

Empowering Rural Women to Create Off-Grid Solar Electrification

Communities in remote, rural areas traditionally lack access to conventional power sources. As these communities have to rely on kerosene or firewood for basic energy needs, pressure on the local environment have increased dramatically having a negative impact on the global environment. It is estimated that one rural family in Africa typically burns 60 liters of kerosene a year, releasing one ton of CO₂ in less than ten years.

Solar energy provides an alternative energy solution while simultaneously spurring progress in human development including poverty reduction, gender equality, education and health. However, there is a need to enhance the capacities of local communities to build, install, maintain and repair solar technologies and local women could play a significant role in addressing these issues.



For this reason, in 2008 the GEF Small Grants Program (SGP) started a joint initiative with Barefoot College to support “Women Solar Engineer” pilot projects across Africa and Asia. In this collaborative effort, the GEF SPG provides communities with technical support and funding for the solar panel kits. The Barefoot College, a pioneer in demystifying complex technological processes for illiterate students, offers a six-months training to the women beneficiaries of the GEF SGP on their campus in Tilonia, India.

The goal of this “Women Solar Engineer” initiative is to build local capacity and electrify poor, “off-the-grid” communities with clean, low-cost solar energy. As such, the project is uniquely positioned to address multiple development goals at once:

- relieves environmental stress by providing an alternative energy source
- bridges the gender gap by empowering poor, illiterate women
- promotes sustainable development outcomes through community ownership and
- enables improvements in health, education, living standards and quality of life

The GEF SGP also provides support in awareness raising, monitoring and evaluation, promotion of the project at the community level, and by mobilizing other partners to support the projects in its different countries programmes. Its National Coordinators and National Steering Committees play a fundamental role in each of the country programmes where the partnership operates.

To date, SGP has invested US\$1 million, raising over \$1.5 million in cofinancing, and supported 28 solar women engineer projects in 18 countries.

SOLAR ELECTRIFICATION TRAINING AND IMPLEMENTATION ON THE GROUND



SGP and the Barefoot College “Women Solar Engineers” partnership is rooted in the belief that it is fundamental to empower communities to develop their own sustainable energy solutions.

Once the project has been approved by the SGP National Steering Committee and the funds and technical support from the GEF SGP are available, each community forms a village solar committee, trained to manage and supervise the community’s solar energy project. This includes providing facilities for a Rural Electronic Workshop (REW), negotiating budgeting and fee collection, and selecting suitable candidates for the women solar engineer training in India.

After learning how to install, maintain and repair solar energy kits, the women solar engineers return to their communities to electrify households in their villages. In return for their installation, maintenance and repair services, the women engineers receive a monthly salary from the village solar committee.

The partnership is currently implementing projects in the following countries:

- Benin
- Chad
- Kenya
- Niger
- Uganda
- Bhutan
- Ethiopia
- Madagascar
- Rwanda
- Vanuatu
- Burkina Faso
- Fiji
- Malaysia
- Tanzania
- Cameroon
- Ghana
- Mozambique
- Togo

RESULTS

As a result, 71 women have been empowered and have been able to electrify over 3,778 households, bringing light to more than 22,739 beneficiaries in 52 villages.

In addition, communities have seized the opportunity to electrify numerous public facilities, including schools, hospitals, food processing plants, local administration offices, religious buildings and community centers. Most fundamentally, the projects have managed to reduce CO₂ emissions, ease pressure on deforestation and decrease air pollution from burning firewood and kerosene.

Environmental Benefits

To assess the results of the initiative, SGP conducted surveys to solicit feedback from the national coordinators in the participating countries, and found that communities have already realized considerable reduction in air pollution, fire and health hazards. Those communities relying heavily on fire wood experienced significant reductions in deforestation and land degradation.

Mozambique estimates that with the help of solar energy annual kerosene consumption fell by 27,375 liters and annual fire wood consumption fell by 91,250 metric tons. This resulted in an overall decrease of 82,125 Kg of CO₂ emissions per year. In Ghana, the rising price of kerosene has led to large-scale deforestation and soil erosion as communities resort to firewood to meet their energy needs. Thanks to solar electrification, communities in Ghana managed to replace 95% of kerosene lamps with solar powered lighting; while those in Niger succeeded in eliminating kerosene lamps completely. In Ethiopia, Cameroon, and Chad, solar electrification had a substantial impact on easing pressure on deforestation as they were able to reduce consumption of both firewood and kerosene.

Socio-Economic Impact

Participating communities are remote, rural towns who have no prospect of being included in the traditional power grid. Therefore, the socio-economic impacts are considerable. Communities registered significant cost savings in expenditures for kerosene and batteries in nearly all communities.

Beneficiaries in Ghana have been able to save more than 70% in energy expenditures, while beneficiaries in Benin registered savings of up to 57%. These cost savings may reduce rural migration which is partly driven by increasing energy costs. Solar energy saved women's time from not having to collect firewood or walk long distances to buy kerosene and batteries, allowing them to dedicate more time to alternative income generating activities and household chores. Mozambique and Ghana reported to have saved roughly 109,500 hours and 61,320 hours per year, which can now be spent on more productive activities.

However, the most profound impact of solar electrification has been on community-wide economic activity. Solar lighting has enabled the extension and improvement on the continuity of economic activities after dark. This has had particularly positive implications for women who are now able to expand income generating activities into the night. In the case of Ghana, for example, solar energy has been providing lighting for two food processing plants where women produce shea butter at night. In Niger, women engaged in increased honey production; in Rwanda, women increased craft-making; and in Ethiopia women got to increase production of handcrafts and 'tela', a locally brewed beverage. Benin reported a 10% increase in income by "women traders" within the first year of receiving solar electrification. In Cameroon, exposure of cocoa farmers surged due to growing attention of visitors to their village.

In the long term, the Women Solar Engineer partnership may also realize a reduction in unemployment. Indeed, some countries including Benin, Ethiopia, Uganda, and Ghana reported that Barefoot alumni have been training other community members.

Another dramatic improvement has been the use of information and communication technologies, since the households received at least one electric plug through the project. All communities noted a substantial increase in mobile phone usage as solar energy users were now able to charge their cell phones on a regular basis. In addition, radios and TVs facilitated more efficient information gathering and educational activities. In Ethiopia, children can now enjoy "school mini-media" thanks to solar energy. Preliminary evidence also suggests that the placement of solar energy powered ICTs and lighting in public places and institutions have contributed favorably to social cohesion and community building.

Education and Health



These projects have also helped electrify streets, schools, medical facilities and community centers, generating community wide benefits. Every single respondent emphasized the overwhelming benefit of solar energy on children's education, especially the opportunity to study after dark. The extended hours allow for higher flexibility in managing domestic duties, work and studying.

Several communities including those in Bhutan and Ghana installed solar energy kits in school buildings. Several communities have also implemented adult literacy programs, along with community television and radios airing audio-visual education programs.

Communities have noticed considerable improvement in health. Beneficiaries, from all countries experienced reduced exposure to toxic fumes and fire hazards from kerosene, firewood or diesel. Ghana even achieved a decrease in whooping



cough. Communities in Ethiopia and other countries installed solar energy in health facilities. There is also evidence that lighting has improved safety and basic hygiene.

Gender

All participating communities noted the powerful effect of the initiative on the social status of women. Women trainees felt empowered to acquire complex technical skills, and return as qualified solar engineers to serve their communities. Pursuing the training in India in a multi-cultural setting also broadened their horizon. Most of the Women Solar Engineers managed to translate their new livelihood activity into better living standards.

Overall, participating communities note how the image of women and girls has been boosted. In Chad, for example, women and girls are very “excited” and

“attracted” by the solar energy program. It has given women a place in the community and allowed them to take on community leadership roles. Most communities emphasized the key role of the SGP to help communities give a stronger role to women on the project. For example, SGP encouraged a greater proportion of women participating and chairing solar energy management committees.

Replication and Up-Scaling

As the widespread benefits of the pilot projects become evident, several communities, government agencies and non-profit organizations have shown interest and started replicating the projects with other donors and partners. This has led to the replication of at least 11 more projects, in which 23 women have been trained locally through peer to peer exchanges benefitting another 5,860 households.

Donors who have replicated this approach include UNWomen, Care International, the Norwegian Church Aid and the Bhutan Foundation, among others, including local governments and partners. In addition, Burkina Faso is in the process to set up a local training center which will start construction in 2015 and will train women solar engineers from all over West Africa. Similarly, Fiji is exploring possibilities to set up a regional training center.

Conclusions

Results clearly show the positive effects of the GEF SGP -Barefoot College partnership on the environment and quality of life of the communities. Key benefits include:



- reduced pollution, deforestation and CO2 emissions
- empowerment of illiterate, rural women
- improved health due to the reduction of toxic fumes
- more time spent on educational activities
- increased economic activities that can be pursued after dark
- higher usage of information and communication technologies

SGP welcomes the opportunity to partner with other organizations to deliver similar community based projects.

250 children in Ghana and 100 primary school children in Niger are now able to study in the evening.

Benin and Ethiopia noted that the impact is particularly important for girls who can now better manage domestic duties and school.