RENEWABLE ENERGY FOR ELECTRICITY GENERATION - RENEWABLE ELECTRIFICATION OF THE GALAPAGOS ISLANDS - ERGAL

(ECU / 02 / G31)

PIMS FSP No. 1295
(ATLAS Project ID 00042428-ID. 00048857)

TERMINAL EVALUATION

(ON THE FINAL YEAR OF EXECUTION)

FINAL REPORT
(WITH COMMENTS RAISED)
(Version 2.1)

HUMBERTO RODRIGUEZ
Consultant

Quito, January 29, 2015

RENEWABLE ENERGY FOR ELECTRICITY GENERATION
RENEWABLE ELECTRIFICATION OF THE GALAPAGOS ISLANDS -ERGAL
ECU / 02 / G31
PIMS FSP No. 1295
(ATLAS Project ID 00042428-ID. 00048857)

Terminal Evaluation
Inception Report: March 14, 2014

Region: Latin America. Country: Ecuador
Operational Program Number 6: Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs
Executing Agency: Ministry of Electricity and Renewable Energy (MEER)

Evaluator: Humberto Rodriguez, Dr. rer. nat.
humberto.rodriguez.m@gmail.com

Acknowledgements: Thanks for the collaboration of ERGAL staff, UNDP Quito, UNDP Panama, MEER, SENPLADES, CONELEC, MAE, Governing Council of Galapagos, Elecgalapagos, Authorities from Santa Cruz and San Cristobal, contractors and supervisors.

REPORT VERSIONS

Spanish versions:
Inception Report V1.0: Delivered March 14, 2014
Inception Report V1.1 with comments raised: April 11, 2014

Closing date for the report: December 8, 2014

Final Report Version 2.0: Delivered December 8, 2014
Final Report Version 2.1: With comments raised: Delivered 29, January, 2015

English versions:

Version 2.1. Translation of the Spanish Version 2.1

TABLE OF CONTENTS

TABLES

FIGURES

ILUSTRATIONS

ACRONYMS

BMZ	German Ministry of Development Cooperation
CENACE	National Energy Control Center
CGREG	Governing Council Special Regime Galapagos
CONAM	National Modernization Council (until 2007)
CONELEC	National Electricity Council
DEREE	Directorate of Renewable Energy and Energy Efficiency (until 2007))
DPNG	Galapagos National Park
e7	e7 Network of Expertise for the Global Environment
EEPG	Galapagos Provincial Electric Company
ELECGALAPAGOS	Galapagos Provincial Electric Company
FERUM	Rural and Marginal Urban Electrification Fund
GEF	Global Environment Facility
GHG	Greenhouse Gas
GoE	Government of Ecuador
INECEL	Ecuadorian Institute of Electrification (until 1996)
INGALA	Galapagos National Institute
IPP	Independent Power Producer
JICS	Japan International Cooperation System
KfW	German Bank for Reconstruction and Development
KOICA	Korea International Cooperation Agency
LF	Logical Framework
MAE	Ministry of Environment
MEER	Ministry of Electricity and Renewable Energy (since 2007)
ME	Midterm Evaluation
MEM	Ministry of Energy and Mines (until 2007)
MRNNR	Ministry of Non-Renewable Natural Resources
PIR	Project Implementation Report
PMU	Project Management Unit
PNG	Galapagos National Park
PPA	Power Purchase Agreement
PSC	Project Steering Committee
RE	Renewable Energy
SENPLADES	National Secretary of Planning and Development
SEREE	Sub-Secretariat of Renewable Energy and Energy Efficiency (since 2007)
SETECI	Technical Secretariat for International Cooperation
TRAC	Advanced Target Resources from the Core.
TTA	Trauma Tecno Ambiental
PMU	Project Management Unit
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Program
WWF	World Wide Fund for Nature

UNITS

kWh	kilowatt-hour
kW	kilowatt
kWp	kilowatt-peak
gal	3.785 liters
GW	gigawatt
MW	megawatt
Mt	million tonnes
t	metric ton (tonne)

CURRENCY

US $	US Dollar
M US $	Million US $

NOTATION

(,)	Thousands
(.)	Fractions

Illustration 1. Map of the Galapagos Islands

0. EXECUTIVE SUMMARY

The Renewable Energy for Electricity Generation - Renewable Electrification of the Galapagos Islands - ERGAL project has been implemented by the Ministry of Electricity and Renewable Energy (MEER) of Ecuador and implemented by the United Nations Development Program (UNDP) with own resources and the Global Environment Facility (GEF), and the United Nations Foundation (UNF) funds that served as catalysts for a major investment from the Ecuadorian State. The Project Document (PRODOC) was signed by the parties in July 2006. The initial project start date was August 1, 2006. The project began execution in November 2007. The initial execution term was three years and was subsequently extended several times until April 30, 2014. The project took double the initial time for reasons that will be explained later.

The Galapagos archipelago is a group of islands located about 1,000 kilometers (600 miles) west of the mainland of Ecuador. The Galapagos due to the immense richness of the diversity of biological species are a natural sanctuary, reason why they were declared in 1978 by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as a World Heritage Site.

In 2001, four of the inhabited islands (San Cristobal, Santa Cruz, Isabela and Floreana) had a total population of about 19,000 inhabitants[1]. The islands' economy depends mainly on tourism and to a lesser extent, fishing. For the supply of electricity in 2001 diesel plants were used which consumed 29% of the 5.78 million gallons of diesel transported from the continent in small tankers[2].

Diesel consumption entails various difficulties and potential problems so it was considered desirable to develop a project to reduce consumption by using renewable energy, reducing the dependence on supplies of fuel, CO_2 emissions, the amount of subsidies in supplying electricity and risks of spills that have occurred in the past with negative effects on the fauna and flora of the islands[3], as well as on the income of the inhabitants due to the impact of these spills on the influx of tourists.

The ERGAL project was eligible for implementation by the UNDP with GEF resources because the Government of Ecuador signed the United Nations Framework Convention on Climate Change (UNFCCC) on February 23, 1993 (which entered into force on March 21, 1994) and also signed the Kyoto Protocol on 15 January, 1999 (ratified on January 13, 2000). Furthermore, the Government of Ecuador has been committed to the conservation and preservation of the Galapagos through measures such as the Special Law for the Conservation and Sustainable Development of the Galapagos Province (March 1998), establishing the legal and administrative framework for policy and planning in the Galapagos, the long-term commitment "Zero Fossil Fuel on the Galapagos" (2007) and other measures that demonstrate the willingness and commitment of the government to increase the share of renewable energy in electricity generation in the islands. The ERGAL project is therefore in line with the environmental and energy policy of Ecuador and especially in the Galapagos, and the Millennium Development Goal 7 of UNDP, "Ensuring environmental sustainability". In addition, ERGAL is also

[1] According to the 2010 census, totaling about 25,000 inhabitants
[2] Source: Petrocomercial. Emissions from the electricity sector were estimated at 19,200 tons of CO2.
[3] On January 20, 2001, the vessel Jessica ran aground in Naufragio Bay on the coast of San Cristobal, causing the discharge of 75,000 gallons of fuel oil and 70,000 gallons of diesel. Iguanas were severely impacted on the Santa Fe Island. The proposed remediation measures had an estimated cost of M US $ 9.

consistent with the objectives of Operational Program Number 6 of GEF: Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs, under the GEF Strategic Priority No. (SP 3): Electricity Sector Policy Frameworks in Support of Renewable Energy and Energy Efficiency. Therefore, ERGAL is eligible for GEF financing program because the problem of Galapagos gave the opportunity to reduce Greenhouse Gas Emissions (GHG) since the electricity sector could have chosen to continue using fossil fuels for the generating plants. At the same time, ERGAL has the secondary objective of reducing risks to the rich biodiversity of the Galapagos derived from future oil spills.

The overall environmental objective of ERGAL is to reduce GHG emissions by eliminating institutional, economic, technical and financial barriers to the development of renewable energy for isolated systems and systems linked to the interconnected grid.

The project objective is to support sustainable development in Ecuador, reducing C02 emissions related to electricity generation, through repowering the four islands of the Galapagos archipelago with wind / PV / diesel / biofuel hybrid systems as a substitute of diesel fuel used in power generation, thus providing a model that can be used to promote renewable energy across the mainland of Ecuador. The project will significantly reduce the volume of diesel annually transported to the islands, thereby reducing the environmental threat of an oil spill that can cause great damage to biodiversity found in and around the coastal ecosystem of the islands[4].

In terms of overall profits, the repowering of the four power generation systems would result in a net reduction of GHG emissions of 10,500 tons of CO_2 / year (about 201,600 tons over the 20 year life of the project). The Unit Cost of Reducing Emissions from GEF contribution is approximately US $ 20 / tCO_2.

To achieve the project objectives, the following barriers, identified during the PDF-B that preceded the formulation of the project, needed to be removed:

- Limited experience with renewable energy technologies, especially with regard to electricity generation;
- Lack of familiarity with the operation and maintenance of renewable energy and hybrid (renewable/conventional) electricity systems;
- High initial capital cost of renewable energy technologies;
- No experience with power purchase agreements and independent power generation;
- Lack of experience with project finance investments and joint venture operations between electric utilities and the private sector; and
- Difficult access to finance for renewable energy technologies that are new to Ecuador due to high perceived risks.

The initial project budget according to the PRODOC (2006) is US $ 30,496,135, with a contribution by GEF of US $ 4,055,498 (13.3% of the total), including US $ 815.832 provided as pre-investment for the

[4] Reducing the risk of fuel spillage is due to the decrease of 15.7% in the frequency of trips to transport petroleum to the islands (from a current level of 6.45 million (2004 figures) gallons of diesel, carrying 1.01 million gallons / year would be avoided with the project), thus improving the preservation of biodiversity.

realization of the PDF-B and PDF-C. The contribution of the Government of Ecuador is US $ 5,148,901 in cash and US $ 250.605 in kind, totaling US $ 5,399,506 (17.7% of the total). The remaining US $ 21,041,131 (69.0% of total) correspond to the project co-financing by international agencies and others.

According to the PRODOC, the project must undergo two evaluations: The Midterm Evaluation (ME) and Terminal Evaluation (TE). The aim of the TE is to determine the relevance, performance and success of the project; look for signs of potential impact and sustainability of results, including the project's contribution to capacity development and the achievement of global environmental goals. The TE also intends to identify and document lessons learned and make recommendations that could improve the design and implementation of other UNDP / GEF projects.

The main results and findings of the Terminal Evaluation are as follows[5]*:*

Project Formulation
Expected Outcomes. Five outcomes were designed to achieve the project objectives, following a Logical Framework (LF) consistent to remove barriers. In this LF, expected outcomes, indicators and critical assumptions were also made. These are:

- Outcome 1: To support national partners in implementing repowering of electricity generation on each of the islands.
- Outcome 2: To support repowering through strengthening the institutional, technical and operational capability of EEPG
- Outcome 3: To facilitate repowering on Floreana and San Cristobal with PV/wind/diesel hybrid electricity generating systems.
- Outcome 4: To facilitate repowering on Isabela and Santa Cruz with PV/wind/diesel hybrid electricity generating systems.
- Outcome 5: Replication of project experience/best practices and lessons learned throughout Ecuador and in other countries in the region.

Modifications to the Logical Framework. The PRODOC contains the necessary elements for its implementation and execution (project organizational structure, institutional arrangements, LF, monitoring mechanisms, follow-up and evaluation). During the execution of the project there were modifications made to the objectives, goals and indicators on three occasions, in response to changes that occurred in the Ecuadorian electricity sector as a result of the constitutional reform of 2008 and project conditions. As a result of the Inception Workshop November 2007, the main changes were:

- Biofuels were included as a source of renewable energy additional to photovoltaic and wind power given the possibility of producing them in the continent and transporting them to the Galapagos.
- The MEER starts a program of energy efficiency in cooperation with EEPG.
- The PRODOC established in Output 2.1 involving Independent Power Producers (IPP) through Power Purchase Agreements (PPA). The new framework of the Electricity Act does not consider these possibilities and therefore this output was eliminated.

[5] The methodology included review of documents received from the parties, interviews them and other stakeholders, field visits and preliminary presentation of results to the parties.

- Output 6 was established: The Project Management Unit (PMU) to manage the administrative part of the project.
- Outcome 7 was established: Monitoring and evaluation, to follow up on project planning and more clearly visualize the different monitoring and evaluations to be undertaken for the project.

On January 28, 2011, amendments to the LF were performed for the second time in response to new situations occurring in the projects and as an initiative assumed by MEER directly within projects in Galapagos. The main changes were:

- Outcome 1 aims at conducting an Islands Energy Inventory.
- The goal of outcome 2 was modified into the Implementation of a Training Plan and Modernization of EEPG.
- Biofuels were included for the Floreana and San Cristobal systems.
- Since the San Cristobal wind farm had started operations in October 2007, Output 3.2 was modified for Systematic monitoring of the San Cristobal system based on diesel / wind.
- Baltra was included as a place to develop the wind park of Santa Cruz wind / diesel / biodiesel hybrid system.
- Output 5.2 goal establishes preparation of the Draft Final Report to be disseminated to stakeholders, project participation in a regional seminar for the presentation and discussion of results / lessons learned and outreach activity for informing the public through of social media and a website.
- Outcome 6 establishes outputs associated with the coordination and monitoring of results, management of Outcome 4 and compliance and implementation of the Outcomes 5 and 7.
- Outcome 7 establishes control, monitoring and evaluating compliance with the objectives of outcomes 1-6.

The latest amendments to the LF on November 29, 2012 were as follows:

- ERGAL participation in Isabela was eliminated because MEER assumed it directly.
- Outcome 1.3 was changed to Island Energy Inventory framed within the Galapagos Zero Fossil Fuels Initiative and as a final goal: Documentation of Progress 2012 and analysis of the potential of renewables in Galapagos.
- The goal of outcome 2 was modified to Collaborate in the implementation of the training plan and modernization of the EEPG.

All these modifications resulted in ERGAL focusing on execution of Floreana and Baltra / Santa Cruz projects because the wind farm in San Cristobal was already in operation from October 2007 and the development of Isabela hybrid system was assumed directly by the MEER.

The *initial term of the project for three years was too short*, and the actual execution runtime of seven years has been too long, partly due to delays in the design and construction of the sub-transmission line from Baltra to Puerto Ayora.

The evaluator conceptualizes that the formulation of the project is ***Highly Satisfactory (HS)*** and the modifications to the Logical Framework were an appropriate response to the changes that occurred during project implementation.

Project Implementation
The LF remained as the roadmap during project implementation. The execution - implementation is simple and transparent.

The work plan presented in the PRODOC was adjusted periodically to respond to project implementation. These plans were presented to the UNDP-GEF and approved by them. The project set out from the start the Terms of Reference for the contracts required for its implementation. In connection with the work of the consulting firms, the evaluator found that people or companies contracted met the deliverables and deadlines, satisfactorily.

Moreover, bilateral communication channels between the parties were satisfactory, and no evidence was found to the contrary.

The evaluator considers that the *implementation approach is* ***Satisfactory (S).***

Monitoring and evaluation
From the review of information received, the evaluator inferred compliance with the following monitoring mechanisms:

- Monitoring mechanisms established by the UNDP have been used.
- The PMU as project implementing unit has dealt with everyday tasks using the AWP.
- Evaluations of Progress towards the Millennium Development Goals and Project Implementation Progress were performed during the years 2011 and 2012, rated as Moderately Satisfactory because the main product of the project, the Baltra wind farm / Sub-transmission Line showed no significant progress with delays due to the construction of the Sub-transmission Line.
- The completion of civil works for the wind turbines and their installation during 2013 motivated again Satisfactory ratings.
- As part of the role of UNDP in the project, there were annual visits to it.
- Project Progress Reports. They consist of APR / PIRs. All PIR / APR in this project were developed (PIR: UNDP GEF Project Implementation Report and APR: UNDP Annual Project Review).
- There are also final reports or products of sub-contracts made by the consultants and consulting firms
- Tripartite meetings. The PRODOC established conducting annual tripartite meetings (RTPs) involving the executing agency, the project team, stakeholders and UNDP.
- Project Closing Report. *The PMU prepared the Final Project Report (March 2014).*
- Meetings of the Project Steering Committee (PSC). Ten reports of meetings held between 2009 and 2013 were received, most of them dealing with the development of the Baltra wind farm. At the PSC meetings, a presentation of the state of development of projects is made and actions are recommended to redirect its course.

Assessment of Midterm (ME) Evaluation. The ME was conducted in October 2010, the third year of the effective start in November 2007. The ME assessed the achievement of results to date and drew conclusions and recommendations based on indicators of relevance, effectiveness, efficiency and sustainability, which were considered and accepted by the PMU and PSC with varying degrees of success as shown in this terminal evaluation. The ME considered vital the operationalization of Baltra- Santa

Cruz Sub-transmission Line / Baltra Wind Farm, as well as the completion of Floreana system and improving the quality of service in San Cristobal. Since the initial completion date of the project was December 2010, and that none of the actions for electrification would be completed at that time, it was recommended to extend the term of the project until December 2012. Due to delays in implementation and to the need to improve project management, MEER recommended to strengthen the management capacity of the PMU on the basis of the recommendations by the ME. The ME also recommended adjustments to the LF to retain its role as the roadmap of the project, which were considered in the second modification of the LF.

As regards external financial audits of the project, two were received. .The first one on the Commercial Trust Renewable Energy for Galapagos - Fidergal on December 31, 2009.Trusfund Fidergal (period covered 1 January to 31 December, 2009) and the second, on the ERGAL (period covered 1 January to 31 December, 2012). Both reports are clean and without comments.

The evaluator considers that there was systematical monitoring of activity progress and therefore that monitoring and follow-up of the project is ***Satisfactory (S)***.

Project Outcomes
Overall Objective
Indicators:

- Amount of fossil fuel displaced by generation from renewable sources and resulting reductions in GHG.
- MWh of generation based on renewable energy in the Galapagos system.

Goals:

- Investment of at least US $ 30 million by the end of the project, electric energy generated from renewable increases the current level of 0% to 60% to at least 6.6 MW.
- 10,500 tons of CO_2 (baseline) prevented annually.

Achievements:

- In June 2014, the amount of investment in renewable projects reached M US $ 20.2, which corresponds to 67% of the expected value of M US $ 30. However, when projects under development are operational during 2015 and 2016, the total value of investments will reach M US $ 70.9 corresponding to 236% of the minimum expected investments.
- In June 2014, the operative total renewable capacity reached 4,156 kW representing 63% of the expected goal at the end of the project of 6.6 MW. By including projects that come into operation during 2015 and 2016, total renewable power from mid-2016 will be 10,500 kW and represent 175% of the final goal of the project.
- In December 2013, the annual reduction in CO_2 emissions reached 3,072 tCO_2 which is 29.3% of the final goal of 10,500 tCO_2 / year. Once projects in development are operational 2015 and 2016, on 2017 emissions reductions will reach 10,816 tCO_2 / year which is 103% of the expected final goal.
- Therefore, when projects currently in execution are put into operation, the project will have attained ***Satisfactory (S)*** compliance of the overall objective, despite delays in implementation.

Outcome 1. National partners supporting the repowering of electrical systems of each of the islands.
Indicators:

- Action Plan for the exercise of repowering and documents available for the other outcomes

Goals

- Complete Repowering of the Santa Cruz / Baltra Electric System.
- Policy, legal and operational standards development, allowing the participation of various stakeholders in the generation of renewable energy for electricity generation and other direct uses.
- Operating Guidelines for power generation based on RE (Renewable Energy) available for project developers.
- Support for Energy Efficiency Measures incorporated into EEPG and MEER energy efficiency plans and / or programs.
- Systematization of Progress up to 2012 and analysis the potential of renewable resources in Galapagos.

Achievements

- The Baltra / Santa Cruz wind farm (3x750 kW) and sub-transmission line were on December 8, 2014 in the process of commissioning, which will conclude in early 2015.
- The photovoltaic plant in Puerto Ayora (1.5 MWp) became operational in June 2014. This project was conducted by the MEER with support from the Korea International Cooperation Agency (KOICA).
- The Baltra (50 kWp) photovoltaic plant and the battery storage system (Li-Ion: 400 kW, 250 kWh; Pub-acid: 500 kW; 4000 kWh) will be completed in late 2015. This project is advanced by the MEER with support from the Japan International Cooperation System.
- Total renewable power in early 2016 will be 4.7 MW which in relation to total operating power by June 2014, represents 36.4% of renewable power in Santa Cruz.
- The mechanism provided in the PRODOC to promote the participation of independent generators in renewable energy lost viability by the development of the constitution of 2008 which saw the energy sector as strategic and empowered institutions that are responsible for formulating policy (MEER) and regulation and tariffs (CONELEC).
- The Operational Guidelines (Operating Guidelines) are being coordinated by MEER´s SIDGE project.
- The potential for energy efficiency in the islands has not been developed and ERGAL did not affect in a clear manner the positioning of these technologies to reduce energy demand in the islands. The subject was assumed by the EEPG directly during project implementation under the guidance of MEER. Currently there is a program with induction stoves and replacing 3000 obsolete refrigerators by efficient ones.
- The systematization of Progress up to 2012 and analyzing the potential of renewable resources in Galapagos is still pending.
- The fulfillment of this outcome is considered ***Marginally Satisfactory (MS).***

Outcome 2: Operational technical and institutional capacities in Elecgalapagos[6] are strengthened to manage renewable energy projects for electrification of the Islands.

Indicators

- EEPG trained and able to run power generation projects based on renewable energy
- Number of staff trained in planning, management, operation and maintenance of renewable energy systems.

[6] Either EEPG or Elecgalapagos is used interchangeably.

Goals

- Assist in the Implementation Plan for EEPG Training and Modernization in order to have better management and efficient operation.
- Contribution to the formation of skilled labor group to manage renewable energy systems in the administrative and technical /legal field
- Have technical / administrative staff to manage RE and Energy Efficiency projects.

Achievements

- Between 2009 and 2014 with the participation or promotion of ERGAL and other institutions over nine training events were conducted which focused on renewable energy and energy efficiency, from general information to specific workshops on solar and wind energy, for the public of the islands in general, decision makers, government officials and staff of enterprises, among other stakeholders. These activities have helped improve the understanding of these new technologies in Galapagos.
- Although there is no register of participants, Elecgalapagos officials and representatives from other institutions attended these events. The information and technical and informational material offered in courses and workshops was provided to the participants but this material has not been uploaded to the website of the project and made publicly available, facilitating access to information.
- ERGAL developed the website http://www.ergal.org/cms.php?c=1233. To facilitate access to project information this site contains institutional information and regarding projects, announcements, news, publications, gallery and seminars, but should also contain material distributed to participants during training events.
- Much of the institutional strengthening in the Operation and Maintenance (O & M) of renewable energy equipment is also a result of staff being involved in the development of projects and then training on O & M of plants offered by contractors. Since several of the projects are still in development, there has not yet been any opportunity for training of EEPG staff.
- As for the training of Elecgalapagos staff to conceive, plan and implement future renewable energy projects for the islands, the evaluator considered it insufficient but once new renewable energy systems are put into operation and training is received, EEPG will likely operate well the plants.
- Strengthening EEPG capacity for executing power generation projects based on renewable energies and for planning, management, operation and maintenance of these systems is considered insufficient, and therefore the result of this task is ***Marginally Unsatisfactory (MU)*.**

Outcome 3: Floreana and San Cristobal with hybrid electricity generation systems: wind / PV / biodiesel / diesel

Indicators

- Successful completion of repowering activities

Goals

- Repowering and operating systems without any technical or administrative problem.

Achievements

- The 2.4 MW EOLICSA wind farm in San Cristobal, private development with the participation of e7, is in operation since October 2007. The penetration of wind power peaked at 36.6% in 2010 and remained greater than 30% except in 2012 due to failure in one of the turbines. This system is the largest renewable power system installed in the islands, with the greatest contribution to reducing fuel consumption and emissions of greenhouse gases. Wind power

penetration has not reached the 50% figure indicated in the initial logical framework of the project.

- The Floreana photovoltaic / diesel / diesel-jatropha system has a capacity of 214.5 kW (138 kW are from dual diesel - diesel / jatropha oil plants and 20.5 kWp PV). ERGAL introduced to the island generation with biofuels produced in the region of Manabí on the continent. The penetration of biofuels was 24% and 51% in 2012 and 2013 respectively.
- Compliance with Outcome 3 is considered ***Satisfactory (S)*** because the San Cristobal wind farm was developed with the participation of a foreign agent under the scheme of private generation, with satisfactory results, and for having introduced into Floreana generation with biofuels.

Outcome 4: Isabela and Santa Cruz / Baltra with hybrid power generation with photovoltaic/ thermal system, and wind / thermal system.

Indicators

- Successful completion of the repowering activities

Goals

- The wind-thermal (diesel) hybrid system in Santa Cruz / Baltra was completed in 2013. The estimated coefficient of penetration of renewable energy is 25%. Construction was completed and system was verified in the 2nd semester of 2013.

Achievements

- For Isabela, ERGAL provided technical assistance up to the determination of the conceptual design in July 2011. Since then, project execution corresponds to MEER. Recently there has been progress in negotiating the contract with the consortium Siemens Germany / Siemens Ecuador and the project is expected to be operational in the second half of 2016.
- MEER together with KOICA developed in Puerto Ayora on Santa Cruz Island, a photovoltaic park of 1.5 MWp which is in operation since June 2014.
- The Baltra wind farm (3 x 750 MW) in December 2014 had a delay of several years, mainly due to the design and construction of sub-transmission line between Baltra and Puerto Ayora on Santa Cruz (34.5 kV, 50 km long) which is in the process of commissioning, like the wind turbines installed since June 2013. This process is expected to be complete in early 2015.
- The expected generating capacity of the wind farm is 6 GWh/year which in relation to the total generation of the 25.1 GWh diesel park during 2013 represents a wind power penetration of 23.8%. If the generation of the 2.4 GWh / year from the Puerto Ayora photovoltaic park is added, the penetration of renewable in relation to diesel generation in 2013 reaches 33.5%.
- The evaluator considers this result ***Marginally Satisfactory (MS).***

Outcome 5: Strengthening replication of project experiences / best practices and dissemination of lessons learned throughout Ecuador and other countries in the region

Indicators

- Experiences from the project collected, analyzed and disseminated
- Compilation of experiences and best practices of the project.
- Discussions about the results, experiences and lessons learned from the project prior to its dissemination.
- Number of agreements / expressions of interest in national replication of the project.

Goals

- Involvement in other RE projects carried out in other provinces of Ecuador through the MEER. EEPG will incorporate renewable energy generation in its future expansion plans.

- All information collected and disseminated according to the milestones achieved until the completion of the project.
- Coordination with the MEER for participation in a regional seminar with the presentation and discussion of results / lessons learned.
- Indication of several initiatives to replicate project activities nationwide. Installing a support network to help stakeholders and project promoters.

Achievements

- ERGAL has been a reference point for the development of other renewable energy projects such as the Sustainable Energy for All Program (SE4A) in Ecuador and also for the development of the Villonaco wind farm.
- The goal of incorporating renewable electricity generation in future EEPG expansion plans fall under jurisdiction of MEER and it is clear that this goal is beyond the scope of ERGAL activities.
- ERGAL collected and disseminated information on projects, calls for tenders, news, publications (research, informational and promotional material) through its website. The technical information distributed at seminars and workshops was not uploaded to the website although it is known that it was received by participants.
- The Document "Zero Fossil Fuel on the Galapagos Islands" for Renewable Energy Future for UNESCO Sites was developed. A paper on the project for the World Wind Energy Conference 2009 was also completed.
- In coordination with the MEER, the presentation and discussion of results and lessons learned in a Regional Seminar is still pending.
- It is considered appropriate to upload on the MEER website, information distributed in the events held
- It is not known which and how many renewable energy projects implemented in Ecuador, besides the two mentioned above, have benefited from ERGAL.
- The evaluator considers the implementation of Output 5 as ***Marginally Unsatisfactory (MU)***.

Result 6: Project Management Unit

Indicators

- No indicators were defined

Goals

- A PMU established and capable of technical and administrative support for renewable energy projects suitable for replication.
- Report achievements, effective restructuring of beneficiary (EEPG).
- Satisfactory operation of hybrid systems installed in the four inhabited islands.
- Memory of procedures, processes, barriers followed and encountered for installation of Baltra / Santa Cruz wind farm.
- Indications of several initiatives to replicate project activities nationwide.
- Installing support network to help stakeholders and project promoters.

Achievements

- The PMU produced three final reports: Project Summary of Achievements 2009-2014, Final Report Concerning Environmental Management of ERGAL Project Development and Full Size Financial Report.
- Satisfactory operation of four hybrid systems is established as a final goal of PMU management: Floreana and San Cristobal systems are in operation, the Baltra wind farm is in the process of commissioning and Isabela is in development (Project Isabela corresponds to MEER).

- ERGAL had a decisive and good performance managing the environmental aspect of the Santa Cruz - Baltra Wind Project. In compliance with the Ecuadorian environmental legislation, a Definitive Environmental Impact Study was conducted, and the approval of the Environmental Licenses for the implementation of the transmission line and the wind project in the Baltra Island were obtained.
- ERGAL did not make indications to replicate nationwide project activities and the development of a support network for project promoters but could be done by the MEER, as part of its duties in renewable energy.
- The Summary of Achievements of Project report contains information on the process of closing ERGAL and activities pending as of April 2014.
- It is considered that Outcome 6 has been executed in a manner ***Marginally Satisfactory (MS)***.

Outcome 7: Monitoring and Evaluation

Indicators

- Indicators not defined

Goals

- Compliance with the objectives; monitoring and follow-up action compliance.
- Macro control reporting and monitoring carried out from the ME until the project closing, highlighting the timely management carried out for each of the barriers presented.

Achievements

- The PMU of ERGAL kept track and monitored compliance of the actions undertaken mainly in its management function for the Baltra Wind Farm and the sub-transmission line.
- The recommendations of the ME were considered by the PMU and PSC, and their implementation were given appropriate follow-up.
- It is considered that the Result 7 was executed in a manner ***Satisfactory (S).***

Relevance of the Project

ERGAL is a ***Relevant (R)*** project for Ecuador because it responds to the priorities of local and national development, it introduces renewable energy for electricity generation, reducing diesel fuel consumption and GHG emissions in Galapagos, resulting in risk reduction of oil spills in a fragile ecosystem, heritage of humanity. ERGAL is also in line with the government long-term policy of "Zero Fossil Fuel on the Galapagos". It also complies with the GEF operational programs.

Effectiveness of the Project

Several of the proposed outcomes were achieved satisfactorily, but not all. The repowering of Floreana has been successful with the introduction of biofuels produced on the continent (jatropha oil) and the Santa Cruz / Baltra wind farm is in the process of commissioning. The project has shown that renewable energy generation is possible in the islands.

After completion of the project in June 2014, renewable power reached 4.16 MW (it was expected at the end of the project > 6.6 MW), with a total investment of M US $ 20.2 (expected > M US $ 30) and a reduction of 3072 tCO_2 / year (expected 10,500 tCO_2 / year). Once projects in development have entered into operation in 2015 and 2016, renewable power will be 10.5 MW (159% the expected value at the end of the project), with a total investment of M US $ 70.9 (236% from the expected value) and a reduction

10,816 tCO_2 / year (103% of the expected 10,500 tCO_2). Then by 2017 compliance with the overall objective of the project will be satisfactory.

However, the strengthening of institutional, technical and operational capabilities of EEPG for the management of renewable energy is considered somewhat unsatisfactory as is the strengthening of the ability to replicate the project in other parts of Ecuador.

ERGAL promoted renewable energy for the islands, led the environmental issues related to renewable projects and implementation of renewable energy projects in Floreana and Santa / Cruz Baltra. The MEER has taken the lead in energy efficiency projects, in renewable energy policy and institutional, technical and financial strengthening of EEPG.

Effectiveness is considered ***Marginally Satisfactory (MS)***.

Cost-effectiveness of the project

The project was run on a remote, universal heritage site of humanity for its unique and fragile ecosystems with stringent standards and environmental regulations. Therefore, this project is clearly beyond any standard cost of renewable energy systems.

As regards the resources used, it should be noted that the total cost of the project will reach M US $ 73.5 in 2017, of which 96.4% are investment resources (M US $ 70.9). 48.2% of total resources (M US $ 35.5) come from the Ecuadorian government, *indicating the high degree of involvement and commitment to renewable energy projects in the Galapagos Islands.* For the management of resources the Fidergal fund was established. In addition, there are resources from other donors (donor agencies) for M US $ 33.2 (45.2%).

Given that the GEF has donated $ 4.1 MUS, the leverage factor of resources has resulted in 16.6, twice the 7.5 estimate at the beginning of the project. This shows great efficiency by MEER and ERGAL in mobilizing resources because Galapagos is a focal point for both foreign agencies and the Government of Ecuador, thereby demonstrating the Government commitment to strengthening renewable energy generation in Galapagos.

The diesel saved from January 2004 to July 2014 amounted to 1,996,244 gal, worth M US $ 7 (cost of diesel US $ 3.5 / gal). When all renewable plants are in operation, the annual savings will amount to 1, 07,021 diesel gal / year, worth M US $ 3.8. Moreover, this reduction in annual consumption of diesel has reduced the annual number of shipments of diesel thus reducing the risk of fuel spills.

In December 2013, emission reductions achieved 3072 tCO_2 / year. If this figure is maintained for 20 years, total emissions avoided will be 61,440 tCO_2. In 2017 when all new plants under development are in operation, emission reductions will achieve 10,816 tCO_2 / year and for 20 years 216,320 tCO_2 will be avoided. GEF investment was US $ 4,055,498. Therefore, in December 2013, the Unit Cost of Reduced Emissions is for the GEF of US $ 66 / tCO_2 and from 2017 US $ 18.75 / tCO_2, a value below the initial estimated at PRODOC of $ 20 / tCO_2 avoided.

The level of budget execution for GEF resources was 100% in April 30, 2014.

Sustainability

The PRODOC states that the project aims to transform in the long run EEPG to a more financially responsible utility company. With ERGAL, EEPG seeks to achieve financial sustainability considering investment costs would be borne by the central government and other stakeholders, so that *the revenue generated by the sale of renewable energy should achieve financial sustainability for the project*. No fund has yet been established in Elecgalapagos that receives the resources of renewable generation specifically for the sustainability of renewable projects and expanding renewable generation. *It is considered that the appropriation of resources to ensure sustainability of the project is a pending task by the MEER and EEPG.*

A second factor that favors the sustainability of the project is the commitment of the Government of Ecuador to continue the policy of Zero Fossil Fuels on the Galapagos and renewable energy generation for the archipelago, efforts under the responsibility of MEER and other institutions.

A third factor is to continue EEPG technical and administrative strengthening for Operation and Maintenance of ERGAL projects.

It is considered that the financial sustainability of the project is ***Probable (P)*** and the institutional framework and governance are equally ***Probable (P)***. On the other hand, renewable generation has been welcomed by the population and development has been done in compliance with current environmental regulations, so that both socioeconomic and environmental sustainability are ***Probable (P).***

Impact

Renewable energy generation has reduced diesel fuel consumption, CO_2 emissions and decreased the risk of ecosystem spills of this fuel. Therefore, the project has reduced the stress on Galapagos ecological systems and by 2017 when all systems are operational in the islands, the project will improve the environmental status and reduce environmental stress, so both impacts are ***Considerable (C)***.

State of the barriers

The state of the barriers at the end of the project is as follows: The ***first***, "Limited experience with renewable energy technologies," especially for electricity generation has been ***partially removed*** because at the end of the project, training on the systems that are in commissioning and being developed is still pending, even though the photovoltaic park in Puerto Ayora and diesel generation plants using biofuels in Floreana are operational. The ***second*** barrier, "Lack of knowledge about the operation and maintenance of renewable energy power systems and hybrid systems (renewable / conventional), for the same reasons above is considered ***partially removed***. These two barriers will be removed in 2017 when all systems are in operation. The ***third*** barrier, "High initial capital cost of renewable energy technologies" ***has not been removed*** because the high initial costs have remained. The ***fourth*** barrier, "No experience with power purchase agreements for independent power or electricity generation" and the ***fifth*** barrier, "Lack of experience in investments and joint ventures between utilities and the private sector to finance projects" ***were not removed because the context for these schemes was weakened***. The ***sixth*** barrier, "Difficulties in obtaining financing for renewable energy technologies new in Ecuador, due to high perceived risks. Perceived risk associated with renewable energy technologies" was *partially removed* because this perception of risks remains valid due to lack of knowledge of renewable technologies but as these penetrate more, knowledge of the true value of renewable energy will develop.

However, in terms of funding, the MEER and ERGAL have achieved a significant participation of cooperation agencies.

Conclusions

- At the closing of the project, it has partially complied with global environmental objectives of renewable power generation, emissions reduction and proposed investments in the PRODOC.
- However, *when projects currently in development are operational in 2017, the project will comply with global environmental objectives*.
- Therefore, prompt execution and commissioning of the projects currently in development and implementation is most important.
- The use of RE in Galapagos is in line with the welfare and the environmental policy of the country, with the goal towards a low carbon development, with the Millennium Development Goals and the need to preserve the Galapagos Islands as a Wildlife Sanctuary.
- The formidable government involvement in the financing of projects demonstrates its commitment to the use of renewable energy in the islands.
- ERGAL was involved in the conception, design and launch of the initiative Zero Fossil Fuel for Galapagos and has contributed significantly to electricity generation from renewable energy and other very important issues such as alternatives to fossil fuels for mobility in the islands.
- The implementation of projects in environmentally sensitive areas has been a challenge for all project stakeholders. The know-how gained by them and by MEER is a valuable asset for future projects.
- UNDP support to the project is considered essential to facilitate the execution of projects in a timely prompt and manner. In this sense ERGAL and UNDP contributed to speed up the progress of the works when faced with delays in the transmission line between Baltra and Santa Cruz.
- Galapagos is experiencing rapid population growth (in 2001, 19,000 inhabitants; in 2010, 26,000) and a rapid growth in the number of visitors (from 70,000 in 2000 to 140,000 in 2009). This is a growing pressure for both electricity and fuel for electricity generation and transportation, and other services. Therefore, it is urgent to update the Land Use Plan in order to establish objectives and development goals that are reflected in the population and tourism policy of the islands, and result in a decrease in pressure on the demands of energy, water and waste management services. In the special case of energy, efficiency measures should be strengthened for generation, transmission, distribution and consumption as well as the use of systems of renewable energy generation, with a strong education and awareness aimed to both residents and visitors population.

Recommendations

To MEER:

- Continue and strengthen the achievements of ERGAL because it is an effort that responds to particular needs and realities of the Galapagos Islands.
- Continue strengthening the capacity of Elecgalapagos to develop Renewable Energy and Energy Efficiency projects.
- Demand the best training of personnel in the delivery of renewable energy power plants to ensure their sustainability.
- For the sustainability of renewable energy systems in operation and maintenance in the long term, both permanent technical and financial support are required. In this sense, it is a good choice for

Elecgalapagos to implement a fund for this specific destination with income from generation by renewables, as recommended in the PRODOC.

Still to execute

- ERGAL has left several unfinished activities, which have been reported in the "Summary of Achievements of the Project" prepared by the PMU. It is worth noting however the following points:
- Maintain ERGAL website and / or move or create a link to the website of MEER.
- Continue with the dissemination of existing information. Upload the information of courses and workshops to the website of MEER.
- Memory of procedures, processes, barriers followed and encountered during the installation of Baltra / Santa Cruz wind farm, once commissioned (output 6.2 pending).
- Develop the Island Energy Inventory integrated into the Integral Resource Planning
- Coordination with the MEER for participation in a Regional Seminar with presentation and discussion of results / lessons learned (Output 5.2 pending).
- Establishment of a fund by Elecgalapagos that collects the resources of renewable generation specifically for the sustainability of renewable projects and for expanding the base of renewable generation, thus ensuring project sustainability. It is considered that this is a task to develop by the MEER.

To UNDP-GEF

- In formulating the PRODOCS it is useful to consider the competences of the projects because some goals can be beyond the scope of project intervention. For example, achieving changes in the legal and regulatory frameworks is not possible although it is clear that projects can encourage and promote these changes, but the end result depends on the institutions of the government.
- The modifications made to the Logical Framework should include always indicators for results.
- Systematization of the achievements and dissemination of the information obtained which may be made public, would have a greater impact on the achievements of this project and would make more visible this joint effort between the GEF- UNDP and MEER

Lessons Learned

The following lessons learned are considered:

- The operation of renewable energy systems in the midst of fragile ecosystems is feasible.
- The deadlines for implementation of projects are often too short and should be extended to advance their implementation. An agile and adaptive management is essential to complete project execution.
- Community involvement is essential to the success of programs for renewable energy and energy efficiency. This participation should be strengthened through public information about development plans, training in the efficient use of energy, awareness of the importance of energy use and its relationship to the preservation of the environment.
- The interaction with authorities is essential because energy supply projects must be consistent with the Land Use Plans, especially when it comes to energy systems in remote, isolated and fragile ecosystems, and critical conservation areas.
- The use of Trust Funds is suitable for managing the finances of projects, provided there is agile management.

1. INTRODUCTION

The United Nations Development Program (UNDP), implementing agency of the Global Environment Facility (GEF) for the project ***Renewable Energy for Electricity Generation- Renewable Electrification of the Galapagos Islands - ERGAL II*** (ERGAL: Energías Renovables para Galápagos) - UNDP-GEF PROJECT (PIMS Project No. 12295) of the Ministry of Electricity and Renewable Energy (MEER) hired Humberto Rodríguez (hereinafter, the evaluator) for the Final External Evaluation of the Implementation Period Project. This external evaluation is provided in the Project Document (PRODOC[7]).

The following Terminal Evaluation (TE) aims to determine the relevance, quality, performance and success of the project. It seeks to identify the impacts and sustainability of results, including the contribution to capacity building and the attainment of global environmental goals. The evaluation also seeks to identify and document lessons learned and make recommendations to improve the design and implementation of other UNDP / GEF projects.

The methodology of evaluation was as follows:

- *Review of documentation (prior to the visit to Quito and the Galapagos Islands)*. The review was an analysis of the PRODOC, the Project Implementation Reports (PIR) and the determination of the key factors on which the evaluator should focus, all linked to the achievement of the objectives and the implementation and execution of the project. This documentation was received from UNDP Ecuador, the Sub-Secretariat of Renewable Energy and Energy Efficiency (SEREE) of the Ministry of Electricity and Renewable Energy of Ecuador and the Project Management Unit (PMU) of ERGAL.

- *Interviews.* At the beginning of his mission in the country, the evaluator will meet in Quito with the following authorities, to obtain information and viewpoints on the project:

    - UNDP
    - MEER and SEREE
    - Ministry of Environment (Ministerio del Ambiente, MAE by its acronym in Spanish)
    - Other institutions defined (e.g. CONELEC SENPLADES ...)

- *Visit to projects*. Companies that have participated in the project in the Galapagos Islands will be visited in order to know the achievements in the development of the commitments of the project executing agency. Works carried out will also be visited for information from the operators about their characteristics (equipment, units, operating time, daily generation, capacity factor, etc.).

[7] UNDP Project Document. - Renewable Energy for Power Generation - Electrification for Galapagos with Renewable Energy - ERGAL II. UNDP-GEF PROJECT (PIMS Project No. 12295) (2007) United Nations Program for Development. Quito.

- *Information analysis*. The information received during the mission will be analyzed to determine the extent to which the project objectives were attained and the way it was implemented and executed.

Project Information. The information (reports and documents) was directly obtained from the PMU and UNDP. The following documents were received: PRODOC, modifications to its logical framework, documents related Monitoring and Evaluation activities such as PIR UNDP / GEF for the years 2009 to 2013, Annual Work Plans (AWP) from 2009 to 2013, minutes of meetings of the Steering Committee (three in 2012 and one in 2013), Minutes of the Advisory Committee[8] (one for 2009, two in 2010 and three in 2011), Reports of Activities from 2009 to 2012, Report of the Midterm Evaluation (ME) and External Audit Report covering execution until 2009.

Reports on Environmental Audits and the Environmental Management Plan (PMA) of the Wind Farm, and on the Trust fund, its establishment and its amendments, were also received.

The list of all the information received is given in Section7.6 and the electronic version of this report contains attached all electronic files received.

This information will be analyzed along with the documents which will be received when visiting Quito and the Galapagos Islands. The evaluator has requested additional information related mainly to the UNDP Country Programme to contextualize the impact that this project will have on the attainment of outcomes.

Limitations encountered during the evaluation. Terminal Evaluation try to cover all aspects of the project and therefore seek to interact with the greatest number of actors. This often leads to a large number of interviews during the short visits, which reduces the time of the interviews, leading to very quick encounters that frequently miss the information required. This situation occurred several times during the development of interviews. This situation was corrected by calling the interviewees to explain beforehand the purpose of the interview and telling them to compile relevant information.

On the other hand, during interviews there is sometimes the need for specific information that in some cases does not reach the evaluator opportunely. Triangulations were used to infer and consolidate such information.

Reviews of the Report. The evaluator has delivered the following versions:

- March 14, 2014, Draft Version 1.0, for review by the UNDP and SEREE.
- April 11, 2014, Draft Version 1.1, with comments made by reviewers.
- December 8, 2014, Spanish Draft version 2.0 for reviews of UNDP and SEREE.
- January 29, 2015, Spanish Version 2.0 with comments raised.

[8] The name in the PRODOC is Steering Committee. The name Advisory Committee was also employed before the ME.

2. THE PROJECT AND ITS CONTEXT

The aim of this chapter is to present an overview of the project, covering the main issues in the PRODOC, base document for this chapter. It should be noted that changes made to the initial formulation of the project will be considered in the next chapter of Findings.

2.1 DESCRIPTION OF THE PROBLEM AND PROJECT BACKGROUND

The Galapagos archipelago is a group of islands located about 1,000 kilometers (600 miles) west of the Ecuador mainland. The Galapagos are a natural sanctuary[9] due to the immense richness and the diversity of biological species, for that reason, the islands were declared in 1978 by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as a World Heritage Site.

The Galapagos in 2001 already had four inhabited islands: Floreana (140 inhabitants), Isabela (1,619 inhabitants), San Cristobal (5,633 inhabitants) and Santa Cruz (11,388 inhabitants)[10,11]. According to the 2010 census, the population of the islands was: Isabela (2,256), San Cristobal (7,475) and Santa Cruz (15,393) (no information about the population of the canton Floreana[12]). The small archipelago's economy depends mainly on tourism and to a lesser extent on fishing.

The power supply used in 2001 isolated power generation systems with diesel fuel transported from the continent in small tanker ships[13]. The use of diesel has several potential difficulties and problems and so it was considered appropriate to develop a project to reduce consumption by using renewable energy and reducing dependence on diesel fuel, CO_2 emissions, subsidies and risks of spills that have occurred in the past with negative effects on the fauna and flora of the islands[14], and on the income of the inhabitants due to the impact of these spills on the influx of tourists.

The problem of power supply with fuels has caused concern and commitments by the authorities of Ecuador. In 1995, the Ministry of Energy and Mines (MEM) carried out a study on the potential of renewable energy in the archipelago. In collaboration with the scientific community of the islands and agencies such as UNDP, the United Nations Industrial Development Organization (UNIDO) and the UNESCO, a study was completed in 1996 that recommended a full investigation of the barriers that existed for the use of renewable energy in the Galapagos.

---

[9] Jackson, M.H. **Galapagos, A natural history**. University of Calgary Press (1997) Calgary, Canada.
[10] Census figures for December 2001.
[11] A fifth inhabited island is Baltra from which old electrical generators will be removed and receive power from the network from renewable generation.
[12] http://www.inec.gob.ec/cpv/. Retrieved on December 20, 2014
[13] In 2001, 29% of the 5.78 million gallons transported to the Galapagos were used for electricity generation and resulted in an emission of 19,200 tonnes of CO_2 (Source: Petrocomercial).
[14] On January 20, 2001, the vessel Jessica ran aground in the Bay Naufragio on the coast of San Cristobal, causing spillage of 75,000 gallons of fuel oil and 70,000 gallons of diesel. Santa Fe Island iguanas were severely impacted. The proposed remediation measures had an estimated cost of M US $ 9.

In 1997, Lahmeyer International with funds of UNDP-GEF developed a PDF-B to identify barriers to the use of renewable energies for the electrification of the Galapagos, having as objectives the reduction of diesel consumption and emissions arising from their use (See Section 2.5)[15].

To address this problem and overcome the barriers identified, UNDP-GEF formulated a Full Size project called *Renewable Energy for Galapagos-ERGAL*, which was approved in December 2001. The project would install demonstration hybrid systems with advanced technology using combinations of photovoltaic, wind energy and diesel, as appropriate, in each of the four inhabited islands (Floreana, Isabela, San Cristobal and Santa Cruz). Pre-feasibility studies for hybrid systems were made during the PDF-B and then after project approval, by PDF-C. This Full Size project would install the largest proportion of electricity generation possible based on renewable energies to encourage the adoption of these technologies and establish a replicable framework for future projects in the electricity sector. Thus, the demonstration investment project proposed is designed not only to demonstrate the sustainable use of renewable energy in an isolated area characterized by its ecologic fragility -the Galápagos- but also to provide a framework that can be used to further promote more electricity generation based on renewable energies in the mainland of Ecuador.

Given that the co-financing required for the implementation of the project was M US $ 21.31, it was decided that a PDF-C should be carried out (started in 2003, at a cost of US $ 560,000) for the project activities to continue while authorities searched for the required co-financing.

By June 2006, US $23,171,135 had been secured for the implementation of the project. The co-financing was deemed sufficient to implement the wind project in San Cristobal and solar photovoltaic projects in Floreana, Isabela and in rural Santa Cruz. However, an additional estimated amount of US $ 3,225,000 was required to execute the wind project in Santa Cruz, which was intended to supply electricity to inhabited areas outside the boundaries of the Galapagos National Park.

The goals and objectives of the project correspond to the priorities for assistance from the United Nations specified in the Common Country Assessment (CCA) and the United Nations Development Assistance Framework (UNDAF) agreed between the UN System and the Ecuadorian government. One of the main objectives is to achieve environmental sustainability through the introduction of environmentally friendly principles in the productive sector, as indicated in the CCA and UNDAF. Outcome 20 of UNDAF is the "promotion of environmentally sustainable practices and models in the productive sector" and outcome 20.9 is "execution and use of renewable energy in Galapagos".

In developing the project activities, the Ministry of Energy and Mines, the Ministry of Environment and UNDP signed on February 20, 2002, an agreement which states among other elements, that "the government has expressed interest in repowering Galapagos with renewable energy in view of the risks associated with the transport and transfer of fuel oil to operate the present system of thermoelectric generation (diesel) and emissions of greenhouse gases at local and global levels."

[15] The PDF-B activities were completed in December 2000. Since then, additional studies have been undertaken by donors / potential investors and the present PRODOC reflects the latest information available. That explains any discrepancies between the information / data presented in the *Project Brief* attached and the PRODOC.

2.2 INSTITUTIONAL, SECTOR AND POLICY CONTEXT

Ecuador has developed since the late nineties a series of reforms, all of them seeking to improve the lives of its inhabitants through structural reforms for the modernization and opening of the state to the participation of the private sector in the provision of public services. The National Congress approved in 1993 the Law on State Modernization, Privatizations and Provision of Services, opening the provision of services to private sector participation.

The Law of the Electric Sector was approved in October 1996. It disaggregated the activities for the provision of power service into generation, transmission and distribution; it established a regulator agency for the sector (National Electricity Council -CONELEC) with pricing duties and implementation of rural electrification programs, among other functions. Subsidies for electricity consumers as in the Galapagos are supplied through the Rural Electrification and Marginal Urban Fund (Fondo de Electrificación Rural y Urbano Marginal, FERUM by its acronym in Spanish).

In March 1998 the Government approved the Special Law for the Conservation and Sustainable Development of the Galapagos Province, establishing the legal and administrative framework for policy and planning in Galapagos. This Law also strengthened the role of the Galapagos National Institute (Instituto Nacional Galapagos, INGALA by its acronym in Spanish) as an agency for development and conservation in the province.

In February 2002 an agreement was signed between the Ministry of Energy and Mines, the Ministry of Environment and UNDP, stating among other things that "the government has expressed interest in repowering Galapagos with renewable energy in view of the risks associated with transport and transfer of fuel oil to operate the system of thermoelectric generation (diesel) and the emission of greenhouse gases locally and globally."

In 2004 the CONELEC fixed differential rates for Independent Power Producers (IPP) to promote renewable power generation in the country with a further increase for generation in the Galapagos.

As a further step to strengthen policy commitments regarding development and environmental protection of the islands, the Government through an agreement signed by five ministries (Foreign Affairs, Finance, Energy and Mines, Environment and Housing), pledged not to install new electricity generation capacity based on fossil fuels in the islands implying that any additional capacity to meet the demand for electricity will be generated based on renewable energy systems.

The CONELEC (Regulation 02/05) established that Renewable Energy (RE) projects could receive capital funding from FERUM. CONELEC would contribute M US $ 3.2 from FERUM for San Cristobal Wind Project.

During 2007, a number of important institutional changes in Ecuador took place which affected implementation of ERGAL. CONAM as institution was liquidated. The Ministry of Energy and Mines was split into two ministries: the Ministry of Electricity and Renewable Energy (MEER) and the Ministry of Non-Renewable Natural Resources (Ministerio de Recursos Naturales No Renovables, MRNNR by its acronym in Spanish). Within MEER the Sub-Secretariat of Renewable Energy and Energy Efficiency (SEREE) was created and assumed the duties and responsibilities of the Directorate

of Renewable Energy and Energy Efficiency (Dirección de Energía Renovable y Eficiencia Energética, DEREE by its acronym in Spanish). It assumed the responsibility of executing the ERGAL Project. Regionally, the Governing Council of the Special Regime for Galapagos (Consejo de Gobierno del Régimen Especial de Galápagos, CGREG by its acronym in Spanish) was created and assumed the functions of INGALA.

2.3 STAKEHOLDERS

Parties interested in using renewable energy in the Galapagos come from different sectors, from Ecuadorian government and international agencies, due to the importance of the Galapagos from a conservation point of view, and for the solution of the problems and costs associated with the provision electrical energy in the islands. For the formulation of PRODOC, there was integration with many institutions and organizations both national and foreign, active players in the field of renewable energy, climate change, Galapagos and international cooperation. These institutions are:

- Ministry of Environment (MAE). Environmental authority, the GEF focal point.
- Ministry of Energy and Mines (MEM). Authority of the energy and mining sector. This ministry was reformed in 2007. The new ministry is the Ministry of Electricity and Renewable Energy (MEER) which controls the Electric Corporation of Ecuador and the National Electricity Corporation (Corporación Nacional de Electricidad, CNEL by its acronym in Spanish).
- Directorate Renewable Energy and Energy Efficiency (DEREE). Responsible for renewable energy, energy efficiency and executing agency of the UNDP / GEF project as a division of MEM. Since 2007, the Sub-Secretariat of Renewable Energy and Energy Efficiency (SEREE) assumed the functions of the DEREE.
- National Electricity Council (CONELEC). Regulator of the electricity sector and it is also responsible for rural electrification programs and administration of subsidies for rural electrification through the Rural Electrification and Marginal Urban Fund (FERUM).
- Galapagos National Institute (Instituto Nacional Galápagos, INGALA by its acronym in Spanish). Agency for the development and conservation in the Galapagos and controls public investment in the islands.
- National Energy Control Center (Centro Nacional de Control de Energía, CENACE by its acronym in Spanish). Controls and monitors the operation of the electrical system and manages the wholesale electricity market in continental Ecuador.
- Galapagos Provincial Electric Company Inc. (Empresa Eléctrica Provincial Galápagos S.A., EEPG by its acronym in Spanish). Also called Elecgalapagos. Utility of the archipelago. Under the lease to operate and maintain electrical system, owned by the Solidarity Fund.
- Galapagos National Park (Parque Nacional Galápagos, GNP by its acronym in Spanish). Institution of the Ministry of Environment in Galapagos, responsible for managing the Galapagos National Park. As the largest institution of the islands in terms of both personnel and infrastructure, it is also a major public energy consumer. Its facilities are to be repowered with a photovoltaic system financed by KfW (Kreditanstalt für Wiederaufbau, German Development Bank).
- Charles Darwin Research Station. Research center for local scientists and the international scientific community.
- e7 and American Electric Power (AEP). AEP is at the head of the San Cristobal Wind Project. The project is implemented by the Commercial Trust San Cristobal Wind Project, which in turn will

establish a corporation as an IPP, which will generate renewable energy and sell it in bulk to Elecgalapagos (distributor).

Citizens also participated in the project formulation and there was interaction with them by publicizing the project and the benefits for the islands. Together with the Charles Darwin Foundation the option of biomass for energy in the archipelago was discarded to prevent the introduction of species whose spread would be undesirable.

2.4 BASELINE

The ERGAL project is designed to remove barriers to the electrification of the Galapagos archipelago based on renewable energy. Thus, the project is in line with the objectives outlined in the GEF Operational Programme No. 6: *Promoting the adoption of renewable energy by removing barriers and reducing implementation costs.* The project is under the GEF Strategic Priority No. 3 (SP 3): Electricity Sector Policy Frameworks that support Renewable Energy and Energy Efficiency. In addition, the project has the secondary objective of *reducing risks to the rich biodiversity of the Galapagos arising from future oil spills*. As it is unlikely that the project activities are implemented without the support of UNDP and GEF, the project is considered largely as *an incremental measure*.

The baseline costs to continue generating electricity for the Galapagos Archipelago based on fossil fuels totaled approximately M US $ 17.01 at the time of project formulation, excluding the potential costs of future environmental damage to biological resources of the archipelago due to possible oil spills, in which case the baseline costs are much higher[16].

Based on information provided by PDF-B and PDF-C and subsequent studies by other donors / investors, the costs of repowering[17] Galapagos within the specified scenarios totaled US $ 30,496,135 (See Table 2-3). In conclusion, incremental costs totaled approximately M US $ 14. In view of the high importance that the Galapagos Islands represent to the global community and the strong interest in supporting the project, the GEF was requested to provide a third of this total, or M US $ 4.1 (including PDF-B and -C).

The expected quality of electricity service provided to users of electricity in the Galapagos would be similar to the one existing at the time of project formulation or even higher after the repowering project. Part of the task of repowering includes an assessment of demand and taking appropriate measures to ensure a rational and efficient use of electricity, reducing demand growth.

In addition to the above, it was assumed that the project would provide huge additional global environmental benefits derived from the reduction of threats to biodiversity due to possible oil spills in the future.

The implementation of renewable energy plants should comply with all local environmental regulations.

[16] PRODOC, page 14
[17] The Spanish version of the PRODOC talks about re-electrification while the English version of repowering. This evaluation will use the term repowering i.e. the inclusion of renewables in electricity generation.

The batteries were to be transported to the mainland for recycling. The location of wind turbines considered the least visual impact and frequent flight paths of birds would be determined to avoid its exposure to wind turbines.

It was proposed that the project would be implemented in two phases. In phase 1, the project would be developed on the islands of Floreana and San Cristobal, and in phase 2, in Isabela and Santa Cruz. The resources come from various national and international agencies sources, as shown in the Table 2-3. In the case of Floreana (already completed at the time of project formulation), Isabela and San Cristobal, resources come from various sources in the form of parallel financing. For Santa Cruz, in addition to GEF funding, according to the PRODOC, funds were obtained from MEM (current MEER), FERUM and KfW.

The Isabela project was fully funded by the German Ministry of Development (Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung, BMZ) through the KfW, according to the PRODOC. In the project status up to 2014, KfW is the largest funder of the project but there is also a national counterpart. The San Cristobal Wind Project was financed by e7, the Fund of the United Nations, the Ecuadorian government and the Ecuadorian taxpayers (it was signed in September 2005 and its construction was planned for late 2006 / early 2007).

The Floreana Project was operational by 2007. This was executed by SEBA and a Spanish NGO with resources from the Spanish Agency for International Cooperation (Agencia Española de Cooperación Internacional, AECI by its acronym in Spanish), the National Park Service, the Parrish Board, the GEF and the World Wildlife Fund for Nature.

It is to be noted that one of the objects of this evaluation is to establish the actual financing of projects implemented, results that are presented in Chapter 3 of findings.

2.5 IDENTIFIED BARRIERS

Through Implementation of the PDF B, the following barriers were identified as major barriers to the utilization of renewable energy for electricity generation in Galapagos:

- Limited experience with renewable energy technologies, especially with regard to electricity generation;
- Lack of familiarity with the operation and maintenance of renewable energy and hybrid (renewable / conventional) electricity systems;
- High initial capital cost of renewable energy technologies;
- No experience with power purchase agreements and independent power generation;
- Lack of experience with project finance investments and joint venture operations Between electric utilities and the private sector; and
- Difficult access to finance for renewable energy technologies new to Ecuador due to high risk perception.

To overcome these barriers ERGAL will install demonstration hybrid systems with advanced technology, using combinations of photovoltaic, wind and diesel energy systems, as appropriate, in each of the four

inhabited islands (Floreana, Isabela, San Cristobal and Santa Cruz). Pre-feasibility studies for implementing such hybrid systems were made during the PDF-B and PDF-C. This Full Size project will seek to install the largest proportion of electricity generation based on renewable energies feasible, to encourage the adoption of these technologies and establish a replicable framework for future projects in the electricity sector.

The *expected situation for the barriers at the end of the project* is that when these are removed for project implementation, sustainable use of renewable energies in an isolated area characterized by its fragile ecology-the Galápagos is demonstrated, providing a framework that can be used to further promote electricity generation based on renewable energies in the mainland of Ecuador and reduce emissions of greenhouse gases.

2.6 PROJECT OBJECTIVES

The *Environmental Global Objective* (project goal) is to reduce greenhouse gas emissions through removal of institutional, economic, technical and financial barriers to national development of renewable energy for isolated systems and systems linked to the interconnected main grid.

The *Project Objective* is to support sustainable development in Ecuador, reducing C02 emissions related to electricity generation, through repowering four islands of the Galapagos archipelago with hybrid power systems with wind / PV / diesel as a substitute fossil fuel (mainly diesel) used in electricity generation, thus providing a model that can be used to promote renewable energy across the mainland of Ecuador.

In terms of overall profits, the repowering of the four power generation systems in the proposal would result in a net reduction of Greenhouse Gas (GHG) emissions of 10,500 tons of CO_2 per year, i.e. about 201,600 tons during the 20 years lifetime of the projects[18]. For the 20 year useful life of the installed equipment, the Unit Cost of Reducing Emissions from the GEF contribution is approximately US $ 20 per tonne of CO_2[19].

If the success of the Galapagos project is replicated in other non-electrified or remote areas of Ecuador, it would have a multiplier effect, starting with an increase of approximately 50% reduction of emissions and reaching 300%, 10 years after the project completion[20].

In addition, the *project will contribute* to significantly reduce the volume of diesel annually transported to the islands, thereby reducing the environmental threat of an oil spill that can cause great damage to biodiversity found in and around the coastal ecosystem of the islands[21].

[18] Reference Note 1 (PRODOC), paragraph 38, page 13
[19] Reference Note 1 (PRODOC), paragraph 108, page 29
[20] Reference Note 1 (PRODOC), paragraph 38, page 13
[21] Reducing the risk of fuel spillage is due to the decrease of 15.7% in the frequency of trips to transport petroleum derivates to the islands (a current level of 6.45 million gallons of diesel (2004 figures), and thus avoid carrying 1.01 million gallons / year with the project), thus improving the preservation of biodiversity.

The activities proposed in the project are designed to remove barriers to development and utilization of renewable energy for electricity generation, initially in the Galapagos but eventually in the entire country.

The *project will develop local capacity* to identify the technical and financial options, and to formulate regulatory, institutional and financial instruments necessary to demonstrate the technical, economic and financial feasibility of establishing joint projects to generate electricity from renewable sources to supply mini-grids or feed larger grids.

The potential for replication of the project is in the deployment of renewable energy in Ecuador (20% of the rural population or 80,000 households have no access to electricity), with an estimated emission reduction potential between 0.5 and 1 Mt / year[22].

2.7 PROJECT OUTCOMES

To remove the barriers identified, *five outcomes* were designed, each with its proposed activities and budget. The outcomes are as follows[23]:

- **Outcome 1: To support national partners in implementing repowering of electricity generation on each of the islands**.
  From this result, two outputs are expected.

  - Output 1.1: Policy, legal and operational regulations enabling the participation of the private sector, in renewable energy-based electricity generation. MEM to initiate an energy efficiency programme in partnership with EEPG.

  - Output 1.2: Feasibility and design completed, including more accurate cost estimates and implementation schedule for repowering electricity generation on each of the 4 islands.

  Note: The implementation of the activities above started under the PDF-C and these activities have been completed or are in the process of completion.

- **Outcome 2: To support repowering-through strengthening the institutional, technical and operational capability of EEPG**

  Three outputs are expected from this outcome

  - Output 2.1: EEPG's capacity to design and negotiate Independent Power Producer (IPP) Schemes and Power Purchase Agreements (PPAs) strengthened.

  - Output 2.2: EEPG's capacity to implement repowering and negotiate contractual arrangements for operation and maintenance strengthened

[22] Reference Note 1 (PRODOC), paragraph 110, page 29
[23] Reference Note 1 (PRODOC), page 16 ff

- Output 2.3: Power purchase and operational agreements between each external entity and EEPG signed.

Note: A global study to apply reengineering to EEPG in order to strengthen both institutional structures and techniques, started under the PDF-C. It will give high priority to the restructuring process under the *full size* project.

- **Outcome 3: To facilitate repowering on Floreana and San Cristobal with PV / wind / diesel hybrid electricity generating systems.**

  Two outputs were expected from this outcome:

  - Output 3.1**:** PV / Wind / diesel hybrid system repowered and in operation on Floreana.

    The use of nut oil (Jatropha curcas) produced on the continent was proposed as fuel for the diesel generator hybrid system of Floreana,

  - Output 3.2: Wind-diesel hybrid system repowered and in operation on San Cristobal

- **Outcome 4: To facilitate repowering on Isabela and Santa Cruz with PV / wind / diesel hybrid electricity generating systems.**

  Three outputs were expected from this outcome:

  - Output 4.1: PV-diesel hybrid system repowered and in operation on Isabela
  - Output 4.2: PV system installed at the premises of Galapagos National Park
  - Output 4.3: Wind / diesel hybrid system repowered and in operation for Santa Cruz

  Note: Under the PDF-C, a pilot program was initiated to increase the efficiency of lighting systems in homes and small businesses. Work is being carried out on the design of a wider program for management of energy demand and rational use in four islands, but not as part of the ERGAL project[24].

- **Outcome 5: Replication of project experience / best practices and lessons learned throughout Ecuador and in other countries in the region**

  Three outputs were expected from this outcome:

  - Output 5.1: Material on project experience / best practices and lessons learned prepared.
  - Output 5.2: Project overall results, experiences and lessons learned disseminated at the national and regional levels.

[24]Reference Note 1 (PRODOC), paragraph 65, page 20

- Output 5.3: Consultations / dialogue for replicating project experiences in other provinces of Ecuador completed.

Note: The process of strengthening the technical structures of EEPG began under the PDF-C with the participation of EEPG technical staff in training seminars on new energy systems and renewable energy and photovoltaic systems.

During project implementation three reviews to the logical framework Project (July 22, 2010, January 28, 2011 and November 29, 2012) were performed to adapt to changes in national policy related to electricity generation in Galapagos and adapt execution to the real situations of the project. As a result of these reviews, the use of biofuels produced on the continent was included as an option for the diesel plants, the various products were divided into two groups, others were removed because they were not applicable due to changes in the regulatory framework and two products were added. These changes in the logical framework are discussed in the section on findings.

2.8 PROJECT ELIGIBILITY

The Ecuadorian government signed the United Nations Framework Convention on Climate Change on February 23, 1993, which entered into force on 21 March 1994. It also signed the Kyoto Protocol on January 15, 1999 and ratified it on January 13, 2000.

In addition, in March 1998, the Government ratified the Special Law for the Conservation and Sustainable Development of the Galapagos Province, establishing the legal and administrative framework for policy and planning in Galapagos. This Act also strengthened the capacity of the Galapagos National Institute to serve as focal agency for the development and conservation in the province.

On the other hand, these issues gave the opportunity to reduce GHG since the electricity sector could have chosen to continue the use of power plants based on petroleum fuels.

2.9 PROJECT APPROVAL BY THE GEF

The Project Proposal was approved by the GEF on May 1, 2006.

2.10 PROJECT SIGNATURE

The final version of the PRODOC was signed on July 25, 2006 by the UNDP-GEF and MEM (now MEER) and includes implementation of a Full Size Project, with *five outcomes* designed to remove the barriers identified (see Section 2.7) to be *developed in three years*.

2.11 PROJECT COST

The initial cost of the project as it relates to the contributions of the signing parties is US $ 4,421,666, with a contribution by GEF of US $ 3,239,666 (73.3%), and co-financing from the Ministry of Energy of US $ 1,182,000 (26.7%).

It should be noted that for the formulation of the Full Project Size a pre-investment of US $ 1,066,437 was made in the PDF B and C, of which GEF contribution was US $ 815,832 and US $ 250,605 from the Ministry of Energy in-kind. Considering these pre-investment contributions, the total contribution of the GEF would total US $ 4,055,498.

Considered all investments necessary for the installation of renewable energy plants, the total initial budget for the project amounted to US $ 30,496,135 (See Section 2.17).

2.12 START AND DURATION OF PROJECT

The start date of the project was scheduled for August 1, 2006 with an initial term of three years (until July 31, 2009). The implementation period has been extended several times because of the necessary steps for the implementation and execution of the renewable energy plants since at the time the time of the signing of the PRODOC in July 2006 these efforts had not been completed.

Extensions for the execution term totaled 4 years 9 months, with final execution term on 30 April 2014. This project therefore has been executed in more than double the initial term. The project up to March 2014 was in the terminal evaluation, thus fulfilling this requirement by GEF. Table 2-1shows the main milestones of the program.

Table 2-1.Main milestones of ERGAL

Activity	**Date**
PDF B – Deadline	01-Dec-00
Signing of PRODOC	25 Jul-06
Project Start - Expected Start Date	01-Aug-06
Inception Workshop - Project start	06 Nov-07
Midterm Evaluation - Expected date of completion	01-Jan-08
PDF C – Deadline	27 Oct-08
Project Final Evaluation - date initially planned	01-Jul-09
Completion of the project - Initial Date	31-Jul-09
Modification of Logical Framework – Approved by Steering Committee	23-Jul-10
Midterm Evaluation - Date of implementation	01-Oct-10
Modification of Logical Framework – Approved by Steering Committee	28-Jan-11
Modification of Logical Framework – Approved by Steering Committee	29-Nov-12
Project Final Evaluation - Execution Date	01-Mar-14
Completion of the project - Revised Date	30-Apr-14

Source: author´s compilation

2.13 INDICATORS, MONITORING AND EVALUATION

The logical framework matrix of PRODOC established for the objective of the project and for each of the five initial outcomes, performance indicators, their respective sources of verification and the

associated assumptions[25]. During the execution of the project, modifications to the logical framework were incorporated. These indicators and sources of verification are the basis of the monitoring and evaluation employed during project implementation by both UNDP and SEREE and the Final Term evaluation.

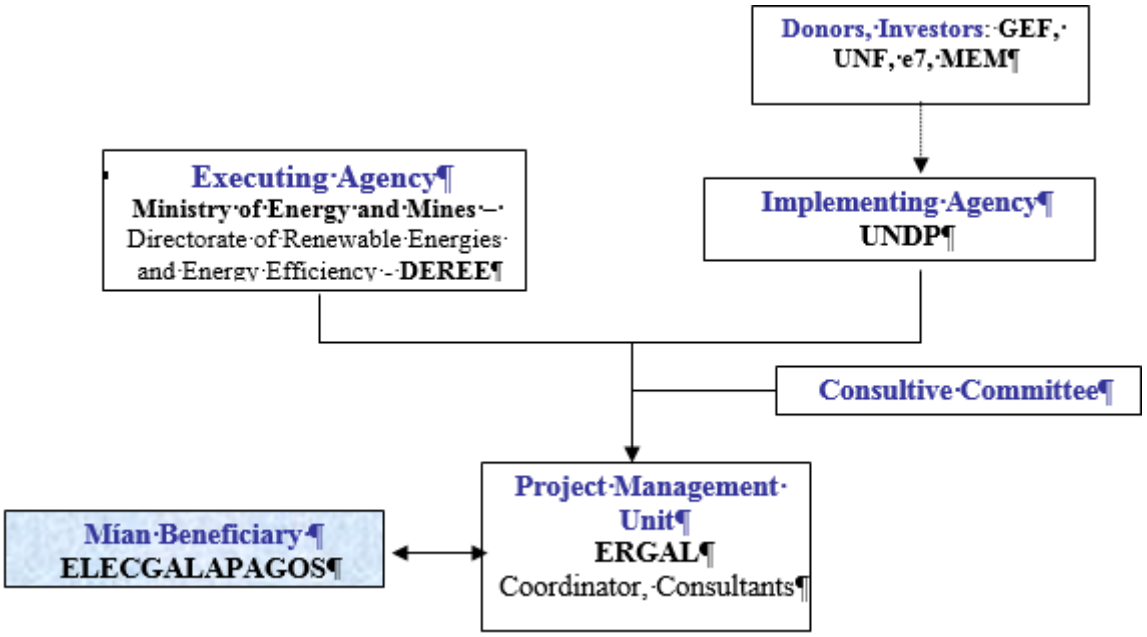
2.14 IMPLEMENTATION AND EXECUTION

The method of implementation of the project is National Execution (NEX: executed by a governmental agency). This method is advantageous because it enhances the technical and management level skills of the implementing agency and it strengthens its overall profile in terms of leadership and advocacy, which affects the sustainability of the project and helps to create the conditions for future replications.

Agencies directly involved in the project are the implementing and executing agency, as well as other stakeholders such as donors and investors. The functions and responsibilities of the implementer and executor are described next.

Figure Figure 2-1shows the organizational structure of the project and the interrelationship between agents at the beginning of it. The Executing Agency when MEER was created was the SEREE in replacement of the DEREE with no changes in the functions of the institution in the project.

Figure 2-1Project organizational structure



[25] PRODOC, p. 29 et seq

2.14.1 Implementing Agency: UNDP Ecuador

The Project implementing agency is the UNDP Ecuador. The UNDP is responsible to the GEF Council as the GEF Implementing Agency in charge of financial management and the achievement of expected outcomes of the project.

The project would be managed in accordance with the regulations and administrative procedures established by the UNDP. The UNDP has the following functions:

- Manage and distribute program funds on behalf of the GEF Secretariat,
- Provide assistance in the procurement of equipment, if required, and ensure that the selection process of both national and international consultants and subcontracting processes will be conducted on a competitive and transparent manner,
- Provide assistance in connection with the formal procedures of GEF regarding reporting,
- Be the formal channel through which the correspondence between the project and UNDP-GEF is managed, and
- Be responsible for the continuous monitoring of project progress.

Also:

- Appoint a Programme Officer as the focal point for this program,
- Provide administrative support and financial and budgetary monitoring for the implementation of the program,
- Providing accounting, financial and budget documentation for the project,
- Conduct the annual audit of the program following the procedures of GEF,
- Charge a fee for the provision of services in accordance with the UNDP Cost Recovery Corporate Guidelines (Medium-High Cost Level in the Universal Price List).

2.14.2 Executing Agency: SEREE

The executing agency for the project was initially the Directorate of Renewable Energy and Energy Efficiency (DEREE) of the Ministry of Energy and Mines (NEX execution modality). Subsequently following institutional changes in 2007, SEREE from MEER was the executing agency. The executing agency is responsible for the overall project day to day development and implementation.

2.14.3 Project Steering Committee

The Project Steering Committee (PSC) is to be formed by representatives of CONAM, EEPG, CONELEC, MEM (now MEER) and MAE, co-directed by INGALA (currently Governing Council Special Regime for Galapagos) and the UNDP, that will provide overall guidance for project implementation. The Ministry of Environment will also oversee and monitor the project as the national focal point of GEF. The PSC may invite private investors that participate in joint ventures or independent power generators to participate in the Steering Committee meetings on an ad hoc status.

2.14.4 Project Management Unit

In order to implement the project, the Project Management Unit (PMU) will be established. The PMU will be responsible for project management, planning strategies and efficient global performance. The PMU will comprise a National Project Manager, Project Officer and an Administrative Assistant[26].

2.14.5 Project Manager

The Project Manager will be responsible for the daily operations and liaison / facilitator tasks between local participants, both in Galapagos and mainland of Ecuador and donors / investors. The main functions of the Manager are:

- Direct, manage and coordinate the daily activities of the team (an assistant consultant and an administrative assistant), including planning, scheduling and execution of activities, application for funds and reports on disbursements, reporting and all other activities that contribute to the proper execution of the project.
- Serve as liaison / facilitator between various stakeholders including agreement and support by local communities for the proposed activities and cooperation between the project partners to ensure consistent progress and achievement of strategic objectives.
- Analyze the different barriers that were found or that may arise during project implementation and develop and implement a strategy to overcome the barriers to ensure project success. Barriers include restrictive regulations; customs duties, taxes, insufficient local capacity, etc.
- Initiate necessary action to achieve technical progress, including the drafting of the terms of reference for sub-contractors, identification and selection, in accordance with the regulations of UNDP, of subcontractors and national / international consultants.
- Coordinate the activities of consultants, including contract administration, management and supervision of fieldwork, logistical support, analysis of results / technical reports, assessment of project achievements and cost control.
- Assisting in the design, monitoring and where appropriate the implementation of capacity building activities and dissemination.
- Support the operation of the Project Steering Committee.
- Provide technical assistance in the discussions and the development of renewable energy policies.
- Plan and coordinate the approved workshops.
- Assume responsibility for the quality and time programming for project objectives and outcomes.
- Assist in monitoring and overall evaluation.
- Support the development of various activities to ensure the development of all re- electrification projects based on renewable energy in Galapagos.

The Manager shall prepare an implementation schedule updated for the entire project and a detailed work plan for the first 12 months of operation. After completing the initial cycle of 12 months, the Manager shall prepare a new work plan for the next 12 months until project completion.

[26] The Terms of Reference of the Project Manager, Assistant Consultant and Administrative Assistant are presented in Part III of PRODOC, page 42.

2.14.6 Other staff for the Project

The project will also hire two assistants who are staff of the PMU in close relation and under the direction and coordination of their activities by the Project Manager. These two positions are: Assistant Consultant and Administrative Assistant. The functions and requirements of experience and education are given in the PRODOC[27].

2.14.7 Project Consultants

The project will hire three consultants for the following tasks

- International Consultant for the Midterm Evaluation.
- International Consultant for the Terminal Evaluation
- National Consultant on Lessons Learned and Dissemination

Two other project activities would be (sub) contracted in compliance with the rules of DEREE (later SEREE) and UNDP / GEF and any other law applicable in Ecuador:

- Subcontract 1: Feasibility studies for wind power project in Santa Cruz.
- Subcontract 2: Detailed Environmental Impact Assessment in Santa Cruz

The PRODOC has defined the scope of studies and qualifications of consultants to hire[28].

2.14.8 Participation of other agents

The EEPG, on its own or in partnership with local / foreign investors, will execute the repowering of the four inhabited islands with renewable energy. For this purpose, it will work closely with INGALA and other relevant institutions such as municipalities, to ensure that they take into account the views of local communities.

Community participation is vital to the success of the whole exercise of repowering. It is therefore important that residents of Galapagos and Ecuador are all informed about the whole process and that their support is obtained. In Galapagos, the Project Manager will need to maintain close contact with INGALA and local communities in each of the islands. The Project Manager will organize meetings with local institutions to get their agreement and support for the proposed activities and to explain the benefits obtained in these islands.

2.14.9 Acknowledgment of GEF

To ensure proper acknowledgment of GEF for its funding, GEF logo should appear on all relevant project publications, including among others, the project equipment and vehicles purchased with GEF funds. Any reference to projects financed by the GEF in publications should give due recognition to the GEF.

[27] The Terms of Reference (TOR) of this staff is given in Sections 2 and 3 of Part III of the PRODOC, pages 43 and 44.
[28] The Terms of Reference of these consultants and scope of subcontracts are given in Sections 4 and 5 of Part III of the PRODOC, pages 45-47.

The UNDP logo should be emphasized and be separated from the GEF logo if possible, as UN visibility is important for security.

2.15 MONITORING AND EVALUATION

The project will be monitored and evaluated according to the rules of UNDP for projects implemented in a national manner (NEX). Monitoring aims to track the performance of the project and provide external support and evaluate the final performance and impact of the project in view of the planned objectives.

The executing agency (MEM, later MEER) will regularly monitor progress of the project implementation. For this task, it will receive support from the PMU. Progress will be measured with respect to the attainment of the goals set out in the Work Plan and the Project Logical Framework. The PMU shall report quarterly on relevant developments to the Director of Renewable Energy and Energy Efficiency of MEM (now Sub-Secretariat of Renewable Energy and Energy Efficiency, SEREE of the MEER and to UNDP. Regular monitoring of the project will take place through this reporting mechanism and through site visits, as required. The disbursement of funds by UNDP-GEF will depend on the ability of the project to establish an appropriate information mechanism.

ATMs involving the executing agency, the project team, stakeholders and UNDP are to be made to review progress, identify problems and agree on solutions to maintain an adequate flow of information on inputs and achievements. The Project Steering Committee will review annual work plans and provide strategic advice on the most effective means of implementation.

The project will be subject to the rules and practices of UNDP / GEF Assessment and Monitoring, including preparation of the yearly Project Implementation Report (PIR).

Additionally, the project will be subject to two independent evaluations: the first at midterm of the implementation and the other at the completion the project. These independent assessments will analyze the progress in implementing the project and make recommendations where appropriate, to improve the timeliness, relevance and impact of the project. They will also help project participants to draw lessons learned, to improve the quality of future interventions of similar development and could be made in collaboration with other project partners. Such assessments with multiple participants and partners will be a very useful learning experience for all concerned. A 360-degree approach could be used to assess the contributions of all participants to the project. The results of the terminal evaluation will be included in the publication on lessons learned for dissemination both inside and outside of Ecuador. All reports will be posted on the project website.

2.16 PROJECT TIMELINE

The project was developed for a period of three years. The PRODOC does not contain a schedule for implementing the project.

2.17 INITIAL PROJECT BUDGET

Today, at the time of project completion, the total budget has been greater than the one initially estimated, as discussed in the findings of the project. Table 2-2

Table 2-2shows the initial overall project budget by source and activity.

Table 2-2. Initial Project Budget (2006)

	GEF	Government		Other Sources		
Project Activity / Component	**US$**	**US$**	**Source**	**US$**	**Source**	**Total**
Activities 1&2. Technical assistance to MEM/EEPG						
PDF-B	300,000					300,000
PDF-C	515,832	250,605	In-kind			766,437
Total	815,832	250,605	In-kind			1,066,437
Activity 3. Construction of Generating Plants (Phase 1)						
(i) Floreana	44,168	200,000	GNPS	320,723	Asociación SEBA	564,891
		55,000	FERUM	31,137	JPF	86,137
		75,000	MEM	18,000	WWF	93,000
				5,000	Araucaria	5,000
					Total Floreana	749,028
(ii) San Cristóbal		3,193,901	FERUM	5,978,087	e7	9,171,988
				350,000	UNF	350,000
				368,682	Income tax	368,682
					Total San Cristóbal	9,890,670
Total	44,168	3,523,901		7,071,629		**10,639,698**
Activity 4.Construction of Generating Plants (Ph.2) on:						
(i) Isabela				7,260,000	KfW	7,260,000
					Total Isabela	7,260,000
(ii) Santa Cruz (FV)				2,790,000	KfW	2,790,000
(iii) Santa Cruz (eólica)	2,955,498	1,625,000	MEM	650,000	UNF	5,230,498
Adjustment				44,502		44,502
				3,225,000	Others	3,225,000
					Total Santa Cruz	11,290,000
Total	2,955,498	1,625,000		13,969,502		18,550,000
Activity 5. Monitoring , Evaluation and Dissemination						
	240,000					240,000
Total	240,000					240,000
GRAND TOTAL	**4,055,498**	**5,399,506**		**21,041,131**		**30,496,135**

Notes: The original table contains two arithmetic errors. The column appears GEF US $ 3,239,666. The correct amount of US $ 4,055,498 was written. In Activity 4, US $ 44.502 were missing for the total of US $ 18.55 million that were allocated to others.

Table 2-3 shows the investment costs of the project and capacities to be installed through renewable energy equipment. 845.5 kWp from photovoltaic systems would be installed and 6 MW from wind energy, with an investment cost of PV US $ 10,371,429 / MWp and wind $ 4,121,113 / MW.

Table 2-3. Scenario Summary (2006)

Island	Scenario (% Renewable)	Technology	Installed Capacity	Cost ($)
Floreana	60%	PV Wind	25.5 kWp 0.4 kW	749,028
Isabela	70%	PV	700 kWp	7,260,000[1]
San Cristóbal	50%	Wind	2.4 MW	9,890,670
Santa Cruz	50%	PV Wind	120 kWp 3.2 MW	2,790,000 8,500,000
Sub-Total				29,189,698
Technical Assistance to MEM/EEPG				815,832
In-Kind contribution from Government of Ecuador				250,605
Monitoring, Evaluation and Dissemination				240,000
Total				30,496,135

1) → Includes $1,000,000 for rehabilitation of diesel plants and diesel storage and handling facilities

Table 2-4 shows the total project budget amounting to US $ 30,496,135, including PDF-B and -C that had a cost of US $ 1,066,437 (GEF: US $ 815.832; GoE: US $ 250.605 in-kind)[29]. As shown by the magnitude of investments in activities 2 and 3, *a determinant factor of project success are the contributions from the Government of Ecuador (GoE) for US $ 5,418,901 and Other Participants for US $ 21,041,131*.

Table 2-4. Initial co-financing of the project (2006)

	Cofinancing					
Project Components / Results	**GoE Cash (US$)**	**GoE In-kind (US$)**	**Oher (US$)**	**Total Cofinancing (US$)**	**GEF (US$)**	**Total (US$)**
1 & 2. Technical Assistance to MEM/EEPG		250,605		250,605	815,832	1,066,437
3. Power Plants Construction (Phase 1)	3,523,901		7,071,629	10,595,530	44,168	10,639,698
4. Power Plants Construction (Phase 2)	1,625,000		13,969,502	15,594,502	2,955,498	18,550,000
5. Monitoring and Evaluation					240,000	240,000
Total Project Cost	**5,148,901**	**250,605**	**21,041,131**	**26,440,637**	**4,055,498**	**30,496,135**

Source: UNDP-GEF - PRODOC, page 15.
Note: There are two arithmetical errors in Table 1 of PRODOC that were corrected[30].

[29] PRODOC, Table 1, page 15
[30] The column sum of GEF contributions to the project is incorrect because the contributions of activities 1 and 2 were not included, but the total amount of the project is correct. The sum of the costs of activity 4 does not correspond to the total value, so it was necessary to add US $ 44,502 to match the total. It was added to others.

Figure 2-2 shows the breakdown of the budget by component and source of financing. As shown, the construction activities of renewable energy systems 3 and 4 require the majority of investments (95%, see Figure 2-3). In this budget, the largest contributor turns out to be Others (69.0%), the Government of Ecuador (GoE) (17.7%) and the GEF (13.3%) (See Figure 2-4).

Figure 2-2. Budget by activity and source of funding (2006)

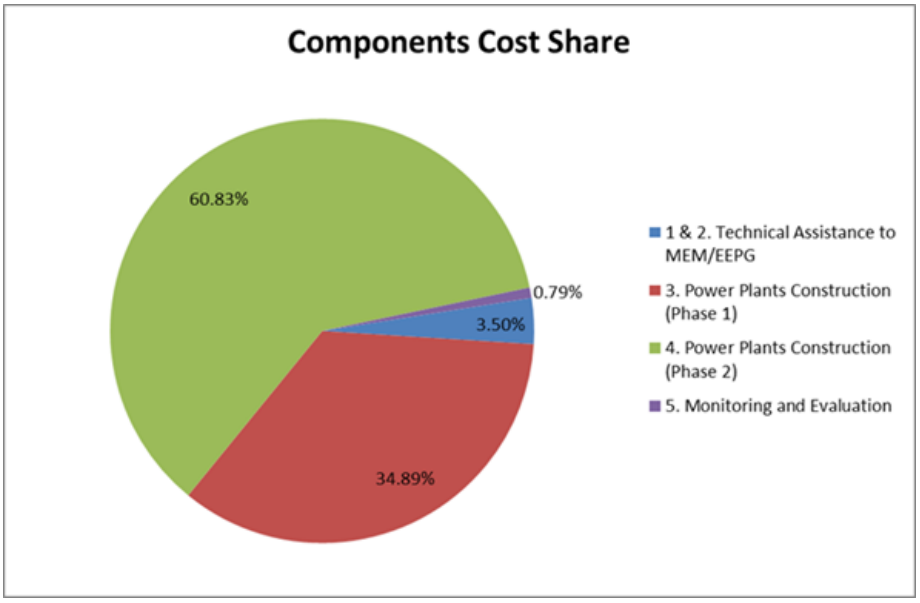
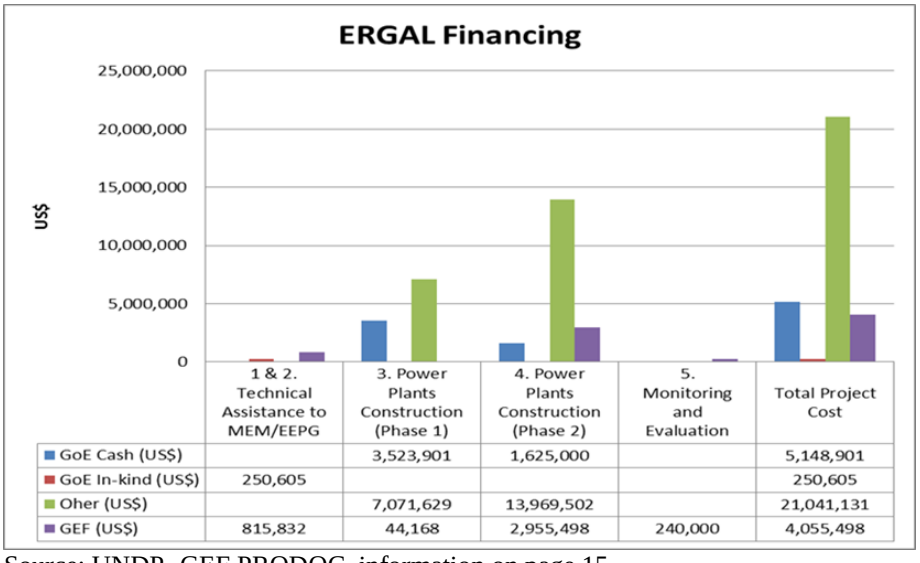


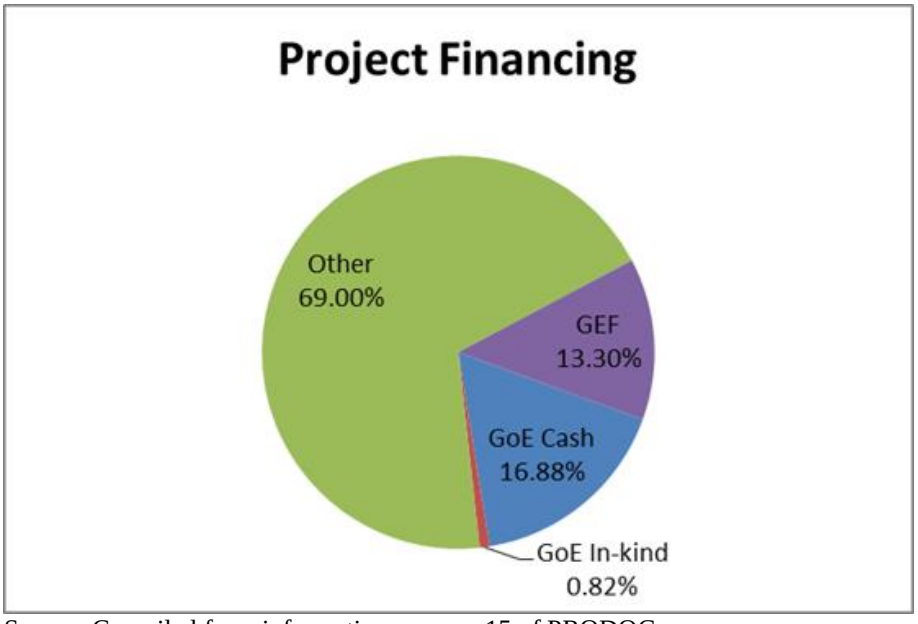
Figure 2-3. Participation of project activities in the budget (2006)



	1 & 2. Technical Assistance to MEM/EEPG	3. Power Plants Construction (Phase 1)	4. Power Plants Construction (Phase 2)	5. Monitoring and Evaluation	Total Project Cost
GoE Cash (US$)		3,523,901	1,625,000		5,148,901
GoE In-kind (US$)	250,605				250,605
Oher (US$)		7,071,629	13,969,502		21,041,131
GEF (US$)	815,832	44,168	2,955,498	240,000	4,055,498

Source: UNDP- GEF PRODOC, information on page 15.
Source: Compiled from information on page 15 of PRODOC.

Figure 2-4. Financing of the project (2006)



Source: Compiled from information on page 15 of PRODOC

2.18 SUSTAINABILITY

The PRODOC considered sustainability from different dimensions[31]. From a financial standpoint, the project will be aimed at transforming, in the long run, the Galapagos Provincial Electric Company (EEPG) in a more financially responsible utility company. Traditionally, EEPG has received allocations from the government for expansion and replacement of assets. However, this project seeks to achieve financial sustainability given that the investment costs will be borne by the central government and other stakeholders, so that the revenue generated by the sale of energy should achieve financial sustainability of the project.

With revenues from electricity generated (electricity sales less operating costs) a fund would be capitalized to provide financial resources for (i) the maintenance and acquisition of spare parts; (ii) monitoring populations of endemic birds around the project area and financing environmental mitigation; (iii) serve as seed capital to continue the effort repowering Galapagos; and (iv) establish a demonstration and training center on renewable energy technologies in Galapagos. It is expected that revenues from solar PV projects in Isabela and Santa Cruz will be part of this fund.

One of the key factors for project sustainability constitutes the capacity building of key national institutions with regard to policy development and institutional, legal, regulatory and operational capacities to promote private participation in power generation based on renewable energies and to develop an awareness program on energy efficiency among users in the islands, along with the

[31] See section "Sustainability", PRODOC, paragraphs 86-89, pages 24 and 25.

dissemination of information to promote replication of the project. These efforts should ensure long-term sustainability of electricity generation from renewable sources in Ecuador.

2.19 RISKS

In formulating the PRODOC several potential risks that may affect the implementation and results of the project were considered.

Regulation risk or risk related to the framework within which the EEPG works. The Law of the Electric Sector clearly establishes the legal framework to promote private sector participation and ensure capital investment under rules of efficiency and competitiveness. Electrical systems not connected to the national grid, as the Galapagos systems, are authorized to maintain a vertically integrated structure in which one company provides all services (generation, transmission and distribution). Therefore, the concession granted by CONELEC establishes the right of the EEPG to generate electric power and its ability to partner with other companies to improve electricity generation capacity. This legal context has allowed e7 to set the Commercial Trust San Cristobal Wind Project. In addition, CONELEC regulations set prices for electricity generated from non-conventional energy technologies for both wind systems as photovoltaic systems. The price of energy generated from wind power in Galapagos was set at the beginning of the project at US ¢ 12.1 cents / kWh, for solar photovoltaic systems at US ¢ 31.2 cents / kWh, prices that changed during the project implementation. These prices are valid for 12 years from the date CONELEC signed the concession. In conclusion, the legal framework prevailing in the country is safe for the project. With the adoption of the feed-in tariff in Ecuador in 2011, valid through December 31, 2012, new prices were fixed for electricity generated by renewable energy in Galapagos and the mainland.

Technical risk, understood as the risk that hybrid systems prove to be too advanced a technology regarding EEPG technological capabilities, qualified staff and management. The consequences of this risk would imply that reducing emissions and saving diesel fuel *could be lower than initially expected*.

During the PDF-C phase, some interventions were started to improve organizational environment and lack of experience by EEPG, and to obtain the human resources needed to manage technological change. These activities will continue throughout project implementation. It also considers the training of personnel for the operation and maintenance of renewable energy systems.

*Execution risk o*r risk that the project is not completely executed despite that the necessary resources have been allocated. The PRODOC considered that *this risk is minimal* because the project has been developed in close consultation with several key government ministries and with support from the highest political levels with a view to promoting the development of renewable energy in Galapagos. The conditions that should allow the operation of independent generators were also analyzed. This risk has diminished at the same time the works of repowering advance (Floreana Island were already completed and those of San Cristobal, Isabela and Santa Cruz were being executed at the time of project formulation).

Risk of increased demand by the natural growth of the population and immigration from the mainland. This increase could also be caused by changes in consumption patterns to the extent that people improve their income and adopt a "continental" lifestyle. This risk is mitigated by controlling immigration to the islands by INGALA. Measures for the rational use of electricity will also be implemented and the new

water systems in San Cristobal and Santa Cruz are to be operated during off-peak hours when there is availability of excess wind energy.

Replication risk. This risk was considered quite small. After achieving the successful demonstration of power generation systems based on solar and wind energy, it is expected that local and foreign investors will consider that these projects and its implementing rules are interesting and replicable. There is already interest in establishing wind farms connected to the national grid in the provinces of Imbabura and Loja on the mainland of Ecuador. Therefore, a positive experience in the Galapagos would accomplish much to generate investor confidence in IPP / PPA arrangements in the electricity sector of Ecuador.

2.20 REPLICABILITY

The PRODOC considers that there is a high probability that the project is successfully executed and therefore can replicate the results and lessons learned in new projects on the mainland, given the large number of communities still lacking electricity service and the possibility of block generation for the national grid.

However, effective replication of the experience of the Galapagos require a combination of policy changes, as well as the targeted dissemination of lessons learned and achievements of the project, providing concrete examples. Thus, the project will facilitate the continuous contacts and collaboration between different participants through seminars, workshops, site visits and other events. In addition, the project will maintain a website that participants can access to monitor project progress and find out the problems encountered and the solutions proposed, results achieved, etc.

3. FINDINGS AND CONCLUSIONS

This chapter aims to present the findings and conclusions on project formulation, implementation and its outcomes, to finally present an overall evaluation of it.

ERGAL is a joint effort of the Government of Ecuador and the UNDP / GEF to help reduce the consumption of fossil fuels for electricity generation in Galapagos and to reduce the risk of fuel spills affecting the biodiversity of a world heritage site .

At the end of the project, the goals set out in the commitments and signed by the parties must have been attained, also creating conditions to minimize the risks of project sustainability.

The status of project outcomes, so to consider that it was properly carried out, relate to the attainment of objectives and outcomes of the project and that the exit strategy establishes the bases to ensure sustainability.

The summary of the evaluation and rating of the project is presented next. Project formulation, project implementation and the results are evaluated, starting with the Global Environmental Objective and then, one by one, each of the seven project outcomes, and issues such as ownership of the project, sustainability, catalytic role, project impacts, current project status and current status of the project barriers.

3.1 SUMMARY OF PROJECT EVALUATION AND RATING

At the close of the project, global environmental objectives in the PRODOC to install renewable power generation, emissions reduction and proposed investments *have been partially attained*.

However, when projects in development are operational from 2017, the project will *attain global environmental objectives.*

Therefore, prompt execution and operation of the projects currently in development is most important.

Project execution can be seen in global terms of outcomes as ***Marginally Satisfactory (MS)*** because after the projects are completed most of the major relevant objectives will have been achieved but with deficiencies in areas such as opportunity in completing outcomes, capacity building, dissemination of technical information, and institutional strengthening.

Project Performance Rating

Criteria	Rating
Monitoring and Evaluation: Highly Satisfactory (HS), Satisfactory (S), Marginally Satisfactory (MS), Marginally Unsatisfactory (MU), Unsatisfactory (U), Highly Unsatisfactory (HU).	
Overall quality of M & E	S
M & E design at project start up	S
M & E Implementation Plan	S
IA & AD Execution: Highly Satisfactory (HS), Satisfactory (S), Marginally Satisfactory (MS), Marginally Unsatisfactory (MU), Unsatisfactory (U), Highly Unsatisfactory (HU).	
Overall Quality of Project	MS
Implementation / Execution	S
Implementing Agency Execution	MS
Outcomes: Highly Satisfactory (HS), Satisfactory (S), marginally Satisfactory (MS), marginally Unsatisfactory (MU), Unsatisfactory (U), Highly Unsatisfactory (HU).	
Overall Quality of Project Outcomes	MS
Relevance	R
Effectiveness	MS
Efficiency	MS
Sustainability: Likely (L), Moderately Likely (ML), Moderately Unlikely (MU) Unlikely (U), Highly Unlikely (HU)	
Overall likelihood of risks to Sustainability:	L
Financial resources	L
Socio-economic	L
Institutional framework and governance	L
Environmental	L
Impact: Significative (S) Minimum (M), Unsignificative (U)	
Improvement of the environmental status	S
Reduction in stress on ecological systems	S

3.2 PROJECT FORMULATION

This section aims to describe and evaluate[32] how efficiently the concept and design of the project did address the problem of the project, with emphasis on consistency and logic of the strategy and logical framework of the project.

[32] All sections of Findings and Conclusions marked with (E) in the ToR should be evaluated as Highly Satisfactory (HS), Satisfactory (S), Marginally Satisfactory (MS), Marginally Unsatisfactory (MU), Unsatisfactory (U) and Highly Unsatisfactory (HU).

3.2.1 Conceptualization / project design

The *project is consistent with the* Operational Objectives of the Program Number 6 of GEF: Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs. It is also under the GEF Strategic Priority No. 3 (SP 3): Electricity Sector Policy Frameworks that support the Renewable Energy and Energy Efficiency. In addition, the project has a secondary objective: reducing risks to the rich biodiversity of the Galapagos arising from future oil spills. As it is unlikely that the project activities are implemented without the support of UNDP and GEF, it is considered that the project is incremental to a large extent. The project is also in line with the environmental and energy policy of Ecuador. In addition, the project is in line with the target 3 Multiannual Financial Framework of UNDP.

For the future energy supply of the Galapagos, the possibility of using indigenous resources such as solar and wind (and subsequently biofuels), was clearly understood by the Government of Ecuador and the *agreement* achieved between the national and local government and other stakeholders managed to establish a long-term commitment as the initiative "Zero Fossil Fuels on the Galapagos" which has become a *crucial and fundamental factor* to the process of introduction of renewable energies to the islands. This initiative arose in 2007 from the Minister of Energy and Mines (pre-MEER) Dr. Alberto Acosta and colleagues, and with the broad support of ERGAL. Therefore, the ERGAL project began implementation having institutional support for activities towards achieving results and act as a catalyst project promoting initiatives and activities of different actors involved in the development of renewable energy in the Galapagos Islands.

These policies and national commitments are on a path towards use of renewable resources in the Islands, the increase of renewable energy in electricity generation, reducing dependency on the use of petroleum fuels and the environmental risk of potential fuel spills in a sensitive ecosystem, heritage site of humanity, and sustainable development, and are *conceptually well connected* in the project characterization.

The project PDF-B identified 6 major barriers which *were well identified* and *the mechanisms proposed to remove them, appropriate*. Therefore, the overall environmental objective, the development objectives of the project and their respective outcomes formulated in the Logical Framework are consistent with the barriers to be removed. However, *the objectives and outcomes of the project are also in line with the initiatives of the Government of Ecuador* to ensure reliable and sustainable supply of electricity in the Islands.

The *implementation strategy of the project is considered effective* since the participation of MEER (formerly MEM) together with the Ministry of Environment, the National Park Service, the Governing Council and CONELEC through the (PSC), was the appropriate institutional framework for development by involving components of leadership and impact on the country's energy policy with MEER, in local development policy with the Governing Council, in environmental policy with the Ministry of Environment and the Galapagos National Park, and in knowledge on renewable energy generation systems on the islands with Elecgalapagos.

The political, regulatory, institutional and economic setting of the project was made manifest in the analysis of risk factors which were identified by the project.

3.2.2 Project Assumptions and Risks

The *direct risk factors* of the project were linked to the positions taken by the parties involved in project execution and the ability to carry out the project satisfactorily.

The *first risk* related to the framework of EEPG refers to the promotion of private sector and securing capital investment in electricity generation, under the Electric Sector Regime. However, the constitutional reform of 2008 declared the energy sector as strategic and therefore further empowered state institutions in the energy sector to participate in the generation, transmission and distribution of electricity in the islands. As a result, EEPG associated with e7[33] to develop the San Cristobal project put into operation in 2007, but subsequently there has been no further similar initiatives by the private sector. The GoE has received cooperation grants from the Governments of Korea, Japan and Germany to implement renewable energy projects which has certainly balanced the lack of private investment in Galapagos.

A *second and third risk* were the possibility that hybrid systems will result too advanced with respect to the capacity of EEPG and the company´s lack of experience to obtain the human resources needed to manage technological change. These risks were considered in regard to EEPG institutional strengthening, but not implemented. The projects have offered training to increase operational knowledge of EEPG staff.

The *execution risk* relates to incomplete execution of the project in spite of necessary resources being allocated. This risk is considered *minimal* for the support given to the project at the highest political level and the close consultation with ministries that took place during its formulation. The GoE has supported the execution of the project with its own resources and through seeking and obtaining grants from international technical cooperation.

The *risk of increased demand* due to the natural growth of the population of the islands, immigration to them and increased tourism is effectively present. The growth rate of power generation in the four has been between 2007 and 2013 in average of 7.4% annually (with a slight decrease in 2013 to 3.4% but with a sharp increase to 11.1% in 2012), which is due to the factors above and increased energy demand from users for new services (

Table 3-5 and Table 3-6). The result is that the penetration of RE in the islands increased from 3.6% in 2006 (photovoltaic generation in Floreana) to 10.55% in 2010, as a result of the operation of the wind farm Eolicsa in San Cristobal in 2007, then decreased to 9% in 2013 mainly due to the increase in demand (Table 3-8).

The project components and activities proposed to achieve the objectives are appropriate and meet the institutional, legal and regulatory conditions in place at the start of the project. Schedules for the activities and their coherence over time can hardly anticipate delays that may occur and then is when project execution must be flexible and adapt to these situations for the benefit of project execution. This situation has been identified in the Annual Work Plans (AWP) from 2006 to 2014, a period in which *the project*

[33] http://www.globalelectricity.org/en/
e7: Initially composed of seven of the largest electric utilities in the world, it is currently composed of 12.

changed its strategy to achieve the expected outcomes and scope. All modifications to the Logical Framework led to changes in the operating level were reflected in the AWPs and subject to approval by the UNDP-GEF, as noted in the PRODOC.
As regards the period of the project, it is considered that *the initial three year term was too restricted* for the execution and should have been longer (Table 2-1). The implementation period has been 7.5 years (more than double the original estimate) but it was a result of policy and regulatory changes that occurred in the country, and logistical and contractual difficulties encountered in implementing the projects in Galapagos.

It is appropriate to note that the Logical Framework formulation foresaw a timetable that was outside the scope of the project[34]:

- **Outcome 1.1:** Completion of the rules of political, legal and operational allowing private sector participation in power generation based on renewable energy. The MEM commence a program of energy efficiency in association with EEPG.
  Comment. The completion of the regulations corresponds to the institutions of government and is outside the scope of the project.

3.2.3 Modifications to the Logical Framework

The Logical Framework (LF) of the project was modified during execution three times, approved on the following dates:

- July 22, 2010
- January 28, 2011
- November 29, 2012

In this report, the final version of the LF is used in the outcomes section of the project (Section **Error! Reference source not found.**). This section lists the changes consolidated in each of the above dates.

Changes as of July 22, 2010

As a result of the Inception Workshop of November 2007, the following changes to the original version of LF were introduced:

- Project objective: RE considered initially were Photovoltaic and Wind power. Biofuels were added by the possibility of producing them on the continent and their transport to the Galapagos Islands.
- Output # 1.2. From Output 1.1, Output 1.2 was derived thus: The MEER starts a program of energy efficiency in cooperation with EEPG.
- Output # 2.1. Eliminated because within the regulatory framework of the electricity law brought by CONELEC there no longer exist Independent Power Producers (IPP) and Power Purchase Agreements (PPA); forcing the project to eliminate such activity.

[34] Project Planning Matrix, PRODOC, p. 32

- Outcome 4.2 (PV system installed on the premises of the Galapagos National Park) was eliminated at the request of the executor in order to allocate more resources to the project of Isabela Island.
- In Outcome 4.3 (Repowering with wind / diesel hybrid system in Santa Cruz) the use of biofuels was included.
- Outcome 6 is added: the Project Management Unit is to manage the administrative part of. Project.
- Outcome 7 is added: Monitoring and evaluation, to follow up on the planning and its annual review and to more clearly visualize the different monitoring and evaluations conducted in the project.

It is noted that the change to the Output # 2.1 is a response to the changing policy of the GoE through CONELEC to remove IPP and PPA mechanisms considered fundamental to the project which expected a significant share of private sector participation in generating renewable energy. Two new outcomes (6 and 7) are added.

Changes as of January 28, 2011

- Output 1.3. The island Energy Inventory is framed within the Integrated Resource Planning
- Goal of Output 2 was modified to include implementation of an EEPG training and modernization plan in order to have better management and efficient operation.
- On the Outputs 3 and 3.1, biofuels were included as renewable source options for hybridization of Floreana and San Cristobal.
- Output 3.2 initially included wind power generation in San Cristobal. Given that this project began operating in 2007; Output 3.2 was amended as systematization of monitoring for repowering system on the island based on the hybrid wind in operation.
- In Output 4.3 (Repowering with hybrid wind / diesel / biodiesel system in Santa Cruz) generation in Baltra was included for Santa Cruz.
- The goals of Output 5.2 (Global Results, experiences and lessons learned from the project disseminated at local, national and regional level) are: 1) Draft final report released to stakeholders, 2) regional seminar for the presentation and discussion of outcomes / lessons learned and 3) public outreach activity through social media / web site communication. In addition, workshop to discuss the results achieved so far.
- Outcome 6 establishes three sub outputs associated with it: 1) the coordination and monitoring of outcomes, 2) management of the outcome 4, and 3) compliance and implementation of expected outcomes 5 and 7.
- Outcome 7 establishes output 7.1 as a control, monitoring and evaluating implementation of the objectives of the outcomes 1-6.
- For Outcomes 6 and 7 there were no indicators defined.

Changes as of November 29, 2012

- Output 1.3. The island Energy Inventory is framed within the Zero Fossil Fuels Initiative for Galapagos and established as the final goal, the Systematization of Progress as of 2012 and analysis of the potential of renewables in Galapagos.
- Output 1.3 goal. Isabela activities are deleted from the final goal because ERGAL is no longer involved in Isabela.

- Output 2 goal was modified to: Collaborate in the implementation of the EEPG training plan and modernization in order to have better management and efficient operation.
- Output 2.1 goal (renumbered, initially it was 2.2) is modified to: Contribution to the consolidation of a group of skilled labor to manage renewable energy systems in the administrative, legal and / technical field.
- Outcome 2.2 (renumbered, initially it was 2.1) eliminated by changes in the regulatory framework given nationally.

The goals of product 3.1 (for Floreana) were formulated explicitly as: 1) repowered Hybrid System operating without any technical or administrative problem, 2) by 2004, penetration of renewable energy of 80%, 3) Rehabilitation of the PV system in 2013, and 4) Operation of 138 kW from biofuels in 2011.

Therefore, the evaluator conceptualizes that the formulation of the project is ***Highly Satisfactory (HS*)** and modifications to the Logical Framework was an appropriate response to the changes that occurred during project implementation.

3.2.4 Stakeholder participation in the conceptualization / project design

The formulation of ERGAL was a process preceded by two PDFs, during which the various stakeholders were identified according to their roles and responsibilities in such a way that the project complied and was structured at the time based on the problem of generating energy in the Galapagos Islands and their environment, and the opportunities presented to implement renewable energy projects with the participation of relevant stakeholders.

No information is available to assess the participation of stakeholders in the conceptualization and design of the project.

3.2.5 Project follow up, monitoring and management

Follow up and monitoring for the project was formulated in line with the UNDP / GEF procedures, considering that the executor (MEER) would also be responsible for its own institutional procedures. The monitoring and control of project management is also strengthened by the PSC where related institutions and beneficiaries of the project are involved. *It is considered that follow up and monitoring project management are well formulated.*

3.2.6 Other aspects

To implement projects, the UNDP has the advantage over other institutions of its enormous power to call on the state sector, unions and society in general. On the other hand, it operates lines of social, environmental and management intervention in tune with the interests of the Government of Ecuador. Its recognized impartiality is also favorable to interact between multiple stakeholders.

3.3 PROJECT IMPLEMENTATION

3.3.1 Implementation approach

The evaluator considers that UNDP Ecuador:

- *Effectively supported* the selection, recruitment, assignment of experts and consultants and national counterparts in defining tasks and responsibilities,
- *Led jointly with the GEF Regional Office in Panama* the consultation process for the approval of contracts.
- *Made the arrangements for payments* in a timely manner in relation to fees and services hired.
- *In relation to the review of products derived from consultancies it did not issue judgments about their quality.*

In terms of effectively communicating processes or responses to queries made to the executing agency, the UNDP made the necessary proceedings.

The meetings held, as indicated earlier in this report, attest to the participation of UNDP in relation to the quantity, quality and timeliness of inputs regarding its responsibilities for project execution which remained constant.

The financial availability was in line with the needs of the project, i.e. the provision of resources for timely payments was carried out "with due process to payment requests."

3.3.2 Monitoring and evaluation

3.3.2.1 Monitoring

The PRODOC established the following monitoring mechanisms for the implementation of the project[35]:

- The program will be monitored according to control, monitoring and evaluation procedures of both the UNDP and the MEER, and both are jointly responsible for the continuous monitoring of project progress.
- UNDP in Ecuador will monitor the performance during implementation
- The Project Coordinator will make internal reviews and comments on performance to provide feedback and direct efforts in the direction desired.
- For each of the components of the project, a detailed monitoring plan at the beginning of the project will be developed.
- As a part of the project start, the Logical Framework of the Project may be reviewed; specifically, detailed indicators will be revised and adapted if necessary, including measures to detect major external project risks.
- Appropriate and specific performance references shall be established before project execution to

[35]) Renewable Energy Program for the Generation of Electric Energy-Electrification with Renewable Energy Galapagos. UNDP-GEF (July 25, 2006. Project Document p. 27.

effectively monitor their progress and to make critical management decisions. A series of annual reports will be established to send progress reports to be distributed to all participants in the project.

- The proposed monitoring and evaluation activities will follow the guidelines contained in the UNDP / GEF Information Package on Monitoring and Evaluation.
- The executing agency (MEER) is responsible for regularly monitoring progress on project execution, with support from the PMU. Progress is measured with respect to meeting the goals set out in the Project Work Plan and Logical Framework.
- The PMU shall report quarterly on relevant developments to the Director of Renewable Energy and Energy Efficiency of MEER and UNDP.
- Annual Tripartite Meetings (ATMs) involving the executing agency, the project team, stakeholders and UNDP are to be held in order to review progress, identify problems and agree on solutions to maintain an adequate flow of information on appropriate input and achievements.
- The Project Steering Committee will review annual work plans and provide strategic advice on the most effective means of implementation. GEF will be informed through the Annual Project Implementation Report (PIR).
- Additionally, the project will be subject to two independent evaluations: the first midterm and the final term at the project completion. These independent assessments analyze the progress in implementing the project and make recommendations where appropriate, to improve the timeliness, relevance and impact of the project.
- The results of the terminal evaluation will be included in the publication on lessons learned for dissemination both inside and outside of Ecuador. All reports will be posted on the project website.

Monitoring mechanisms established by the UNDP have been applied.

- The PMU as project executing agency has dealt with the daily tasks of the project using the AWP.
- More specifically and regarding monitoring mechanisms, in this project all PIR / APR were developed (PIR: UNDP GEF Project Implementation Report and APR: UNDP Annual Project Review) from 2008 until the last dated 2014 (On December 2014, the park is in the process of commissioning.
- Tripartite meetings. The PRODOC established conducting Annual Tripartite Meetings involving the executing agency, the project team, stakeholders and UNDP. The report of the meeting corresponding to 2012 was presented where one of the main issues discussed was the development of wind farm Baltra and ongoing actions to advance execution of the project.
- Project Closing Report. *The Final Project Report was made (March 2014)*
- Meetings of the Project Steering Committee (PSC). Ten meetings reports of the Project Steering Committee held between 2009 and 2013 were received, most of them between 2011 and 2012 and related to the development of wind farm Baltra. At these meetings the PSC makes a presentation of the current state of development of projects and actions recommended to redirect its course.

- Table 3-2). Progress evaluations towards the Millennium Development Goals and Project Implementation, were during the years 2011 and 2012 Moderately Satisfactory because the main product of the project, Baltra / Transmission Line wind farm showed no significant progress and had presented some delays due to the development of the sub-transmission line.
- The completion of civil works for wind turbines and installation during 2013 motivated Satisfactory ratings.
- Project Progress Reports. They consist of APR / PIRs. There are also final reports or products of

sub-contracts made by the consultants and consulting firms.

Table 3-1 shows the documents received related to Project Monitoring and Evaluation from 2006 to 2013. After reviewing this information, the evaluator was able to infer compliance of the following monitoring mechanisms:

- Monitoring mechanisms established by the UNDP have been applied.
- The PMU as project executing agency has dealt with the daily tasks of the project using the AWP.
- More specifically and regarding monitoring mechanisms, in this project all PIR / APR were developed (PIR: UNDP GEF Project Implementation Report and APR: UNDP Annual Project Review) from 2008 until the last dated 2014 (On December 2014, the park is in the process of commissioning.
- Tripartite meetings. The PRODOC established conducting Annual Tripartite Meetings involving the executing agency, the project team, stakeholders and UNDP. The report of the meeting corresponding to 2012 was presented where one of the main issues discussed was the development of wind farm Baltra and ongoing actions to advance execution of the project.
- Project Closing Report. *The Final Project Report was made (March 2014)*
- Meetings of the Project Steering Committee (PSC). Ten meetings reports of the Project Steering Committee held between 2009 and 2013 were received, most of them between 2011 and 2012 and related to the development of wind farm Baltra. At these meetings the PSC makes a presentation of the current state of development of projects and actions recommended to redirect its course.

- Table 3-2). Progress evaluations towards the Millennium Development Goals and Project Implementation, were during the years 2011 and 2012 Moderately Satisfactory because the main product of the project, Baltra / Transmission Line wind farm showed no significant progress and had presented some delays due to the development of the sub-transmission line.
- The completion of civil works for wind turbines and installation during 2013 motivated Satisfactory ratings.
- Project Progress Reports. They consist of APR / PIRs. There are also final reports or products of sub-contracts made by the consultants and consulting firms.

Table 3-1. Monitoring and Evaluation Activities

Class	Type	2006	2007	2008	2009	2010	2011	2012	2013	2014	Observations
1. Reports	PIR				X	X	X	X	X		
	Activities Reports				X	X	X	X			
	Final Project Report									X	
2. Meetings	Tripartite Committee Minutes							1			
	Project Steering Committee Minutes				x	2	3	3	1		
	Consultive Committee				1	2	3				
3. Operational Plans	Annual Operational Plans				X	X	X	X	X		
4. Evaluations and Audits	Mid-Term Evaluation					X					
	Financial Audits				X						Fidergal Audit
	Terminal Evaluation										This report.

- On December 2014, the park is in the process of commissioning[36].
- Tripartite meetings. The PRODOC established conducting Annual Tripartite Meetings involving the executing agency, the project team, stakeholders and UNDP. The report of the meeting corresponding to 2012 was presented where one of the main issues discussed was the development of wind farm Baltra and ongoing actions to advance execution of the project.
- Project Closing Report. *The Final Project Report was made (March 2014)*
- Meetings of the Project Steering Committee (PSC). Ten meetings reports of the Project Steering Committee held between 2009 and 2013 were received, most of them between 2011 and 2012 and related to the development of wind farm Baltra. At these meetings the PSC makes a presentation of the current state of development of projects and actions recommended to redirect its course.

Table 3-2. Evaluation Ratings of the project execution according to the PIR

Rating of Progress Towards Meeting Development Objective (DO)					
Period	National Project Manager/Coordinator	Government GEF Operational Focal Point	Executing Agency (MEER)	UNDP Country Office Programme Oficer	UNDP Regional Technical Advisor
2008	HS			HS	S
2009	S		S	S	S
2010	S			S	S
2011	MS	MS	S	MS	MS
2012	MS	MS	S	MS	MS
2013	S	S	S	S	MS
2014	S	-	-	-	-

Rating of Implementation Progress (IP)					
Period	National Project Manager/Coordinator	Government GEF Operational Focal Point	Executing Agency (MEER)	UNDP Country Office Programme Oficer	UNDP Regional Technical Advisor
2008	S			S	S
2009	S	S		S	S
2010	S			S	MS
2011	S	MS	S	MS	MS
2012	MS	MS	S	MS	MS
2013	S	S	S	S	S
2014	S	-	-	-	-

Ratings: Highly Satisfactory (HS), Satisfactory (S), Marginally Satisfactory (MS)

3.3.2.2 Midterm Evaluation

The Midterm Evaluation (ME) was conducted in October 2010, the third year (fourth year) of effective start in November 2007 (nominal start in August 2006) of the Project[37]. The ME assessed the achievement of outcomes to date and drew conclusions and recommendations based on the indicators relevance, effectiveness, efficiency and sustainability. It is worth mentioning that the results and indicators subsequently underwent changes, so that several of the comments made at the time lost relevance upon completion of the project in 2014 and others were introduced.

[36] During the review period of this report, on December 22, President Correa and the UNDP inaugurated the wind farm.
[37] Curbelo, A. ME - ERGAL Project (October 2010) Quito

The ME presents recommendations to enhance project performance towards achieving results that were considered and accepted by the PMU and the Project Board, with varying degrees of success as shown in this terminal evaluation.

As for project completion, the ME considered vital the operation start of Baltra Wind Farm / Baltra Transmission Line - Santa Cruz, as well as the completion of Floreana system, improving quality of service in San Cristobal and there, actions to change the negative perception of the service by the population affected by the initial difficulties of putting into operation the hybrid system.

Since at the time of project completion, December 2010, no electrification work would be finished, it was recommended to extend the term of the project for more than one year but less than two (deadline December 2012).

Given the delays in execution and the need to improve project management, it was recommended that MEER should strengthen the management capacity of the PMU on the basis of establishing coordination mechanisms between the PSC and the Governing Council of Galapagos, and that the Advisory Committee assume the functions of the PSC adjusting the operating regulations to encourage the prompt execution of the project. LF adjustment was also recommended to retain its role as a roadmap of the project.

As regards the achievements, the ME considered that progress of the energy efficiency program to be performed by the MEER and ERGAL were still very limited.

3.3.2.3 External Financial Audits

The evaluator received the report of the external financial audit to the Commercial Trust Renewable Energy for Galapagos - Fidergal on December 31, 2009[38]. The concept of the external auditor is that at that time Fidergal financial statements presented fairly the financial position of trust, the results of operations and cash flows in accordance with accounting principles generally accepted in Ecuador.

The Commercial Trust Renewable Energy for Galapagos is administered by the National Financial Corporation - CFN and was established by public deed of November 15, 2007. The constituents of the trust fund are: MEER and The Galapagos Provincial Utility - Elecgalapagos SA (Also beneficiary). The contributions and balance already reached US $3,601,000 by December 31, 2007, US $6,222,000 by December 31, 2008, and $ 8,890,000 by December 31, 2009. The one single disbursement was made on December 31, 2009 for the amount of US $163,000 to the Joint Venture VWP-Proviento for the implementation and execution of Hybrid Power Generation System in Isla Baltra including the laying a sub-transmission line Baltra to Puerto Ayora[39].

All financial management and relevant supporting documentation was handled by UNDP-Ecuador. In accordance to UNDP rules, this project should conduct an audit. UNDP hired a financial audit with an

[38] Financial statements for the Year Ended December 31, 2009 and Report of Independent Auditors. Deloitte (April 21, 2010) Quito
[39] Page 10, Ref. 38.

external accountants specialized firm. UNDP received the audit for the period January 1 to December 31, 2012[40]. *The report is clean and without comments.*

The evaluator considers that there was systematic monitoring to the progress of activities and therefore monitoring and follow-up of the project is ***Satisfactory (S).***

3.3.3 Financial Planning

3.3.3.1 UNDP / GEF Resources

The project was carried out according to the method of "partial national execution", whereby transactions, contracts and disbursements necessary for project execution are approved by the Project Steering Committee, but are subject to review by the UNDP, agency making direct payments and handling the accounting of transactions.

In relation to co-financing and according to the PIR of June 30, 2010[41], the co-financing of non-governmental actors was executed directly by them with adequate information to MEER (See Section 3.3.3.2). Co-financing of government resources was done primarily through Trust (Fidergal) or directly through its agencies and therefore neither the resources from nongovernmental or government actors were under the order of spending by the UNDP.

As regards GEF resources on December 2013, 97% had been executed and after project closure (April 2014)100%. 100% of TRAC[42] and UNDP funds had been executed by December 2013. UNF funds had been executed at 97%.

3.3.3.2 Amount of GEF investments, co-financing and leverage factor

Table 3-3 shows the financing of the project. Its current total value is $ 73,543,217, twice the initial value of US $ 30,496,135 (See Table 2-2). Considering that GEF provided US $ 3,431,393 as an investment for Baltra Wind Project, total investments when all projects are completed in 2016, amount to US $ 70,892,367 (Section 3.4.1.5) corresponding to 96.4% of the total. The project initially considered the installation of about 6.4 MW through wind and photovoltaic plants in the amount of US $ 29,189,698 (See Table 2-3), and the project will end in 2016 installing 10.5 MW in wind, solar, diesel / jatropha and battery banks (see Table 3-15).

As for the origin of resources, the Government of Ecuador has contributed $ 35,483,329 corresponding to 48.2% while other (international agencies) have provided US $ 33,237,150 (45.2%). It is to highlight the *enormous commitment of the Government of Ecuador* to the generation of renewable energy in Galapagos which increased six fold the amount of their contributions going from M US $5.4 to M US

[40] Reporte Combinado de Desembolso No.00048857.1 Enero a 31 Diciembre 2012. PKF & Co. (Marzo 2013). Quito. Ecuador.
[41] The most recent PIR June 2011 contains no financial information on the project.
[42] TRAC: Target Resources Advanced from the Core. Resources are assigned from the headquarters of the UNDP to country office for emerging or very strategic projects.

$ 35.5, and the large capacity that MEER and ERGAL have had to attract funding for the project from e7, KOICA, JICS -Japan International Cooperation System- and KfW.

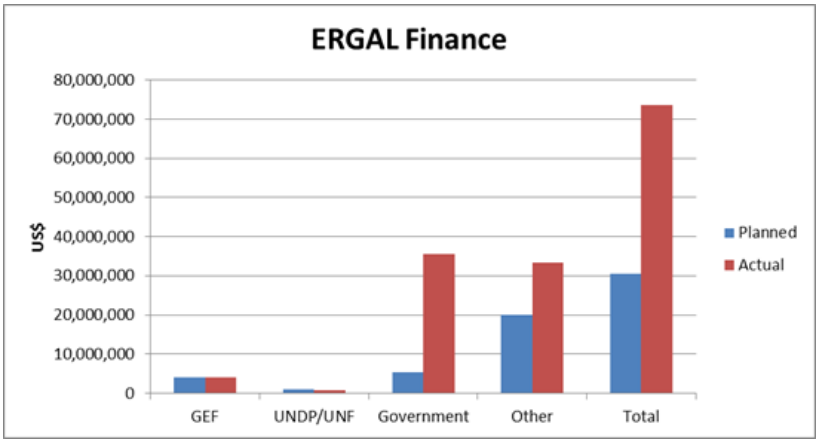
GEF contributions amounting to US $ 4,055,498[43], corresponding to 5.5% of the total project. Taking into account this contribution versus the total amount of the project, *the leverage factor for the GEF*[44] initially estimated at 7.5 *was 16.6, twice higher* than initially expected! This demonstrates how Galapagos is of much interest for both foreign agencies and the Government of Ecuador.

Table 3-3. ERGAL project co-financing

Co-financing / Type - Source	ERGAL CO-FINANCE									
	GEF (US$)		UNDP (US$)		Government (US$)		Others (US$)		Total (US$)	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
Grants	$4,055,498	$4,055,498	$1,000,000	$767,240	$1,700,000	$1,008,700			**$6,755,498**	**$5,831,438**
Investment (cash /projects)					$3,448,901	$34,224,024	$20,041,131	$33,237,150	**$23,490,032**	**$67,461,174**
Loans/Concessions										
· In-kind support					$250,605	$250,605			**$250,605**	**$250,605**
· Other										
Totals	**$4,055,498**	**$4,055,498**	**$1,000,000**	**$767,240**	**$5,399,506**	**$35,483,329**	**$20,041,131**	**$33,237,150**	**$30,496,135**	**$73,543,217**
Planned Leverage Factor		7.5								
Actual Leverage Factor		**16.6**								

Source: Compiled from information in section 3.4.1.5.

Figure 3-1. Co-financing of the project (2006)



3.3.4 Project Effectiveness

The outcomes to be discussed and evaluated later clearly show that several of the outcomes presented were achieved satisfactorily but not the totality. The repowering of Floreana has been successful with the introduction of biofuels produced on the continent (jatropha oil) and the wind farm Santa Cruz /

[43] We have included contributions to the PDF-B and C, both from GEF (US $ 815.832) as those provided in kind by the MEM of US $ 250.605 and a small error of US44502 was found in the PRODOC for the accounting period.
[44] The leverage factor is the ratio between the total amount of the project and the contribution of the GEF.

Baltra is in the process of commissioning. The project has shown that renewable energy generation is possible in the islands.

Once the project was completed, by June 2014 renewable power reached 4.15 MW (expected at the end of the project > 6.6 MW), with a total investment of M US $ 20.2 (expected > M US $ 30) and a reduction of 3072 tCO_2 / year (expected 10,500 tCO_2 / year). Once projects in development enter into operation in 2015 and 2016, renewable power will be 10.5 MW (159% of the expected value at the end of the project), with a total investment of M US $ 70.9 (236% of the expected value) and a reduction of 10,816 tCO_2 / year (103% of the expected 10,500 tCO_2). Then by 2017 satisfactory compliance with the overall objective of the project will be attained. However, the strengthening of EEPG institutional, technical and operational capabilities for the management of renewable energy is considered somewhat unsatisfactory as is strengthening the ability to replicate the project in other parts of Ecuador.

ERGAL promoted renewable energy for the islands, led the environmental issues related to renewable projects and implementation of renewable energy projects in Floreana and Santa / Cruz Baltra. The MEER has taken the lead in energy efficiency projects in renewable energy policy and institutional, technical and financial strengthening of EEPG.

It is considered in terms of effectiveness ***Marginally Satisfactory (MS).***

3.3.5 Cost-effectiveness of the project

The cost / effectiveness in project formulation also considers unit costs for the development of PV and wind projects but without taking into consideration the logistical circumstances and severe environmental rules and regulations that developers would face. Moreover, given the nature of the project, the value that conservation of the flora and fauna of the Galapagos represents for humanity, *the costs aspect of project was not more widely taken into account in the formulation of the project*. Therefore, this project is clearly beyond any standard cost of renewable energy systems.

As regards the resources used, it should be noted that the total cost of the project will reach M US $73.5 in 2017, of which 96.4% are investment resources (M US $ 70.9). The total resources, 48.2% (M US $ 35.5) are resources of the Ecuadorian government, indicating the high degree of involvement and commitment to renewable energy projects in the Galapagos Islands. In addition, there will be resources from other donors (donor agencies) for M US $ 33.2 (45.2%).

Given that the GEF has donated $ 4.1 MUS, the leverage factor of resources has resulted in 16.6, twice the estimate at the beginning of the project which was 7.5. This shows great efficiency by MEER and ERGAL in mobilizing resources because Galapagos is focal for both foreign agencies and the Government of Ecuador, thereby demonstrating the Government commitment to strengthening renewable energy generation in the Galapagos.

By December 2013, the reduction of emissions reached 3,072 tCO_2 / year. If this figure is maintained for 20 years, total emissions avoided will be 61,440 tCO_2. In 2017 when all new plants under development are in operation, emissions reductions will reach 10,816 tCO_2 / year and for 20 years period 216,320 tCO_2 will be avoided. GEF investment was US $ 4,055,498. Therefore, in the first scenario the unit cost of reduced emissions is for the GEF of US $ 66 / tCO_2 and in the second scenario, US $ 18.75 / tCO_2 value below the initial estimated at PRODOC $ 20 / tCO_2 avoided.

3.3.6 Methods of execution and implementation

The evaluator considers that the UNDP Ecuador:

- *Effectively supported* selection, recruitment, assignment of experts and consultants and national counterparts in defining tasks and responsibilities.
- *Led jointly with the GEF Regional Office in Panama* the consultation process for the approval of contracts.
- *Made the arrangements for payments* in a timely manner in relation to fees and contracted services.
- *Regarding to the review of products derived from consultancies it did not issue judgments about their quality.*

In terms of effectively communicating processes or responses to queries made to the executing agency, the UNDP proceeded taking the necessary steps, for example, to the modifications that were made to the Logical Framework.

Meetings held, as indicated earlier in this report, attest to the permanent participation of UNDP in relation to the quantity, quality and timeliness of inputs regarding its responsibilities for project execution.

The financial availability was in line with the needs of the project, i.e. the provision of resources for timely payments was timely "following the due process payment requests."

3.3.7 Project Execution

The time between the gestation of this project and then its formulation and initiation period was large enough to have to consider changes in the project.

The Project Inception Workshop was conducted in November 2007. There the first adjustments to the LF in the PRODOC are introduced to take into account changes in the political and regulatory framework from the time of its formulation to date. The Development Goal was set correctly to include the use of biofuels as an option for electricity generation. This inclusion is a response by ERGAL to support the strategy of "Zero Fossil Fuels on the Galapagos"[45]. *The changes made to the logical framework are given above in section 3.2.3.*

3.4 OUTCOMES

The achievements in relation to the Global Environmental objective of the project and its results are analyzed next, using as criteria the proposed indicators and sources of verification described in the final PRODOC, result of the changes that were made.

[45] http://www.energia.gob.ec/cero-combustibles-fosiles-en-galapagos-2/
http://www.elecgalapagos.com.ec/bienvenidos

3.4.1 Global Environmental Objective

The Global Environmental Objective (project goal) is to reduce greenhouse gas emissions through **removal of institutional, economic, technical and financial barriers to national development of renewable energy for isolated systems and connected systems linked to the core network systems.** Table 3-4 shows the Global Environmental Objective, its indicators and sources of verification.

Table 3-4. Global Environmental Objective. Objective, indicators and sources of verification

Goal	**To address the issue of reducing greenhouse gas emissions through the utilization of renewable energy for electricity generation, initially in Galapagos and later throughout Ecuador and the region.**		
Project Strategy	**Indicators**	**Midterm and End-of-Project Target**	**Sources of Verification**
Objective: Promote the use of renewable energy (PV and wind) for electricity generation, thus reducing dependence on diesel transported to Galapagos from the mainland of Ecuador.	• Quantity of fossil fuel replaced by renewable energy generation and the resulting GHG Emission Reductions. • MWh of renewable energy production. • MW and MWh of renewable energy based generation system in the Galapagos.	• **Midterm:** Investment of at Least $ 10 million, 11,600 MWh produced from renewable energy. Annually, 10,500 tons of CO_2 reduced annually. • **End-of Project:** Investment of at Least $ 30 million by end of project, electricity generated from renewable energy increased from the present 0% to 60%, to at least 6.6 MW. 10,500 tons of CO_2 avoided (from baseline) annually.	Data generated from the performance reports on new renewable facilities, plus data from annual electricity production and fuel consumption.

The indicators to verify the results at the end of the project are the renewable generation in the islands and the quantity of replaced fuel. The installed renewable capacity, penetration of renewables in the generation, reducing annual CO_2 emissions and the amount of investment should also be checked, both for operational projects by June 2014 and those which are in development.

3.4.1.1 Power generation, fuel consumption and CO_2 emission reduction

To calculate the amount of fossil fuel replaced by generation from renewable energies, historical information of generation on the islands of San Cristobal, Santa Cruz, Isabela and Floreana was used.

Table 3-5 shows the historical trend of net generation in the four islands[46]. As can be seen, as of July 2014 there was generation from renewables in San Cristobal and Floreana, and only after June 2014, with solar PV in Santa Cruz. The table shows zero renewable generation between 2004 and July 2014 in

[46] ENERGY BALANCE JULY 2014 09_09_2014.xlsx. Received September 29, 2014 from Elecgalapagos

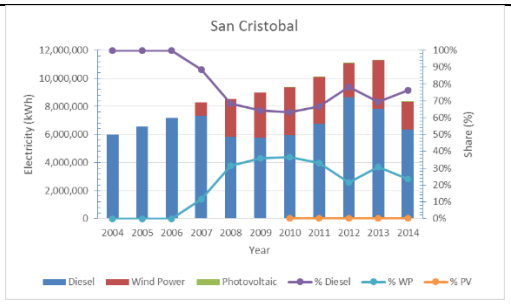
Isabela[47]. The figures show the penetration of each renewable energy in the generation of each of the islands; significant in San Cristobal and Floreana.

Table 3-5. Historical evolution of net energy generated in each of the four islands of Galapagos

San Cristobal (kWh/year)

Year	Diesel	Wind Power	Photovoltaic	Total	Increase
2004	5,970,261	0	0	5,970,261	
2005	6,546,056	0	0	6,546,056	10%
2006	7,170,788	0	0	7,170,788	10%
2007	7,322,207	962,135	0	8,284,342	16%
2008	5,831,051	2,682,461	0	8,513,512	3%
2009	5,761,595	3,204,893	0	8,966,488	5%
2010	5,935,993	3,434,854	17,977	9,388,824	5%
2011	6,766,989	3,344,626	17,851	10,129,466	8%
2012	8,668,079	2,398,373	16,744	11,083,196	9%
2013	7,829,615	3,451,451	16,981	11,298,047	2%
2014	6,363,661	1,973,537	9,798	8,346,995	

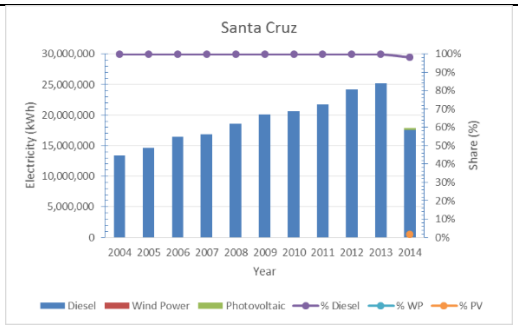
2014: Cumulative electricity generation,including july.



Santa Cruz (kWh/year)

Year	Diesel	Wind Power	Photovoltaic	Total	Increase
2004	13,392,140	0	0	13,392,140	
2005	14,603,200	0	0	14,603,200	9%
2006	16,499,677	0	0	16,499,677	13%
2007	16,917,886	0	0	16,917,886	3%
2008	18,627,631	0	0	18,627,631	10%
2009	20,104,826	0	0	20,104,826	8%
2010	20,597,401	0	0	20,597,401	2%
2011	21,774,924	0	0	21,774,924	6%
2012	24,160,676	0	0	24,160,676	11%
2013	25,173,472	0	0	25,173,472	4%
2014	17,591,762	0	290,712	17,882,474	

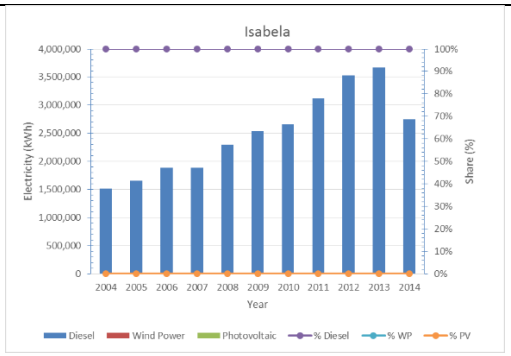
2014: Cumulative electricity generation,including july.



Isabela (kWh/year)

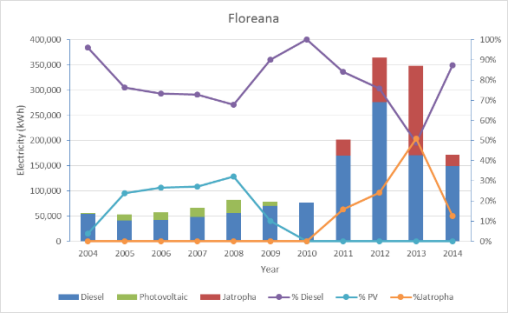
Year	Diesel	Wind Power	Photovoltaic	Total	Increase
2004	1,517,305	0	0	1,517,305	
2005	1,655,270	0	0	1,655,270	9%
2006	1,884,770	0	0	1,884,770	14%
2007	1,889,125	0	0	1,889,125	0%
2008	2,299,855	0	0	2,299,855	22%
2009	2,534,146	0	0	2,534,146	10%
2010	2,660,563	0	0	2,660,563	5%
2011	3,120,064	0	0	3,120,064	17%
2012	3,533,703	0	0	3,533,703	13%
2013	3,667,443	0	0	3,667,443	4%
2014	2,746,449	0	0	2,746,449	

2014: Cumulative electricity generationg,including july.



[47] Elecgalapagos in DETAIL OF CENTRALS UP TO SEPTEMBER 2014.xls reports the existence of isolated PV with a total capacity of 7.5 kWp but does not report its generation.

Floreana (kWh/year)						
Year	**Diesel**	**Wind Power**	**Photovoltaic**	**Jatropha**	**Total**	**Increase**
2004	54,379	0	2,223	0	56,602	
2005	41,071	0	12,846	0	53,917	-5%
2006	42,520	0	15,494	0	58,014	8%
2007	48,760	0	18,162	0	66,922	15%
2008	56,438	0	26,687	0	83,125	24%
2009	70,553	0	7,874	0	78,426	-6%
2010	77,078	0	0	0	77,078	-2%
2011	169,822	0	0	32,006	201,828	162%
2012	276,488	0	0	87,721	364,209	80%
2013	170,558	0	0	177,581	348,139	-4%
2014	150,294	0	0	21,851	172,145	
Note: 2014: Cumulative electricity generationg,including july.						



Source: Compiled from ENERGY BALANCE JULY 2014 09_09_2014.xlsx. Received September 29, 2014 from Elecgalapagos

Also shown in the tables in this figure, the *high annual increases in total net generation in all the islands* corresponding to the increase in the number of customers and the average consumption per customer. In the period considered between 2008-2013, the growth rates of users are higher than 4% in all the islands, particularly in Floreana in 2010 with an increase of 18.8%. Also in this island energy generation per customer increased from 1352 kWh / year in 2010 to 3105 kWh / year in 2011 and then to 5203 kWh / year in 2012 (See Table 3-6).

Table 3-6. Evolution of number of customers and customer consumption

Island	San Cristobal				Santa Cruz			
Year	Clients	Increase	Consumption (kWh/year/client)	Increase	Clients	Increase	Consumption (kWh/year/client)	Increase
2008	2,346		3,629		4,171		4,466	
2009	2,441	4.0%	3,673	1.2%	4,460	6.9%	4,508	0.9%
2010	2,553	4.6%	3,678	0.1%	4,761	6.7%	4,326	-4.0%
2011	2,662	4.3%	3,805	3.5%	5,057	6.2%	4,306	-0.5%
2012	2,766	3.9%	4,007	5.3%	5,350	5.8%	4,516	4.9%
2013	2,890	4.5%	3,909	-2.4%	5,641	5.4%	4,463	-1.2%

Island	Isabela				Floreana			
Year	Clients	Increase	Consumption (kWh/year/client)	Increase	Clients	Increase	Consumption (kWh/year/client)	Increase
2008	810		2,839		47		1,769	
2009	847	4.6%	2,992	5.4%	48	2.1%	1,634	-7.6%
2010	893	5.4%	2,979	-0.4%	57	18.8%	1,352	-17.2%
2011	960	7.5%	3,250	9.1%	65	14.0%	3,105	129.6%
2012	1,045	8.9%	3,382	4.0%	70	7.7%	5,203	67.6%
2013	1,097	5.0%	3,343	-1.1%	69	-1.4%	5,045	-3.0%

Source: Compiled from ENERGY BALANCE JULY 2014 09_09_2014.xlsx. Received September 29, 2014 from Elecgalapagos

The following table shows the *penetration of each renewable energy and their total in each of the islands*. In San Cristobal wind power penetration levels went over 30% between 2008 and 2011, and during 2013[48]. In Santa Cruz there is a penetration of solar energy of 1.6% by July 2014, due to the plant that enter into operation in June 2014. Isabela has no renewable generation. In Floreana penetration has reached up to 32.1% with photovoltaics in the 2004-2009 period and up to 51% with jatropha in 2010-2013.

Table 3-8 shows the *combined net electricity generation of the four islands*. Since 2004 there is a small photovoltaic power generation, then from 2007 the EOLICSA wind plant in San Cristobal starts its operation increasing penetration of renewable significantly and then the jatropha based power plants begin operation in 2011 and on June 2014 the Santa Cruz PV plant. *The average penetration of renewables in the four islands reached between 2009 and 2013 a 9.1%.*

[48] During 2012 a failure occurred in one of the turbines EOLICSA.

Table 3-7. Penetration of renewable technologies in net electricity generation in each island.

Year	San Cristobal			Santa Cruz		Isabela	Floreana		
	Wind	PV	Total RE	PV	Total RE	Total RE	PV	Jatropha	Total RE
2004	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.9%	0.0%	3.9%
2005	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	23.8%	0.0%	23.8%
2006	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	26.7%	0.0%	26.7%
2007	11.6%	0.0%	11.6%	0.0%	0.0%	0.0%	27.1%	0.0%	27.1%
2008	31.5%	0.0%	31.5%	0.0%	0.0%	0.0%	32.1%	0.0%	32.1%
2009	35.7%	0.0%	35.7%	0.0%	0.0%	0.0%	10.0%	0.0%	10.0%
2010	36.6%	0.2%	36.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2011	33.0%	0.2%	33.2%	0.0%	0.0%	0.0%	0.0%	15.9%	15.9%
2012	21.6%	0.2%	21.8%	0.0%	0.0%	0.0%	0.0%	24.1%	24.1%
2013	30.5%	0.2%	30.7%	0.0%	0.0%	0.0%	0.0%	51.0%	51.0%
2014	23.6%	0.1%	23.8%	1.6%	1.6%	0.0%	0.0%	12.7%	12.7%

Note: 2014, from january to july.

Source: Compiled from ENERGY BALANCE JULY 2014 09_09_2014.xlsx. Received September 29, 2014 Elecgalapagos

Table 3-8. Net electricity generation in the four islands by resource

Electricity Generation of Four Islands (kWh)								
Year	Diesel	Wind Power	Photovoltaic	Jatropha	Total		RE Total	RE Share (%)
2004	20,934,085	0	2,223	0	20,936,308		2,223	0.01%
2005	22,845,597	0	12,846	0	22,858,443		12,846	0.06%
2006	25,597,755	0	15,494	0	25,613,249		15,494	0.06%
2007	26,177,978	962,135	18,162	0	27,158,275		980,297	3.61%
2008	26,814,975	2,682,461	26,687	0	29,524,123		2,709,148	9.18%
2009	28,471,120	3,204,893	7,874	0	31,683,886		3,212,767	10.14%
2010	29,271,035	3,434,854	17,977	0	32,723,866		3,452,831	10.55%
2011	31,831,799	3,344,626	17,851	32,006	35,226,282		3,394,483	9.64%
2012	36,638,946	2,398,373	16,744	87,721	39,141,784		2,502,838	6.39%
2013	36,841,088	3,451,451	16,981	177,581	40,487,101		3,646,013	9.01%
2014	26,852,165	1,973,537	300,510	21,851	29,148,064		2,295,898	7.88%

Note: 2014: Cumulative electricity generation, including july.

Source: Compiled from ENERGY BALANCE JULY 2014 09_09_2014.xlsx. Received September 29, 2014 from Elecgalapagos

The *penetration* of each of renewable energy is calculated as the percentage of the annual generation of each renewable energy to total annual generation with all sources. Table 3-9 shows that the penetration of renewable peaked at 10.55% in 2010 almost entirely due to the penetration of EOLICSA wind plant in San Cristobal. The methodology *of calculation of avoided emissions* used in this assessment is as follows:

EmEv (tCO_2/ year) = EGR (kWh / year) * (1 / Performance (kWh / gal diesel)) * CED (tCO_2/ gal diesel).

where:

- EmEv: Avoided emissions
- EGR: Energy Generation Renewable energy source
- When there is no value of renewable energy generated, this is estimated as follows:

EGR = Renewable Power * Capacity Factor * 8760 hours / year.

- Capacity Factor: Percentage of operation of plant at full capacity,

- R: Performance of diesel fuel in local diesel plants, and
- CED: Coefficient of emissions of diesel fuel.

Figure 3-3 shows the share of different sources on the net generation of the four islands where there is prevalence of wind contribution, to a lesser extent jatropha and with a few months of operation of the PV park in Santa Cruz, the contribution of photovoltaic.

Figure 3-2 graphically displays the results of the table above. It can be seen that the *total generation grew between 2007 and 2013 at an average annual rate of 7.6% while diesel generation, due to the contribution of renewables, grew on average by 6.6% per year, which clearly shows that the effect of renewables has been to slow the rate of growth in consumption of diesel due to the strong pressure of demand on the islands.*

The *penetration* of each of renewable energy is calculated as the percentage of the annual generation of each renewable energy to total annual generation with all sources. Table 3-9 shows that the penetration of renewable peaked at 10.55% in 2010 almost entirely due to the penetration of EOLICSA wind plant in San Cristobal. The methodology *of calculation of avoided emissions* used in this assessment is as follows:

EmEv (tCO_2/ year) = EGR (kWh / year) * (1 / Performance (kWh / gal diesel)) * CED (tCO_2/ gal diesel).

where:

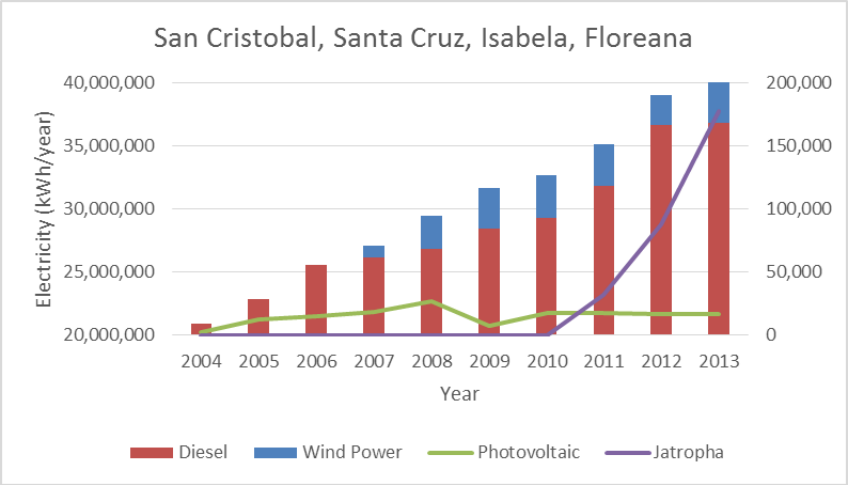
- EmEv: Avoided emissions
- EGR: Energy Generation Renewable energy source
- When there is no value of renewable energy generated, this is estimated as follows:

EGR = Renewable Power * Capacity Factor * 8760 hours / year.

  - Capacity Factor: Percentage of operation of plant at full capacity,
- R: Performance of diesel fuel in local diesel plants, and
- CED: Coefficient of emissions of diesel fuel.

Figure 3-3 shows the share of different sources on the net generation of the four islands where there is prevalence of wind contribution, to a lesser extent jatropha and with a few months of operation of the PV park in Santa Cruz, the contribution of photovoltaic.

Figure 3-2. Net generation in San Cristobal, Santa Cruz, Isabela and Floreana, by resource



Source: Compiled from ENERGY BALANCE JULY 2014 09_09_2014.xlsx. Received September 29, 2014 Elecgalapagos

Table 3-9. Penetration of renewables in the net generation in the four islands

All four Islands				
Year	**Wind Power**	**Photovoltaic**	**Jatropha**	**Total**
2004	0.00%	0.01%	0.00%	0.01%
2005	0.00%	0.06%	0.00%	0.06%
2006	0.00%	0.06%	0.00%	0.06%
2007	3.54%	0.07%	0.00%	3.61%
2008	9.09%	0.09%	0.00%	9.18%
2009	10.12%	0.02%	0.00%	10.14%
2010	10.50%	0.05%	0.00%	10.55%
2011	9.49%	0.05%	0.09%	9.64%
2012	6.13%	0.04%	0.22%	6.39%
2013	8.52%	0.04%	0.44%	9.01%
2014	6.77%	1.03%	0.07%	7.88%
2014: From January to july 2014				

Source: Compiled from ENERGY BALANCE JULY 2014 09_09_2014.xlsx. Received September 29, 2014 from Elecgalapagos

As regards the *reduction of diesel consumption due to renewable generation* to the four islands, Table 3-10 shows the number of gallons saved from generation with renewable sources in each island. This figure is calculated annually taking into account the efficiency of diesel fuel plants in electricity generation in each of the islands. As shown, the island that has contributed more to saving diesel in the Galapagos Islands is San Cristobal with a total of 1,936,511 gallons in the period 2004 to July 2014, corresponding to 97.0% of 1,996,244 gal saved on islands . *Wind energy (San Cristobal wind farm) is the renewable energy technology that has contributed more to fuel savings (96.7%).*

The *methodology of calculation of avoided emissions* used in this assessment is as follows:

EmEv (tCO_2/ year) = EGR (kWh / year) * (1 / Performance (kWh / gal diesel)) * CED (tCO_2/ gal diesel).

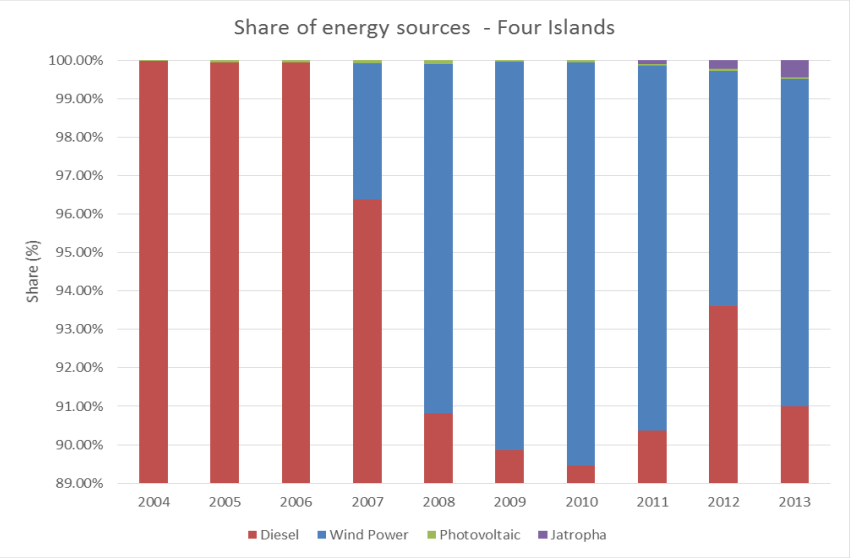
where:

- EmEv: Avoided emissions
- EGR: Energy Generation Renewable energy source
- When there is no value of renewable energy generated, this is estimated as follows:

EGR = Renewable Power * Capacity Factor * 8760 hours / year.

  - Capacity Factor: Percentage of operation of plant at full capacity,
- R: Performance of diesel fuel in local diesel plants, and
- CED: Coefficient of emissions of diesel fuel.

Figure 3-3. Participation of different energy sources in the four islands.



Source: Compiled from ENERGY BALANCE JULY 2014 09_09_2014.xlsx. Received September 29, 2014, Elecgalapagos

Table 3-10. Diesel saved in the four islands from renewable generation

Saved Fuel (gal Diesel)									
Year	**San Cristobal**			**Santa Cruz**	**Isabela**	**Floreana**			**Total**
	Wind	**PV**	**Total**	**PV Total**	**Total**	**PV**	**Jatropha**	**Total**	
2004	0	0	0	0	0	359	0	359	**359**
2005	0	0	0	0	0	1,941	0	1,941	**1,941**
2006	0	0	0	0	0	1,971	0	1,971	**1,971**
2007	76,434	0	76,434	0	0	1,970	0	1,970	**78,404**
2008	246,652	0	246,652	0	0	3,290	0	3,290	**249,941**
2009	321,894	0	321,894	0	0	904	0	904	**322,798**
2010	317,459	1,661	319,121	0	0	0	0	0	**319,121**
2011	303,792	1,621	305,413	0	0	0	3,321	3,321	**308,734**
2012	222,524	1,554	224,077	0	0	0	7,481	7,481	**231,558**
2013	288,013	1,417	289,430	0	0	0	15,326	15,326	**304,756**
2014	152,731	758	153,490	21,284	0	0	1,886	1,886	**176,659**
Total	**1,929,499**	**7,012**	**1,936,511**	**21,284**	**0**	**10,435**	**28,014**	**38,449**	**1,996,244**
Share	96.7%	0.4%	97.0%	1.1%	0.0%	0.5%	1.4%	1.9%	100.0%

Note: January to July 2014.
Source: Compiled from ENERGY BALANCE JULY 2014 09_09_2014.xlsx. Received September 29, 2014 Elecgalapagos

The fuel efficiency of diesel plants has been calculated based on gross electricity generation and consumption of diesel for each group in each of the islands. The CED is taken from US Environmental Protection Agency and is 0.01008 tCO_2 / gal of diesel[49].

The *CO_2 emissions avoided* in electricity generation come from diesel saved by renewable energy generation. Table 3-11 shows these avoided emissions.

Table 3-11. CO_2 emissions avoided in the Galapagos Islands by renewable generation.

Avoided CO2 Emissions (tons)									
Year	**San Cristobal**			**Santa Cruz**	**Isabela**	**Floreana**			**Total**
	Wind	**PV**	**Total**	**PV Total**	**Total**	**PV**	**Jatropha**	**Total**	
2004	0	0	0	0	0	4	0	4	**4**
2005	0	0	0	0	0	20	0	20	**20**
2006	0	0	0	0	0	20	0	20	**20**
2007	770	0	770	0	0	20	0	20	**790**
2008	2,486	0	2,486	0	0	33	0	33	**2,519**
2009	3,245	0	3,245	0	0	9	0	9	**3,254**
2010	3,200	17	3,217	0	0	0	0	0	**3,217**
2011	3,062	16	3,079	0	0	0	33	33	**3,112**
2012	2,243	16	2,259	0	0	0	75	75	**2,334**
2013	2,903	14	2,917	0	0	0	154	154	**3,072**
2014	1,540	8	1,547	215	0	0	19	19	**1,781**
Total	**19,449**	**71**	**19,520**	**215**	**0**	**105**	**282**	**388**	**20,122**
Share	96.7%	0.4%	97.0%	1.1%	0.0%	0.5%	1.4%	1.9%	100.0%
Diesel Emisssion Factor =			0.01008	tCO2/gal diesel		EPA coefficient			

Note: January to July 2014.
Source: Compiled from ENERGY BALANCE JULY 2014 09_09_2014.xlsx. Received September 29, 2014 Elecgalapagos

Total reduced emissions during the period 2004-July 2014 is 20,122 tCO_2, with an average of 2918 t CO_2 / year during 2008-2013. In December 2013 the annual reduction reached 3072 tCO_2 (See Table 3-4). Given that at the end of the project an annual emission reduction 10,500 tCO_2 / year was expected, ***by December 2013 the project reached 29.3% of the final goal of reducing annual emissions.***

3.4.1.2 Renewable power installed

The total operational capacity on June 30, 2014 in the Galapagos amounts to 18,376.6 kW, of which 77.4% are diesel plants, 1.0% to dual diesel / jatropha plants, 8.5% to photovoltaic plants and 13.1% to wind farms. 22.6% (4,149 kW) corresponds to renewable energy plants installed during the execution of the ERGAL project (Table 3-12*)*. This table includes two projects put into operation during 2014:

- *Photovoltaic Park Puerto Ayora* on the island of Santa Cruz, with a capacity of 1,500 kWp which came into operation in May 2014. The generation of this park was 141,803 and 143,491 kWh during the months of June and July, respectively (average value: 142,647 kWh / month).
- *Photovoltaic Plant Perla Solar de Floreana* 20.5 kWp. This plant was initially of 18 kWp and became operational in 2004 but went out of service in 2009. It has been repowered to 20.5 kWp and is back in service since June 28, 2014.

[49] Emissions Factors for Greenhouse Gas Inventories. Updated 4 April 2014. Environmental Protection Agency. USA.

Table 3-12. Operational installed capacity in the Galapagos Islands on June 30, 2014

Island	Operational Capacity up to 30 june 2014 (kW)					
	Diesel Plants	Diesel/Jatropha	PV Plants	Wind Farms	Total	Share
Floreana		188.0	20.5		208.5	1.1%
Isbela	2,050.0				2,050.0	11.2%
San Cristobal	5,010.0		12.5	2,400.0	7,422.5	40.4%
Santa Cruz	7,167.5		1,528.1		8,695.6	47.3%
Total	14,227.5	188.0	1,561.1	2,400.0	**18,376.6**	**100.0%**
Share	**77.4%**	**1.0%**	**8.5%**	**13.1%**	**100.0%**	

Source: Compiled from ENERGY BALANCE JULY 2014 09_09_2014.xlsx. Received September 29, 2014 Elecgalapagos

3.4.1.3 Status of projects in development on December 8, 2014

The following projects are in various stages of development on December 8, 2014:

3.4.1.3.1 Baltra- Santa Cruz - Baltra Wind Farm

The Baltra wind farm has 3x750 kW turbines each (2250 kW in total). It has an estimated capacity factor 30%. The project includes the sub-transmission line Baltra to Puerto Ayora (50 kilometers to 34.5 kV). ***The park on December 8, 2014 is in the process of commissioning expected to be completed in early 2015[50]***.

3.4.1.3.2 Baltra - Santa Cruz - Baltra Photovoltaic Plant and Battery Bank

During 2015, a 50 kWp photovoltaic park is to be mounted in Baltra with energy storage in two banks of batteries with capacities of 250 kWh Li-ion and 4000 kWh Lead acid, respectively. ***Its entry into operation is expected in late 2015.***

3.4.1.3.3 Isabela-Hybrid System (Diesel Plant / Jatropha Plant + Photovoltaic Plant + Battery Bank)

Today, Isabela has a generating capacity of 2050 kW in four diesel units that generated during the years 2012 and 2013 with capacity factors of 19.7% and 20.4% respectively. These four plants represent almost all of the generation capacity of the island (Elecgalapagos also reports isolated Photovoltaic System with a total capacity of 7.5 kWp[51]).
The ongoing project involves the installation of a photovoltaic park of 0.920 MWp, 265 kWh energy storage with Li-Ion batteries and 1625 kW (5x325 kW) dual fuel generators (diesel / jatropha)[52]. It also includes the replacement of fuel tanks (120 m^3) and updating of the distribution network. This project is managed directly by MEER since 2012. ***The entry into operation of this project is expected by mid-2016.***

[50] During the review period of this report, on December 22, President Correa and the UNDP inaugurated the wind farm.
[51] Generation Unit UNI309. Isolated Isabela Solar. Reported in DETAIL OF PLANTS WITH GENERATING UNITS ON SEPTEMBER 2014.XLS. Elecgalapagos.
[52] The project has recently changed. Previously it consisted of 1.1 MWp, 3.36 MWh of energy storage and 1.3 MW in dual fuel generators (diesel / jatropha). Information from MEER of December 4, 2012.

3.4.1.4 Power, generation and reduction on diesel consumption and emissions expected from 2017

Expected generation from renewable energy as of 2017 is the result of generation estimated through renewable operating systems on 30 June 2014 (Since 2017, the expected generation of projects coming into operation during 2015 and 2016 is 7,542,504 kWh / year, without even including the generation of dual-fuel diesel generators of Isabela which is 132% higher than the current generation with renewable and 121% higher than the diesel fuel currently saved, emissions avoided and the value of diesel saved. There will also be 4,515 kWh of energy storage and a sub-transmission line between Baltra and Santa Cruz.

Table 3-13) and the estimated generation of the projects expected to come into operation during 2015 and 2016 (pagos

Table 3-14).

For operational projects on June 30, 2014, the expected annual generation is 5,698,748 kWh, replacing 483,746 gallons of diesel / year and avoiding the emission of 4,876 tCO_2/ year[53]. The value of diesel saved (at $ 3.50 / gal[54]) is US $ 1,693,112 / year.

Since 2017, the expected generation of projects coming into operation during 2015 and 2016 is 7,542,504 kWh / year, without even including the generation of dual-fuel diesel generators of Isabela[55] which is 132% higher than the current generation with renewable and 121% higher than the diesel fuel currently saved, emissions avoided and the value of diesel saved. There will also be 4,515 kWh of energy storage and a sub-transmission line between Baltra and Santa Cruz.

Table 3-13. Renewable energy projects in operation (status as of June 30, 2014)

		RE PROJECTS (UP-TO 30 JUNE 2014)					
Description	**Unit**	**San Cristobal Wind Farm**	**San Cristobal PV Plant**	**Santa Cruz /Puerto Ayora PV**	**Floreana Diesel - Jatropha Power Plant**	**Floreana PV Plant - Retrofit**	**Total**
Location		San Cristobal	San Cristobal	Puerto Ayora	Floreana	Floreana	
Technology 1		Wind	Photovoltaic	Photovoltaic	Diesel - Jatropha	Photovoltaic	
Nominal Wind Power	kW	2,400					**2,400**
Nominal PV Power	kWp		12.7	1,528		20.5	**1,561**
Nominal Dual Diesel Power	kW				188		**188**
Annual Generation	kWh/year	3,086,110	17,388	2,430,000	132,651	32,599	**5,698,748**
Saved diesel fuel	gal/year	283,030	1,595	184,917	11,403	2,802	**483,746**
Avoided CO2 emissions	t CO2/year	2,853	16	1,864	115	28	**4,876**
Cost of diesel savings	US$/year	990,604	5,581	647,210	39,910	9,808	**1,693,112**

Source: Compilation. Includes average values reported on renewable generation
ENERGY BALANCE JULY 2014 09_09_2014.xlsx. Received September 29, 2014 Elecgalapagos

[53] For plants that have more than one year of operation (San Cristobal Wind Farm and PV Plant, Floreana Diesel - Jatropha Power Plant), estimated generation is the average of the effective generation reported by Elecgalapagos. For plants put into operation during 2014 (Santa Cruz / Puerto Ayora and Floreana PV Plant PV Plant-Retrofit) generation has been estimated with a capacity factor of 18.15% estimated by providers of the Puerto Ayora Park. The replaced fuel was estimated with a consumption coefficient (kWh / gal diesel) of diesel plants of each island. The cost of diesel is the value used in the reports of ERGAL. The coefficient of diesel emissions is the one used by EPA (Environmental Protection Agency, USA).

[54] The cost of a gallon of unsubsidized diesel and including transportation to Galapagos is US $ 3.5 / gal. Information Elecgalapagos - December 10, 2014

[55] There is no information on the generation of these units.

Table 3-14. Renewable energy projects coming into operation during 2015 and 2016

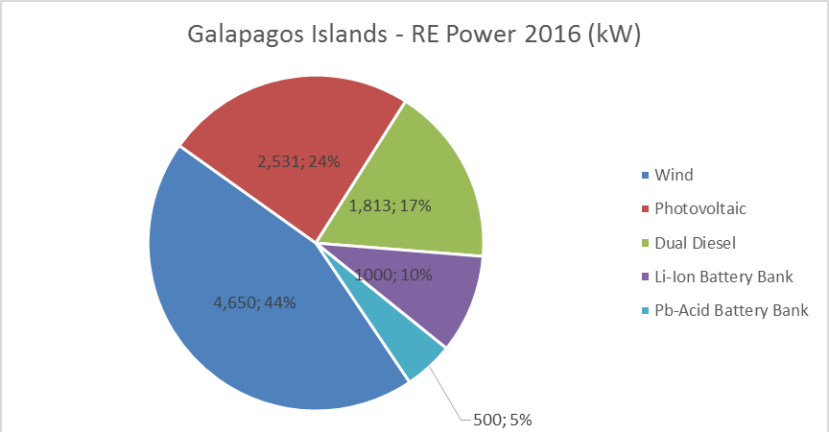
		PROJECTS IN DEVELOPMENT (STATUS TO 04 DECEMBER 2014)				
Description	**Unit**	**Baltra Wind Park + Transmission Line**	**Baltra PV + Storage**	**Isabela Hybrid (PV+Diesel /Jatropha) Power Plant**		**Total**
Location		Baltra	Baltra	Isabela	Isabela	
Technology 1		Wind Power	Photovoltaic	Photovoltaic	Diesel (dual fuel: diesel +	
Nominal Wind Power	kW	2,250				**2,250**
Nominal PV Power	kWp		50	920		**970**
Nominal Dual Diesel Power	kW				1,625	**1,625**
Annual Generation	kWh/year	6,000,000	79,511	1,462,993	ND	**7,542,504**
Saved diesel fuel	gal/year	456,585	6,051	125,818	ND	**588,454**
Avoided CO2 emissions	t CO2/year	4,602	61	1,268	ND	**5,932**
Cost of diesel savings	US$/year	1,598,048	21,177	440,364	ND	**2,059,589**
Expected start-up	date	Early 2015	December 2015	June 2016		
Storage System 1						
Battery Technology			Li-Ion	Li-Ion		
Effective Power	kW		400	600		**1000**
Capacity	kWh		250	265		**515**
Storage System 2						
Battery Technology			Pb-Acid			
Effective Power	kW		500			**500**
Capacity	kWh		4,000			**4,000**
Transmission Line						
Voltage	kV	34.5				**34.5**
Line Length	km	50				**50**
Diesel Emisssion Factor=	0.01008	tCO2/gal diesel				
US$/gal=	3.5					
ND: No data available.						

Combining the results of the above two tables, it is expected that by 2017 a renewable energy system of nominal 10,494 kW and 44% capacity in wind power, 24% photovoltaic, 17% in diesel dual fuel plants and 14% in battery banks (Table 3-15). While the system will have 4,515 kWh energy storage capacity battery banks (Table 3-16) and sub-transmission line Baltra - Santa Cruz.

Table 3-15. Renewable power expected in Galapagos (2016)

RE Source	**Unit**	**Sub-total**	**Share**
Wind	kW	4,650	44.3%
Photovoltaic	kWp	2,531	24.1%
Dual Diesel	kW	1,813	17.3%
Pb-Acid Battery	kW	500	4.8%
Li-Ion Battery	kW	1000	9.5%
Total	**kW**	**10,494**	100.0%

Figure 3-4. Renewable power expected in Galapagos (2016)



The total operating renewable capacity as of June 2014 of 4,156 kW represents 63% of the expected 6.6 MW goal at the end of the project. If projects expected to come into operation during 2015 and 2016 are included, total renewable power from mid-2016 onwards is 10,494 kW representing 175% of the final goal of the project.

Table 3-16. Energy storage capacity expected in Galapagos (2016)

Battery Technology	**Storage Capacity (kWh)**
Li-Ion Battery Bank	515
Pb-Acid Battery Bank	4,000
Total	**4,515**

The generation capacity is estimated at 13,241,252 kWh (excluding the generation of diesel dual fuel system in Isabela); the quantity of diesel saved is 1,072,201 gal / year, a savings of diesel fuel per US $ 3,752,702 / year and avoided emissions of 10,808 tCO_2/ year.

Table 3-17. Generation, diesel saved and avoided emissions of the RE Galapagos system (2017).

Parameter	**Unit**	**Total**	**Comments**
Annual Generation	kWh/year	13,241,252	ND for Isabela Dual Diesel Plant
Saved diesel fuel	gal/year	1,072,201	ND for Isabela Dual Diesel Plant
Avoided CO2 emissions	t CO2/year	10,808	ND for Isabela Dual Diesel Plant
Cost of diesel savings	US$/year	3,752,702	ND for Isabela Dual Diesel Plant
Note: Diesel cost: US$3.5/gal			

Therefore, *starting on 2017 an emission reduction of 10,808 tCO_2 / year is expected, which is 103% of the final goal of annual emission reductions 10,500 tCO_2 / year (and greater when considering the generation with jatropha in Isabela).*

3.4.1.5 Investment in renewable energy

The total amount of investments in renewable energy has been divided into two periods:

- Value of *operating projects* as of June 2014 (Table 3-18). These amounted to the sum of US $ 20,185,375, of which 76.6% were from e7 and KOICA, 1.6% in grants from GEF and from UNF, and the remaining 21.7% to national contributions (national counterpart, municipality and EEPG)[56].
- Value of projects under development and that will be put into operation during 2015 and 2016 (Table 3-19). These amount to US $ 50,706,992 of which 58.9% correspond to the national counterpart[57].

Table 3-18. Investments in renewable energy projects until June 2014

Source of Funds	Unit	San Cristobal Wind Farm	San Cristobal PV Plant	Santa Cruz /Puerto Ayora PV	Floreana Diesel - Jatropha Power Plant	Floreana PV Plant - Retrofit	Total	Share
Non-Reimbursable Contribution (GEF + UNF)	US$	326,193					326,193	1.6%
e7	US$	5,475,638	Donation				5,475,638	27.1%
KOICA (Korea)	US$			10,000,000			10,000,000	49.5%
National Counterpart	US$	3,193,901		400,000	500,000	ND	4,093,901	20.3%
Municipality	US$	239,643				ND	239,643	1.2%
EEPG	US$				50,000	ND	50,000	0.2%
Total	**US$**	**9,235,375**	**0**	**10,400,000**	**550,000**	**0**	**20,185,375**	100.0%
ND: No Data available								

Table 3-19. Investments in renewable energy projects that come into operation during 2015 and 2016

Source of Funds	Unit	Baltra Wind park + Transmission Line	Baltra PV + Storage	Isabela Hybrid (PV+Diesel	Total	Share
Non-Reimbursable Contribution (GEF + UNF)	US$	3,105,000			3,105,000	6.12%
e7	US$				0	0.00%
KOICA (Korea)	US$				0	0.00%
JICS (Japan)	US$		8,958,333		8,958,333	17.67%
KfW (Germany)	US$			8,803,179	8,803,179	17.36%
National Counterpart	US$	22,091,000	749,480	7,000,000	29,840,480	58.85%
Total	**US$**	**25,196,000**	**9,707,813**	**15,803,179**	**50,706,992**	**100.00%**
ND: No Data available						

Table 3-20 shows the value of investments of all renewable energy projects. The total amount reaches US $ 70,892,367 of which ***47.87% (US $ 33,934,381) corresponds to government resources, indicating***

[56] The information on investment comes from the Galapagos Project report (September 18, 2014) MEER, Quito.
[57] The last modification made to Project Isabela has increased the national counterpart to about 7 M US $.

a high degree of participation of the Government of Ecuador and a clear sign of its commitment to the use of RE in the Galapagos Islands.

Table 3-20. Total Investment in renewable energy of the Ergal Project.

Source of Funds	**Unit**	**Sub-total**	**Share**
Non-Reimbursable Contribution (GEF + UNF)	US$	3,431,193	4.84%
e7	US$	5,475,638	7.72%
KOICA (Korea)	US$	10,000,000	14.11%
JICS (Japan)	US$	8,958,333	12.64%
KfW (Germany)	US$	8,803,179	12.42%
National Counterpart	US$	33,934,381	47.87%
Total	**US$**	**70,892,367**	**100.00%**

Therefore, in terms of ***investments***, projects in operation as of June 2014 represent an investment of 67.3% of the minimum expected value at the end of the project of $ 30 million. However, when projects under development enter into operation during 2015 and 2016, the total value of investments will be US $ 70,892,367 corresponding to 236.93% of the minimum expected investments.

Table 3-21 summarizes the attainment of the project in terms of the ultimate goals.

Table 3-21. Project achievements

Targets in	**Unit**	**Target - end of project**	**Results up to 30 June 2014**		**Results to 2017**	
			Quantity	**% of expected**	**Quantity**	**% of expected**
Investments	US$	> 30,000.000	20,185,375	**67.3%**	70,892,367	**236.3%**
Renewable Power	MW	> 6.6	4.16	**63.0%**	10.49	**159.0%**
CO2 Emissions reduction	tCO2/año	10,500	3,072	**29.3%**	10,816	**103.0%**
Note: CO2 Emissions reduction as of 30 june 2014 corresponds to 2013						

As of June 30, 2014, outcomes do NOT attain project goals. When considering projects that are under development and will enter into operation during 2015 and 2016, projects will widely exceed goals both in investment and in installed capacity and will meet the goals in terms of reducing emissions.

Therefore, when projects currently underway are put into operation, ***compliance of the global objective will be Satisfactory (S).***

3.4.2 Outcome 1: To support national partners in Implementing re-powering of electricity generation on each of the islands.

Table 3-22 shows Outcome 1, its indicators and sources of verification.

The project's Outcome 1 is *support of national partners in the repowering of electrical systems in each of the islands*. When the project was conceived, it was expected that potential national partners would get involved in the repowering of generation systems on the islands. ERGAL has supported institutions (MEER) and EEPG in different aspects of repowering, as will be seen later, but at the end of the project partners identified in the repowering are international agencies KOICA, JICS and GIZ, the group e7, the German government through KfW, but *no national companies*. The mechanism envisaged for implementation of the projects was the signing of PPA with the private sector; this mechanism was found unsuitable as an implementation mechanism as a result of changes in government policy of Ecuador. In this perspective, only the above, all foreigners, were the executors of RE projects. ***But what is obvious and is noteworthy is the high financial commitment that the Government of Ecuador has committed to the development of renewable energy in Galapagos.***

Table 3-22. Outcome 1. Objectives, indicators and sources of verification

O#	Objective	Indicator	End-of Project Target	Sources of Verification
1.0	To support national partners in implementing re-powering of electricity generation on each of the islands.	• Plan of action for repowering exercise.	• Repowering of Santa Cruz/Baltra completed. • Operational guidelines for private power generation from renewable energy available to project developers.	• Project report
1.1	Policy, legal and operational regulations enabling the participation of different actors in renewable energy-based electricity generation and other direct uses.	• Sample documents available.	• MEER responsible for policy, CONELEC for Regulatory issues and tariffs, GADs for issuing ordinances. 2nd Semester 2013	• Sample documents.
1.2	MEM to initiate an energy efficiency program in partnership with EEPG and technical assistance of ERGAL	• Sample documents available.	• Support for Energy Efficiency Measures incorporated in plans and / or Energy Efficiency Programs of EEPG and MEER	• Reports.
1.3	Island-wide energy inventory within the Zero Fossil Fuels Initiative for Galapagos	• Sample documents available.	• Systematization of Progress up to 2012 and analyses of the potential of renewable resources in Galapagos.	• Reports

Goal 1.0 at the end of the project is the repowering of the electrical system of Santa Cruz / Baltra.

Table 3-23 shows the composition of Santa Cruz-Baltra generation Park. The total operational installed capacity by June 30, 2014 is 9,798. kW, of which 15.6% is renewable (photovoltaic plant of Santa Cruz). This project (item 2) was developed by MEER in cooperation with the Korean International Cooperation Agency (KOICA: Korea International Cooperation Agency).

Table 3-23. Power generation system in Santa Cruz

Santa Cruz / Baltra					
#	**Power Plants**	**Fuel / RE**	**Nominal Capacity (kW)**	**RE Share**	**Status**
1	Diesel	Diesel	8,270		Operational
2	PV Plant	Solar	1,528	15.6%	Operational since June 2014
	Subtotal 1		**9,798**	**15.6%**	
#	**Power Plants**	**Fuel / RE**	**Nominal Capacity (kW)**	**RE Share**	**Status**
3	Wind Plant	Wind	2,250	70.3%	In comissionning process - Expected fully operational early 2015
4	PV Plant	Solar	50	1.6%	Operational End 2015
5	Li-Ion Battery Bank	Battery	400	12.5%	Operational End 2015
6	Pb-Acid Battery Bank	Battery	500	15.6%	Operational End 2015
	Subtotal 2		**3,200**	**1.00**	
	Power Plants		**Nominal Capacity (kW)**	**RE Share**	
	Total (Subtotals 1+2)		**12,998**	**36.4%**	
#	**Other Systems**				**Satus**
7	Transmision line Baltra - Santa Cruz				Expected fully operational early 2015
8	Cogeneration sea water desalting plant				Under study

The development of Wind Plant Baltra (item 3) has been one of the most important activities of ERGAL and has demanded greater participation. The contract for the supply, installation and commissioning of the first phase of the wind farm on Baltra Island with an installed capacity of 2.25 MW was signed on July 21, 2010 between the Unison Consortium - LeoKonKorea and Renewable Energy Commercial Trust for the Galapagos Islands and its Fiduciary, the National Financial Corporation. This project is an important milestone to realize the implementation of Galapagos Zero Fossil Fuels Initiative, and in which the performance of ERGAL was definitive for the progress of the project since it has been the focus of activities in renewable energies in the Islands.

ERGAL participation has been on the following project phases and fields of action:

In the first phase of the project:

- **Execution of studies**
  - Feasibility Study Validation
  - Definitive Environmental Impact study of wind farm and electrical interconnection system
  - Baltra - Puerto Ayora Electrical Interconnection Study

- **Search for financing**
  - SENPLADES profile document preparation
  - Project financing through MEM internal funds and subsequently with central government resources channeled through the MEER

- Identification, grants for the development stages of PDD (Project Design Document) and its validation in implementing the CDM (Clean Development Mechanism) for co-financing of the Project.

- **Project management**
  - Obtaining environmental permits and permits from DGAC for the project
  - Prepare tender documents for the supply of wind turbines
  - Evaluation, negotiation and signing of wind turbine supply contract and contract development
  - Process for hiring the wind farm civil works.
  - Recruitment of Civil Works and Environmental Audits

In a second phase of the project:

- **Wind Resource Measurement**
  - Bid for selection of the company to supply and install wind measuring towers
  - Installation of 2 additional towers in Baltra island
  - Wind measurement at new sites from May 2009

- **Cogeneration Plant in Baltra**
  (In preliminary state)
  - Project conception
  - Search funding for feasibility study / preliminary design

ERGAL as manager of the wind farm project developed activities with UNISON Korean suppliers of wind turbines, as well as with contractors of environmental studies, civil works, installation of the turbines and the supervisors of the civil works of the park. It also played an important role in the development of the transmission line, construction which was in charge of Transelectric. It also participated in coordinating designs of the SCADA system (Supervisory Control And Data Acquisition), given the importance of coordinating the generation systems at the time of energy dispatch.

The project required the construction of a transmission line of 34.5 kV and 50 km long (item # 5). The construction of the line has been in charge of CELEC EP - Transelectric. The network has different sections: underwater, underground and aerial. The underground section was made due to requirements of the environmental authority, which has affected the line construction in costs and delays in that was scheduled for March 2013[58] and that led to an extension by ERGAL until March 2014.

It should be noted that the project is also a challenge in logistic and environmental terms, so ERGAL leadership has been instrumental in advancing the project. The wind farm is in the *process of commissioning, and is expected to be completed between January and May 2015, once the commissioning tasks thereof are completed and the transmission line is properly tested in operation with the diesel park in Puerto Ayora[59]. At the end of ERGAL in April 2014, these duties were assumed by Elecgalapagos.*

[58] ERGAL, Work Report 2013.
[59] Information Ing. Luis Manzano, SEER (MEER), December 4, 2014.

A PV system in Baltra with a generating capacity of 50 kWp (item # 4) is also in development today and will have an associated battery storage system (item # 6, Li-Ion 400 kW, 250 kWh; Pb-acid: 500 kW, 4000 kWh). This project is being developed directly by the MEER with the assistance of JICS and Oriental Consultants. ERGAL contributed to this project with:

- Search for potential donors
- Participation in technical meetings both in Quito and Galapagos in various aspects
- Implementation and negotiations with the Japanese Government
- Assistance in the development of the preliminary project design

A future study Seawater Desalination Plant by Cogeneration (item # 7) is also under study for which the project has contributed in its conception and in search of funding.

Thus, Santa Cruz -Baltra will have by early 2016 an installed capacity of 12,998 kW, of which 36% will be renewable energy.

The Development of Operational Guidelines, *second goal* of this outcome, as originally proposed in the Logical Framework, is being coordinated with the SIDGE Project, the Electrical Systems Control Project nationwide. However, the evaluator has NOT received any information on the development of these operational guidelines for renewable energy systems[60].

Outcome 1.1 is the development *of political, legal and operational standards, allowing the participation of various actors in the generation of renewable energy for electricity generation and other direct uses.* ERGAL documents and reports are the sources of verification.

It should be noted that the role of the project is the promotion and facilitation of actions that lead to the development of policies and of a legal and reglamentary framework for the development of renewable energy in Ecuador, and that its formulation and development is the responsibility of the state and its institutions, not of the project. To evaluate the role of the project in the development of policies and reglaments, it is necessary to note that the project considered in the initial LF the participation of IPP employing renewable sources, participation expected through PPAs. High interest of the private sector in the Galapagos was also expected. Therefore, ERGAL could contribute to the development of appropriate policies and reglaments to that end. The role of the project in this outcome was influenced by the development in 2008 of a new constitution, under which the energy sector is considered strategic for the nation and therefore the role of state institutions resulted empowered by the constitution. As a result the institutions were strengthened in their skills related to renewable energy and energy efficiency: MEER, executor of ERGAL project, strengthened its institutional competence as formulator and developer of new renewable energy sources policy and energy efficiency, CONELEC in its role in regulation and tariffs and the autonomous governments (GADS), in developing ordinances.

Currently, Regulation Coded No CONELEC - 001/13, adopted on March 13, 2014[61] establishes the treatment for the participation of generators, with non-conventional renewable energy, in the Ecuadorian Electrical Sector, and related aspects are addressed: i) preferential conditions, ii) general procedure for

[60] http://issuu.com/rxrvrxrv/docs/catalogo_sigde

[61] http://www.conelec.gob.ec/normativa_detalle.php?cd_norm=753

obtaining accreditation with the CONELEC, iii) quotas for the development of generation projects, iv) operating conditions, and v) commercial terms. Thus was established a policy and a regulation is in development that allows the generation and dispatch to the electrical system energy from photovoltaic and solar thermal, wind, small hydro, geothermal, biomass, biogas, waves, tidal, and hot dry rock power plants, by the authorities. ERGAL supported in due course these activities when consulted by these institutions in the subject of renewable energy and energy efficiency.
The *Output 1.2* is the support for energy efficiency measures incorporated in EEPG and MEER plans and / or programs of energy efficiency. ERGAL collaborated with EEPG in campaigns for energy efficient refrigerators (technical assistance), and in the development of the First Fair of Renewable Energy Efficiency in Galapagos. However, the potential for energy efficiency in the islands has not been developed and ERGAL did not affect distinctly the positioning of these technologies to reduce energy demand in the islands. The subject was assumed during project implementation directly by the EEPG under the guidance of MEER. At present, the EEPG is undertaking a program promoting induction cooktops cookstoves and replacing 3000 obsolete refrigerators with new efficient ones.

Output 1.3 is the Energy Inventory of the islands framed within the ***Galapagos Zero Fossil Fuels Initiative***), which is fulfilled marginally. This activity aims at Systematization of Progress up to 2012 and analyses of the potential of renewable resources in Galapagos. This activity was planned to be performed when the construction phase was completed and project closure period began. ***However, having now closed the project, on November 2014 there has not been information found on this finished inventory and therefore it is considered a missing output.***

Therefore, it is considered that for Outcome 1 (national partners supporting the repowering of electrical systems on each of the islands) most of its major relevant objectives have achieved, but with some significant deficiencies and therefore compliance is considered ***Marginally Satisfactory (MS).***

3.4.3 Outcome 2: Technical and operational institutional capacities of Elecgalapagos strengthened to manage renewable energy projects for electrification of the Islands.

For Outcome 2 it is worth mentioning that in the formulation of LF (Logical Framework) during the PRODOC 3 outputs were established, which were modified during the execution of the project and so its goals. Output 2.1 in the initial LF was strengthening EEPG capacity to design and negotiate with IPPs and PPAs schemes. The Regulatory Framework of the Electricity Act did not consider neither the IPP nor the PPA. For this reason the initial 2.1 was deleted (LF as of July 22, 2010).

Table 3-24 shows the latest version of Outcome 2, its indicators and sources of verification.

Table 3-24. Outcome 2. Objectives, indicators and sources of verification

O #	Objective	Indicator	End-of Project Target	Sources of Verification
2.0	Outcome 2: Technical and operational institutional capacities of Elecgalapagos strengthened to manage renewable energy projects for electrification of the Islands.	• EEPG trained and able to run power generation projects based on renewable energy	• Assist in the implementation of the training plan and modernization of EEPG in order to have better management and efficient operation	• Activities reports
2.1	EEPG capacity strengthened to implement the repowering of electrical systems using renewable energy technologies and energy efficiency; negotiating contractual arrangements for operation and maintenance, and environmental management thereof.	• Number of staff trained in the planning, management, operation and maintenance of renewable energy systems.	• Contribution to the creation of a working group trained to manage renewable energy systems in the administrative, legal and technical fields	• Activities reports.
2.2	Areas of renewable energy, energy efficiency, environmental management of EEPG and other stakeholders strengthened.		• Have technical / administrative staff to manage projects of Renewable Energy and Energy Efficiency	• Activities reports

The focus of the development of technical and operational capabilities for managing renewable energy projects (including energy efficiency) and environmental management thereof is Elecgalapagos. The process of strengthening the technical structures of EEPG began under the PDF-C with the participation of its technical staff in training seminars on new energy systems, and renewable energy and photovoltaic systems.

In 2006, ERGAL under the PDF-C hired a study for institutional strengthening of Elecgalapagos. The recommendations of this study have not yet been implemented by Elecgalapagos.

The last program in development is the Multiyear Training to achieve the Galapagos Zero Fossil Fuels Initiative. It is developed directly by the MEER in cooperation with GIZ. It aims to train administrative and technical staff through workshops from the electricity sector of the Galapagos Islands and continental Ecuador. The project cost is US $ 993,831, of which the nonrefundable grant from GIZ is US $ 840,000, from UNDP US $ 30,000 and MEER US123, 831.

Table 3-25 shows the capacity building activities undertaken between 2009 and 2014 with the participation or promotion of ERGAL and other institutions. Participation in these events was depending on the type of event, from the general population of the islands to policy makers, government officials and staff of enterprises, among other stakeholders. These activities have helped to improve knowledge on renewable energy.

The last program in development is the Multiyear Training to achieve the Galapagos Zero Fossil Fuels Initiative. It is developed directly by the MEER in cooperation with GIZ. It aims to train administrative and technical staff through workshops from the electricity sector of the Galapagos Islands and continental Ecuador. The project cost is US $ 993,831, of which the nonrefundable grant from GIZ is US $ 840,000, from UNDP US $ 30,000 and MEER US123, 831.

Table 3-25. Activities to strengthen capacity (or promoted) by ERGAL

Year	Activity	Partners	Objective
2009	Energía 2009 – Eficiencia Energética, Energía Renovable y Medio Ambiente frente al Cambio Climático		Participación de ERGAL
2010	Estrategias Cero Combustibles Fósiles para la Generación de Electricidad en las Islas Galápagos"		Conferencia de ERGAL
2010	Salidas de campo con estudiantes de todos los colegios de la Isla Santa Cruz	Fundar Galápagos - ERGAL	Difundir conocimientos sobre energías renovables y demostrar su utilidad para la generación de energía limpia en Galápagos
2010	Eco Feria Feria de Energía Renovable, Eficiencia Energética y Consumo Responsible	ERGAL, MEER, PNUD, el Gobierno Municipal de Sta. Cruz, Cámara de Turismo (a través de BID-FOMIN), FUNDAR Galápagos y ELECGALAPAGOS.	Acercar a la comunidad de Galápagos a las nuevas tecnologías que permitan reducir sustancialmente el impacto al ambiente provocados principalmente por el consumo de combustibles fósiles.
2010	Taller Sistemas Alternativos de Movilidad	MEER - ERGAL - BMU (Ministerio Alemán para el Medio Ambiente)	Fortalecimiento capacidades nacionales orientadas al diseño, instalación y operación de sistemas energéticos no convencionales, capacitación a los actores de decisión en materia energética para la determinación de políticas y legislación que fomenten la introducción de energías renovables; ejecución de programas de eficiencia energética con el objetivo de apoyar la iniciativa gubernamental Cero Combustibles Fósiles en Galápagos. Desarrollado por InWEnt-Capacity Building International.
2011	Taller de energías renovables convocado por el Consejo de Gobierno de Galápagos (CGG)	ERGAL - CGG	Socializar las iniciativas de energías renovables destinados a reconvertir / transformar/optimizar la combinación de fuentes de energía para las islas Galápagos y el establecimiento de un calendario plurianual (2011-2014) de ejecución de proyectos.
2011	Taller Fundamentos Básicos de Energía Eólica en Guayaquil	ERGAL - GIZ	Capacitación
2011	Taller Fundamentos Básicos de Energía Solar Fotovoltaica	ERGAL - GIZ	Capacitación
2011 - Dic 2014	Programa de Capacitación Plurianual para Alcanzar la Iniciativa Cero Combustibles Fósiles en Galápagos	MEER - GIZ - ERGAL	Desarrollo de capacidades locales a nivel técnico en las áreas de energía renovable y eficiencia energética, Desarrollo de capacidades locales a nivel administrativo en proyectos de energía renovable y eficiencia energética, Desarrollo de capacidades locales a nivel político a fin de impulsar el desarrollo y utilización de proyectos de energía renovable y eficiencia energética, Promoción y difusión de aplicaciones para continuar con la Iniciativa "Cero Combustibles en Galápagos".

The evaluator knows the participation of Elecgalapagos officials and attendants from other institutions in all of these events, however it does not have a register of participants. It is also known that the technical information of the courses and workshops was provided to the participants *but this material has not been uploaded to the website of the project and made publicly available, providing access to information*.

To facilitate access to information about the project, ERGAL developed the website http://www.ergal.org/cms.php?c=1233. This site contains institutional information and project announcements, news, publications, gallery and seminars, but should also contain the material distributed to participants of training events.

When it comes to technically strengthening of an institution involved with renewable energy, this strengthening is also a result of staff getting involved in the development of projects and then in the

training on the operation of the plants offered by project contractors. Since a number of renewable energy projects are not operational, there has been no opportunity for the training of EEPG. As for the training of Elecgalapagos staff to conceive, plan and implement future renewable energy projects for the islands the evaluator considers it insufficient although once new renewable energy systems go into operation and training is received, EEPG will likely operate them very well.

It is then considered that the advance of Outcome 2, strengthening the capacity of the EEPG for implementing power generation projects based on renewable energies and for the planning, management, operation and maintenance of these systems is ***not sufficient***, and therefore the result of this task is ***Marginally Unsatisfactory (MU).***

3.4.4 Outcome 3: Floreana and San Cristobal with electricity generation hybrid systems: wind / PV / biodiesel / diesel

Table 3-26 shows Outcome 3, its objectives, indicators and sources of verification. The initial Logical Framework was modified in outcome 3.1 to include biofuels as alternative of renewable energy for Floreana Island. Outcome 3 considers two systems in operation, repowering and operating without any failure.

Table 3-26. Outcome 3. Objectives, indicators and sources of verification

R#	Objective	Indicator	End-of Project Target	Sources of Verification
3.0	Outcome 3 Floreana and San Cristobal with hybrid electricity generation systems: wind / PV / biodiesel / diesel.	• Successful completion of the repowering activities	• .Systems in Operation	• Monitoring Mission Report / Project Report
3.1	Operation and normal operation of the hybrid photovoltaic - thermal biofuel system in Floreana	• . Successful completion of the repowering activities.	• Repowered and operating system without any technical or administrative problem.	• Monitoring Mission Report / Project Report.
3.2	Systematization of the monitoring of the hybrid wind / diesel in operation in San Cristobal.	• Successful completion of the repowering activities	• Repowered system without faults	• Monitoring Mission Report / Project Report

3.4.4.1 San Cristobal hybrid system

This wind / PV / diesel system has an operating capacity of 7,423 kW, of which 2,400 kW are wind power (32.3%) and a small PV capacity of 13 kW (0.2%).

Table 3-27. Generating capacity of the hybrid system of San Cristobal

San Cristóbal					
#	**Power Plants**	**Fuel / RE**	**Nominal Capacity (kW)**	**RE Share**	**Status**
1	Diesel	Diesel	5,010		Operational
2	PV Plant	Solar	13	0.2%	Operational
3	Wind Plant	Wind	2,400	32.3%	Operational
	Total		**7,423**	**32.5%**	

The wind farm EOLICSA, private development with the participation of e7, is operational since October 2007[62]. The penetration of wind power peaked at 36.6% in 2010 and has remained above 30% except in 2012 year during which it presented a failure in one of the turbines (See

Table 3-5, Table 3-7). It is noteworthy that *this hybrid system represents the largest operating wind capacity in the islands, and makes the greatest contribution to reducing fuel consumption and greenhouse gas emissions (Table 3-10, Table 3-11). Despite this, the penetration has not reached the figure of 50% indicated in the initial Logical Framework of the project.*

This project is a private initiative and ERGAL PMU did not participate in any activity relating to the wind farm except for being the point of contact and establishing links between the project stakeholders. Currently the system is operating without faults and without technical or administrative problems. The park will be transferred to the Elecgalapagos in 2016.

As regards the Outcome 3.3, Systematization of the Monitoring System for San Cristobal is being coordinated with the SIDGE project.

3.4.4.2 Hybrid System Floreana

This photovoltaic system / diesel / diesel-jatropha has a capacity of 208.5 kW, 138 kW of which are dual diesel plant diesel / jatropha oil (66.2%) and 20.5 kW photovoltaic (9.8%).

The PV generation started in 2004 with 18 kWp and was expanded 2.5 kW in 2007, for a total of 20.5 kWp[63]. The penetration of photovoltaic energy peaked at 32.1% in 2008 and from 2009 due to system failures, it went out of service. This plant has been enabled again from June 28, 2014. ERGAL contributed to submit to USAID a funding request for the study of repowering the PV system, which was conducted by NREL and delivered to the EEPG.

[62] http://www.eolicsa.com.ec/index.php?id=23%27%60%28%5B%7B%5E~&L

[63] The initial PV system of 18 kWp was funded by Spanish Cooperation, the Parrish Board of Floreana and the Galapagos National Park, ERGAL and the Ministry of Energy and Mines, with an estimated US $ 0.75 million investment. http://www.tta.com.es/en/sectores_actividad/electrificacion_rural.php

In 2011 two dual diesel (diesel / jatropha) units with a total capacity of 138 kW (2x69 kW) were installed. The jatropha oil is produced on the mainland in Manabi. The generation with jatropha reached a penetration of 51% in 2013 (see Table 3 2, Table 3 4, Table 3 7, Table 3 8).

Table 3-28. Generating capacity of the Floreana hybrid system

Floreana					
#	**Power Plants**	**Fuel / RE**	**Nominal Capacity (kW)**	**RE Share**	**Status**
1	Diesel	Diesel	50.0		Operational
2	Diesel	Diesel / Jatropha	138.0	66.2%	Operational
3	PV Plant	Solar	20.5	9.8%	Operational
	Subtotal		**208.5**	**76.0%**	

The PMU managed the Pinon Project, at the request of the Board of the Trust Fund. ERGAL participated in the execution of studies, assisted MEER and GIZ in different aspects of the project, mainly in the agroindustrial component, and in the project implementation (bidding documents for supply, installation and technical support, management of the supply contract, installation and commissioning), among others. Also in the field inspection with the officer for performance verification of equipment and delivery of spare parts.

The expected penetration of renewable energy in Floreana according to the PRODOC is 80%. The penetration figures for the jatropha power plants were 24.1% and 51% in 2012 and 2013 respectively. From 2014 it is necessary to include the contribution of the repowered photovoltaic system that will increase the penetration of renewables.

Compliance with the Outcome 3 is considered ***Satisfactory (S)*** because the San Cristobal wind farm was developed with the participation of a foreign agent under the scheme of private generation, with satisfactory results and for having introduced in Floreana generation with biofuels.

3.4.5 Outcome 4: Isabela and Santa Cruz / Baltra with hybrid power systems: photovoltaic-thermal (diesel) and wind - thermal (diesel), respectively.

The initial Outcome 4 in PRODOC was to facilitate the repowering on the islands of Isabela and Santa Cruz with hybrid power generation systems with PV / wind / diesel. Output 4.2, the installation of a PV in the Galapagos National Park was eliminated in the 2011 review of the Logical Framework to appropriate more resources to the Isabela project. Table 3-29 shows the objectives, indicators and sources of verification.

As regards Output 4.1, the hybrid system of Isabela Island, ERGAL participated in this activity until July 2011, when the review of the Technical Design Concept was performed. ERGAL was relieved of this Output and MEER assumed directly project execution in Isabela.

As a result, the Steering Committee at its meeting in November 2012, "decided to remove it from the Logical Framework considering that the goal set was fulfilled"[64]. Prior to that date, developing the PDF A, Lahmeyer had determined the feasibility of hybrid system on the island. From 2011, the participation of ERGAL in the Isabela Project has been sporadic in technical aspects and in the share of experiences related to logistics in Galapagos projects. At present the Isabela project has advanced to the negotiation of the contract with the consortium Siemens Germany / Siemens Ecuador and the project is expected to be operational in the second half of 2016.

Table 3-29. Outcome 4. Objectives, indicators and sources of verification

R#	Objective	Indicator	End-of Project Target	Sources of Verification
4.0	Outcome 4 Isabela and Santa Cruz / Baltra with hybrid power systems: photovoltaic-thermal (diesel) and wind – thermal (diesel), respectively.	• Successful completion of the activities of repowering	• Hybrid power generation system in operation to the second half of 2013.	• Monitoring Mission Report / Project Report
4.1	Photovoltaic –thermal (diesel) hybrid system on Isabela Island designed and goods supply contract awarded	• Successful completion of the activities of repowering.	• Technical assistance for the Conceptual Design- July 2011	• Monitoring Mission Report / Project Report.
4.2	Wind-thermal (diesel) hybrid system operating and normal functioning in Santa Cruz / Baltra .	• Successful completion of the activities of repowering	• Completed in 2013. Estimated renewable energy penetration coefficient: 25%. Construction completed and verification of the system in second semester 2013.	• Monitoring Mission Report / Project Report

Thus, Outcome 4 was reduced from 2011 to Output 4.2, the wind-thermal (diesel) hybrid system in Santa Cruz Baltra, which constituted the main activity of ERGAL. It is appropriate to note that within the 2011 review of the Logical Framework, the completion of this project was expected in 2012, in the review of 2012 though, it was postponed to 2013, keeping the goal of penetration of renewables.

The hybrid generation systems project for Santa Cruz Island is within the "Zero Fossil Fuel on the Galapagos' strategy and initially considered using wind energy and thermal (diesel) energy. The project has evolved since the initial release of PRODOC and subsequently included photovoltaics, battery banks and a seawater desalination plant with cogeneration.

Due to environmental constraints on the island of Santa Cruz for the development of a wind farm and that wind potential of the neighboring island of Baltra was high, this island was considered the appropriate place for the installation of wind turbines. This new location of wind turbines required the installation of a 50 km interconnection line to Puerto Ayora. The overall planning of the project includes three phases: F1: high penetration of wind power; F2: wind / diesel (diesel off mode) and F3: wind /

[64] Summary of Achievements of Project 2009-2014. Project ECU/02.G31 – ERGAL (March 2014) Quito. Page 7.

diesel with large battery bank capacity. F2 proposes relocating the diesel units from Santa Cruz to Baltra to a place nearer to the wind farm. The proposed goals are:

- Renewable penetration is expected for F1: 25%; F2: 50% and F3: 100%.
- No diesel generators operating at low load
- Sufficient reserve of rotation (spinning reserve) to prevent outages

Initial planning considered the development of wind farm in the first stage of approximately 2-3 MW and interconnection Santa Cruz-Baltra since 2008 (tenders) should be completed by 2010. The transfer of diesel plants from Santa Cruz and the installation of the desalination plant plants were initially planned to be completed in 2012 and 2013 respectively.

Table 3-30 shows the major milestones in the development of the wind farm and 34.5 kV transmission line between Santa Cruz and Baltra. The feasibility study of wind farm by Proviento was revised by the German contractor Factor 4 (December 2006) where 3 locations for park development were evaluated, being taken for mainly environmental reasons, develop the park on the island of Baltra. In reviewing the concept of the park is formulated in 3 phases of development that includes the interconnection with Puerto Ayora. In phase 1 a 2.4 MW park is proposed to achieve a penetration of 25% renewables in Santa Cruz. In the two subsequent phases, wind capacity is added to total 6.4 and 32 MW respectively reaching integration with other components of energy generation and storage for high penetration of renewable energy in Santa Cruz / Baltra. In 2009, bids for phase 1 are received, the Trust Fund is created for managing resources, a wind tower installed in Baltra and the ERGAL project coordinator which has led it to completion is designated.

In 2010 the contract for supply and installation of (3x750 kW) wind turbines was assigned to Unison - LeonKonKorea (Korea). In 2011, the construction of the interconnection line was assigned to Transelectric. The project was suspended by the auditor, and the suspension lifted in June 2012. In 2012 the civil works began for the wind farm and in August 2013 the installation of the 3 wind turbines was completed. The works of the transmission line began in October 2013 and by the time of the visit of the evaluator on September 9, 2014, the transmission line had not been tested or commissioned. Later in October 2014 the activities for the commissioning of the wind farm began.

Currently the project has a delay of several years, mainly due to the design and construction of the sub-transmission line, which is in the process of commissioning, like wind turbines installed since June 2013. This process is expected to conclude in the first months of 2015[65] [66].

Development costs of the park have also risen considerably because it was necessary to build an extensive sub-transmission line having exceeded these costs from an estimated M US $ 14 in 2009 to about M US $ 25 in 2014.

It is important to mention that ERGAL has participated in all efforts to advance the development of the wind farm including activities with contractors. It is also necessary to note that by the characteristics of the Galapagos conditions, the environmental component has played a decisive role in the development of all environmental studies (Final Environmental Impact Studies and Environmental Management Plan for both the park and for the line transmission, made in 2008), in obtaining the environmental license (granted to ERGAL) and induction on environmental issues to contractors.

[65] Factor 4 Personal communication.
[66] During the review period of this report, on December 22, President Correa and the UNDP inaugurated the wind farm.

Table 3-30. Santa Cruz Baltra Hybrid project milestones

Report / Bulletin #	Bulletin Date	Year	Activity	Participants	Objective
Report	01-feb-08	2008	Technical Review of the Feasibility Study for the Wind Energy Project Santa Cruz / Baltra	Factor 4	
1	abr-09	2009	Recepción ofertas parque eólico Santa Cruz		
1	abr-09	2009	Establecimiento Fideicomiso Energías Renovables Galápagos	MEER	
1	may-09	2009	Intalación de torres de medición en Baltra	ERGAL	
1	jun-09	2009	Coordinador L. Zaragocin en cargo	ERGAL	
	23-abr-10	2010	Large PV at Santa Cruz / Baltra	Factor 4	
9	23-jun-10	2010	Visita JICS Parque Fotovoltaico de más de 200 kWp + banco de baterías	JICS -MEER - ERGAL	Inspección sitio
8	21-jul-10	2010	Contrato suministro, instalación y puesta en marcha parque eólico de Baltra	Consorcio Unison – LeoKonKorea y Fideicomiso	Contrato
11	28-oct-10	2010	Misión Exploratoria de UNISON – LEOKONKOREA,		Parque eólico de Baltra
14	may-11	2011	Responsable de construcción interconexión Santa Cruz / Baltra	TRANSELECTRIC	
16	31-may-11	2011	Sistema de Cooperación Internacional Japonesa (JICS)	Oriental Consultants	Consultoria proyecto Electricidad Solar Baltra
17	21-jul-11	2011	Proceso Servidumbre Tramo Baltra - Pto Ayora	TRANSELECTRIC	Proceos con la comunidad
Report	16-sep-11	2011	Evaluación Datos Recurso Eólico	Factor 4	
3	22-oct-12	2012	Inducción Ambiental a contratistas	Consorcio Jaramillo - Vintimilla	Inducción
4	22-oct-12	2012	Inicio obras parque eólico Baltra	Consorcio Jaramillo - Vintimilla	
5	06-nov-12	2012	Programa monitoreo invertebrados en zona parque eólico Baltra	Agrocalidad Galápagos	
3	ago-13	2013	Instalación de aerogeneradores completada	UNISON	
4	oct-13	2013	Inicio obras de línea de transmisión y programa relaciones comunitarias	Pileggi Construcciones - TRANSELECTRIC - Cardno Entrix	
1	03-dic-13	2014	Pre-comisionamiento parque eólico Baltra	UNISON - ELECGALAPAGOS	
1	30-abr-14	2014	Cierre proyecto ERGAL		
	24-may-14	2014	Planta Fotovoltaica 1.5 MWp Puerto Ayora	KOICA	
Report	29-oct-14	2014	Comisionamiento	Factor 4	

As regards the goals of wind energy penetration, once the park is operational during 2015, the expected generating capacity is 6,000,000 kWh/year (See pagos

Table 3-14)[67] , that in relation to the total generation of diesel park during 2013 of 25,173,472 kWh represents a penetration of the wind power of 23.8%. If the generation of Puerto Ayora photovoltaic park of 2,4330,000 kWh/year is added (See Since 2017, the expected generation of projects coming into operation during 2015 and 2016 is 7,542,504 kWh / year, without even including the generation of dual-fuel diesel generators of Isabela which is 132% higher than the current generation with renewable and 121% higher than the diesel fuel currently saved, emissions avoided and the value of diesel saved. There will also be 4,515 kWh of energy storage and a sub-transmission line between Baltra and Santa Cruz.

Table 3-13), the penetration of renewable generation in relation to diesel generation in 2013 will reach 33.5%.

The evaluator considers that the Result 4, the Baltra wind farm, there have been failures in execution management that have produced delays of several years until 2015. The wind farm is by December 2014 in the commissioning process.

The conditions for successful commissioning of the park such as the wind farm SCADA and remote power control, and commissioning of sub-transmission network are considered medium to low risk for completion of the park.

The evaluator considers this result ***Marginally Satisfactory (MS).***

3.4.6 Outcome 5: Project experiences / best practices replicated and lessons learned disseminated throughout Ecuador and countries of the region

[67] The energy ultimately delivered by the wind farm to the grid depends on the dispatch.

Table 3-31 shows the Outcome 5, its objectives, indicators and sources of verification.

In relation to Outcome 5.0, ERGAL has been a reference point for the development for other renewable energy projects, having participated in the SE4A (Sustainable Energy for All) program. For the development of Villonaco wind farm, information from the Baltra wind farm was requested for execution[68].

Regarding the incorporation of electricity generation from renewable energies into future EEPG expansion plans, these are the responsibility of MEER and it is clear that this goal is beyond the scope of the project activities.

With reference to Output 5.1, gathering and disseminating information according to the milestones attained, this has been done through the website, which contains about 30 newsletters from 2009-2014 on ERGAL and other project-related activities[69]. It also includes information on projects, calls for tenders, news, publications (research, information and promotional material.). The very valuable technical information distributed at seminars and workshops conducted by the project, was not uploaded to the website although it is known that it was received by participants.

As regards the global dissemination of results, experience and lessons learned, the document "Zero Fossil Fuels on the Galapagos Islands" for RENFORUS (Renewable Energy Futures for UNESCO Sites) was developed[70]. A publication on the project for the World Wind Energy Conference 2009 was also submitted[71].

[68] Personal communication from Eng. L.E. Manzano, MEER. Villonaco: https://www.celec.gob.ec/index.php?option=com_content&view=article&id=189:eolico
[69] http://www.ergal.org/mapaSitio.php?p=1%EB2%EB5%EB13%EB30%EB31#31
[70] http://195.76.147.227/renforus/site/?page_id=2592
[71] Jargstorf, B. and C. Jacome. 100% Renewable Energy Island - Galapagos: the concept of Zero Fossil Fuels and the Wind Energy Project of Santa Cruz / Baltra (Republic of Ecuador). WWEC (2009)

Table 3-31. Outcome 5. Objectives, indicators and sources of verification

O #	Objective	Indicator	End-of Project Target	Sources of Verification
5.0	Outcome 5 Project experiences / best practices replicated and lessons learned disseminated throughout Ecuador and countries of the region	• Experiences from the project collected, analyzed, and disseminated	• Involvement in other RE projects are being carried out in other provinces of Ecuador through the MEER. EEPG incorporate electricity generation with renewable energy in its future expansion plans.	• Final project report. • Expansion plan of EEPG
5.1	Available documentation on Project experiences / best practices and lessons learned	• Compilation of experiences and best practices of the project.	• All information collected and disseminated according to milestones being achieved until completion of the project.	• Project documentation.
5.2	Overall results, experiences and lessons learned from the project disseminated at local, national and regional level on issues of generation based on renewable energy.	• Discussions about the results, experiences and lessons learned from the project prior to its dissemination	• Coordination with the MEER for participation in a regional seminar with the presentation and discussion of results / lessons learned	• Project reports and publications / website
5.3	Initiatives in power generation based on renewable energy at national level, benefiting from the project experience	• Number of agreements / expressions of interest for national replication of the project	• Indications of several initiatives to replicate project activities nationwide. Installing support network to help stakeholders and project promoters	• Terminal evaluation

Coordination with MEER for participation in a Regional Seminar with presentation and discussion of results / lessons learned is still pending (Output 5.2).

As to Output 5.3 (Initiatives in power generation based on renewable energy at national level, benefiting from the experience of the project) it is not known how many or which projects in Ecuador, besides the two mentioned above, have benefited from the project.

It is recommended that outcomes / lessons learned from ERGAL project are presented and discussed in a regional seminar, in coordination with the MEER, and upload technical information available of events held at the MEER website.

*The evaluator considers the implementation of Outcome 5 as **Marginally Unsatisfactory (MU).***

3.4.7 Outcome 6: Project Management Unit

Outcome 6 was introduced in the modification to the LF on January 28, 2011 and for this outcome no indicators were developed.

For Outcome 6, the Project Management Unit should have been consolidated and capable of technical and administrative support of renewable energy projects for suitable replication. For Baltra Wind Farm project execution, the PMU had to address various and multiple tasks to achieve project progress and coordination of the activities of different actors. However, upon completion of the project MEER is expected to capitalize outcomes and experiences of the project.

Table 3-32. Outcome 6. Objectives, indicators and sources of verification

O #	Objective	Indicator	End-of Project Target	Sources of Verification
6.0	Outcome 6 Project Management Unit.	• No Indicator	• Consolidated Management Unit capable of supporting technically and administratively renewable energy projects for its appropriate replication.	• Project documentation
6.1	Coordination / tracking of Expected Result 1, 2 and 3	• No Indicator	• Achievements Report, effective restructuring of beneficiary (EEPG). Satisfactory operation of hybrid systems installed in the four inhabited islands.	• Project documentation
6.2	Management, planning and implementation of Expected Result 4.	• No Indicator	• Memory of procedures, processes, barriers that were followed for the installation of the wind farm in Baltra / Santa Cruz	• Reports and publications project / website
6.3	Compliance and implementation of Expected Results 5 and 7. .	• No Indicator	• Indications of several initiatives to replicate project activities nationwide. Installing support network to help stakeholders and project promoters	• Project documentation

As a goal of Output 6.1, the project has developed three project final reports

- PMU ERGAL. Summary of Achievements of Project 2009-2014. ERGAL Project - ECU / 02 / G31 (March 2014) Quito
- PMU ERGAL. Final Report Concerning Environmental Management of ERGAL Project Development - ECU / 02 / G31 (March 2014) Quito
- PMU ERGAL. Financial Report Full Size. ERGAL Project - ECU / 02 / G31 (March 2014) Quito

Which contain valuable, detailed information on the achievements and work of the project and technical, administrative and financial information. The *effective restructuring of the project beneficiary (EEPG) is not under control of ERGAL.*

The operation of hybrid systems installed in the four inhabited islands is also established as a goal. Floreana and San Cristobal systems are in operation, while the Baltra wind farm is still in the process of

commissioning and Isabela is in development (in phase of contract adjustment between the supplier, the MEER and KfW). The competence of the Isabela project corresponds to MEER.

Summary of Achievements document contains the detailed descriptions of the development of Baltra / Santa Cruz wind farm project, but as it has not been commissioned yet, this task is pending (Output 6.2).

One of the most important tasks and most important steps in ERGAL was in the environmental management of the Santa Cruz - Baltra Wind Project. This project has two components: the wind farm installed on Baltra Island; and the interconnection system itself composed of two substations (one in Baltra and another in Santa Cruz) and the sub-transmission line, which crosses the island of Santa Cruz and reaches the town of Puerto Ayora.

For the development of Baltra wind farm, ERGAL environmental efforts began before the development of the Full Size project in 2007 and 2008 and had a higher incidence during its development (2009- 2014). Prior to the implementation of the wind farm and the sub-transmission line and in compliance with the Ecuadorian environmental legislation, the respective Definitive Environmental Impact Assessment (EIAD) was performed, obtaining the approval thereof by the CONELEC (Conseco Nacional de Electricidad), PNG (Galapagos National Park, PNG by its acronym in Spanish) and MAE. The environmental license for the project execution, construction and operation of the sub-transmission line, under Resolution 223 was issued by the MAE on July 24, 2009. On the same date and under Resolution 224, the Environmental License for the implementation of Baltra Wind Project in the Galapagos Islands is obtained.

According to the Environmental Control Agency, "ERGAL imposed order and control within the project for the full implementation of the Environmental Management Plan, which has led to effective responses by the Contractor and improved response times of the findings raised by the Environmental Control Agency "[72].

Indications to replicate nationwide project activities and the development of a support network for project promoters (Output 6.3) *was not performed by ERGAL* but could be done by the MEER, as part of its competencies in renewable energy

Finally, the Summary of Achievements of the Project, contains information about the process of ERGAL closing for the transfer of assets, functions, responsibilities to the beneficiary of the project (MEER), reports on realized and pending activities as of April 2014, the delivery of equipment and assets lists, the list of administrative-financial activities and documentation on environmental issues. *Additional activities found in this final report are still pending also.*

Execution of Outcome 6 is considered ***Marginally Satisfactory (MS).***

[72] Diaz, Cristina Aracely. Final report on Environmental Aspects of ERGAL Project for the transfer process. Prepared for United Nations Development Programme (UNDP) and the Ministry of Electricity and Renewable Energy (MEER). (March, 2014) ERGAL. Quito

3.4.8 Outcome 7: Monitoring and Evaluation

Outcome 7 was introduced in modification of the LF of January 28, 2011 and for this outcome no indicators were developed (
Table 3-33).

Table 3-33. Outcome 7. Objectives, indicators and sources of verification

R#	Objective	Indicator	End-of Project Target	Sources of Verification
7.0	Outcome 7 Monitoring and Evaluation.	• Without Indicator	• Compliance with the objectives, follow up and compliance monitoring of the actions undertaken.	• Project documentation
7.1	Control, monitoring and evaluating implementation of the objectives within each Expected Result 1-6	• Without Indicator	• Macro report of control and monitoring from the ME to project closure, showing the timely management carried out in each of the barriers presented.	• Project documentation.

The PMU of ERGAL kept track and monitored compliance of the actions undertaken mainly in its management function in the Baltra Wind Farm and sub-transmission line. In terms of significance for ERGAL for its overall environmental goal, this is undoubtedly the most important project. The PMU kept duly informed the PSC and the instances that correspond to the MEER to overcome difficulties encountered in the realization of civil works, electrical works, compliance with environmental requirements, procurement and updating of environmental licenses and overall monitoring of this project, among the many functions and proceedings performed.

As regards the recommendations of the ME, these were considered by the PMU and PSC, and appropriate follow up was made for their implementation.

It is considered that execution of Output 7 was ***Satisfactory (S)***.

3.4.9 Appropriation of the project by the country

Given the history of national public policies of the Government of Ecuador, aimed at the welfare and protection of the rights of nature, contained in the constitutional reform of 2008, the project was relevant to the country in that it favored the penetration of renewable energy providing valid technological, economic and environmental options for development of public policies in the Galapagos Islands and to the nation likewise.

Besides the high relevance of the project for the country, the project has not only reached the achievements that have been discussed above, it has positioned renewable energy in the MEER and other ministries (Ministry of Environment and others), in the municipal governments of Santa Cruz and San Cristobal, and the Governing Council of the Special Regime for Galapagos, as a valid and sustainable option for the supply of electricity. In addition, other project stakeholders, Elecgalapagos, consulting and engineering companies, have appropriated knowledge of renewable technologies, management and

implementation of projects in fragile and sensitive ecosystems, the development of mechanisms for sustainability, so these actors have verified the convenience of renewable energy projects for the country.

The degree of participation of stakeholders reached during this process of appropriation was high. The project interacted with all previous institutions to coordinate activities during the 7 years of execution. For the tasks, the project had to create a supportive environment, consensus and awareness of the renewable energy, create technical conditions and mainly policies for project implementation and to achieve compliance with the immediate objectives.

3.4.10 Sustainability

The aim of this section is to assess the extent to which project benefits will continue within or beyond the scope of the projects after it has ended.

The PRODOC states that the project aims to transform EEPG in the long run to a utility company more financially responsible. ERGAL seeks to achieve financial sustainability considering that investment costs would be borne by the central government and other stakeholders, so that the *revenue generated by the sale of renewable energy should help achieve financial sustainability*. No fund has been established yet in Elecgalapagos that captures the resources of renewable generation specifically destined for sustainability of renewable projects and expansion based on renewable generation. *It is considered that the appropriation of resources to ensure sustainability of the project is still a pending task to develop by the MEER and EEPG.*

A second factor that favors the sustainability of the project is the commitment of the Government of Ecuador to continue the policy of Zero Fossil Fuels on the Galapagos and renewable energy generation for the archipelago, efforts under the responsibility of MEER and other institutions.

A third factor is to continue to strengthen EEPG technically and administratively for the Operation and Maintenance of ERGAL projects.

ERGAL has contributed to these aspects, but is task of MEER and EEPG to continue the strengthening process that leads to the sustainability of projects in Galapagos.

It is considered that the financial sustainability of the project is ***Likely (L)*** and the institutional framework and governance is equally ***Likely (L)***. On the other hand, renewable generation has been welcomed by the population and development has been done in compliance with current environmental regulations, so that socioeconomic and environmental sustainability is ***Likely (L)***.

3.4.11 Catalytic Role

Projects supported by the UNDP and funded by the GEF are key components in the national programming of UNDP, as well as in regional and global programs. ERGAL integrated with other priorities of UNDP and the Government of Ecuador, as is the 304 Effect of the Country Programme which seeks better governance, prevention and recovery from natural disasters. ERGAL is one of the first projects to introduce mitigation measures to climate change in Ecuador, with significant impacts on reducing environmental stress in such a sensitive and important ecosystem for humanity such as the Galapagos.

3.4.12 Impacts

As regards the impact of the project, in its current state it has been shown that renewables have reduced diesel fuel consumption, CO_2 emissions and decreased the risk of fuel spills in the ecosystems. Therefore, the project has reduced the stress on ecological systems and when all systems are operational in the islands in 2017, the impact of ERGAL will be even greater, so that both impacts are ***Considerable (C).***

3.5 CURRENT STATUS OF THE PROJECT

ERGAL is closed since April 30, 2014. As of December 8, 2014 the Baltra and Santa Cruz wind farm - associated sub-transmission line is in the process of commissioning. The Photovoltaic Project - Battery Bank of Baltra is expected to be operational by the end of 2016. And the Hybrid Project Isabela is expected to be operational in mid-2016.

The operation of these new projects starting in 2017 will finally show the strength of the goals so far achieved. Since ERGAL is already closed, the attainment these goals depends on MEER.

3.6 CURRENT STATUS OF THE BARRIERS

The state of the barriers at the end of the project is as follows:

*The first***, "**Limited experience with renewable energy technologies", especially for electricity generation, has been ***partially removed*** because at the end of the project, a training program about the systems that are being commissioned and which are in development *is pending,* even though the photovoltaic park of Puerto Ayora and diesel generation plants using biofuels in Floreana are operational.

*The second barrier, "*Lack of knowledge about the operation and maintenance of renewable energy based power systems and (renewable / conventional) hybrid systems", for the same reasons above, is considered ***partially removed***. These two barriers are to be lifted in 2017 when all systems are in operation.

The *third barrier*, "High initial capital cost of renewable energy technologies" is ***not removed*** because the high initial costs still remain.

The *fourth barrier*, "No experience with power purchase agreements or with independent electricity generation" and the fifth barrier, "Lack of experience in investments and joint ventures between utilities and the private sector to finance projects" were ***not removed because they lost validity.***

The *sixth barrier*, "Difficulties in obtaining financing for renewable energy technologies that are new for Ecuador, due to high perceived risks. Perceived risks associated with renewable energy technologies" *was* ***partially removed*** because this perception remains due to ignorance of renewable technologies but as these penetrate, the true value of renewable energy will be recognized. However, in terms of funding, the MEER and ERGAL have achieved a significant participation of cooperation agencies.

4. CONCLUSIONS

- At the closing of the project, it has partially complied with global environmental objectives of renewable power generation, emissions reduction and proposed investments in the PRODOC.
- However, *when projects currently in development are operational in 2017, the project will comply with global environmental objectives*.
- Therefore, prompt execution and commissioning of the projects currently in development and implementation is most important.
- The use of RE in Galapagos is in line with the welfare and the environmental policy of the country, with the goal towards a low carbon development, with the Millennium Development Goals and the need to preserve the Galapagos Islands as a Wildlife Sanctuary.
- The formidable government involvement in the financing of projects demonstrates its commitment to the use of renewable energy in the islands.
- ERGAL was involved in the conception, design and launch of the initiative Zero Fossil Fuel for Galapagos and has contributed significantly to electricity generation from renewable energy and other very important issues such as alternatives to fossil fuels for mobility in the islands.
- The implementation of projects in environmentally sensitive areas has been a challenge for all project stakeholders. The know-how gained by them and by MEER is a valuable asset for future projects.
- UNDP support to the project is considered essential to facilitate the execution of projects in a timely prompt and manner. In this sense ERGAL and UNDP contributed to speed up the progress of the works when faced with delays in the transmission line between Baltra and Santa Cruz.
- Galapagos is experiencing rapid population growth (in 2001, 19,000 inhabitants; in 2010, 26,000) and a rapid growth in the number of visitors (from 70,000 in 2000 to 140,000 in 2009). This is a growing pressure for both electricity and fuel for electricity generation and transportation, and other services. Therefore, it is urgent to update the Land Use Plan in order to establish objectives and development goals that are reflected in the population and tourism policy of the islands, and result in a decrease in pressure on the demands of energy, water and waste management services. In the special case of energy, efficiency measures should be strengthened for generation, transmission, distribution and consumption as well as the use of systems of renewable energy generation, with a strong education and awareness aimed to both residents and visitors population.

5. RECOMMENDATIONS

To MEER:

- Continue and strengthen the achievements of ERGAL because it is an effort that responds to particular needs and realities of the Galapagos Islands.
- Continue strengthening the capacity of Elecgalapagos to develop Renewable Energy and Energy Efficiency projects.
- Demand the best training of personnel in the delivery of renewable energy power plants to ensure their sustainability.
- For the sustainability of renewable energy systems in operation and maintenance in the long term, both permanent technical and financial support are required. In this sense, it is a good choice for Elecgalapagos to implement a fund for this specific destination with income from generation by renewables, as recommended in the PRODOC.

Still to execute

- The ERGAL project has left several unfinished activities, which have been reported in the "Summary of Achievements of the Project" prepared by the PMU. It is worth noting however the following points:
- Maintain ERGAL website and / or move or create a link to the website of MEER.
- Continue with the dissemination of existing information. Upload the information of courses and workshops to the website of MEER.
- Memory of procedures, processes, barriers followed and encountered during the installation of Baltra / Santa Cruz wind farm, once commissioned (output 6.2 pending).
- Develop the Island Energy Inventory integrated into the Integral Resource Planning
- Coordination with the MEER for participation in a Regional Seminar with presentation and discussion of results / lessons learned (Output 5.2 pending).
- Establishment of a fund by Elecgalapagos that collects the resources of renewable generation specifically for the sustainability of renewable projects and for expanding the base of renewable generation, thus ensuring project sustainability. It is considered that this is a task to develop by the MEER.

To UNDP-GEF

- In formulating the PRODOCS it is useful to consider the competences of the projects because some goals can be beyond the scope of project intervention. For example, achieving changes in the legal and regulatory frameworks is not possible although it is clear that projects can encourage and promote these changes, but the end result depends on the institutions of the government.
- The modifications made to the Logical Framework should include always indicators for results.
- Systematization of the achievements and dissemination of the information obtained which may be made public, would have a greater impact on the achievements of this project and would make more visible this joint effort between the GEF- UNDP and MEER

6. LESSONS LEARNED

The following lessons learned are considered:

- The operation of renewable energy systems in the midst of fragile ecosystems is feasible.
- The deadlines for implementation of projects are often too short and should be extended to advance their implementation. An agile and adaptive management is essential to complete project execution.
- Community involvement is essential to the success of programs for renewable energy and energy efficiency. This participation should be strengthened through public information about development plans, training in the efficient use of energy, awareness of the importance of energy use and its relationship to the preservation of the environment.
- The interaction with authorities is essential because energy supply projects must be consistent with the Land Use Plans, especially when it comes to energy systems in remote, isolated and fragile ecosystems, and critical conservation areas.
- The use of Trust Funds is suitable for managing the finances of projects, provided there is agile management.

7. ANNEXES

7.1 TERMS OF REFERENCE

i. INTRODUCTION

In accordance with UNDP and GEF Monitoring and Evaluation (M & E) policies and procedures, all Medium and Regular Size Projects supported by the UNDP and funded by GEF should have a terminal evaluation once the execution is finished. These terms of reference (TOR) establish the expectations of the terminal evaluation of the Project for Renewable Energy for Galapagos-ERGAL (PIMS No. 12295).

PURPOSE AND SCOPE

The Project Renewable Energy for Galapagos -ERGAL aims reducing greenhouse gas emissions through electricity generation with renewable energy, initially in Galapagos and then throughout the Ecuador and the region. The project objective is to promote the use of renewable energy (photovoltaic, wind and biofuels) to generate electricity, reducing the dependence of Galapagos on diesel transported from mainland Ecuador.

This full size project envisages the following expected results:

- National partners supporting the repowering of electrical systems of each of the islands.
- Technical and operational institutional capacities of Empresa Eléctrica Provincial Galápagos (EEPG) strengthened to manage renewable energy projects for electrification of the Islands.
- Floreana and San Cristobal with hybrid electricity generation systems: wind, PV, biofuel / diesel.
- Isla Santa Cruz / Baltra hybrid power systems: wind - thermal.
- Experiences / best practices of the project replicated and dissemination of lessons learned throughout Ecuador and countries of the region.
- Project Management Unit, coordination, management, planning, implementation and monitoring, as appropriate to the expected results.
- Monitoring and evaluation of compliance with the expected results.

The project will develop local capacity to identify the technical and financial options and to develop the institutional and financial regulatory instruments necessary to demonstrate the technical, economic and financial feasibility to develop projects with renewable sources to supply mini networks or power grids.

The Project Document (PRODOC) was signed on July 26, 2006 and began operating in July 2008 and its completion date has been delayed several times, it was last extended until March 2014. The expected results of the logical framework have been repeatedly revised, and the last review was on November 2012.

The total amount of the project is US $ 67,284,029.64 and is divided as follows: a contribution of US $ 3,239,666.00 from GEF, implemented by UNDP through the Country Office of Ecuador; with contributions from the Government of Ecuador for $ 25,973,897.34 and other cooperation agencies: UNF, KfW, KOICA, JICS for $ 38'070,466.30.

The MEER acts as the executing Agency for the Project.

This project is located in the priority area "Access to sustainable energy services" of UNDP strategy for Energy and Environment. The portfolio of projects in the area of Environment, Energy and Risk Management (EE & RM) is responsible for three outcomes at the level of Country Program Effect: Effect 303 "*Institutional Reform and increased capacity of authorities and other entities to prioritize and incorporate into the national program of social development, conservation issues, access and sustainable use of biodiversity and environmental management "*, Effect 304 *"authorities and other agencies have been empowered with greater skills to formulate adaptive / mitigating responses to climate change and to develop renewable energy sources and promote energy efficiency "* and Effect 306 *"Strengthened Decentralized National Risk Management System (DNRMS) "*. Thus, the project hopes to contribute specifically to Effect 304 "authorities and other agencies have been empowered with greater skills to formulate responses adaptation / mitigation against climate change and to develop renewable energy and promote energy efficiency" of the country program.

The final evaluation was performed according to the guidelines, rules and procedures established by the UNDP and GEF, as stated in the UNDP Evaluation Guide for Projects Financed by GEF.

The objectives of the evaluation will analyze the achievement of project results and extract lessons that can improve the sustainability of project benefits and help improve generally UNDP programming.

The final evaluation of ERGAL project will also provide inputs to identify the project's contributions to effect 304 for the current 2010-2014 UNDP programming cycle in Ecuador.

ii. APPROACH AND METHOD OF EVALUATION

Over time an approach and a general method[73] was developed for Terminal Evaluation of projects supported by the UNDP and the GEF. It is expected that the evaluator frames the evaluation work using the criteria of relevance, effectiveness, efficiency, sustainability and impact, as defined and explained in the Guide for Terminal Evaluation of the projects supported by UNDP and funded by GEF which can be downloaded from the link http://web.undp.org/evaluation/documents/guidance/GEF/GEFTE--Guide_SPA.pdf.
A series of questions were made covering each of these criteria and it is included in these ToR (Annex C). It is expected that the evaluator modifies, completes and submits this matrix as part of an initial evaluation report, and includes it as an appendix to the final report.

The evaluation should provide evidence-based information that is credible, reliable and useful. The evaluator is expected to follow a participatory and consultative approach that ensures close involvement with government counterparts, particularly GEF Operations Coordination Center, the

[73] For more information on evaluation methods, refer to the Handbook of Planning, Monitoring and Evaluation for development results, Chapter 7, p. 163 in http://web.undp.org/evaluation/handbook/

UNDP Country Office, the project team, the GEF / UNDP Regional Technical Advisor and key stakeholders. The evaluator is expected to make a field mission in Quito and Galapagos, including the following project sites: Santa Cruz, Baltra, Floreana, Isabela and San Cristobal Islands. Interviews were conducted at least with the following organizations and individuals:

- Ministry of Electricity and Renewable Energy
- Ministry of Environment
- CONELEC -National Council of Electricity
- SETECI - Technical Secretary of international cooperation
- SENPLADES –Secretariat of National Planning and Development
- Galapagos Governing Council
- Galapagos Provincial Electric Utility (EEPG)
- Municipality of Santa Cruz
- Municipality San Cristobal
- Parrish Board of Floreana
- Galapagos National Park
- WWF-World Wide Fund for Nature
- FUNDAR Galapagos, NGO
- Santa Cruz Community
- Baltra Local Institutions

The evaluator will review all relevant sources, such as the project document information, project reports, including annual IAP/IEP and other reports, reviews of project budget, midterm evaluation, progress reports, and monitoring tools of the area of interest of GEF project files, strategic and national legal documents. Likewise, the evaluator shall review the annual reports of results (*Results Oriented Annual Report* or ROAR or by its acronym in English), Ecuador 2010-2014 CPD and CPAP and any other material which the evaluator considers useful for this empirically based evaluation. A list of documents that the project team will facilitate the evaluator for the review are provided in Annex B of these Terms of Reference.

Additionally, the evaluator will perform a brief report that values the contributions of project outputs to the effect 304 of the Country Programme. Specifically, it is expected that the evaluator values the contribution of UNDP to changes in behaviors, practices and / or institutional performance of the actors included in this effect. The specifications of this Annex report is included in Appendix H of the Terms of Reference. The evaluation methodology to analyze the project's contribution to Effect 304 must be based on the Handbook on Planning, Monitoring and Evaluation of Results of UNDP (2009) and the Manual of Guidelines for Evaluators of Effects of UNDP[74].

iii. CRITERIA AND RATINGS FOR THE EVALUATION

An evaluation of project performance will be carried out, compared to the expectations set forth in the Project Logical Framework and Results Framework (see Appendix A), which provides performance and

[74] http://web.undp.org/evaluation/handbook/spanish/
http://web.undp.org/evaluation/documents/guidance/UNDP_Guidance_on_Outcome-Level%20_Evaluation_2011.pdf

impact indicators for project execution, along with the corresponding means of verification. The evaluation will cover at least the following criteria: **relevance, effectiveness, efficiency, sustainability and impact**. Ratings must be provided in accordance with the following performance criteria. The entire table must be included in the executive summary evaluation. Mandatory rating scales are also included in Annex D of the ToR.

Calificación del rendimiento del proyecto	
Criterios	**Comentarios**
Seguimiento y Evaluación: Muy satisfactorio (MS), Satisfactorio (S), Algo satisfactorio (AS), Algo Insatisfactorio (AI), Insatisfactorio (I), Muy Insatisfactorio (MI).	
Calidad general del SyE	(Califique con una escala de 6 puntos)
Diseño de SyE al comienzo del proyecto	(Califique con una escala de 6 puntos)
Ejecución del plan de SyE	(Califique con una escala de 6 puntos)
Ejecución de los IA y EA: Muy satisfactorio (MS), Satisfactorio (S), Algo satisfactorio (AS), Algo Insatisfactorio (AI), Insatisfactorio (I), Muy Insatisfactorio (MI).	
Calidad general de la aplicación y ejecución del proyecto	(Califique con una escala de 6 puntos)
Ejecución del organismo de aplicación	(Califique con una escala de 6 puntos)
Ejecución del organismo de ejecución	(Califique con una escala de 6 puntos)
Resultados: Muy satisfactorio (MS), Satisfactorio (S), Algo satisfactorio (AS), Algo Insatisfactorio (AI), Insatisfactorio (I), Muy Insatisfactorio (MI).	
Calidad general de los resultados del proyecto	(Califique con una escala de 6 puntos)
Relevancia: relevante (R) o no relevante (NR)	(Califique con una escala de 2 puntos)
Efectividad	(Califique con una escala de 6 puntos)
Eficiencia	(Califique con una escala de 6 puntos)
Sostenibilidad: Probable (P), Algo probable (AP), Algo improbable (AI), Improbable (I).	
Probabilidad general de los riesgos para la sostenibilidad	(Califique con una escala de 4 puntos)
Recursos Financieros	(Califique con una escala de 4 puntos)
Socioeconómico	(Califique con una escala de 4 puntos)
Marco institucional y gobernanza	(Califique con una escala de 4 puntos)
Ambiental	(Califique con una escala de 4 puntos)
Impacto: Considerable (C), Mínimo (M), Insignificante (I).	
Mejora del estado ambiental	(Califique con una escala de 3 puntos)
Reducción de la tensión ambiental	(Califique con una escala de 3 puntos)
Resultados generales del proyecto	(Califique con una escala de 6 puntos)
Progreso hacia el cumplo de la tensión y el estado	(Califique con una escala de 3 puntos)

iv. FINANCING / CO-FINANCING PROJECT

The evaluation will assess the project's key financial issues, including the scope of financing planned and carried out. Data costs and project funding will be required, including annual expenses. The differences between planned and actual spending should be evaluated and assessed. The results of the recent financial audits should be considered, if available. Evaluators will receive assistance from the Country Office and Project Team for financial data to complete the following table of cofinancing, which is to be included in the final evaluation.

Cofinanciación (tipo/fuente)	**Financiación propia del PNUD (millones de USD)**		**Gobierno (millones de USD)**		**Organismo asociado (millones de USD)**		**Total (millones de USD)**	
	Planificado	Real	Planificado	Real	Planificado	Real	Planificado	Re
Subvenciones	3`239,666	3`239,666	4´532,601	25`973,897.34	17´134.621.43	38´096,169.18	24`906,888.43	67´309,7
Préstamos/concesiones	-	-	-	-	-	-	-	-
Ayuda en especie	-	-	-	-	-	-	-	-
Otro	-	-	-	-	-	-	-	-
Totales	3`239,666	3`239,666	4´532,601	25`973,897.34	17´134.621.43	38´096,169.18	24`906,888.43	67´309,7

v. INTEGRATION

Projects supported by the UNDP and GEF funded are key components in the national programming of UNDP, as well as in regional and global programs. The evaluation will assess the extent to which the project was integrated with other UNDP priorities, including poverty reduction, improved governance, prevention and recovery from natural disasters and gender. Furthermore, the evaluation will be included in the evaluation plan office in the country.

vi. IMPACT

The evaluators assessed the extent to which the project is achieving impacts or is progressing towards achieving impacts. The key results that should arrive in assessments include whether the project has demonstrated: a) verifiable improvements in the ecological status, b) verifiable reductions in stress of ecological systems, or c) demonstrated progress toward achieving these impacts[75].

vii. CONCLUSIONS, RECOMMENDATIONS AND LESSONS

The evaluation report should include a chapter that provides a set of conclusions, recommendations and lessons.

viii. ARRANGEMENTS FOR THE IMPLEMENTATION OF THE EVALUATION

This evaluation will be managed through the Evaluation Reference Group, composed by the UNDP AE & GR Program Specialist area, a member of the Ministry of Electricity and Renewable Energy and a member of the Galapagos Provincial Utility accompanied and advised by the UNDP Evaluation Office. This group ensures the quality of the evaluation process and products produced and will be specifically responsible for the formulation and revision of the terms of reference of the evaluation, selection of the Consultant and review of all evaluation reports, as well as preparing the Management Response to the recommendations defined by the Consultant in the final report. Furthermore, the group together with the Project Unit, will support the Consultant in the process, providing the information and documentation required, coordinating logistical arrangements at national level and providing access to partners and other stakeholders to be interviewed.

ix. TERM EVALUATION

The total duration of the evaluation will be in accordance with the following schedule:

x. FINAL RESULTS OF THE EVALUATION

It is expected that the evaluation team accomplishes the following:

[75] A useful to measure progress in achieving impact tool is Review of Outcomes to Impacts (ROtI) method developed by the GEF Evaluation Office: ROTI Handbook 2009
http://www.thegef.org/gef/sites/thegef.org/files/documents/M2_ROtI%20Handbook.pdf

Resultado final	Contenido	Período	Responsabilidades
Informe inicial (corregido)	Este informe el evaluador mostrará que tiene comprensión cabal del objeto a evaluar, y las tareas y actividades a realizar para alcanzar los objetivos propuestos de la evaluación. Además mostrará cómo se responderá cada pregunta de la evaluación mediante los métodos propuestos, las fuentes de datos propuestas y procedimientos de recopilación de datos. El informe debe incluir la propuesta de un cronograma de tareas, actividades y resultados finales.	No más tarde que 2 semanas antes de la misión de evaluación	El evaluador lo presenta a la OP del PNUD
Presentación de Hallazgos	Presentación de Hallazgos	Fin de la misión de evaluación	Presentado a la Unidad de Gestión del Proyecto, OP del PNUD. MEER
Borrador del informe final	Informe completo, (bajo formato del Anexo F) con anexos. No debe exceder de 40 páginas en total sin incluir anexos. Este informe debe estar	Dentro del plazo de 2 semanas desde el fin de la misión de evaluación y	Enviado a la OP, revisado por el Grupo de Referencia , los ATR,
	escrito en español	presentación de hallazgos	las PCU, los CCO del FMAM
Informe final*	Informe revisado.: Tanto en Español como en Inglés.	Dentro del plazo de 1 semana después de haber recibido los comentarios del PNUD sobre el borrador	Enviado a la OP para cargarlo al CRE del PNUD

* When the final evaluation report is presented, the evaluator is also required to provide an 'audit path', with details on how all comments received have been addressed (or not) within the final evaluation report.

xi. TEAM COMPOSITION

The evaluation team shall be composed of one international evaluator. The consultant should have previous experience in evaluation of similar projects. Experience in projects funded by GEF is an advantage. The selected evaluator must not have participated in the preparation or execution of the project and should have no conflict of interest with activities related to the project.

The consultant must meet the following qualifications:

Training:

- University professional in the field of engineering, or management, with a degree from a national or foreign university.

- Preferably postgraduate studies in the area of energy, environment or related international cooperation, public policy, project management or fields related to these issues.

Experience and skills:

- Relevant professional experience of at least 5 years
- Extensive experience in project evaluation, specifically experience is required in evaluating results-based management.

- Communication, writing and analytical skills for quantitative and qualitative data analysis and systematization.
- Experience in the public and / or private sector and the development of projects related to energy sustainability, energy efficiency, renewable energy, sustainable development, environmental conservation.
- Specialized studies in evaluation and monitoring of projects.
- Evaluation experience in GEF-UNDP projects would be an asset.
- Consultancy Experience and knowledge in environments similar to the Galapagos, demonstrated through their participation in national / international institutions or studies related to these matters.

xii. ETHICS EVALUATOR

Evaluation consultants must assume the highest ethical standards and must sign a Code of Conduct (Annex E) to accept the assignment. UNDP evaluations are conducted in accordance with the principles described in the 'Ethical Guidelines for assessments' that are found in the link of the Evaluation Group of the United Nations (UNEG) http://www.unevaluation.org/ethicalguidelines.

7.2 ITINERARY

Table 7-1. Air and sea routes H. Rodriguez.

Date	Day	Hour	Flight	Maritime
01-sep-14	Monday	07:53	Bogota - Quito	
07-sep-14	Sunday	07:10	Quito - Santa Cruz/Baltra	
10-sep-14	Wednesday	07:00		Santa Cruz - San Cristóbal
11-sep-14	Thursday	13:20	San Cristóbal - Quito	
12-sep-14	Friday	18:40	Quito - Bogotá	

7.3 LIST OF INSTITUTIONS / INTERVIEWEES

#	Día	Hora	Personas	Institución	Lugar Reunión	E-mail	Teléfono Institucional
1	sep-01	14:30 – 15:30	Gabriel Jaramillo, Oliver Page y AMN	PNUD Inicio de la misión + Teleconferencia Oliver Page	PNUD piso 11 (oficina Gabriel Jaramillo), Av. Amazonas, 28-89 y la Granja, Quito-Ecuador		
2	sep-02	9:00 – 10:00	Ing. Alonso Moreno Jefe de la Unidad Ambiental	CONELEC	Oficinas CONELEC, Av. Naciones Unidas E7-71 y Av. De Los Shyris Quito-Ecuador	alonso.moreno@conelec.gob.ec	2440123 ext. 2011
3		11:00-12:00	Nuria Estrella Asesora Ministerial para Galápagos	MAE	Oficinas MAE Calle Madrid 1159 y Andalucía, Quito-Ecuador	nestrella@ambiente.gob.ec	02-3-987600 ext. 1708
4		14:00-15:00	Ing. Alfredo Samaniego SEREE Ing. Luis Manzano	MEER	Oficinas MEER José Tamayo E10-25 y Lizardo García, Quito - Ecuador	alfredo.samaniego@meer.gob.ec, luis.manzano@meer.gob.ec	23976000 ext. 1510
5		16:00 – 17:00	Ing. Geovanny Pardo Gerente	CELEC - TRANSELECTRIC	Oficinas CELEC-TRANSELECTRIC Av. 6 de Diciembre N 26-235 y Orellana, Edificio Transelectric, PISO 10, Quito - Ecuador	geovanny.pardo@celec.gob.ec	02-2900-400 ext. 2574
6	03-sep	08:00-09:00	Benjamin Jargstorf	Factor 4	Skype	benjamin@factor-4.com	(0049)-30-6891 9898
7		09:00-10:00	Carla Zambrano Subsecretaria de Planificación y Desarrollo Zonal 5	SENPLADES	Skype	czambrano@senplades.gob.ec	042971154 ext. 4501
8		11:00-12:00	Vanesa Cachafeiro – Analista de Política y Negociación	SETECI	Oficinas SETECI Av. 6 de Diciembre N 31–89 y Whymper Edificio Cosideco, piso 3. Quito-Ecuador	vanessa.cachafeiro@seteci.gob.ec	2233986 ext 56
9		14:00-15:00	Ing. Santiago Sánchez		PNUD- Sala 4- Mezzanine	tatagosanchez@gmail.com	
10		16:00-18:00	Dr. Leonardo Zaragocín		PNUD- Sala 4 -Mezzanine	leonardo.zaragocin@gmail.com	992065864

#	Día	Hora	Personas	Institución	Lugar Reunión	E-mail	Teléfono Institucional
11	04-sep	09:00-10:00	Olaf Schwetje Gerente	PROVIENTO	Oficinas PROVIENTO, Barcelona E14-136 y Mallorca, La Floresta, Quito-Ecuador	ecuador@proviento.com	2231844
12		11:00-12:00	Ing. Pedro Flores Gerente	MACROCONSULT	Oficinas MACROCONSULT Av. Toledo N23-126 y Madrid, Edf. Munich, Piso 3, Ofc. N° 8, Quito-Ecuador	pedro.flores@macroconsult.com.ec	2541471
13		14:00-15:00	Ing. Miguel Alemán Gerente General	CARDNO - Entrix	PNUD- Sala 5 -Mezzanine	miguel.aleman@cardno.com	02-355-0110
14		16:00-17:00	Ing. José Jaramillo Gerente	Consorcio Jaramillo – Veintimilla	PNUD- Sala 5 -Mezzanine	josefranciscojaramillo@hotmail.com	
15		19:00-20:00	Carlos Lee / Bryan Park	UNISON	Skype		
16	05-sep	09:00-10:00	Max Freire	Junta Parroquial de Floreana	Cuenta Skype: verdefloreana	juntaparroquialfloreana@gmail.com	052524876
17		10:00-11:00	Ing. Carlos Jácome		Skype	caraljacome@yahoo.com	
18		11:00-13:00	Gabriel Jaramillo	PNUD	PNUD – Oficina Gabriel Piso 11	gabriel.jaramillo@undp.org	022460330 Ext. 2113
19	8- Sep.	09:00-10:00	Leopoldo Bucheli Alcalde	Municipio de Santa Cruz	Oficinas Municipio Santa Cruz, Av. Charles Darwin y 12 de febrero, Santa Cruz, Galápagos-Ecuador	secretaria2@santacruz.gob.ec	052526153 / 4
20		11:00-12:00	Joge Carrión (Ab. Andrés Delgado) Director de Gestión Ambiental	Parque Nacional Galápagos	Oficinas Parque Nacional Galápagos, Av. Charles Darwin, Puerto Ayora, Santa Cruz, Galápagos-Ecuador	jcarrion@galapagos.gob.ec	052526189 / 052526511
21		16:00-17:00	Carlos Zapata Director Ejecutivo	FUNDAR Galápagos	Oficinas FUNDAR Galápagos, C/Isla Genovesa y Lobo Marino, esquina Puerto Ayora, Isla Santa Cruz, Galápagos-Ecuador		

#	Día	Hora	Personas	Institución	Lugar Reunión	E-mail	Teléfono Institucional
22	9 Sep.	09:00-10:00	Ing. Víctor Vélez	ELECGALAPAGOS		Victor.velez@elecgalapagos.com.ec	994366539
23		11:00-11:30	Eco. Edgar Navas Jefe de Aeropuerto	Dirección de Aviación Civil	Oficinas Dirección de Aviación Civil, Baltra, Galápagos-Ecuador	edgar.navas@aviacioncivil.gob.ec enavasm@gmail.com	053015369 0980 969 056
24		14:30-15:30	Ing. Flavio Pisco	Junta Parroquial de Sta.	Oficinas Junta Parroquial de Sta. Rosa	gadprsantarosa.santacruz@hotmail.com	
25		16:00 – 17:00	Tco. Ricardo Sevilla Presidente	Junta Parroquial de Bellavista	Oficinas Junta Parroquial de Bellavista	ricardosevillac@hotmail.com	52532137
26	10-sep	14:00-15.00	David Moreno Secretario Técnico y Jorge Vargas Asesor Ministra	Consejo de Gobierno de Galápagos/ SAN CRISTOBAL	Oficinas Consejo de Gobierno de Galápagos, Av. 12 de Febrero, Vía al Progreso (Cerro Patricio). Isla San Cristóbal, Galápagos-Ecuador	jorge.vargas@cgg.gob.ec david.moreno@cgg.gob.ec	
27		16:00-17:00	Ab. Pedro Zapata Alcalde	Municipio de San Cristóbal	Oficinas Municipio de San Cristóbal, Av. Charles Darwin y 12 de Febrero, Isla San Cristóbal, Galápagos-Ecuador		052520008 / 052520798
28	11 Sep.	08:00-10:00	Ing. Marco Salao Presidente Ejecutivo	ELECGALAPAGOS	Oficinas ELECGALAPAGOS C/ Española y Juan José Flores, Puerto Baquerizo Moreno, Isla San Cristóbal, Galápagos-Ecuador	marco.salao@elecgalapagos.com.ec	052 520 136
29	12 Sep.	9:00-10:00	Dr. Arturo Villavicencio		PNUD- Sala 4 -Mezzanine		
30		10:00-11:00	Diego Zorrilla y Nuno Queiros	Debriefing con RR y DRR	PNUD- Piso 12– Oficina Diego Zorrilla		
31		11:00-13:00		Debriefing con el Grupo de Referencia (Ing. Salao, Ing. Manzano, Gabriel Jaramillo, Jorge Vargas.	PNUD – Sala piso 13		

7.4 SUMMARY OF INTERVIEWS

Location:	Quito and Galapagos Islands
Consultant:	Humberto Rodríguez
Project:	ERGAL Renewable Energy Program
Dates of mission:	September 2014
Objective:	**1. Get first hand key information** **2. Clarify doubts about previously reviewed documents**

Date	Meeting and Key Considerations
01/09	**1. UNDP officials** Initial meeting, agenda adjustment and administrative matters. Special emphasis is placed on 1. Project support for the conceptual development of the policy of "Zero Fossil Fuels on the Galapagos" 2. Impact on the 4 islands in which the GEF decided to intervene 3. How the Santa Cruz– Baltra project advanced, the park is not finished, is this transfer in progress? 4. How this transfer occurred and how was the institutional development? **5.** Did transfers and institutional development happened?
02/09	**2. Head of the Environmental Unit, CONELEC** The Environmental Unit is responsible for compliance with environmental issues in project execution. It is in this sense that it has interacted with ERGAL. ERGAL obtained the projects' environmental licenses. **3. Galapagos Ministerial Adviser, International Management, MAE** The MAE is the focal point of GEF. Relevance: Galapagos is a heritage of mankind and must preserve this heritage. ERGAL is relevant to the country Impact on the country: • ERGAL supported the policy Zero Fossil Fuels on the Galapagos planned for 2020 • Relevant for national targets • It is an example that these energies may be used in the country. • Knowledge transfer to Elecgalapagos Effectiveness. They are a small component of the energy mix of Galapagos. Cost / effectiveness: • The costs are high but Galapagos is unique case • ERGAL applied for funding to Japan for the energy storage project. NREL was brought by ERGAL. • Calls for tenders were made by ERGAL • In Isabela there was interest from 54 companies initially.

	• In Isabela, ERGAL had German cooperation and competence for the project was subsequently transferred to the MEER. Implementation: Assumed by the government Sustainability strategy: Elecgalapagos and MEER are responsible for project sustainability. Training: • Issues regarding batteries, electric cars, eco-efficient construction, among others have been addressed • Imparted to staff and institutions from Galápagos, • Training has been for MEER, • Weakness in the retention of staff in institutions due to its rotation Environmental considerations: • ERGAL intervened in setting the Zero Fossil Fuel Plan in the Galapagos. • The Galapagos model is small to indicate that it is possible to replicable it in the mainland. **4. SEREE Sub-Secretary and Engineers** Once the objectives of the evaluation were explained, SEREE presented a comprehensive and informative insight on RE systems in Galapagos and a brief mention of energy efficiency. Baltra • Transmission to 34.5 kV, 2.25 MW wind farm (3x750 kW), Korean. • Autonomous system generating 300 kW. Santa Cruz • 14000 inhabitants • 9 MW diesel, 6 units of 1.7 MW is the largest, diesel Hyundai • 1.5 MW PV project, Korean, in operation since May. San Cristobal • 3 MW diesel capacity • Since 2007, EOLICSA wind farm with 2.4 MW (Spanish wind turbine manufacturer MADE). • Some PV systems of several kW, also from e7 • e7 financing and fiscal resources. Floreana • 2 thermal Diesel, Deutz, 60 KVA each (efficiency 11.5 kWh / gal; 1.13 gal jatropha / gal. of diesel)

	Isabella • System in development (photovoltaic, dual thermal plants, 3000 kWh Pb-acid battery bank). The evaluator received preliminary information on the generators of the islands (2010) and an energy balance of the generation in the four islands up to 2010. More updated information was promised to the evaluator. **5. Transelectric Manager** Company in charge of the sub-transmission line between Baltra and Puerto Ayora. The plan is building a 34.5 kV line under the conditions of Galapagos. The line is currently undergoing testing. Working in Galapagos has several peculiarities as obtaining temporary permits through calls, night work is not allowed, among others. The project has been a challenge due to the special conditions. The laying of the network in Galapagos has been a great learning. ERGAL did the audit of the environmental management plan. ERGAL brought attention to RE in the country.
03/09	**6. Manager, Factor 4 (Germany)** Linked to the project since its inception and has participated in: • Evaluation. Verification of the feasibility studies of Baltra wind farm. • Evaluation of offers of equipment for the wind farm. • Proposal of other measures to reduce the demand for fuel in the islands, including the introduction of electric transport with small vehicles. • Currently in charge of commissioning of the wind farm. **7. Secretary of Planning and Development Zone 5, SENPLADES** *Relevance*: ERGAL has been extremely relevant for the objectives of development. Promoting Renewable Energy is vital. Lessons learned. Eight hydroelectric are being built, by 2016 over 90% of energy will be renewable. ERGAL has caught the attention of the country towards the RE. *Results Preview*: Progress is considered to have been made. It has left a great experience. The delays are due to dynamics proper to the islands. ERGAL objectives have been achieved. *Cost efficiency:* If the project is viewed from a financial point of view, the project is not viable. The costs are high because it is so remote and due to the conservation elements. Costs are high by the characteristics of the island conditions. The per capita cost in the islands is very high. In addition there is NO availability of resources. Implementation of systems for such a small population is very expensive. There are other initiatives into play that will be included in a study seeking alternatives to meet Zero Fossil Fuels on the Galapagos. The nut oil (jatropha) is very expensive despite the benefits to the inhabitants of Manabi. *Sustainability*. The regime of the islands offers no mobility of staff. It is expected that Elecgalapagos staff absorbs the lessons related to operations and maintenance. It is hoped that permanent residents get involved into the operation and maintenance.

	Strategy. There is today no strategy for long-term sustainability. Elecgalapagos technicians have been receiving technology transfer. Consider the labor regime of the island. High school graduates who are permanent residents should be trained to give long term maintenance to these systems. Users should be prepared too. Creation of one large corporation that vertically integrates the electricity business. One public company that will allow the integration of knowledge. Elecgalapagos is the energy trader. *Zero Fossil Fuels on the Galapagos* means several things: reduced risk of oil spill (ship Jessica) and secondly the reduction of emissions. And preserve the Galapagos ecosystem. **8. Policy and Negotiation Analyst, SETECI** The SETECI (Technical Secretariat for International Cooperation) is the state agency that monitors International Cooperation projects. SETECI does not track any specific project but the cooperating agency. The type of monitoring is strategic but not operational in nature. Therefore monitoring to the UNDAF and UNDP Country Programme is made. Temporarily was in ERGAL Steering Committee. **9. Former ERGAL Officer** Project manager in the previous period prior to the formulation of PRODOC. Period: 2003-2004 He was in charge of ERGAL planning, in establishing relations with Elecgalapagos, and developing links with other actors like e7, KfW, among others. He contributed decisively to the development of PRODOC. ERGAL took place in a time of transition of the electricity sector. He acted as a catalyst for various initiatives. He has had no further contact with ERGAL **10. PMU Coordinator, ERGAL** PMU coordinator from June 2009 until its closing (there were two coordinators before). *Relevance*. ERGAL was conceived as an umbrella project. Its function was to coordinate all development of RE in Galapagos. This went well until 2009. Then came the change in the policy of the Ministry. In 2009, the Ministry requested the transfer of all ERGAL information to the Ministry. *Baltra wind project status*. Preliminary studies of the network were made in 2010. Subsequently the sub-transmission line. Engineer B. Jargstorf interrupted works as Audit Engineer in June 2011, until the interconnection works were finished. In 2012 contracts for the construction of the line were made. A stability study of the system is required. DIGSILENT (German company) was contracted two years ago with resources from MEER. The study predicts the occurrence of overvoltage on the network. There are three wind turbines installed since June 2013 but have not yet began testing for commissioning. *Zero Fossil Fuels Initiative for Galapagos.* This initiative originated in 2007 and was a result of Minister Alberto Acosta and Arturo Villavicencio. *Progress towards results.* At every level. Most objectives have been achieved. At every level environmental consciousness and about RE was raised. *Efficiency*. The economic part is not applicable due to the particularities of Galapagos.

	Sustainability. Sustainability is in the hands of Elecgalapagos. The equipment should be taken into account. *Recommendation*. Ensure the timely flow of funds from the state to the sustainability of projects by Elecgalapagos. *Staff training*. Priority was given to native Galapagos staff. *Galapagos Local Community Impact.* The greatest environmental impact was with farmers due to the sub-transmission line in Santa Cruz. The community participated in the talks and dialogues for setting up the line. ERGAL has been demanding in compliance with environmental criteria. The importance of CONELEC regulation on renewable energy is evident when it gives attractive prices to renewable energy. The project in the end resulted in the Baltra wind project. The transmission system was in MEER.
04/09	**11. Manager, PROVIENTO** Proviento provides renewable energy equipment, measuring equipment and provides technical services as wind measurements. Proviento worked for ERGAL in three projects. *1st Project. Wind measurements.* Proviento won the bid for the installation of measuring towers. Three were installed: one in Baltra and two in Santa Cruz (Santa Rosa, near the canal and one in Camote, near one of the old towers of Lahmeyer). The best potential was in Baltra. PROVIENTO contracted specialists in topography, soils and environmental impact. In the hybrid part, they hired David Corbus from NREL. They hired Giorgio Fioravant for the electrical connection, because the concept was to bring everything to Baltra as the island is the industrial part of Santa Cruz. PROVIENTO is going to install a tower for UNISON. ERGAL was a total success leading, guiding the process, independent from organizations. The work of Arturo Villavicencio and Carlos Jacome is to be highlighted for their contributions to the project. *2nd Project. Floreana* During the administration of ERGAL of Carlos Jacome and Leonardo Zaragocín. Proviento sought the generators for the jatropha project in Floreana, and managed the project. VB.P from Germany (Georg Gruber) supplied the engines. The project was accompanied by Gerd Seiler from DED (German Development Service). *3rd Project. Isabella* In ISABELA they did wind measurements. Finally the measurements were made by Lahmeyer for KfW. **12. Manager, MACROCONSULT** Contract: Supervision of civil works for the Wind Project in Baltra Civil works contractor: Consortium Jaramillo – Vintimilla (JV). Tasks: Foundation for wind turbines, access roads, control room (30 m^2), rainwater and wastewater management from the operation of the wind power plant. Macroconsult won the international tender opened by UNDP. Contract cost US $ 122,000, with expansion reached $ 175,000. There were complementary contract and thus for the audit too. Duration: 8 months, October 2012 to June 2013).

	Delays in the audit were due to delays by JV and UNISON Consortium. A delay was due to the prohibition to use stone materials from the islands. The bidding process is considered transparent. ERGAL supervised the contract also with Elecgalapagos intervention. **13. General Manager, CARDNO - Entrix** US – Australian Consulting Company. Two Environmental contracts with ERGAL. *First. Environmental consulting firm WALSH* (Subsidiary of Ecology Energy) conducted the environmental assessment of the wind farm. CARDNO-ENTRIX conducted the Environmental Audit updating the Environmental Management Plan (EMP), which included changes in the project, primarily the sub-transmission line of Baltra wind farm to Santa Cruz Island. Contract completed in January 2014. *Second. EMP compromises* The wind farm and the transmission line fulfilled all the commitments for the Environmental License granted by MAE and as provided in the specific EMP for their construction. The construction of the wind farm and sub-transmission line had a permanent environmental audit on contractors. Compliance with environmental commitments by contractors and project developer was documented. All these are documented in monthly reports and in the final report delivered to ERGAL. Contractual aspects: The contractual interaction with ERGAL was very good. A team committed to very strict environmental guidelines was formed. Both contracts were made with the United Nations office to the satisfaction of the parties. **14. Manager, Consortium, Jaramillo - Vintimilla** Civil Works Contractor for the Wind Farm Baltra. Contracting with Elecgalapagos, by the Public Procurement Portal. Civil works: Foundations for three wind turbines (approx. 300 m^3 of concrete), access roads (for trucks), and dispatch station. Duration: August 2012-March 2013. Contract supervision by ERGAL and Environmental Monitoring by Elecgalapagos. Jose Pilegi built the civil works of the sub-transmission line. Contract: approx. M US $ 1.4 (final cost for rock excavation through a complementary contract and change of grounding meshes, designed by Elecgalapagos and UNISON). CFN (National Financial Corporation) made the payments. *The final acceptance certificate was NOT signed by the audit in the report, due to omission. It would have been desirable and recommended that the audit had been hired by Elecgalapagos.* **15. UNISON** Bryan Park has been the project manager. Now it is Carlos Lee. UNISON became interested in the project in 2009 and won the tender in 2010.

	After completion of the bidding process, there have been delays in the execution. In July 2012, they were waiting from the Trust the start date of the project. Installation began in October 2012 and completed in July 12, 2013. The delay has produced many overcosts. According to Mr. Park, the delay was due to the construction of the sub-transmission line in Baltra. Prompt and timely execution of this line should have been provided. Then in 2013 there were difficulties with customs taxes for the imported equipment. According to Ecuadorian regulations, renewable energy products are free of taxes. They had to pay them and then receive them from the Trust. This meant loss of time and costs. As expressed by the Trust, Elecgalapagos is in the process of completing all pending work on September 1, 2014 and tests will be made until September15. The commissioning is expected from September 15, 2014. UNISON will arrive at Galapagos on September17. According to the Commissioning schedule, its tasks will end on October 15. According to UNISON, ERGAL supported them a lot for this project. Final decisions are made by the Trust and not by ERGAL, and this has caused delays.
05/09	**16. Parrish Board of Floreana** Interview to the Chairman of the Parrish Board. In Floreana, he supported the topic of RE, especially the dual fuel diesel/jatropha diesel generators and improving of the recently repowered PV system. ERGAL has been very visible regarding RE projects. Its work is considered very good. The initial system of 22.5 kWp (funded mainly by the Spanish Cooperation and installed by the company TRAMA) collapsed in 2009 and was recently repowered. The population had a pent-up demand. From 2005-2010 tourism activity increased in Floreana and that pace invigorated the economy. Hotels went from 2 to 10, with a tourist load of 60 rooms /day, increased equipment and the population has grown to 150 inhabitants In 2010, two dual fuel diesel generators (diesel / jatropha) and induction cookers were installed in homes Floreana should have had greater detail in the design of the diesel / jatropha diesel generators. Initially the load included a desalination plant. As the plant was not installed, the load was replaced by a bank of resistors. **17. Former ERGAL official** He was linked to ERGAL from August 2004 to July 2011. The meeting was held by teleconference and only general issues were addressed. The minister who promoted the policy of Zero Fossil Fuels on the Galapagos was Alberto Acosta supported by Arturo Villavicencio, ERGAL Coordinator. Acosta gave political support with the backing of the President. Mr. Villavicencio left ERGAL later. The project was subsequently subject to political whims. UNDP was isolated and provided limited support to the project. **18. UNDP** Meeting to gather the results of the interviews and adjustments to plan the evaluator trip to Galapagos.

08/09	**19. Mayor, Municipality of Santa Cruz** The meeting was attended by the Director of Institutional Management (since 2005 in various positions. Tel. 099 9695064, danielproanob@gmail.com). The Governing Council of Galapagos is composed of the Ministries of Environment, Tourism, SENPLADES, three mayors and a representative of parish boards (one of three). It is chaired by the Minister Maria Isabel Salvador, President's Delegate. *ERGAL has been positive for the development of RE on the islands*. There existed a false premise that the Zero Fossil Fuel Initiative pertained to ERGAL project and the electricity sector. ERGAL did not produce a systematic evaluation of RE systems which should now be evaluated consistent with current developments on the island. In 2007, the declaration of Galapagos at Risk was issued (on the list of UNESCO Heritage Sites in Danger). One of the 7 components in this declaration is the dependence on fossil fuels, low governance and overpopulation. There are several cases that show a lack of interaction between ERGAL with communities and a lack of project follow up. The following three examples show how was the interaction between local government and ERGAL. *1st case. Project Floreana* For this project, in the context of the "Zero Fossil Fuel Initiative" three workshops were held to formulate the baseline. The RE project was understood by the population as increased supply of energy and thus bought more equipment such as refrigerators. Since a PV System was out of service, ERGAL thought of repowering it. Due to the scarcity of water, a desalination plant was also envisioned. So when thinking of hybridizing the system, diesel plants were considered with the load of the desalination plant. The desalination plant project was suspended by the MIDUBI (Ministry of Urban Development and Housing). ERGAL was not aware of that decision and went ahead with the project. ERGAL entered the region, then worked in isolation and continued with the analysis, and returned with the solution, without taking into account local developments. This is a planning mistake. Faced with excess diesel capacity in Floreana, the desalination plant is again being considered. There was a lack of coordination and interaction with local authorities. It was said that technical decisions were at the whim of politicians. *2nd case. Santa Cruz.* A PV system was going to be installed on the Airport ceiling (cooperation with Korean government). ERGAL requested a meeting with local actors. Subsequently the airport operator (AMERICA CORPORATION) decided not to do the project. ERGAL did not know this decision and this resulted in problems with cooperation. *3rd case.* Interpretation Centre of Renewable Energy (KOICA) KOICA started without environmental impact assessment and approval of local institutions. Three months ago the municipality approved the building permit. This abnormal behavior was tolerated because it is a national strategy. Renewable energy should be a new paradigm in Galapagos

	Energy efficiency There is nothing concrete in ERGAL work on the subject. On this issue, there is only the issue of savings. The question is: Who should be the actors to achieve results? A current proposal is the lighting of public roads with LEDs. The municipality finds this technology expensive in terms of investment and is still not clear about the benefits of the investment. Efficiency must be achieved because there are heavy subsidies at all energy levels. *Positive aspects of Ergal* ERGAL has made renewable energy part of the discussion of energy policy planning and the issue is now part of the local development model. The Zero Fossil Fuels Initiative is already a national policy. There is much reflection on how the RE and energy efficiency will change the development model and the energy matrix of the islands. The issue of tourism must also be reconsidered. Galapagos had a leading role in the country with the issue of renewable energies with the San Cristobal Wind project. The Galapagos brand is very positive for the territory and therefore the use of RE in the islands is a very positive factor for the brand. **20. Director of Environmental Management, Galapagos National Park** The relationship with ERGAL was related to environmental licenses and EMPs of the two projects in Baltra. The delay in the sub-transmission line was due to soil quality mainly because of its hardness. The MAE granted the environmental license 224 of July 24, 2009 for the wind farm Baltra and the license 223 for the transmission line on the same date. The licenses have been transferred to Elecgalapagos. In 2012, an environmental audit was carried out and the EMP was updated. The Environmental Audit and EMP update was reviewed and approved by the director. A concession of 30 hectares for the wind farm was given. *ERGAL is one of the projects with best compliance of the EMPs. And if some aspect was not included in EMP, approval for it was sought.* The photovoltaic park in Puerto Ayora is outside the protected area and was regulated by CONELEC. **21. FUNDAR Galapagos** FUNDAR Galapagos is an NGO operating since 2003 in the field of energy efficiency and renewable energy. It conducted an Energy Efficiency Strategy promotional campaign in 2011 for ERGAL (radio and TV spots). There were no more projects with ERGAL.
09/09	**22. Renewable Energy Engineer, Elecgalapagos** There was no previous plan or entity for management and energy planning in the Galapagos Islands. Generation equipment comes from the east of the country. The energy demand growth rate of the islands is between 7 and 11% annually. The Japanese project of Baltra is the result ERGAL work. There are CDM funds by Mitsubishi from the Japanese government for the wind project.

	The Engineer of Elecgalapagos guided the evaluator to visit the Baltra Wind Farm, the transmission line and the Puerto Ayora PV Park. **23. Airport Chief, Civil Aviation** The Direction is interested in the project given the possibility for them to use renewable energy. Their interaction was mainly with Elecgalapagos rather than ERGAL. **24. Parrish Board of Sta. Rosa** No interview was performed. **25. Chairman of the Parrish Board of Bella vista** Recently named. He has had no connection with ERGAL.
10/09	**26. Technical Secretary, Galapagos / San Cristobal Governing Council** The Council was created by the constitutional reform of 2008 (Art 258) and is the fusion between INGALA and the Provincial Council of Galapagos. It is the coordinating, planning and control body (in charge of immigration and vehicular control). For transportation, the ideal would be to have electric buses. Already there have been studies of routes, traffic, etc. But there is still nothing concrete. On March 24, 2014 the Council was invited to the ERGAL closing meeting. There was presentation of: • 2013Work Report • 2013 budget execution • Summary of project achievements Regarding ERGAL there were difficulties such as: • Energy efficiency was not reflected by the community. • Lack of monitoring of projects • Socialization of the project results • The Logical Framework was adjusted two times for political reasons • Generation was successful but the distribution has failed. • More diffusion between institutions was needed • There were interaction problems between authorities and ERGAL (no specifics were given) ERGAL encouraged the use of RE in Galapagos and facilitated the acquisition of know-how in the use of the RE. **27. Mayor, Municipality of San Cristobal** He has had no connection with ERGAL. He considers that renewable energies are beneficial to the islands, particularly the EOLICSA Park in San Cristobal.
11/09	**28. Executive Chairman, Elecgalapagos.** Asked about the work of ERGAL, the Executive Chairman explained: • ERGAL managed very well the Environmental Licenses and was very demanding. It has created a culture in environmental management that has been appropriated by Elecgalapagos.

	• ERGAL gave all technical and environmental support in the Baltra wind farm and Transmission Line. • ERGAL lacked socialization to improve the linkages of local actors and the Ministry, Municipal Government and Galapagos Park. Socialization and teamwork with those institutions was lacking. • Generally, from the start of ERGAL, coordination and later political work with local authorities was missing. • There are still projects to conclude (Baltra wind farm and the interconnection line). ERGAL obtained environmental permits for both projects. • Regarding Floreana, the jatropha Project is closing from the financial point of view • ERGAL has made a significant contribution to the development of RE in the Islands. The President recognizes with the evaluator the need for a Master Plan for the development of the Islands. There has already been a meeting (coordinated by the Ministry and the Governing Council).
12/09	**29. Former ERGAL Coordinator** The meeting was not performed due to unavailability of the former coordinator. **30. Debriefing with Resident Representative and Deputy Resident Representative, UNDP.** The local UNDP responsible for ERGAL also attended the meeting. The main point of the meeting was the recommendation by the evaluator, discussed with the Governing Council of Galapagos, for a Land Use Plan of the Islands. The Council informed the evaluator of the existence of a preliminary plan that would be given to him. A plan of this nature sets trends for the demands of energy, water and other public services. The reason for the plan arises because the demand for electricity has been increasing considerably and obviously there is a need to rethink the role of renewable energy in this scenario. Furthermore the evaluator reported on project achievements. The first issue is that the Baltra wind farm and the sub-transmission line were not completed and therefore not operational, six months after the project had been closed. The San Cristobal wind park by e7 is operational and wind energy has a high penetration factor, as expected in the PRODOC. Difficulties in coordinating activities between ERGAL and other government agencies in the Islands were found. The energy efficiency actions were found very limited. **31. Debriefing with the Reference Group** Elecgalapagos President did not attend the meeting. A Ppt presentation was made.

7.5 VISITS TO WIND AND SOLAR FARMS IN GALAPAGOS, AND EQUIPMENT FOR RENEWABLE ENERGY AND EFFICIENCY FOUND

Visits to Baltra wind farm, Baltra-Santa Cruz sub-transmission line and the photovoltaic park in Puerto Ayora were performed under the guidance of Elecgalapagos Eng. Victor Velez on 09/09/2014.

7.5.1 Wind farm and sub-transmission line Baltra-Santa Cruz

Figure 7-1 shows images of the transmission line and the wind farm. The visit was explanatory and demonstrate the existence of equipment. Very general park information was received (capacity, technology, tower height, etc.) and also regarding the line as voltage level, line length, and aerial, underground and underwater lengths. Neither project was operational.

7.5.2 Photovoltaic Park Puerto Ayora - Santa Cruz

Figure 7-2 shows images of the solar farm. The visit was explanatory and demonstrate the existence of equipment. Very general park information was received (capacity, technology, etc.). The park is operating since June 2014.

7.5.3 San Cristobal Wind Farm

Figure 7-3shows images of the control room of the park. EOLICSA was created as a corporation. On 2016 it will be transferred to Elecgalapagos. The funds for the project come from a grant by e7, the national government with M US $ 3 and the municipality with US $ 500,000.
The park became operational on October 1, 2007. Its main features are:

- 2400 kW Capacity, 3 x 800 kW, MADE (now Games)
- Cost M US $ 10, at $ 4,000 per kW.
- Leroy Sommer Inductive Generator
- 12 km transmission line, output 13.8 kV, input 13.2 kV
- Winenerg Gearbox
- Pitch control, variable pitch.
- Availability 95%
- Capacity Factor (CF) in good months reaches almost 50%. CF is 18% annually.

When the project began in 2007 (for 2 months) there were failures and difficulties of integration for coupling the turbines to the island diesel system. In 2007 a power outage occurred when energy came back, due to overvoltage in machine 3, and it was necessary to check the machine. It was about 3 months out of service during the period of greatest wind. The damage was caused in a current transformer. The card would send a false signal.

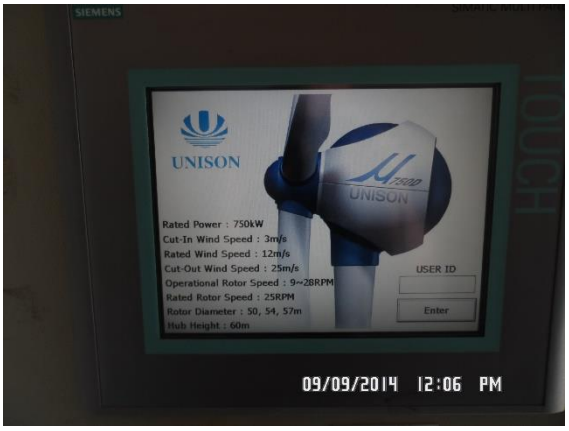
Annual maintenance. Each year external cleaning is performed by 3 experts seeking points of rust
Parts. There are no gearbox, blades or generator spare parts. There are spare parts for rest of the items.
Excess energy. A central hydraulic energy storage has been considered.

Figure 7-1. Baltra Wind Farm and Baltra - Santa Cruz Sub-transmission Line

Lying sub-transmission line

Sub-transmission line

Baltra Wind Farm



Switchgear

Switchgear

Figure 7-2. Santa Cruz Photovoltaic Park

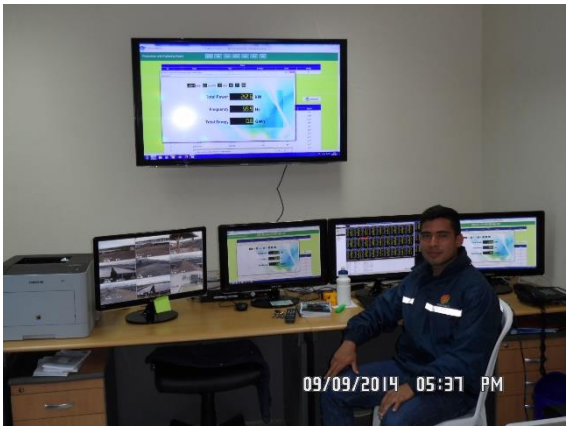
Performace board

Overview of the solar modules field

Module Features

Mounting Detail

Control Room

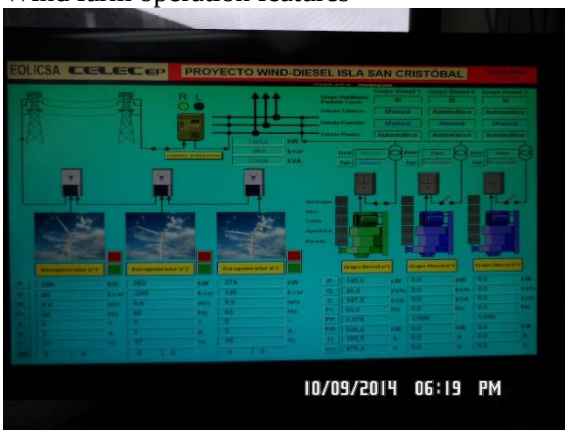


Equipment and switchgear room

Figure 7-3. San Cristobal Wind Farm

Turbine operation features

Wind farm operation features



7.5.4 Other renewable and efficient equipment

During the week of September 7 to 10, 2014, the evaluator found in Santa Cruz some renewable energy equipment in use like solar heaters, photovoltaic systems operating in grid isolated generation scheme, some efficient air conditioners, widespread use of Compact Fluorescent Lamps (CFL) and two efficient equipment types being promoted by Elecgalapagos such as induction cooktops and low power consumption Category A refrigerators.

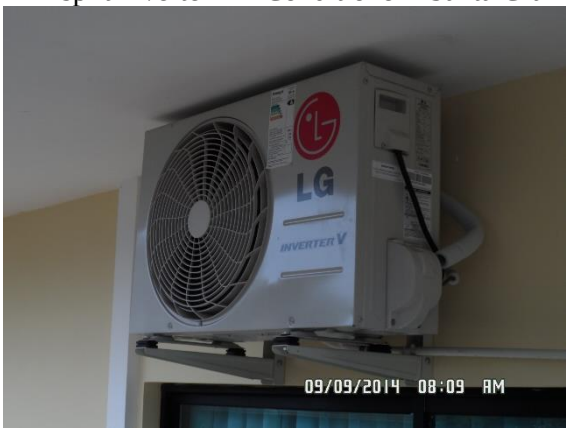
Of all the equipment, the only massively employed are CFLs.

Renewable energy and energy efficient equipment

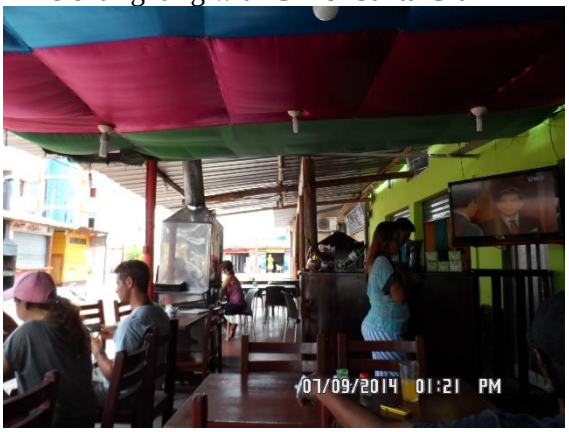
Solar water heaters - Santa Cruz

Photovoltaic system - Santa Cruz

Minisplit inverter Air Conditioner - Santa Cruz

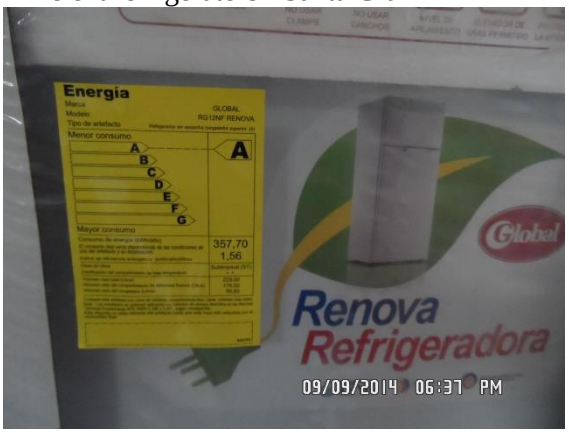


Efficient lighting with CFLs- Santa Cruz



Electric induction cooktop - San Cristobal

Efficient refrigerators - Santa Cruz



7.6 LIST OF DOCUMENTS REVIEWED

The following is a list of documents used in this Terminal Evaluation.

o CIERRE-PDFC	
Informe de cierre PDFC (Esta es una fase inicial del proyecto)	
o POAs	
	Plan Operativo Anual 2009 vs final
	POA 2010 vs Final
	POA 2011
	POA 2012
	POA 2013
o PRIMER ENVIO 12-02-014 (Esta fue la información que se envió en la fecha indi	
	EVALUACION MEDIO TERMINO
	INFORMES DE GESTION ANUALES
	PIRs
	PRODOC – MARCO – LOGICO
· Carpeta SEGUNDO ENVIO	
o AUDITORIA AMBIENTAL Y PMA	
	PARQUE EOLICO
	SISTEMA DE INTERCONEXIÓN
o COMITÉ DIRETIVO-CONSULTIVO-TRIPARTITO	
	Acta Comité Directivo 11-07-2012.pdf - Acceso directo
	Acta Comité Directivo 18-10-2012.pdf - Acceso directo
	Acta Comite Directivo 29-11-2012.pdf - Acceso directo
	Acta Comité Directivo 23-09-2013 GLPS.pdf - Acceso directo
	Acta Comite Tripartito 29-11-2012.pdf - Acceso directo
	CD-12 de marzo de 2009 Ayuda Memoria
	CD-4 de octubre de 2010 acta
	CD-22 de abril de 2010 – acta
	CD-29 agosto de 2011 acta
	CD-A- 22 de noviembre de 2011
	CD-A-28 enero de 2011 acta
	Copia de Listado Comites Consultivos Directivos
	Reglamento de Comité Directivo Proyecto ERGAL firmado
TRIP-23 de abril de 2010 acta	
o CONTRATO PARQUE EOLICO	
	Contrato UNISON Puesta en marcha
o FIDEICOMISO	
	15-11-2007 Constitución del Fideicomiso Mercantil
	Reforma Fideicomiso-2010
	Reforma-Fideicomiso-2009
	reforma-Fideicomiso-2011
o INCEPTION REPORT	
	Inception Report ingre. foms
	o Informe audit 2009
o PERFIL SENPLADES	
	Perfil 2012

7.7 REVIEWS

This section aims to present comments to the draft report by the SEREE, UNDP- Ecuador and the UNDP-GEF Regional Technical Advisor. The report was submitted for review on December 8, 2014.

This section displays all comments received and referred to in draft version 2.0. Response and / or action taken is given. The grammatical corrections and drafting suggestions were made directly in the text. --

7.7.1 Comments from MEER

Comments on the report were received on December 17, 2014. On January 15, 2015 a discussion was held with Eng. Luis Manzano MEER to clarify aspects of MEER comments.

Comment. Page 2-7
"Previously there was talk of 5 islands"

Answer: Indeed the PRODOC of ERGAL considers four inhabited islands. HR mistakenly included Baltra, next to San Cristobal, where the wind farm was installed.
Action: Corrected to four on page 2-7, Section 2.5.

Comment. Page 2-7
"In terms of overall profits, the repowering of the four power generation systems presented in the proposal would result in a net reduction in greenhouse gas (GHG) emissions of 10,500 tons of CO_2 per year, i.e. about 201,600 tons during the 20 year life of the projects."

Comment: "Specify the method used to obtain these avoided emissions"

Answer. The calculation method is included in Section 3.4.1.1. In the PRODOC there was a reduction figure of 10,500 tCO_2 / year and an estimated 201,600 tCO_2 over 20 years, approximate useful life of the project in terms of emission reduction. These figures are taken from PRODOC paragraph 38, page 13. The source of those figures are given in the report.

Comment. Page 2-8
"For the 20 year of useful life of the equipment installed, the Unit Cost of Reducing Emissions from GEF contribution is approximately US $ 20 per tonne of CO_2".

Comment: "Explain the method of calculation".

Answer: Since the ERGAL project had a GEF contribution of approximately $ 4 million, then the cost of avoided tCO_2 is for the GEF of US $ 20 / tCO_2. See PRODOC paragraph 108, page 29.

Comment. Page 2-8
"If replicating the success of the Galapagos project in other non-electrified remote areas of Ecuador were possible, it would have a multiplier effect, starting with an increase of approximately 50% reduction of emissions and reaching 300%, 10 years after project completion."

Comment: " This is so, based on what?"

Answer. This note is taken from PRODOC paragraph 38, page 13

Comment. Page 2-10
"Note: Under the PDF-C, a pilot program was initiated to increase the efficiency of lighting systems in homes and small businesses. There is current work for the design of a wider program on demand management and rational use of energy in four islands, but not as part of ERGAL project. "

Comment: "Which program? Please explain. "

Answer. This note is taken from PRODOC paragraph 65, page 20. The evaluator does not have the PDF-C report and mentions the text of the PRODOC.

Comment. Page 2-11
"51 million ??"

Answer. It is a typographical error. The figure written is "US $ 1,182,000 (26.7%). This was corrected.

Comment. Page 2-20
"Please change the name of millions with the symbol (') and thousands with (.) and decimal with (,)"

Answer. The Spanish version will use thousands with (.) and decimal with (,). The English translation will use thousands with (,) and decimals with (.).

Comment. Page 2-21
"However, this project seeks to achieve financial sustainability given that the investment costs will be borne by the central government and other stakeholders, so that the revenue generated by the sale of energy should achieve project financial sustainability ".

Comment: "This is not applicable because at the end of the day Elecgalapagos sells power to the users of the islands".

"With the proceeds of electricity (electricity sales less operating costs) the creation of a fund to provide financial resources for (i) maintenance and ..."

Comment: "This is not applicable"

"It is expected that revenues from solar PV projects in Isabela and Santa Cruz become part of this fund."
Comment: "There is no extra income, except for the savings on fuel purchases, with photovoltaic and wind projects."

Answer. The source of this section is PRODOC, Section Sustainability, paragraphs 86-90, pages 24 and 25. This section considers the mechanism to ensure sustainability of the project which according to the commentary of MEER is not applicable.

Comment. Page 3-3
The evaluation of the Project Concept states:
"As it is unlikely that the project activities are implemented without the support of UNDP and GEF, it is considered that the project is largely incremental".

Comment: "Why is this assertion made ??".

Answer. This statement comes from the PRODOC developed before 2006, when it was considered that the project activities would not be implemented without the support of UNDP and GEF, valid statement at the time and that justified the GEF contribution to the project.

Comment. Page 3-4
"The result is that the penetration of ERs in the islands increased from 0.06% (for photovoltaic generation in Floreana) in 2006 to 10.55% in 2010, as a result of the commissioning of the EOLICSA wind farm in San Cristobal in late 2007, then decreased to 9% in 2013 mainly due to the increase in demand (Table 3-8) ".

Comment: "This RE percentage was obtained from which projects ??".

Answer. Increased participation of RE in 2010 was due to EOLICSA park.

Comment. Page 3-7
"• The goals of product 3.1 (for Floreana) were formulated explicitly as: 1) Hybrid System repowered and operating without any technical or administrative problem, 2) To date, 2014, penetration of renewable energy of 80%. 3) Rehabilitation of the PV system in 2013 and 4) Operation of 138 kW from biofuels in 2011″.

Comment: "Check these dates".

Answer. The first date is 2004 according to modifications to the PRODOC and others are correct.

Comment. Page 3-12
"As it relates to the achievements, it was considered that the progress of energy efficiency program to be performed by the MEER and ERGAL was still very limited."

Comment: "Based on what criteria was this comment made ?? Furthermore, what actions the Evaluator recommends should have been done ?? "

Answer. The Midterm evaluator states that "The replacement of 100% of incandescent bulbs in the archipelago by saving bulbs is an action already implemented that directly contributes to the reduction of electricity consumption in the region. He concludes: "Advances in this output are still limited."

The report of the ME was prepared in October 2010. The Galapagos Energy Master Plan was published by the MEER in June 2010. The Galapagos Energy Efficiency Program has actions for 2011 and 2012 so the evaluator concluded that advances are limited.
Curbelo, A. Midterm Evaluation - ERGAL Project (October, 2010) Quito. Page 9 and 70.

Comment. Page 3-12
".... Execution of Hybrid Power Generation System in Baltra Island including the layout of a Baltra - Puerto Ayora sub-transmission line ".

Comment: "Could you please explain how this system was initially conceived??"

Answer. The evaluator has NOT found an official report with this information.

Comment. Page 3-13
"... The co-financing of non-governmental actors were executed directly by them with adequate information to MEER".

Comment: "What other governmental actors were there besides the UNDP? Could these contributions be mentioned? ".

Answer. See the source of the table in section 3.3.3.2, prepared with the information of section 3.4.1.5

Comment. Page 3-13
"This shows the great capacity that ERGAL has had to attract funding for the project, mainly foreign government agencies (US $ 33,237,150 from e7, KOICA, JICS -Japan International Cooperation System- and KfW)".

Comment: "KOICA and KfW were not managed by ERGAL"

Answer: Since there has also been direct participation by MEER in the gathering of resources it is considered that success in raising funds is due to the importance of renewable projects in Galapagos.
The paragraph has been written as follows:
This shows the great ability MEER and ERGAL have had to attract funding for the project...

Comment. Page 3-14
"Who are the other contributors??"

Answer. Table 3.3 has been prepared with the information of section 3.4.1.5

Comment. Page 3-17
"In Isabela there has not been renewable generation!!
Answer: According to the information by Elecgalapagos, there has not.

Comment. Page 3-23
¨Please indicate the method of calculation for these values and a model exercise"

Answer. The calculation methodology was inserted into the text.
Example:
A diesel plant generates 1,000 kWh / year with a yield of 10 kWh / gal. If the plant is replaced by a renewable energy plant with the same annual generation, then:
EmEv (tCO_2/year) = EGR (kWh/year)*(1 / Performance (kWh/gal diesel))* CED (tCO_2/gal diesel).
EmEv (tCO_2/year) = 1000 (kWh/year)*(1 / 10 (kWh/gal diesel))* 0.01008 (tCO_2/gal diesel).
EmEv (tCO_2/year) = 100 (gal diesel/year))* 0.01008 (tCO_2/gal diesel)
EmEv (tCO_2/year) = 1.008 (tCO_2/year) = ap. 1 tCO_2/year)

Comment. Page 3-24
"The capacity of the photovoltaic plant is 1500 kWp. Please explain".

Answer. That is right: 1500 kWp. The capacity of the auxiliary photovoltaic plant adjacent to the park and other systems in the rural sector reported by Elecgalapagos had been included.

Comment. Page 3-24
¨Please inform where the project is located”

Answer. There are isolated PV systems with a total power of 7.5 kW. Reported in DETAIL OF PLANTS WITH GENERATING UNITS SEPTEMBER 2014.XLS. Elecgalapagos.

Comment. Page 3-25
"Please support this value better."

Answer. US $ 3.5 / gal, as given by Elecgalapagos will be used.

Comment. Page 3-41
"Due to environmental constraints on the island of Santa Cruz for the development of a wind farm ...."

Comment: "it is not only due to this factor, but to the wind potential of Baltra".

Answer. That's right. For the selection of Baltra its wind potential was considered also favorable. The text is corrected appropriately.

Comment. Page 3-42
"I'm not sure, I THINK THAT THE THIRD PHASE WAS OF 12 MW. Please check ".

Answer. What is written is correct. In the second and third phase a total of 6.4 and 32 MW, will be reached respectively.

Comment. Page 3-42
"The development costs of the park also have risen considerably from an estimated M US $ 14 in 2009 to about M US $ 25 in 2014."

Comment: "There were high because the cost of the line should be considered".

Answer. It is specified in the text as follows:
Development costs of the park have also risen considerably because it was necessary to build an extensive sub-transmission line having passed from an estimated M US $ 14 in 2009 to about M US $ 25 in 2014.

Executive Summary comments received on January 26, 2015 and clarified in a conversation with Eng. Luis Manzano from MEER on January 28, 2015.

Comment. Page 0-9

Comment: "20.5 kWp"

Action: It was corrected to 20.5 kWp that is the figure declared by Elecgalapagos.

Comment. Page 0-9

"The Baltra wind farm (3 x 750 MW) in December 2014 had a delay of more than four years," ...

Comment: "This really is not so. In January of 2013, the execution of civil works of the interconnection line is starting. This exaggerated delay cannot be included in the report. "

Answer. Table 3-30 presents project milestones. The contract for the supply of wind turbines was signed on July 21, 2010, on May 11, 2011 Transelectric was selected as responsible for the execution of the interconnection, on October 22, 2012 works by the consortium Jaramillo - Ventimiglia started, in August 2013 the wind turbines are installed, and on October 13 the works of the transmission line started.

Action: Four years is corrected by several years.

Comment. Page 0-10

- The evaluator considers the execution of Output 5 as Marginally Unsatisfactory (SU).

Comment: "In disagreement, the project was consolidated in Galápagos, being a landmark for other projects which are not of this nature yet acquired its good practices".

Answer: In determining the rating for Outcome 5, it is necessary to consider the remaining targets and indicators, and not only the issue of whether it served as a guide to other projects, of which two were identified.

Action: The rating stays the same.

Comment. Page 0-12

"As regards the resources used, it is noteworthy that the total cost of the project will reach M US $ 73.5 in 2017, of which 96.4% are investment resources (M US $ 70.9). Of the total resources, 48.2% (M US $ 35.5) are resources of the Ecuadorian government, indicating the high degree of involvement and commitment to renewable energy projects in the Galapagos Islands. For the management of resources the Fidergal fund was established. In addition, resources from other donors were provided (donor agencies) for M US $ 33.2 (45.2%) ".

Comment: "Check with what was mentioned in point 1"dealing with total project value.

Answer: In the aforementioned point 1, the evaluator mentions the initial budget and here it deals with total project budget at the end of it.

Comment. Page 0-12

"Given that the GEF has donated $ 4.1 MUS, the leverage factor of resources has resulted in 16.6, twice the estimate at the beginning of the project 7.5. This shows great efficiency by MEER and ERGAL in mobilizing resources because Galapagos is the focus for both foreign agencies and the Government of

Ecuador, thereby demonstrating the Government commitment to strengthening renewable energy generation in Galapagos.

Comment: "According to this paragraph why are there some Marginally Satisfactory evaluations??"

Answer: There is no doubt about the efficiency in achieving funds. Marginally Satisfactory means "There were moderate deficiencies".

Comment. Page 0-14
"The second barrier, "Lack of knowledge about the operation and maintenance of power systems based on renewable energy and hybrid systems (renewable / conventional), for the same reasons above, is considered *partially removed*. These two barriers will be removed in 2017 when all systems are in operation.

Comment: "Not true. Today renewable energy systems installed are being operated and maintained. "

Answer: The project has a variety of hybrid systems technologies. Knowledge about the operation and maintenance is achieved when very good training is given by the developers of projects and there is experience in their operation for a reasonable time, a year or more. Floreana operates for several years. The Puerto Ayora PV for 6 months. The Baltra wind farm is under commissioning. Other PV systems with battery banks in Baltra and Isabela are not installed, neither is the Isabela hybrid system. Therefore, there is still operational experience to be gained.

Action: The view is maintained.

Comment. Page 0-14
"The fourth barrier," No experience with power purchase agreements or with independent power electricity generation"

Comment: "This model does not apply in Galapagos

"And the fifth barrier," Lack of experience in investments and joint ventures between utilities and the private sector to finance projects "these were not removed because validity had ceased."

Comment: Not applicable in Ecuador

Answer: Precisely for this reason these barriers are not removed because validity of this option ceased.

Comment: "According to this paragraph, why are there are negative reviews??"

Comment. Page 0-16

- Lessons Learned, "The operation of renewable energy systems in the midst of fragile ecosystems is feasible."

Answer: Floreana and San Cristobal wind farm have been in operation for several years which demonstrates that the operation is feasible. But within the project there are deficiencies identified.

7.7.2 Comments from UNDP-Ecuador

Comments received on December 22, 2014.

Comment
"I confirm the comments made by MEER, by the Regional Advisory and Assessment Center".
"... Recommendation to codify or enumerate each of the recommendations to facilitate the exercise of management responses by the Reference Group"

Answer: This section is precisely the answer to all comments.

Comments to the Executive Summary received on January 26, 2015

Comment. Page 0-5
Monitoring and evaluation

Comment: "Visits to project at least once a year as part of the role of UNDP."

Answer: It was added

- As part of the role of UNDP in the project, annual visits were made.

Comment. Page0-6
Comment: ME: "Any mention of management responses and the appropriate follow up from the PMU and main stakeholders."

Answer: included on page 0-11, result 7 achievements. The recommendations of the ME were considered by the PMU and PSC, and their implementation will receive appropriate follow-up.

7.7.3 Comments from UNDP-Panama Assessment Center

Comments received on December 17, 2014.

Comment.
"1. Description of the methodology. A more detailed description would be expected in the introduction given that there already are elements to tell the interviewees and what field visits were made, among others. The annexes are complete on this issue so I suggest to refer to them in the text. Also, I recommend including limitations that were identified for evaluation, including methodological limitations, and how these limitations were to overcome.

Answer: The limitations encountered and how these were overcome are written in the Introduction.

Comment.
"2. In this regard, following the considerations of confidentiality and anonymity of informants in the evaluation, I recommend that the summary of interviews section is removed or the organization of this section be amended so that any names of those interviewed are not identified.

Answer
Within the summary of the interviews, only the name of the institution interviewed was left.

Comment.
"3. A peculiarity of this evaluation explicitly requested by UNDP Ecuador (which is reflected in the TOR) was that it could produce a brief analysis of the project's contribution to the effect 304 of UNDP Country Programme (it could be included as an annex to the report for instance). Some points can be identified in the findings, but something more explicit on this subject is expected. It does not have to be an additional report, but it needs to reflect findings about the contribution of UNDP to " authorities and other agencies have been endowed with greater skills to formulate adaptation / mitigation responses against climate change and to develop renewable energy sources and promote energy efficiency ", i.e., to change behaviors, practices and / or institutional performance of the actors involved. Although stakeholders do not know the effect 304 and contribution of UNDP, it would be interesting to hear your perspective as an external evaluator on this point from information gathered. "

Response: This observation is taken into account in an Annex related to the effect 304.

Comment
"4. Separate the findings, Conclusions and Recommendations sections. There is a logical relationship between the three sections and for more clarity they would be have to be separated. Also, considering that the GEF expects later a Management Response based on the recommendations made, so I suggest that this division is made. "

Answer: This change has been introduced.

7.7.4 Comments from the UNDP-GEF Regional Technical Advisor

Received on December 19. On January 19, 2015 aspects of the comments were discussed with the Regional Technical Advisor

Comment
"I have reviewed the comments from MEER and the UNDP monitoring unit and agree with all of them, so I suggest that the next version will incorporate these suggestions and / or justify the initial position, depending on the case. For my part, I think the report is complete and properly reflects the strengths and weaknesses of ERGAL project. I am delighted that the final conclusion of the report clearly indicates that the project has made a significant contribution to renewable electrification of the Galapagos Islands".

Answer: All comments from MEER were reviewed (Section**Error! Reference source not found.**).

Comment
"Finally, I suggest to delve a little in the section of sustainability, particularly because the evaluation concludes that the result 2 has been Unsatisfactory (although it is mentioned that EEPG most likely operates well the systems). An important part of the project involves a transfer of technology to EEPG, however the evaluation concludes that institutional strengthening of this entity was not the best. What implications does that have for the sustainability of the project? What are the risks that such weakness of the project will have negative consequences on the sustainability of the systems? What can the MEER do to avoid these problems? "

Answer. Institutional strengthening of Elecgalapagos related to renewable technology transfer is linked to training on Operation and Maintenance (O & M) received by the company during the process of receiving renewable energy plants. In the process of the plants being put into operation, training is also being provided. Therefore, it is of utmost importance to ensure the sustainability of plants, to demand the best training of personnel in the delivery process of plants. The risk associated with this training is minimal to medium and depends on the quality of the training. This is a vital aspect to recommend to the MME and Elecgalapagos.

Regarding the availability of resources to ensure the costs of O & M, income received by the renewable generation or savings from fuel should be considered. In the PRODOC (paragraphs 86-90) it is proposed that a fund should help achieve financial sustainability using renewable energy sales but according to the MME this is "not applicable". Therefore it is recommended that MME finds the appropriate mechanism to ensure the financial sustainability of the O & M of renewable equipment.

Action taken: Included in recommendations.

Comment
"I appreciate the consideration of these issues as well as the other comments that have been provided to this evaluation. To facilitate further review, I suggest a table is made with comments by each participant and response (with reference to changes made, if applicable). Importantly, being an independent evaluation, the final decision on how to respond to each comment is for the evaluator to make (and the burden of justifying its decision). Finally, I remind you that once we agree a final version of the document, it must be translated into English for submission to the GEF. "

Answer.
This section contains all the comments and the answers given.

7.7.5 Approval Form

APPROVAL FORM TO BE COMPLETED BY THE UNDP-CO and UNDP-GEF RCU

Reviewed and approved by:

UNDP Country Office

Name: _____

Signature: _____ Date: _____

UNDP-GEF RCU

Name: _____

Signature: _____ Date: _____

LAST PAGE