

Country Name	<b>The Project for the Capacity Development for Rural Electrification</b>
Republic of Zambia	

**I. Project Outline**

Background	<p>Zambia had aimed at improving the rural electrification rate from 3.1% at the time of ex-ante evaluation (2008) to 51% by 2030 and the urban electrification rate from 47% at the time of ex-ante evaluation to 90% by 2030. JICA conducted a development study, “The Study for Development of the Rural Electrification in Zambia (2006-2008)”, and the Rural Electrification Master Plan (REMP) was formulated in 2008. The Rural Electrification Authority (REA), which was established in 2004, was tasked to promote rural electrification based on REMP. However, REA did not have sufficient experience and capacity to promote rural electrification. Thus, in order to implement rural electrification projects based on REMP, it was required to develop capacities of REA for planning and managing rural electrification projects, financial management, introducing solar power generation to areas where extension of power distribution networks is not suitable and properly updating REMP.</p>												
Objectives of the Project	<p>Through enhancing REA’s planning capacities for rural electrification, technical capacities for distribution line extension, mini-hydro electrification and photovoltaic (PV) systems, and project management and financial management capacities, the project aimed at strengthening the capacities of REA for implementing and updating REMP, thereby increasing access to electricity in rural areas.</p> <ol style="list-style-type: none"> <li>Overall Goal: Access to electricity in rural areas increases.</li> <li>Project Purpose: The capacities of REA for implementing and updating the Rural Electrification Master Plan (REMP) are strengthened.</li> </ol>												
Activities of the Project	<ol style="list-style-type: none"> <li>Project Site: the whole country</li> <li>Main Activities: (1) Prepare a manual for the formulation of five year rolling plan, conduct Rural Growth Center (RGC)<sup>1</sup> field survey, repackage RGCs<sup>2</sup>, and prepare five year rolling plan and annual work plan; (2) Prepare a feasibility study (F/S) and detailed design (D/D) manual for grid extension electrification and conduct F/S and D/D in accordance with the manual; (3) Prepare a F/S manual for mini-hydro electrification and conduct F/S in accordance with the manual; (4) Prepare a manual for project management and tender documents related to F/S and D/D, material procurement and construction, carry out the contracting process, prepare a manual for supervision of grid extension electrification and supervise construction work; (5) Conduct basic training on PV systems for Department of Energy (DOE) and REA, develop the technical specifications of PV systems, prepare a plan for disseminating PV systems for rural electrification, human resource development plan, trainer’s training text books and manuals and a manual for inspection and monitoring of PV systems, and conduct trainer’s training; and (6) Effectively make transactions for financial management and prepare proper reports satisfactory to stakeholders, and improve the guidelines and manuals for accounting and financial management etc.</li> <li>Inputs (to carry out above activities) <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Japanese Side</td> <td style="width: 50%;">Zambian Side</td> </tr> <tr> <td>1) Experts: 17 persons (Japan: 14, the Philippines: 3)</td> <td>1. Staff Allocated: 15 persons</td> </tr> <tr> <td>2) Trainees Received: 5 persons</td> <td>2. Project office and office furniture</td> </tr> <tr> <td>3) Equipment: vehicle, projector, AC/DC clamp meter, voltage logger, current meter, GIS software, GPS, and CAD software etc.</td> <td>3. Local cost</td> </tr> <tr> <td>4) Operational expenditure</td> <td></td> </tr> </table> </li> </ol>			Japanese Side	Zambian Side	1) Experts: 17 persons (Japan: 14, the Philippines: 3)	1. Staff Allocated: 15 persons	2) Trainees Received: 5 persons	2. Project office and office furniture	3) Equipment: vehicle, projector, AC/DC clamp meter, voltage logger, current meter, GIS software, GPS, and CAD software etc.	3. Local cost	4) Operational expenditure	
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Project Period	August 2009 – December 2013 (Extended Period: August 2012 – December 2013)	Project Cost	(ex-ante) 300 million yen, (actual) 376 million yen										
Implementing Agency	The Rural Electrification Authority (REA)												
Cooperation Agency in Japan	CHUBU Electric Power Co.,Inc.												

**II. Result of the Evaluation**

< Special Perspectives Considered in the Ex-Post Evaluation >

- Target Year for Indicator of Overall Goal: The target year for the indicator of Overall Goal stated in PDM is 2018. If it is confirmed in this ex-post evaluation that 80% of the target (target: 80% of the five year rolling plan) is highly likely to be implemented by the end of 2018, this indicator is evaluated as ‘achieved’. In more concrete terms: (a) if 80% of the target, i.e.,  $80\% \times 80\% = 64\%$ , of the five year rolling plan is highly likely to be implemented by the end of 2018, this indicator is evaluated as ‘achieved’, (b) if 40% to 63% of the plan, which means 50-79% of the target, is likely to be implemented by the end of 2018, it is evaluated as ‘partially achieved’, and (c) if less than 40%, which means below 50% of the target, is likely to be implemented by the end of 2018, it is evaluated as ‘not achieved’.

<sup>1</sup> Rural Growth Center (RGC) is a center of economic activities in rural areas in Zambia which functions as a place to exchange cash and goods, purchase daily essentials and access to public services etc.

<sup>2</sup> REMP packaged 1,217 non-electrified RGCs into 180 project packages and proposed electrification priorities and the most appropriate electrification mode for each RGC.

## 1 Relevance

### <Consistency with the Development Policy of Zambia at the Time of Ex-Ante Evaluation and Project Completion>

The project was consistent with Zambia's development policy on 'achieving a stable supply of environmentally friendly and economical energies to the whole country' and 'promotion of rural electrification' etc. as set forth in the "Zambia Vision 2030", "Fifth National Development Plan 2006-2010", and "Sixth National Development Plan 2011-2015" at the time of both ex-ante evaluation and project completion.

### <Consistency with the Development Needs of Zambia at the Time of Ex-Ante Evaluation and Project Completion >

At the time of ex-ante evaluation, Zambia aimed at increasing electricity supply for establishment of stable and well balanced economic infrastructures and poverty reduction. At the time of project completion, the demand for rural electrification in Zambia was still very high, and REA was expected to implement more projects than ever and the number of their project was expected to be increased continuously.

### <Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation>

The project was consistent with Japan's ODA policy, as assistance for establishment of balanced economic structure was emphasized in the Country Assistance Program for Zambia (2002), in which infrastructure development as a basis to support economic activities was stated as one of development issues.

### <Evaluation Result>

In light of the above, the relevance of the project is high.

## 2 Effectiveness/Impact

### <Status of Achievement for the Project Purpose at the time of Project Completion>

The Project Purpose was achieved by the time of project completion. REA completed electrification of 70 RGCs against the target of 54 RGCs by the time of terminal evaluation (Indicator 1). While at least 18 project packages mentioned in REMP were targeted to be listed in Annual Work Plans by December 2013, the scale of project packages listed in REMP was too large to implement as a single project (i.e. too large to put together as a single tender document). Therefore, the project packages were re-packaged as "lots". Regarding grid-extension projects, REA listed 22 lots in Annual Work Plan 2011, 2012 and 2013 that were re-packaged from the list in REMP (Indicator 2). All newly listed ten projects (100%) were contracted in FY2011 and 21 among 22 newly posted projects (95%) were contracted in FY2012 (Indicator 3).

### <Continuation Status of Project Effects at the time of Ex-post Evaluation>

The project effects have been partially maintained since project completion. The number of RGCs electrified after project completion has been significantly less than the target number stated in the five year rolling plan except for 2014 (4% to 58% of target). The main reason for this is lack of funds, particularly, the exchange rate almost doubled in 2015 compared to that of 2013, which has reduced financial resource availability. Moreover, REA has embarked on mini-hydro electrification projects since 2015, which is much more expensive than distribution line extension projects and hence further reduced financial resource availability (Indicator 1). Annual work plans have been prepared from the five year rolling plan every year since project completion. While the number of project packages listed in these annual work plans were more or less the same as the target (18 project packages) from 2014 to 2016, the number was significantly reduced in 2017, due to the inadequate funding both from the government and various development partners and the fluctuation of exchange rates, which made it difficult for REA to plan for future projects<sup>3</sup> (Indicator 2). While more than 70% of the newly-posted projects in the annual budget were contracted in 2014 and 2015 (and 2017 (the number of the newly-posted projects in the annual budget was already very small in 2017)), this was not achieved in 2016, due to the same reasons as stated above (Indicator 3).

### <Status of Achievement for Overall Goal at the time of Ex-post Evaluation>

The Overall Goal was partially achieved at the time of ex-post evaluation. While the target number of RGCs to be electrified from 2014 to 2018 in the five year rolling plan is 244 RGCs in total, 130 RGCs have been actually electrified since project completion, which means 53% of the target has been achieved at the time of ex-post evaluation. Thus, it is unlikely that 80% of the five year rolling plan would be implemented by 2018. The main reason is due to the insufficient funds allocated to REA as stated above, and staff changes may have also affected the project, as strategically important people to this project such as the CEO and the Technical Director left REA in 2012.

### <Other Impacts at the time of Ex-post Evaluation>

No negative impact on natural environment has been observed and no land acquisition and resettlement has been occurred under the project. In Mumbwa district, where the project directly supported to conduct F/S and D/D for grid extension, employment creation was observed, as REA enabled the provision of electricity to a huge agriculture business in Mumbwa which has employed more than 1,000 rural people. Moreover, according to observations during field visits and interviews with beneficiaries in rural communities and REA officials, the project has contributed to some positive impacts through capacity building of REA. For example, schools in RGCs that were electrified by REA have become able to conduct ICT lessons and evening classes, rural clinics in RGCs that were electrified by REA have become able to handle emergencies at night, shops in rural markets that were electrified by REA have become able to open for longer hours in evening, which has resulted in an increase of sales, and many women in RGCs that were electrified by REA have started small informal businesses such as saloons and shops.

### <Evaluation Result>

In light of the above, through the project, targets set in indicators for Project Purpose were achieved by the time of project completion, the project effects have been partially maintained since project completion, and the Overall Goal was partially achieved at the time of ex-post evaluation. While electrification of the target number of RGCs in the five year rolling plan is unlikely to be achieved by the target year (2018), the project has contributed to activation of rural economy through employment creation and an increase in sales and improvement of social services such as education and medical services in RGCs electrified by REA. Therefore, the effectiveness/impact of the project is fair.

<sup>3</sup> While the project packages were re-packaged as "lots" and listed in annual work plans during project implementation as stated above, the numbers shown in the table below after 2014 are the numbers of "project packages". There was no answer from REA on why the numbers of "project packages" are listed in annual work plans since 2014 instead of "lots".

Achievement of Project Purpose and Overall Goal

Aim	Indicators	Results																																				
<p>(Project Purpose) The capacities of REA for implementing and updating the Rural Electrification Master Plan (REMP) are strengthened.</p>	<p>1. At least 54 RGCs mentioned are electrified by Dec. 2013.</p>	<p>Status of the Achievement: achieved (partially continued) (Project Completion) REA already completed electrification of 70 RGCs by the time of terminal evaluation (May 2013). (Ex-post Evaluation) The number of RGCs electrified after project completion has been significantly less than the target number stated in the five year rolling plan except for 2014.</p> <table border="1" data-bbox="751 309 1549 987"> <thead> <tr> <th></th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> </tr> </thead> <tbody> <tr> <td><b>The target number of RGCs to be electrified in five year rolling plan</b> (including distribution line extension, mini-hydro and PV systems)<sup>4</sup></td> <td>42</td> <td>71</td> <td>47</td> <td>35</td> <td>49</td> </tr> <tr> <td>The number of RGCs actually electrified by distribution line extension/grid extension</td> <td>12</td> <td>14</td> <td>2</td> <td>3</td> <td>-</td> </tr> <tr> <td>The number of RGCs actually electrified by mini-hydro</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>-</td> </tr> <tr> <td>The number of RGCs actually electrified by PV systems</td> <td>72</td> <td>27</td> <td>0</td> <td>0</td> <td>-</td> </tr> <tr> <td><b>The total number of RGCs actually electrified</b></td> <td>84</td> <td>41</td> <td>2</td> <td>3</td> <td>-</td> </tr> </tbody> </table>		2014	2015	2016	2017	2018	<b>The target number of RGCs to be electrified in five year rolling plan</b> (including distribution line extension, mini-hydro and PV systems) <sup>4</sup>	42	71	47	35	49	The number of RGCs actually electrified by distribution line extension/grid extension	12	14	2	3	-	The number of RGCs actually electrified by mini-hydro	0	0	0	0	-	The number of RGCs actually electrified by PV systems	72	27	0	0	-	<b>The total number of RGCs actually electrified</b>	84	41	2	3	-
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	<p>3. At least 70 % of the newly-posted projects in the annual budget (except carry-over projects) are contracted within each fiscal year.</p>	<p>Status of the Achievement: achieved (partially continued) (Project Completion) All newly listed ten projects were contracted in FY2011 and 21 among 22 newly posted projects were contracted in FY2012. (Ex-post Evaluation) In 2016, less than 70% of the newly posted projects were contracted.</p> <table border="1" data-bbox="751 1597 1549 1892"> <thead> <tr> <th></th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> </tr> </thead> <tbody> <tr> <td>The total number of newly-posted projects in the annual budget in each fiscal year</td> <td>17</td> <td>15</td> <td>15</td> <td>3</td> </tr> <tr> <td>The number of newly-posted projects in the annual budget that were contracted within each fiscal year</td> <td>12</td> <td>14</td> <td>2</td> <td>3</td> </tr> </tbody> </table>		2014	2015	2016	2017	The total number of newly-posted projects in the annual budget in each fiscal year	17	15	15	3	The number of newly-posted projects in the annual budget that were contracted within each fiscal year	12	14	2	3																					
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<sup>4</sup> The reason why the target number fluctuates largely is that the five year rolling plan is revised every year according to financial availability to reflect issues in a given year and targets not having achieved in a given year to the following year.

project completion, which means 53% of the target has been achieved at the time of ex-post evaluation.

Source : Terminal Evaluation Report, questionnaire and interview surveys to REA

### 3 Efficiency

Both project cost and project period exceeded the plan (ratio against the plan: 125% and 147%, respectively). Project period was extended, as (1) significant technical transfer was not conducted during the first year until the engagement of the short-term expert team, (2) it became apparent that for project counterparts (C/Ps) to fully acquire knowledge and experience necessary to properly carry out mini-hydro electrification projects, the original duration of project (three years) was too short, and (3) while REA had only four engineers when the project started, REA continuously increased its technical staff, and additional training for new members was necessary. Therefore, the efficiency of the project is fair.

### 4 Sustainability

#### <Policy Aspect>

“Zambia Vision 2030” is still effective at the time of ex-post evaluation. This project is also consistent with the revised “Sixth National Development Plan 2013-2016”, which targets at achieving the total national electricity generation capacity of 3,121 MW by 2016, and the revised “National Energy Policy 2008”, which targets at increasing access to energy, particularly in rural areas.

#### <Institutional Aspect>

REA is still responsible for promoting rural electrification at the time of ex-post evaluation. The number of quota in the technical department, which is responsible for all technical works in the organization, in REA is 36 engineers<sup>5</sup>. While there were only six engineers in the department during the project implementation, there are 18 engineers in the department at the time of ex-post evaluation. However, the current number (18 engineers) is still not sufficient to promote rural electrification. There are two Certified Basic Trainers and two Certified Intermediate Trainers of solar PV systems, which is also not sufficient, as electrification by solar PV systems has been increasing. Moreover, as stated above, strategically important people to this project such as the CEO and the Technical Director left REA in 2012. Furthermore, while it is required for REA to establish its offices in provincial centers countrywide, only one office has been established in Samfya in Luapula Province due to inadequate operational funding.

#### <Technical Aspect>

At the time of ex-post evaluation, nine out of 15 C/Ps still work at REA. According to the technical department of REA, engineers’ technical skills are generally sufficient to prepare five year rolling plans and annual work plans, conduct F/S and D/D for distribution line extension and F/S for mini-hydro electrification, prepare tender documents, supervise construction works, and carry out load assessment, design, cost estimation and inspection and monitoring of solar PV systems, as these tasks have been conducted properly. However, their skills to update REMP is not sufficient (REMP has not been updated since project completion), particularly, skills for calculating Financial Internal Rate of Return (FIRR) and Economic Internal Rate of Return (EIRR) etc. are not sufficient. TOTs on solar PV systems have been conducted twice since project completion; one was conducted in 2015 for eight REA staff, and the other was conducted in 2017 for two ZESCO (a state-owned company)<sup>6</sup> staff (TOTs for REA staff have not been conducted after 2015 due to lack of budget). Various manuals prepared under the project are utilized by REA officials. Equipment procured under the project such as a vehicle, projector, AC/DC clamp meter, voltage logger, current meter, GIS software, GPS and CAD software etc. are utilized and maintained by REA at the time of ex-post evaluation.

#### <Financial Aspect>

REA has been allocated a stable amount of budget as seen in the table. However, these amounts are not sufficient to update REMP, achieve targets stated in the five year rolling plan, and conduct TOTs on solar PV systems for REA staff. The excel database developed under the project for improvement of efficiency in financial management and sharing information on the same platform with other departments is not used at REA. REA has installed and used the pastel accounting system (a South African accounting software package developed by SoftLine Group) which serves as an integrated system that links various aspects for better accounting management.

Budget and Expenditure of REA (Unit: ZMW)

	2014	2015	2016
Total budget allocated (Actual)	174,274,499	141,057,089	160,541,410
Capital projects	162,075,284	120,494,812	136,665,876
Administrative	12,199,214	20,562,277	23,875,534
Total expenditure (Actual)	101,964,428	140,775,767	135,621,230
Capital projects	82,090,468	120,213,490	112,551,141
Administrative	19,873,960	20,562,277	23,070,089

Source: REA Finance Department

#### <Evaluation Result>

In light of the above, some problems have been observed in terms of the institutional, technical and financial aspects of the implementing agency. Therefore, the sustainability of the effectiveness through the project is fair.

### 5 Summary of the Evaluation

Through the project, targets set in indicators for Project Purpose were achieved by the time of project completion. The project effects have been partially maintained since project completion, and the Overall Goal was partially achieved at the time of ex-post evaluation. While electrification of the target number of RGCs in the five year rolling plan is unlikely to be achieved by the target year (2018), the project has contributed to activation of rural economy through employment creation and an increase in sales and improvement of social services such as education and medical services in RGCs electrified by REA. As for sustainability, some problems have been observed in terms of the institutional, technical and financial aspects. As for efficiency, both project cost and project period exceeded the plan.

Considering all of the above points, this project is evaluated to be partially satisfactory.

<sup>5</sup> These engineers are the core personnel in the organization.

<sup>6</sup> ZESCO is a state-owned joint stock electricity company, which implements construction works as a contractor based on plans prepared by REA and conducts O&M after construction works.

### III. Recommendations & Lessons Learned

#### Recommendations for Implementing Agency:

- As stated above, REMP has not been updated. To update REMP in accordance with the current realistic budgetary situation will enable REA to plan and meet their targets realistically.

#### Lessons Learned for JICA:

- As stated above, REMP has not been updated. In addition to Joint Coordination Committees, a project, which support implementation of rural electrification plans, should consider to include activities for advocacy/dissemination of a developed master plan and discussion and planning on how the master plan can be updated and implemented under budget constraints, cooperating with stakeholders including electric utility companies and other donors.



Rural people converge to watch TV at a teacher's house electrified by REA



Solar PV system installed in rural Samfya.