

The funny thing about the supply of Photovoltaic systems, is that unpredictability of where the weakest link in the chain lies. You only spot it when it breaks! Twenty years of exporting to Africa, The Middle and Far East, Indonesia and the Indian sub-continent have exposed Dulas to the odd broken link. The lessons learnt now shape the export operations, with the focus equally on after sales service, training and simplicity of design.

More and more the financial controls on the industry strengthen the confidence that we have in new customers. Letters of credit facilitate purchasing decisions, as the ever-increasing size of the shipments improves the co-operation of freight forwarders and shipping agents. The business logistics and controlled scheduling for delivery of all the component parts are only the beginning of a successful installation.

The most common reason solar photovoltaics applications have on occasion failed to meet the needs of the users, are because of inappropriate product selection and inadequate after-sales support. Dulas Ltd. is a supplier to UNICEF and World Health Organisation programmes, and through these contracts has been working with indigenous companies to promote and support the installation of PV systems.

The practical experience in overcoming the common problems through sensible and professional practice invariably works, however an unorthodox and sometimes unconventional approach has at times been equally effective!

Dulas has supplied and installed hundreds of solar power systems in situations as diverse as Indian mountain villages to the flat lands of Nigeria to remote Scottish islands. Without exception the biggest fears of the first time buyer is the robustness of the technology, the lack of noise and moving parts creates an uncertainty, placated by the predictable drone of a genset, drumming away reassuringly in the background.

In a survey of WHO solar powered vaccine refrigerators it was found that the most common cause of failure was lack of training for installers and maintenance staff. Where the failings had been catastrophic i.e. 80% or above, the overriding factor had been the lack of operator training.

In the absence of a support infrastructure many solar electric systems have failed. This is almost always due to poor installation, management and maintenance and not the solar power systems themselves. Like grid power, solar electrification efforts need training management, standardisation, maintenance and back-up support to be successful.

Solar electricity has clearly has a role in the development of rural communities. Thousands of systems are already in place and working. Solar electricity is a good choice because it is locally manageable and creates skilled jobs in rural areas. It also provides communities with a local, sustainable energy source.

To function properly all forms of electricity generation need staff, equipment, vehicles and financial resources. Solar is no different. When governments, donors and utilities install grid power systems they make sure that they have the means to maintain them – this is equally relevant to solar systems.

## Dulas Training Programme

Dulas engineers have undertaken extensive training programmes for engineers, technicians and users in Eritrea, Peru, Yemen, India and Sudan to name a few. The most recent, featured here is Sierra Leone.

Dulas standard training programme comprises a three day classroom/workshop based structured training schedule. During this time technicians learn the fundamentals of solar energy including battery technology, charge controller operation and an overview of the uses of solar energy. Structured into the learning programme are hands-on sessions testing modules, building small PV systems and fault finding.

After three days in the classroom the party set off for field experience and usually spend around one more week installing a number of systems on site at their intended locations. This gives the chance for technicians and trainers to communicate on the more specific and practical level as well as being a very good quality control technique. Whilst on site the party have the opportunity to raise awareness of the technology and carry out demonstrations to local people.

The structure for the recent Sierra Leone programme comprised of a four day training work shop in Freetown, followed by twelve-day field trip, including eight installations of the VC150 refrigerator in eight of the countries eleven regions: Freetown, Bonte, Moyamba, Kenema, Bo, Port Loko, Tonkolili and Pujehun. Those trained included 8 of UNICEF's district operational officers, 4 cold chain technicians and of UNICEF's engineers.

On average, each installation took one and a half days. This included revisiting the site a couple of days after the installation of each system for the final checking and connection of the refrigerator.

The participants had the opportunity to experience the following:

- Site planning
- PV array siting
- PV support structure assembly and roof fixing methods
- PV module wiring
- PV array testing
- Battery siting
- Filling batteries with acid
- Battery testing
- Battery wiring
- PV Controller siting
- PV Controller installation
- PV controller testing
- Fridge siting
- Fridge installation
- Fridge testing
- System wiring
- Overall system checking

## Tools and Equipment

A common problem experienced is that of poorly equipped technicians. Working in the field most of their lives makes the technicians extremely resourceful but they rarely hold a set of tools adequate to do the job of installing solar systems. Even refrigerator technicians have to use wasteful and potentially dangerous techniques to achieve results. Dulas therefore recommends that a provision is made for tooling during the procurement phase of any programme. On a programme worth \$100,000 for provision of solar vaccine refrigerators for instance, tools represent less than 5% addition to the cost and will help to establish a secure back-up service for the systems installed and for past and future installations in that area. In the case of lighting, pumping or general power supplies this percentage may reduce to just 1%.

## Experience in Sierra Leone

There were a number of specific issues that made this particular programme challenging. The installations included managing difficult terrain, often very long distances, adding to the already challenging road communications. Journeys of up to a day were often experienced travelling from the capital Freetown to installation sites. Curfews and transport restrictions have only recently being lifted, following the general disarmament in January of this year. The main reason for choosing solar PV in Sierra Leone was the unpredictable nature of the bottled gas supply.

The project required 8 solar fridge systems for health units; some are particularly isolated, with as few as only six staff. These are the first refrigerators to be installed since the war, in which the British army were involved, in 2001. Regional solar fridges with large capacity vaccine storage and ice-pack freezers, were used to support the isolated health centres. Each of these centres was equipped with a solar fridge freezer, with a vaccine storage capacity of 30 litres.

These first 8 refrigerators have been deployed on a district basis, as part of a pilot scheme to assess the performance of the solar units. There is every possibility that a significant further programme for peripheral health units (PHU) will follow.

The Expanded Programme of Immunisation team with whom Dulas Ltd worked has to be one of the most capable, organised and well trained. This helped with the difficult implementation of the solar fridge systems, especially at health centres where technical skills were limited. The flexibility and operational robustness of the solar fridge systems has contributed to the over all success of the W.H.O. immunisation programmes. With the advantages of the solar systems of reliability, low running and maintenance coasts and security of supply; far outweighing the disadvantages of cost and variable battery performance in harsh climates.

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May sees the launch of the Renewable Energy Investment Club (REIC), which is an initiative to promote commercial activity in renewable energy.

REIC provides local people with the opportunity to have a real stake in sustainable energy initiatives such as solar, wind, tidal, hydro or biomass, by linking them with

renewable energy developers and providing a mechanism for investment in approved projects.

Being a club, the project provides individuals, community groups and businesses with opportunities to invest directly in sustainable energy projects in their locality, and make a direct contribution to improving the environment and local economy.

Two-way dynamics are expected as potential investors can register as members and receive information about projects in which they may wish to invest. Conversely renewable energy developers are able to secure local support, through investment and ownership.

REIC was developed by Dulas Ltd and Groundwork Bridgend & Neath Port Talbot and was generously supported by the Countryside Council for Wales, the Welsh Development Agency and the European Commission.

The Club is non-profit making and does not itself make investments in any company. Nor does it intend to make any profit from putting companies into contact with its members.

A membership fee from prospective investors will fund the club from the end of October 2002, supplemented by a charge for developers wanting to raise finance for their project.

By investing in a sustainable form of energy, the community is able to contribute towards a real stake in how the project develops. As a result of their involvement, people develop an awareness of the issues surrounding energy use and the importance of diversifying from fossil fuels.

The Club's first investment was the Bro-dyfi Community Renewables single wind turbine project. The project proved to be hugely popular and was over subscribed with would-be supporters. **£54,000** was raised within three weeks. 96% of investors were local people, and as the area is fairly sparsely populated, the uptake was extremely high.

REIC is currently reviewing business plans from:  
Unit(e), two small wind projects, Border Wind, Sundance Renewables and Welsh Biofuels.

The Renewable Energy Investment Club has a comprehensive web-site which provides essential information for developers, individuals or local or community groups alike. Visit [www.reic.co.uk](http://www.reic.co.uk) for more details.

## Background

Dulas Solar is a World player in the solar energy for health market. The company is one of a handful of organisations qualified to supply solar refrigerator systems to WHO and the UN organisations.

Established in 1982, Dulas has been involved with supply, training and R&D activities in PV. Key areas of activity are:

Solar Water pumping

Solar Lighting

Telecommunications power supplies

Solar Refrigeration for health applications

Solar Desalination.