a growing recognition that the world's non-renewable energy resources are being depleted.

Telecommunications service providers are also stepping up to this challenge, as they are significant energy users – consuming billions of kilowatt-hours of electricity per year. Based on an extrapolation of energy usage statistics from some of the largest service providers in the world, such as Telefonica, Deutsche Telekom, NTT and Verizon, the global telecommunications industry uses roughly 1 percent of all the electricity consumed in the world. Data suggests that about 2/3 of that electricity flows through a DC power system on its way to power the equipment that provides telecommunications services. All tolled, power flowing through DC power systems amounted to about 115 billion kWh in 2007.

Many carriers have adopted across-the-board energy reduction programs to ease the impact and these have yielded good progress. Carriers have placed an emphasis on lower power consumption for the new generation of radio, transport, access, switching and other equipment being placed into the network. But as wireless networks continue to expand and broadband capabilities grow, it is a challenge to achieve significant reductions in the overall need for DC power. In 2004, NTT projected that it would require 1.5 times its current energy usage level to support the widespread deployment of always-on broadband connections in 2010⁵.

Another area that deserves to be explored is upgrading the DC power plant to boost the power conversion efficiency.

Eltek Valere has unquestionably been the technology leader in rectifier design; it was one of the first companies to deliver a 92 percent efficient system back when the state of the market was 88 percent. Even at 92 percent efficiency, 8 percent of the AC power is lost as heat in the power conversion process. Eltek Valere was also the first mover in developing high efficiency (HE) rectifier technology, which cuts the lost power in half by achieving unprecedented efficiency of 96 percent or more.

As demonstrated through the case studies in this paper, the HE rectifiers enable service providers to achieve both significant reductions in energy usage and a lower overall cost than alternative solutions. A life cycle analysis of these typical cases clearly shows that the energy savings from the use of the HE rectifiers will quickly payback any existing first-cost premium. These cases are further improved by the positive impact of the HE rectifiers on cooling systems, or on the thermal performance of cabinets that do not have air conditioning. For the replacement of older systems, there is the added benefit of improved reliability and operational features.

The specific payback period for the use of the HE rectifier is dependent on a number of factors including capacity and load on the system, efficiency of the alternative product being compared, the cost of electricity at the site, etc. For new systems, the payback period is generally in the range of two years or less. For retrofit applications, particularly those involving older rectifiers, the payback period is often closer to one year. In nearly all instances, a 10-year life cycle analysis will result in an extremely favorable rate of return on the initial rectifier investment.

What impact could the HE rectifier have on energy usage? As stated earlier, the telecommunications industry used an estimated 115 billion kWh of electricity to run DC power systems for its services in 2007. If all of those systems could achieve a 4 percent efficiency improvement, which is the minimum offered by the HE rectifiers, then the overall result would be a savings of 4.8 billion kWh of electricity and a reduction of 3.5 million tons of CO₂ emissions. Those annual reductions are equivalent to the electricity used by 480,000 homes, and the emissions from 580,000 automobiles. In addition to improving the environment, this 4 percent efficiency increase would result in an annual savings of \$480 million (at \$0.10 per kWh for electricity) for the industry.

The introduction of the HE rectifiers has given service providers an outstanding vehicle to help accomplish both their environmental and financial objectives. This product has reinforced Eltek Valere's technology leadership in the industry, and it has enabled the start of a Green Revolution in DC Power Systems.

CASE STUDY: HE ADOPTED BY EUROPEAN CARRIERS

The high efficiency (HE) rectifier movement has taken off full force in Europe, as the world's largest mobile telecommunications provider and a Tier-1 European carrier both have approved the Eltek Valere rectifier solution for green-conscious DC conversion within their networks.

These providers selected the Flatpack2 HE rectifier after stringent technical review processes. The Flatpack2 HE is a standalone 48-volt rectifier and battery charger that provides up to 2 kW of power for telecom applications, offering an industry-best 96 percent efficiency. The new high-efficiency rectifier will replace various older power systems, increasing the global efficiency of power supplies and cutting waste power by at least 50 percent.

These companies' selection of the Flatpack2 HE is aligned with a commitment to reduce energy use to positively impact climate change, the global provider even going so far as to target reducing its CO₂ emissions by 50 percent by the year 2020.

CASE STUDY: SPRINT ADOPTS HE TO REDUCE CO2

Committed to reducing greenhouse gas emissions, Sprint has been recently recognized by the US Environmental Protection Agency at their Climate Leaders conference as a 'GHG Reduction Goal Setter' for its goal to reduce greenhouse gas emissions by 15 percent by 2017.

An integral part of this plan is to add efficiency to its AC-DC conversion process by leveraging Eltek Valere's HE rectifier solution, which enables the US-based carrier to cut the amount of power wasted in conversion by 50 percent or more. Additionally, by reducing the amount of power wasted, the system runs at a cooler ambient temperature, offering the secondary benefit of saving on HVAC costs.

Partnerships like the one between Sprint and Eltek Valere are driving the industry toward higher levels of efficiency that make a larger positive impact on the environment. Subsequent steps include adding alternative energy to these solutions.

CASE STUDY: HYBRID GEN-SET-SOLAR SYSTEM POWERS WIRELESS BACKHAUL

A leading wireless telephone service provider for a south Pacific country needed to build out a backbone network to boost its bandwidth and reduce its utilization of expensive satellite connections. However, the dense and mountainous terrain in the country mandated that network architects build network locations in areas without grid power.

Until the network build out, the company's backbone connections had been primarily through satellite transmission. The new network would expand bandwidth dramatically and lower costs by using microwave towers to backhaul traffic across the country. But many of the microwave sites were in areas so remote they had no access to the power grid. Initially, the mobile operator had installed large battery plants in each location with diesel generators (gen-sets) to charge the batteries, but they required monthly helicopter fueling trips to provide the diesel necessary for constant network uptime.

The mostly sunny weather across the country made it possible to incorporate a solar solution, but since an all-solar solution would have to size the number of solar panels to cover the worst-case light solution, the cost of the system could not be justified. The answer was a hybrid solar and gen-set solution.

This was a perfect scenario for Eltek Valere's recently launched Flatpack2 HE Solar Charger. The charger converted power from the solar panels into DC needed to charge the batteries or to power the network equipment. It also sat alongside a Flatpack2 HE rectifier that provided conversion for the power from the gen-set. Managing the entire system is the Smartpack controller, which maximized power draw from the solar panels and intelligently switched between solar and gen-set.

The impact of this solution on the carrier's network has been dramatic. The gen-sets have gone from continuous operation at low load and efficiency to being run only about four hours per day on average at 80-90 percent efficiency. Other cost decreases result from lower service and maintenance charges due to the reduced engine hours. The rest of the time, power is supplied by the solar panels.