Dee Associates

Solar electrification of telecommunications masts

Outline of options

I low traffic zones, telecoms masts consume about 1.2kW but this may vary according to location and duty. There are a large number of masts in developing economies which are powered by mains grid electricity. The total demand on the national grid is significant and the potential exists to free up capacity by providing dedicated solar panel generators at each mast site.

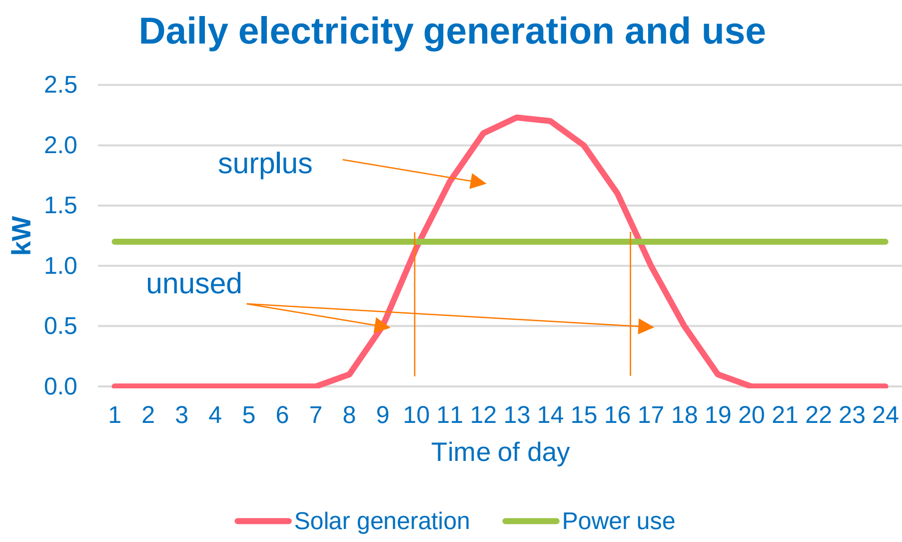
Telecomms masts are structurally designed to support the antennae but are assumed to be inadequate to support glass solar panels or auxiliary equipment. Masts are assumed to be enclosed in a secure compound with sufficient ground space to accommodate ground-based solar panels and control equipment.

Various configuration options exist ranging from simple solar panel installation to more complex arrangements which can further enhance the displacement of grid power. These options are:

- Solar panels to meet main daytime use
- Solar panels with battery storage
- Surplus panel capacity with grid feed-in
- Solar capacity for local area network
- Centralised control centre and communications

Solar panels only

The power demand of the towers is relatively constant so that a solar panel only arrangement would be designed to meet the steady demand during the daytime, assumed to be about 7 hours.



The chart above shows the generation from a nominal 2.5kW capacity system during a 24 hour period in a region with high levels of sunlight. This would produce about 15kWh of power but only 8.4kWh could be used to displace grid electricity. For some periods the power generated would be insufficient to meet demand and the grid power would remain engaged. Excess solar power which is not used equates to 30% of the amount generated in a typical day. A smaller system of say 2kW would generate less surplus (19%) but displace less grid electricity (7kWh). A 1.75kW system would displace only 5kWh.

Solar panels with battery

The provision of battery storage increases the grid power displaced but adds complexity in terms of maintenance, cost and control systems needed. Storage of the unused and surplus power is potentially possible by charging the battery during the day and using the battery power overnight to displace grid supplies. This would almost double the effectiveness of the system and allow about 15kWh to be displaced out of a total power use of 29kWh.

Grid feed-in

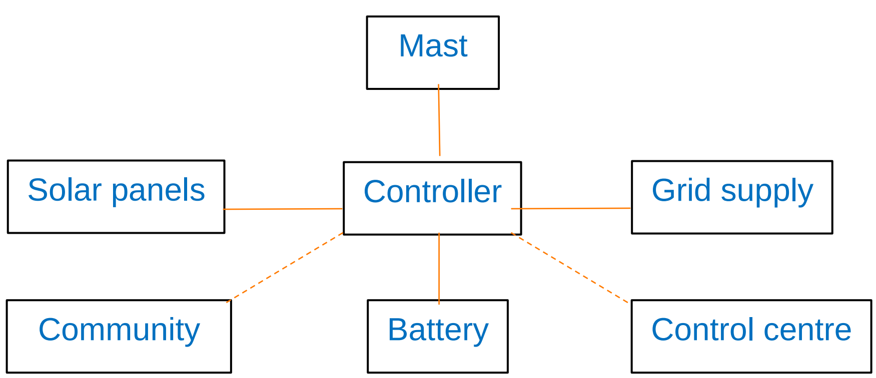
Many owners of renewable energy generating equipment are also connected to the main electricity grid. This means they can balance their consumption with mains power, but in certain circumstances they can also feed-in surplus electricity. This facility has fostered the growth of renewable power generation by enabling owners of wind and solar generating equipment to sell surplus power into the electricity system. A feed-in tariff is paid on metered supplies and appears on electricity bills. In general, the feed-in tariff is very much smaller (about one third) than the cost of electricity purchased from the grid so, it is not always advantageous to use this facility. It is often better to try to use as much electricity as possible from the renewable energy unit and to displace grid supplies. Battery storage can help to achieve this, leaving feed-in as a last resort to minimize overall costs.

Local area networks

Solar power offers an exciting solution to improving lifestyles to those communities which are beyond the reach of stretched mains grid services. Individual renewable energy units are limited by the timing and intensity of power generation, and the mismatch with the varying user needs. The sharing of power can improve the benefits for all and reduce capital costs, for example for battery storage, but control, metering and payment mechanisms need to be implemented.

Communications and controls

Advanced systems which communicate with control centres allow monitoring of capacity utilization and optimization of whole networks. These offer most advantage where some scope exists to reduce offtake in peak periods in order to balance supply and demand (DSR). Complex pricing models can be used to influence consumer behavior.



Specification of Requirements

Dee Associates is happy to quote to undertake the implementation of projects. With this in mind we seek initially to establish the details of customer requirements. The following definitions are sought:

A Customer, division, authorized personnel, contacts

B Existing facilities, services and locations, masts and compounds

C Electricity pricing and tariffs

D Future plans, upgrades and extensions

E Overall solar infrastructure model (see above)

F Commercial model – e.g. procure, build, maintain and operate.

G Scope of work, standards, guarantees, etc.

H Terms, finance, etc.

I Stages, timelines and documentation

J Legal

Dee Associates

Formed in 1989 by Dr Mike Hancock C.Eng., F.E.I., F.I.Chem.E.

Energy efficiency consultancy

Experts in design and development of renewable energy applications

ISO 50001 Energy Management Standard auditor

ESOS lead assessor

Register of professional energy consultants – RPEC