Hybrid Power for Telecom Sites
All over the world, mobile telecom networks are continually expanding, often into areas with limited or no access to power infrastructure. At the same time, operators and tower companies are struggling with unreliable and expensive power for existing networks. Choosing diesel as the main power source for base stations, or as the backup for an unreliable grid, is becoming increasingly hard to justify – both economically and environmentally. So what’s the solution? eSite™ by Flexenclosure.

**eSite is a fully integrated hybrid power system for telecom sites that cuts diesel costs by up to 90%.**

eSite can work as a diesel-battery hybrid, or with any combination of grid or renewable energy sources and diesel generator backup, to provide reliable, cost efficient power in areas where mains electricity is either unreliable or unavailable.

**Cut your diesel costs by up to 90%**

If you run base stations with unreliable grid power or fully off-grid, you know that the diesel costs are substantial. Not so with eSite. It’s a fully integrated and optimised site power solution that can deliver a 90% reduction in diesel fuel consumption, CO₂ emissions, and energy-related OPEX. eSite delivers the best sustained performance over time versus any competing hybrid power system. And its integrated site monitoring and management capability makes service costs low and predictable, further ensuring the lowest possible total cost of ownership.

**Fully integrated system**

eSite is a single cabinet solution, specifically designed for powering base stations. Every component has been selected for this purpose and it’s all controlled by Diriflex™ – Flexenclosure’s patented intelligent power management system. Diriflex controls eSite’s adaptive charging strategy, and ensures that as much energy as possible is extracted from the available sources while keeping energy losses low. It optimally balances the combination of battery lifetime and diesel generator run-hours to ensure the best economic result.

**Remote management and optimisation**

Fully integrated into eSite is eManager™, a cloud- or server-based one-stop interface for remote management and optimisation of all the eSites in your network. eManager supports Operations, Engineering, Business Control and Site Logistics, providing reliable data on everything from real time alarms, fault analysis and remote system configuration, to detailed reports on site performance, fuel monitoring, service logistics and energy OPEX forecasting.

**Designed for reliability and total control**

Designed to run 24/7, year after year, eSite supports 100% uptime. It is fully built, preconfigured and tested before it’s shipped to the site, so you can be confident it works from day one. Site installation typically takes one day, including simple web-based commissioning. With Diriflex optimally managing all system components and eManager constantly monitoring the status of all the eSites in your network, you’ll always know exactly how your eSites are performing, making proactive maintenance easy.
How eSite works

Solar energy
eSite makes maximum use of sunlight by using advanced charging algorithms and energy source prioritisation with a solar controller with MPPT (Maximum Power Point Tracking) and 99% efficiency.

Unreliable grid
An unreliable power grid at the site can efficiently be used as a power source even if the grid power varies in both voltage and phase. Diriflex Grid Manager controls it all and makes sure uptime is never jeopardised.

Generator
eSite minimises diesel consumption by using the generator at maximum efficiency to change the batteries quickly. When renewable energy sources are also available, the generator is only used as a backup.

Other sources
We have extensive experience with wind turbine technology for telecom applications and can also add modules for other renewable energy sources, such as biogas.

Diriflex
The intelligent control system
Diriflex is eSite's patented control system. It’s an intelligent power management system that controls the generation, storage and distribution of energy in real-time. Its advanced algorithms control the whole system to maximise use of grid and renewable energy and minimise diesel generator use. It controls cooling and battery charging, increasing energy efficiency and prolonging the service life of the components.

Regardless of where the energy comes from – partial grid, genset, solar panels, etc. – Diriflex makes sure it’s used efficiently. Energy losses and bottlenecks are minimised, thanks to the carefully dimensioned and calibrated system.

A key factor driving efficiency is how the batteries are handled. Diriflex maximises this by using adaptive charging and monitoring strategies, developed through years of close cooperation with selected battery suppliers.

Battery bank
eSite’s adaptive charging algorithms minimise generator use regardless of whether the eSite is being run as a diesel-battery hybrid or with other energy sources. The Diriflex controlled charging strategy ensures longest possible battery life.

eManager
Site power network optimisation
Fully integrated into eSite, at no additional cost, is eManager, a cloud- or server-based solution providing a one-stop interface for proactively monitoring, analysing and optimising the performance of an entire network of eSites.

eManager co-ordinates all energy-related data provided by every Diriflex control system in every eSite in your network into a single, comprehensive energy data warehouse. A wide range of reporting options allows you to build a customisable data picture to support every aspect of your business, from engineering to operations to site logistics and business control.

This means better opportunities for network analysis, management of OPEX, tighter tracking of assets, faster response times to site critical failures, more efficient maintenance scheduling and reduced frequency of site visits overall.

So with eManager you have all the real-time performance data and alarms you need to plan and budget effectively for maintenance and refuelling, proactively manage unforeseen events and make better commercial and technical decisions from Day One, ensuring reliable site power and optimised performance across your networks.
**Shared sites**

With mobile operators increasingly looking to outsource their telecom site requirements, the eSite k10 has been designed and built specifically for tower companies. It provides the features required for multi-tenant management and enables capital efficient expansion as the number of tenants increases.

- The eSite k10 is capable of hosting up to four tenants with a combined power load up to 10kW
- It is equipped with separate energy metering for each tenant and load disconnect functionality

- All the eSite k10 requires as the number of tenants increases is the expansion of its battery bank. No other changes are necessary in order to enable capital efficient expansion of tower sites
- Consumed energy (kWh) and other tenant-related data is monitored through Diriflex and eManager, and tenants can be added or removed easily
- eSite will work with any configuration of existing site equipment, thus instantly simplifying the increasingly complex network management problem faced by tower companies as they expand.

**Services and support**

Remote support and software maintenance

In addition to providing customer training on eSite operation, maintenance and first line support, Flexenclosure provides two comprehensive Remote Support and Software Maintenance (RSSM) packages for eSite - standard RSSM and RSSM Plus. The standard RSSM package includes all software updates, KPI reporting, remote support and system audits. The RSSM Plus package includes all of the above with the addition of enhanced system auditing and reporting, as well as extensive local fault resolution, system optimisation and annual maintenance support.

Formalised processes are in place to manage all support requests and to provide reporting on actions taken, problem resolution and training on avoiding similar situations in future.

Flexenclosure's RSSM service will give you peace of mind for the full lifetime of your eSite network power equipment.

Feasibility studies

How much money could eSite save at your sites? We can help you find out.

Using historical data from real sites and an advanced projection algorithms, we can accurately evaluate the expected performance on any location – regardless of if you’re building a new site or upgrading an existing diesel-powered one. This way, we can deliver reliable feasibility reports for you to base your decisions on.

**Performance**

eSite is designed and calibrated to use the optimal combination of genset, grid and/or solar power to dramatically cut fuel consumption, lowering both diesel costs and overall site power-related OPEX by up to 90%. Developed for powering both on- and off-grid base stations at either single or multi-tenant sites, eSite is the ideal choice for both new sites and upgrades. And with complete payback, on average, after only 18 months, the numbers speak for themselves.

<table>
<thead>
<tr>
<th>Total site load (kW)</th>
<th>Multi tenant</th>
<th>Daily grid hours</th>
<th>Solar array (kWp)</th>
<th>Cabinet</th>
<th>Battery bank (Ah)</th>
<th>Genset runhours</th>
<th>Diesel savings</th>
<th>Payback (years)</th>
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</thead>
<tbody>
<tr>
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<td>No</td>
<td>0</td>
<td>3</td>
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<tr>
<td>1.5</td>
<td>No</td>
<td>0</td>
<td>6</td>
<td>eSite k4</td>
<td>760</td>
<td>2.4</td>
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<td>1.5</td>
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<tr>
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<td>Yes</td>
<td>6</td>
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<td>2.4</td>
<td>85%</td>
<td>2.1</td>
</tr>
</tbody>
</table>
There are three models available, the Site k2, eSite k4 and eSite k10. eSite is modular and can be tailored to suit any and all local site conditions:

- **eSite k2** supports up to 2kW site load
- **eSite k4** supports up to 4kW site load
- **eSite k10** supports up to 10kW site load

### Diriflex Grid Manager option

Diriflex Grid Manager (DGM) controls and optimises the use of any available grid power, regardless of its stability or voltage, thus radically reducing the cost of running sites:

- DGM is extremely powerful in reducing the cost of running a site even when grid uptime is limited and sporadic.
- DGM maximises grid usability. It can cope with voltage variations from 85 to 300V and frequencies from 45 to 65Hz. And it can still charge the batteries even if one or two phases are not available.
- DGM is “system aware”, constantly monitoring battery charge levels, such that in the case of grid failure it knows whether to switch to the battery bank or to start the generator.

### Solar power option

The optional eSite solar module comes complete with elevated solar stand optimised for telecom sites, junction box, MPPT (Maximum Power Point Tracking) solar controller and 10 polycrystalline panels, providing a 20m² surface area with a installed capacity of 3,0kWp. Under the control of Diriflex, operating at 99% efficiency, the solar energy harvest is maximised.

- An eSite k2 can be fitted with up to two solar power modules, supporting up to 6kWp of solar panels.
- An eSite k4 and an eSite k10 can be fitted with up to three solar power modules, supporting up to 9kWp of solar panels.

### Cooling options

- Free air cooling
- Air conditioning
- Air conditioning + free air cooling
- Heat exchanger

### Power options

- Intergraded inverters for 230V AC load are available for eSite k2 and eSite k4
- Intergraded converters for 24V DC loads are available for eSite k2 and eSite k4
- Both 230V AC and 24V DC are available as external boxes for eSite k10

### Multi-tenant option

The multi-tenant option for eSite k10 has been specifically designed for tower companies and includes four separately metered DC power outlets, each providing up to 2.5kW of power.

For details see the “Shared sites” section.