



“Power&Life Container” installed in Neuenrade, Germany.

Sustainable Energy for Remote Radio Towers in Algeria

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Continuing fluctuations in the Algerian national electric power system cause considerable off-times in the mobile telecommunication system. As a result, one of the local mobile network operators (MNO) is looking to install emergency power systems for existing radio towers and to operate new radio towers off-grid by using the “Power&Life Container” (PLC) – a mobile power plant developed by SaEnergy Systems. SaEnergy Systems is currently working with a partner on the bidding phase of the project.

Installation and maintenance of mobile telecommunication networks in Algeria is a challenging task. As one of the largest territorial states in the world, and the largest one on the African continent, Algeria demands a great deal from its nationwide telecommunication operators. Roughly 87% of the country is considered Saharan territory, with almost 80% being devoid of any vegetation. This makes expanding the national power grid to remote installations like radio towers difficult, as well as expensive. The very range of power supply networks necessary for covering such a large country with such demanding environmental conditions makes technical difficulties

within the power supply inevitable. Fluctuations in the national grid, leading to off-times in telecommunication networks, are the consequence. Therefore, technical installations that depend on permanent and steady power have to be provided with a power back-up. So far diesel-powered generator sets and battery systems have filled this niche.

While Algeria is one of the largest oil exporting countries in the world, the government declared in February 2011 that in order to conserve its fossil fuel reserves, and free itself from a unilateral dependency, the country is planning to generate 40% of its energy from renewable energy sources by 2030.

Today, the energy potential of the solar irradiation in Algeria alone would exceed the world-wide demand. This makes the use of sun and wind as infinite and sustainable energy resources the perfect choice for Algeria.

The above mentioned reasons make it is easy to comprehend why it is favourable for Algerian mobile telecommunication providers to switch emergency power supply of remote radio towers progressively from fossil fuelled generation to power that is generated from renewable energy. In this context, SaEnergy Systems is planning to provide radio towers with its “Power&Life Container” as a versatile and mobile power generator based on renewable energy in a co-operation with the supplier of the Algerian mobile network provider.

Back-up Power

The first part of the co-operation includes provision of existing radio towers connected to the national electricity grid with a back-up power solution, a move away from diesel-powered generator sets. Here the “Power&Life Container” offers the possibility to generate sustainable energy from infinite renewable energy sources. The PLC consists of a standard 20-foot shipping container, a combination of different modules, including a solar power plant, a wind turbine, an energy storage system, and a power stand-by unit. The interaction of the different components and the operational processes are monitored and managed by an electronic control unit. The PLC can be outfitted to produce between 5 kW and 35 kW, according to requirements. Housing the components within a standard 20-foot intermodal container is highly beneficial for mobility, erecting/assembly, and operation. When the system is set up, the polycrystalline solar modules are mounted on a specially designed rack system, are placed conveniently near the container, and can thus be aligned optimally to the sun. The mast for the wind turbine is attached to the container itself, so that no extra foundation or anchoring is necessary. Wind turbine and solar power plant can be assembled with standard tools within a relatively short period of time (approx. 8–10 hours). The control unit, the energy storage system, and the power stand-by unit remain inside the container. The PLC can easily be dismantled and moved to a different location, if necessary. In comparison with regular emergency power systems like diesel-powered generator sets, the PLC generates energy 24 hours with very low operational costs. Excess energy can be used for a variety of different applications or fed into the grid until needed as emergency supply.

Stand-alone Power

For the second phase of this project, it is planned to supply newly built radio towers with energy provided by the “Power&Life Container” right from the start instead of connecting them to the national grid first. As a result it won’t be necessary to expand the communication network exclusively along existing power distribution lines and have areas without grid-supply not included in the mobile communications network.

Construction and maintenance of long range energy transport systems usually account for a significant portion of the industry related investments and add significantly to the costs per kW. Simply put, the generation of power on-site and off-grid from renewable energy sources would be a lot more cost-effective in the long run.

Delinking the radio station locations from the grid infrastructure enables the MNO to locate the stations where they provide the best mobile network cell coverage. Connection to the power grid would not be a limiting factor anymore.

Furthermore, the PLC control system contains a communication module which enables remote monitoring, controlling, and programming of the system, allowing the surveillance of the stand-alone system, and making it less dependent on constant inspections at isolated locations. Transmission of the signal can be easily achieved via the radio tower installation itself.



Energy flow chart illustrating electricity generation and distribution among consumers.

Excess Power

Another significant step is planned for a third phase in this project. Any excess energy generated by the “Power&Life Container” at the radio towers may also inure to the benefit of nearby settlements, maybe even resulting in a positive symbiosis of the network operator and the local community, e.g. as a Public Private Partnership (PPP). While one party profits from inexpensive electricity, the other party may profit from acceptance and care for the technical installation. Rural areas can be provided with basic electricity, enabling the supply of electric lighting and cooling and, thus, in turn enabling education, communication, health care, and electricity for the production of drinking water and industrial processes. This way, the provision of such services can help to overcome poverty, illiteracy, water and food shortages in developing or rural areas and help establish regional economic cycles.

Usually radio towers can be powered with an output of about 10 kW. In case a PLC with a nominal output of 15, 20, or up to 35 kW is installed, the excess power could be given away and power potentially a water treatment unit or a water desalination unit. For these applications, the PLC can be equipped with modular water treatment or desalination units, customised depending on the environmental requirements or the degree of pollution of the available water. The processed drinking water and/or excess generated electricity could, for example, supply a nearby village. Considering that Algeria is one of the most arid countries in the Mediterranean region, access to safe drinking water and sanitation would be highly beneficial. In return, the local community could provide small-scale service for the PLC and its components. This may include cleaning the solar panels from sand, refilling the current generators fuel tank, or even protecting the PLC and the radio tower against theft or vandalism. This trade-off would reduce the network operators own costs for maintenance or larger safety installations for their remote radio towers and would provide access to electricity, or clean water, for the local population.

Stand-alone power for remote radio towers.

Conclusion

The planned provision of renewable energy as either back-up power, stand-alone power, or stand-alone with a PPP component is a high visibility project. The realisation will lead to a more reliable mobile network in Algeria, creating an improved telecommunication system for both the users and the industry, and potentially generating excess power which can be used by local communities, thus being benefiting all parties. All of this is based on renewable energy that abounds in the region. Stable telecommunication through the use of sustainable and environmentally compatible energy sources could be trend-setting for Algeria, and the rest of the world.

