Using solar power in humanitarian action

Network meeting: January 2016

1. Introduction

The use of solar power (and renewable energy in general) in humanitarian action presents a certain number of opportunities, but also some challenges. This meeting of the Humanitarian Environment Network looked at the issues involved in using solar power (in NGO offices in the field and in humanitarian programmes), and discussed ways of ensuring that solar installations in the field are durable and how to recycle batteries.

2. Solar power in humanitarian action

The complexity of crises and humanitarian action and the prolonged presence of organisations in the field mean that investing in solar power has become more relevant.

There are a number of reasons in favour of using solar power in humanitarian action:

- Environmental: reducing greenhouse gas emissions and pollution (including sound pollution) caused by generators;
- Economic: reducing running costs of diesel-fuelled generators;
- Being exemplary: giving a good example by reducing the carbon footprint of the organisation and their programmes;
- The quality of programmes: access to electricity is one of the new Sustainable Development Goals.

Solar power can have several uses:

- For humanitarian actors: supplying offices and staff residences (notably in isolated areas and/or in areas where there is conflict or where supply is a problem)
- For programmes: electricity supply for hospitals and prisons or use of solar energy for water pumps http://www.pseau.org/outils/ouvrages/arene_ps_eau_le_pompage_solaire_2015.pdf

- To supply electricity to the population, using solar power for cooking (e.g. solar ovens), or for income-generating activities (e.g. soldering)

There are 3 types of installations, depending on the use and the amount of power that is needed:

- Sunlight-based: supply without a battery, based on sunlight (possible for water pumps, for example, or small installations)
- Connected to the electricity grid
- Photovoltaic panels with storage: energy travels from the solar panels to a battery via a regulator (which ensures that the battery does not completely discharge)

3. Cost and cost-effectiveness

It is clear that the investment needed for a photovoltaic installation is expensive. But the cost of panels has considerably fallen in recent years (a quarter of their cost 10 years ago) and the costs are recovered quickly because the running costs are lower than those of generators (fuel can be expensive and difficult to transport). In the long term, solar energy is therefore more economical than diesel.

Example of MSF residential base in Chad (15KVA or 12Kw)

	Generators (2)	*PV*
Investment	*20 000 EUR*	*54 000 EUR*
Fuel	*17 000 L/diesel/year*	*3000L/diesel/year*

Paying for the photovoltaic installations remains a major challenge, particularly for humanitarian actors who do not have access to their own funds. A few ideas:

- Approaching foundations (e.g. Fondations Véolia/Fondation de France/GRDF) or environmentally conscious institutional donors such as SIDA, DFID, USAID and Irish Aid.
- Negotiating with the donors to encourage change through action and by highlighting the cost of using generators (for the environment/for beneficiaries)
- Begin by including solar energy in programmes (and therefore programme costs as this will perhaps increase the possibility of it being accepted?)

4. Performance :

There is some doubt about the capacity of solar energy to supply field installations, notably for programmes where power cuts can have serious consequences (e.g. hospitals). In such cases, a **hybrid solution** (a diesel generator and solar power) should be considered (see the example of MSF below).

The power produced by solar panels depends on a number of factors including the latitude of the site, the season, the time of day, the meteorological conditions (cloud covering, dust), and shade. In Africa, there is a significant supply and solar panels can produce an average of 5-7 Kw/m2/day (compared to 1-2 Kw/m2/day in Europe).

The performance of photovoltaic installations is steadily increasing and they can be bought in the majority of countries.

5. Life cycle of installations

The life cycle of solar installations has increased a great deal in recent years (an installation currently lasts between 20 and 30 years). The life cycle of batteries is, however, more problematic (between 3 and 10 years). The maintenance of installations is therefore essential to make sure they continue to operate.

Maintaining panels:

- Find out about the manufacturer's image and about technical standards
- The importance of low-level maintenance : the panels should be cleaned regularly (avoid the accumulation of sand and dust)

Battery maintenance:

- The batteries should be located in a ventilated room which is not too hot
- Regulate the level of discharge of the batteries using the **regulator**. Set the rate of use at 45 or 50%
- Even though the battery may be new, it may have been stored for a long time and therefore will discharge rapidly (be careful when purchasing)
- Anticipate the cost of replacing batteries (careful management of expenses)
- Prioritise sunlight-based operation (**limit night use** as this uses the batteries more)

⇨ **The regulator is very important. It allows the current to be regulated and helps to ensure that the battery does not become discharged. It is therefore important to ensure that it is of good quality (leader STECA)**

Installation maintenance:

- Set up maintenance contracts with local businesses/ train electricians in the community about using solar technology.
- The state delegates a service to an operator that runs platforms
- Make the installations secure (e.g. install locks on the batteries or recruit a guard).

But above all:

- The **size of the installation needs to be as closely adapted to needs as possible** – the right balance needs to be found between production, consumption and storage
- **Energy-efficient equipment**
- **Controlled consumption (which also raises the question of comfort in the field)**

6. Recycling of batteries

Recycling batteries is a major challenge for humanitarian actors in the field. There are very few reliable operators in the field. Recuperation and recycling businesses exist in many contexts but the way materials are recycled is often questionable. This is often done in a low-tech manner, leading to significant pollution of the soil and the water table (acid neutralization, lead recuperation). It also constitutes a health risk for the recyclers. In addition, the transportation of dangerous waste to other countries is restricted by the

Basel Convention, and this makes it difficult to return it to organisations' headquarters or to neighbouring countries: http://www.basel.int/Portals/4/Basel%20Convention/docs/text/BaselConventionText-f.pdf

Gel batteries (closed) last longer than liquid batteries (open), but the latter are currently easier to recycle. Today the majority of batteries are lead batteries (recyclable, with a high market value of 1600 US$/tonne). Lithium batteries (which are more energy efficient) are becoming more common but as yet they are not recycled.

Reminder: the life cycle of batteries depends on the conditions in which they are maintained and used: number of cycles, depth of discharge and the temperature (not too hot, ventilated location)
It should be noted that depending on their use, they do not necessarily need to be stored (with a small sunlight-based installation)

Battery recycling solutions:

- Return them as they are to the manufacturer (include the question of the cost of transport in contracts)
- Identify local recycling businesses
- Return them to headquarters (refer to the Basel Convention)

⇨ *Follow up: Compilation of information on recycling operations by Groupe URD*

Comments from the participants

Organisation	Current projects and interests
MSF France	- Hybrid system (diesel generator + solar) being developed in several bases in the field, including Chad: https://youtu.be/xL6dKbvIFSM - Uganda : HYBRID MOBILE SYSTEM Laboratory Truck (5kVA). This truck allows the team to be autonomous for several days. - MSF HAITI office (12kVA) Office roof for the installation of solar panels - SKID SOLAIRE 6 KVA Plug and Play Kit being developed (the kit provides autonomy, and includes a control module, photovoltaic panels, a battery, photovoltaic supports for the roof or the ground, cables and hardware: 15 000 EUR)
GRET	ERUDI project to bring electricity to villages by means of a multi-functional solar platform, in order to : • Develop the economic activity of villages by providing access to energy • Show that it is possible to develop productive activities with solar energy • Provide the state with references for its off-grid electrification policy

	Info about lessons from the programme : www.riaed.net
ESF **Electricien Sans Frontières** **http://www.electriciens-sans-frontieres.org/fr/**	• Electrification project in Haiti in IDP camps • Installation of solar pumps in Africa

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