

## Summary of Evaluation

<b>I. Outline of the Project</b>		
Country: Republic of Kenya		Project title: The Project for Establishment of Rural Electrification Model Using Renewable Energy
Issue/Sector: Energy		Cooperation scheme: Technical Cooperation Project
Division in charge: Industrial Development and Public Policy Department		Total cost: Approx. 290.1 million yen (as of March 2013)
Period of Cooperation	(R/D) October 2011 March 2012 – February 2015 (3 years)	Partner Country's Implementing Organization: Ministry of Energy and Petroleum (MoE&P), Rural Electrification Authority (REA)
		Supporting Organization in Japan: Nippon Koei etc.
Related Cooperation: Capacity Development for Promoting Rural Electrification Using Renewable Energy (BRIGHT Project) (2011-2015)		
<b>1. Background</b> <p>The government of Kenya has been actively working on the enhancement of electric power supply aiming for the stable and balanced economic foundation as well as poverty reduction. Ministry of Energy and Petroleum (MoE&amp;P) has been in charge of the energy sector in Kenya and the Rural Electrification Authority (REA) was established under section 66 of the Energy Act No. 12 of 2006 and became operational in July 2007. REA's mandate, vision and mission are aligned with the national development plan such as Vision 2030. Vision 2030 is designed as a vehicle for accelerating the transformation of the country into an industrialized middle income nation. To achieve this goal, electricity has been identified as one of the drivers where it is expected to achieve 100% electrification rate by 2030.</p> <p>Regarding the rural electrification, Rural Electrification Master Plan (REMP) has been prepared and updated to attain its goal; 40% of rural electrification rate by 2020 which was below 10% in 2009. Trading centers, secondary schools, health centers are prioritized as important public facilities under REMP, so the electrification rate of those facilities has improved from 10% (2003) to 89% (June, 2013). As a rolling plan of REMP, REA strategic plan has been prepared and updated every 5 years. The latest plan (REA strategic plan 2013/2014-2017/2018) as well as new energy policy by MoE&amp;P clearly states the focus on the utilization of renewable energy. Additionally, in order to promote the decentralization policy under the new constitution (2010), the function of central government is expected to focus on the national level policy formulation, while the county government will be responsible for the planning and implementation of each project.</p> <p>Therefore, both MoE&amp;P and REA recognized the need for establishment of the rural electrification model by renewable energy to meet these national demands and requested a technical cooperation to Japan International Cooperation Agency (JICA). In response to the request, The Project for Establishment of Rural Electrification Model Using Renewable Energy started in March 2012 for the three-year cooperation period.</p>		

## 2. Project Overview

### (1) Overall Goal

Rural electrification models using renewable energy are disseminated in the country to improve the quality of Kenyan's life.

### (2) Project Purpose

Rural electrification models using renewable energy are established.

### (3) Outputs

- 1) A practical model for photovoltaic (PV) electrification of health service institutions in nonelectrified areas is developed through pilot projects.
- 2) A practical model for PV electrification of schools in nonelectrified areas is developed through pilot projects.
- 3) The Capacity of REA / MoE&P to undertake project using Micro HydroPower (MHP), Biogas and Wind technologies is enhanced.
- 4) Necessary policy and institutional frameworks for rural electrification using renewable energy are recommended.

### (4) Inputs

#### Japanese side:

Short-term Expert: 11 (90.96M/M)	Equipment: 28,967,847 KSh. (34 million yen)
Trainee received: 3 trainees (in Japan), 7 trainees (in Third Countries: India and Thailand)	Local cost: 51,642,688KSh. (62.1 million yen)

#### Kenyan side:

Counterpart personnel (C/P): 19	Local cost: 2,360,404KSh. (2.8 million yen)
Land and facilities: An office space including desks, chairs, a lockable cabinet, electricity, water, drinking water and tea	

## II. Evaluation Team

Members of Evaluation Team	The Japanese side		
	Mr. Tadayuki Ogawa	Leader/ Rural electrification	Senior Advisor, JICA
	Ms. Yuki Masuya	Evaluation planning	Energy and Mining Group, Industrial Development and Public Policy Department, JICA
	Dr. Kumiko Shuto	Evaluation analysis	Senior Consultant, IMG Inc.
	The Kenyan side		
	Ms. Judith Kimeu	Assistant Engineer, Renewable Energy Department, REA	
Period of Evaluation	September 30 – October 14, 2014		Type of Evaluation: Terminal Evaluation

III. Results of Evaluation
<p><b>1. Project Performance</b></p> <p>1-1. Inputs</p> <p>Inputs both from the Kenyan and Japanese sides are provided basically as planned. Among the inputs provided, the distance between the project office and REA/MoE&amp;P has caused inefficiency to a high degree. Although the number of the C/Ps increased substantially compared with the situation at the beginning, their limited availability for project activities, due to their other duties, has hampered effective technical transfer from the Experts.</p> <p>1-2. Outputs</p> <p>(1) Output 1 (solar PV model at dispensaries)</p> <p>Output 1 is judged to be achieved to some degree at present and many of the activities for achieving this output, such as further monitoring, synthesizing monitoring results, finalizing financial analysis, developing guidelines/user manuals and, finally, completing the models are still ongoing. Furthermore, there is still a certain level of uncertainty with regard to nationwide applicability of O&amp;M of the solar PV systems. More efforts to ensure sustainable O&amp;M models of the solar PV systems, particularly financial and institutional arrangements, need to be made in the remaining implementation period.</p> <p>(2) Output 2 (solar PV model at schools)</p> <p>The achievement of Output 2 is basically the same as that of Output 1. Output 2, however, has more challenges than Output 1 in terms of institutional and financial arrangements of sustainable O&amp;M of solar PV systems since involvement of Ministry of Education, Science and Technology (MoEST) in establishing the O&amp;M mechanism is still nascent.</p> <p>(3) Output 3 (capacity development on MHP, biogas and wind technologies)</p> <p>Output 3 is expected to be achieved to some degree if the ongoing activities, such as the preparation of guidelines and documentation/ presentation of Simple Pre- Feasibility Study (F/S), are completed as planned. Since the pilot projects for Output 3 were cancelled toward the end of the first year of the project period, most of the C/Ps had little chance to practice what they have learned in trainings. The C/Ps' more active participation is needed in the ongoing activities for Output 3 so that their practical knowledge will improve in the remaining project period.</p> <p>(3) Output 4 (recommendation on policy and institutional frameworks)</p> <p>Output 4 is expected to be achieved to a relatively high degree if the remaining activities, such as holding the International Workshop and proposition of recommendations are completed as planned. On the other hand, whether or not the Project can present truly effective and realistic recommendations depends largely on successful production of Output 1 through 3. The Experts are now preparing recommendations based on findings from the three Outputs. Close discussions with the C/P institutions need to be undertaken in order to produce truly useful recommendations.</p> <p>1-3. Achievement of Project Purpose</p> <p>The Project Purpose is achieved to some degree at present. If unfinished activities are conducted successfully, the achievement level is expected to be relatively high at the end of the project period.</p>

Successful completion of all the activities for the four Outputs with full participation from the C/Ps is required to attain a high level of achievement.

#### 1-4. Implementation process

##### <Positive factors>

##### (1) Collaboration with JKUAT and the BRIGHT Project

The C/Ps and staff of County Offices of the MoH have been attending and/or making presentations at various seminars and trainings organized by the JKUAT and/or JICA's technical cooperation project "The Project for Capacity Development for Promoting Rural Electrification Using Renewable Energy (the BRIGHT Project)". Such collaboration with JKUAT and the BRIGHT Project is contributing to raising efficiency of the Project.

##### <Challenges>

##### (1) Demanding work volume of the C/Ps

Demanding work volume of the C/Ps outside the Project, such as work for diesel power generation, has been impeding effective and efficient technical transfer from the Experts to C/Ps. In particular, the C/Ps have been having a hard time finding time to go to the pilot sites (for Output 1 and 2) and pre F/S sites (for Output 3). Hence much of the field activities, particularly activities for Output 1 and 2, have been conducted by the Expert Team alone, without much participation from the C/Ps.

##### (2) Inconvenient location of the project office

The project office is located far from REA/ MoE&P, making the Experts and C/Ps difficult to see each other in person. This physical distance inhibits smooth project operation to a significant degree.

##### (3) Effects of rapid grid extension in Kenya

REA has been vigorously extending electrical grids to non-electrified areas in Kenya. The sites extended by grid, by nature, often overlap with the Project's potential and existing solar PV pilot sites. In fact, the Project had to re-select the pilot sites for Lot 2 several times since it became apparent the area would be soon covered by grid extension plans. It took much longer time for the Project to finalize its selection of the pilot sites, particularly for Lot 2.

##### (4) Time spent for planning collaboration with UNIDO

In the first year of the Project, the Project Team spent about nine months planning the details of collaboration with UNIDO. The collaboration was planned to facilitate pilot activities of MHP, biogas and wind power, which was for Output 3. However, after research, it was realized that such collaboration would not be effective and a decision was made to cancel the plan. The Project had to modify the plan for Output 3 substantially and the time spent for planning since the commencement of the Project was wasted to a large extent.

##### (5) Transition to the County System in Kenya

Kenya has seen a transition to the County System in the last few years. The roles and responsibilities of the central government and county governments dramatically changed particularly in mid to late 2013 (for Output 1). This change has caused the Project to spend a lot time for coordination with both

national and sub-national stakeholders with regard to the O&M of the pilot solar PV systems.

(6) Poor performance of solar PV systems installers contracted by the Project

The level of skills and techniques of local solar PV systems installers contracted by the Project was much lower than anticipated. The solar PV systems at the pilot sites are facing repeated technical and mechanical troubles which need to be rectified frequently by the Project. The Project Team has to spend such a long time shooting troubles in the fields that some of the work that needs to be done in Nairobi is being delayed.

(7) Remoteness of the pilot sites of Lot 2

The Project had to select pilot sites for Lot 2 which were far in the distance from Nairobi because there was no other choice. The selection was appropriate considering typical areas where off-grid electrification systems operate. However, the sites have security issues and require a long travel time. It is not possible for the Experts and C/Ps to visit the sites often within the limited timeframe of the Project, which in turn hampers technical transfer activities for Output 1 and 2.

(8) Heavy workload of the C/Ps for the Laptop Program

The C/Ps' work volume for the Kenyan Government's Laptop Program has become increasingly large since around April 2014. The time they can spend for project activities has become even less than before.

## **2. Summary of Evaluation Results**

(1) Relevance

Relevance is relatively high. The project is well aligned with Kenya's development priority as well as with Japan's ODA policy towards Kenya. The project is also appropriately responding to the needs of the target group, especially the needs of those public facilities in nonelectrified areas by mobilizing Japan's comparative advantage of expertise in renewable energy, community participation, O&M, and business analysis. On the other hand, Kenya has been seeing rapid grid extension in recent years and some of the sites selected for the pilot project have become covered by such an extension. Such a situation could have been avoided if strategic and systematic planning on rural electrification had been in place at REA/MoE&P before the commencement of the Project.

(2) Effectiveness

Effectiveness is fair at present. Although the project purpose is expected to be achieved to a relatively high degree by the end of the planned period, there is still uncertainty regarding the achievements of all the Outputs, from Output 1 through 4. If ongoing activities are completed smoothly and effectively and the concerned institutions take action in accordance with the recommendations to the Project specified in this report, effectiveness is expected to be higher at the completion of the Project.

(3) Efficiency

Efficiency is fair. Inputs from both Japanese and Kenyan sides are basically provided as planned. However, the C/Ps, having many other duties, are not able to spend sufficient amount of time for project activities especially before the Mid-term Review, hence lowering the level of technical transfer from the

Experts to the C/Ps. The plan for pilot projects at industrial facilities was cancelled in the first year and it took time to rearrange the project framework. Various key activities were delayed due to reasons such as solar PV pilot site re-identification to avoid grid extension, system troubles at solar PV systems and Lot 2 being in a remote area. Furthermore, Kenya's transition to the County System around mid-2013 required time to identify stakeholders and their roles and responsibilities regarding O&M of solar PV systems. On the other hand, collaboration with the JKUAT and BRIGHT Project is contributing to raised efficiency to a certain extent.

#### (4) Impact

Impact is fair. The achievement level of the Overall Goal will largely depend on that of the Project Purpose. It will also depend on the practicality and replicability of the electrification models to be finalized in the remaining project period. Since there is a certain level of uncertainty regarding the achievement of the Project Purpose at the moment, the Overall Goal is also subject to uncertainty. Positive impacts of the Project are: (1) Stakeholders of renewable energy technologies increased their awareness regarding the high O&M cost and (2) It is likely that REA will discuss O&M issues with potential facility owners/users in future implementation of systems instalment. There are also impacts at the community-level which improved daily lives of the community members after the installation of solar PV systems at the pilot sites. For instance, personal security of female pupils and staff has improved with lighting at evening and night time. The community members, particularly women and children, are now enjoying improved public health services such as being provided better care during deliveries at night and getting immunizations at local dispensaries. On the other hand, REA could not adopt some specifications suggested by the Project regarding the solar PV systems design for the Laptop Program due to time constraints, which, if realized, would have been a remarkable impact affecting as many as 3,000 primary schools in Kenya.

#### (5) Sustainability

Sustainability is fair. Presently, the level of policy and institutional sustainability is difficult to judge since REA is planned to be transformed into the National Electrification and Renewable Energy Authority (NERA). However, if the suggestions from the Project are incorporated into the current policies on renewable energy in future, policy sustainability will be high. The roles and responsibilities regarding the O&M of solar PV systems need to be further clarified and ensured among the national and county governments for better institutional sustainability. Technical sustainability is facing challenges because the C/Ps' practical skills have room for improvement compared with their theoretical knowledge in all four renewable energy technologies. Financial sustainability also needs to be improved, particularly for the appropriate O&M of solar PV systems, since the governments' budgets for pushing forward model dissemination is yet to be secured.

### **3. Factors that promoted realization of effects**

#### (1) Factors concerning the planning

N/A

#### (2) Factors concerning the implementation process

N/A

#### **4. Factors that impeded realization of effects**

(1) Factors concerning the planning

N/A

(2) Factors concerning the implementation process

All the negative factors listed in “1-4. Implementation process” have impeded realization of effects in some way or other throughout the project period.

#### **5. Conclusion**

At the time of the Terminal Evaluation, the achievement level of the Project Purpose was fair. However, the achievement level will be higher if the remaining activities are completed successfully without delay in the remaining project period and appropriate action is taken in accordance with the recommendations proposed in this report.

The Project Team has been conducting planned activities despite the challenges of multiple adversities which contributed to lowering efficiency. There are still many issues to be addressed in the remaining implementation period until the Project can present practical and sustainable models. In particular, presenting optimal O&M mechanisms of solar PV systems requires obtaining understandings and agreement from relevant organizations. The Project will then need to give effective recommendations to C/P organizations, which should be authorized and endorsed, so that the models will take root at the C/P organizations. If these issues are addressed properly, the achievement level of the Project Purpose will be much higher.

The Project is advised to take action explained above as well as to follow recommendations presented in the next section. The Project should be completed in February 2015 as originally planned.

#### **6. Recommendations**

##### **Recommendation to the Project (To be addressed in the remaining project period)**

(1) Ensuring sustainability by establishing the O&M models

The Project should continue discussing the O&M models of solar PV systems with relevant institutions including MoH, MoEST, county governments and so forth so as to ensure sustainability of the solar PV systems. Having high-level dialogues and then entering into MOUs with relevant institutions is strongly recommended since it would officially promise institutional and financial commitment to the O&M models. Providing quantitative data on projected annual O&M cost, both total and itemized, by the Project to the prospective signees of the MOUs would facilitate informed decision-making at the signees' sides.

With regard to MoEST's institutional framework for O&M, an option such as giving a stronger facilitator role to County Education Offices is to be considered. The Offices could then effectively link the solar PV-installed schools and MoEST when the schools are in need of financial resources for solar PV O&M.

Furthermore, appropriate management and handling of cash generated from the battery charging business needs to be discussed in order to prevent possible misconduct at the facilities.

The proposed O&M models, on the other hand, should be authorized by the C/P organizations.

Departments/persons responsible for continuous improvement of the models should also be identified and appointed.

(2) Conducting and presenting a quantitative analysis on applicability of the models

A quantitative analysis on applicability of the proposed models is recommended to be conducted and presented to REA/MoE&P. It is beneficial for the C/P organizations to be equipped with quantitative information on, but not limited to, (1) a projected scope of applicability of the proposed models to their future rural electrification plans, (2) the estimated number of applicable cases, and (3) required O&M costs. When conducting the quantitative analysis, site-selection criteria for battery charging stations need to be clarified also. Thus, the Project is advised to build upon its knowledge acquired through its experience on the pilot activities and propose most appropriate criteria.

(3) Formulating realistic policy recommendations

In order to complete the work for Output 4, which is about proposing recommendations on policy and institutional frameworks for rural electrification using renewable energy, the Project is advised to have close dialogues with relevant institutions regarding the proposed solar PV models. The Project, then, should formulate realistic policy recommendations and garner support for their implementation by the concerned institutions. It is important to facilitate active adoption of the proposed models by REA in future. Therefore, if the models are deemed effective in the Project Completion Report, application of the models is advised to be specified in REA's "Annual Renewable Energy Work Programme (Performance Contract)" as well as in Rural Electrification Master Plan (REMP) at the time of updating. The Project and REA are encouraged to work on this issue before the Project terminates.

(4) Working on intensive technical transfer with strong participation from the C/Ps

In order to fill the knowledge/skills gap, it is advised that the technical transfer from the Experts to C/Ps be undertaken actively during the remaining project period. Strong participation from the C/Ps in such activities is key for attaining satisfactory levels of technical transfer in each field of renewable energy technology. The C/Ps' participation includes, but not limited to, preparation and presentation of papers for the International Workshop to be held in February next year.

(5) Recording the achievements of the Objectively Verifiable Indicators, challenges and recommendations

At the time of the Terminal Evaluation, some of the key Objectively Verifiable Indicators in PDM have not reached their targets. They are expected to be attained in the next few months as the Project progresses. When writing the Project Completion Report to be submitted in February 2015, the achievement levels of those indicators should be clearly written so that an objective judgment of project performance can be made easily. Furthermore, remaining challenges and measures to be taken for raising sustainability should be discussed with the C/P and other related organizations and the results of the discussions should be delineated in the Project Completion Report.

**Recommendation to the C/P institutions (To be addressed as medium- to long-term measures)**

(1) Utilizing and improving the proposed models continuously

The C/P organizations are recommended to continue utilizing and improving the solar PV models proposed by the Project. Assignment of the departments/persons responsible for the coordination with relevant institutions is also recommended to make an institutional effort to improve the models.



(2) Utilizing and revising the guidelines continuously

As for MHP, biogas and wind technologies, pilot project implementation was cancelled in the first year of the project period. Thus, the C/Ps did not have a chance to experience the whole cycle of planning, analysis, system designing, installation and monitoring which are necessary for carrying out activities on the ground. The Project, instead, gave intensive training to the C/Ps and guidelines are being developed for future use. It is strongly recommended that the C/Ps will build on their training experience in the Project and leverage their increased knowledge in actual implementation of MHP, biogas and wind technologies in the field. In doing so, utilizing and revising the guidelines, including one on solar PV systems, should be conducted continuously. REA should be responsible for revising and updating the guidelines.

(3) Improving database on the Rural Electrification Master Plan (REMP)

Current database for the REMP needs to be improved making use of Geographical Information System (GIS). The improvement will help relevant organizations including development partners avoid duplication or overlap of future project sites. It will also facilitate easier decision-making concerning locations of future development.

(4) Exchanging knowledge and human resources with JKUAT

REA's and MoE&P's knowledge sharing and exchange with JKUAT have been proved to be beneficial. Continuous exchange of knowledge and human resources with JKUAT is advisable for strengthening capacity on renewable energy technology at REA and MoE&P. Such knowledge exchange includes, but not limited to, sharing REA's guidelines and other documents produced by the Project so that JKUAT can utilize them in their training courses. With regard to JKUAT's trainings on solar PV systems, regular attendance to such trainings by MoH, MoEST, and County Governments should be ensured.

(5) Improving basic skills for installation work of electrical facilities

It has been observed that the quality of basic installation work for wiring, switches, breakers, etc. was rather low. Thus, the responsible Expert became fully occupied with fixing those poor installations. Without the supervision of the Experts, most solar PV systems installed by local contractors may soon experience faults and malfunctions. In order to improve the quality of basic installation works, it is important for REA to compile detailed appropriate designs and rigorously supervise/ inspect the contractors' job accordingly.

## **7. Lessons learnt**

### **(1) Taking appropriate measures to minimize negative factors before and during the Project**

There is no doubt that the current delay in producing sufficient outputs is largely attributable to many negative factors. There are as many as eight factors, both internal and external, which have been negatively influencing the Project throughout the implementation period. The project implementers should have made more efforts to identify and tackle these critical issues both before and during the project period so that unfavourable ramifications would be minimized. In some cases, drastic modifications on project design and modalities, including revision in project scope and change in the mode of expert dispatch, to name a few, could have been considered so as to best address major issues.