Feasibility Studies with the Aim of Developing Joint Crediting Mechanism FY2014

JCM Feasibility Study on Model Project of Rural Electrification without Power Transmission Line in Ethiopia

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The promotion of solar-panel-equipped lead battery, designed under the concept “produce and use the exact amount of electricity only at necessary places”, helps to develop electrification model in non-electrified areas of Ethiopia, which are difficult to construct transmission and distribution lines. Since Ethiopia has a vast non-electrified area, the promotion of this proposed battery is expected to greatly reduce the amount of CO₂.

**Summary**

This study aims to investigate the feasibility of electrification model of the proposed product in Ethiopia, applicability to other areas, and impact of technology transfer, as well as to mitigate the emission of CO₂ using renewable energy.

**Survey Items**

1) Study on the market of the proposed product and policy trends
2) Determination of specification of the proposed products, identification of technological challenges, and planning of countermeasures
3) Evaluation of project feasibility and financial analysis
4) Determination of project site
5) Establishment of MRV methodology and calculation of potential CO₂ emission reduction
6) Consideration of impact of technology transfer
7) Organizing workshops

**Partner/Site**

- Auto Truck PLC, Ethiopia
- Woliso, Oromia Region, Ethiopia (Planned Site)

**Estimated Reduction Amount** **66 tCO₂/y** (when 50 Community Kits, 200 LED Street Lights, 10 Built-in Inverters are installed)

**Reference Emission**

When the project is not underway, electricity in non-electrified areas are assumed to be supplied by diesel power generators. Reference emission is calculated by multiplying electricity generated by the project and emission factor of diesel power generator.

[Reference Emissions] = Annual electricity generated by products installed in the project \* CO₂ emission factor of diesel power generator

= 66 t-CO₂/y

**Project Emission**

CO₂ emission is reduced by installing solar power generator through the project. Electricity generated by solar power generator is measured by measuring equipment. It is noted that emission of solar power generator is zero.

[Project Emissions] = 0 t-CO₂/y
The rechargeable lead acid battery, developed over many years by GS Yuasa, is used in this project (list of products are shown in Figure 1). Currently, solar lanterns which are widely spread in African countries, are equipped with small lithium-ion batteries which are almost the same capacity as that for mobile phones. However, as shown in Table 1, compared to lithium-ion batteries of similar price range and functions, the capacity of GS Yuasa's lead acid battery is more than double. This results in significant difference in hours of illuminance. In addition to bright LED and charging phones, the battery's large capacity enables use of various electronics such as mosquito repellent, shaver and so on which other products can't. Furthermore, lead acid battery was produced more than 100 years ago in Japan. The use of sealed type in cyclic (frequent charge and discharge) application and recycling method have been established. In order to develop products compatible to the environment of Ethiopia, which is different from Japan, we will gather performance data of the introduced technology though implementation of this project.

**Table 1: Comparison Between the Lead Battery and Existing Product**

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<thead>
<tr>
<th></th>
<th>Existing Product (Lithium-ion)</th>
<th>Lead Battery</th>
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</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>10 WH</td>
<td>84 WH</td>
</tr>
<tr>
<td>Illuminance</td>
<td>37 Lux/1m</td>
<td>110 Lux/1m</td>
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</tbody>
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**Figure 1: List of Installed Products**

- Community Kits
- Built-in Inverters
- LED Street Lights