1. Project Data

Summary project data			
GEF project ID		2537	
GEF Agency project ID		90058	
GEF Replenishment Phase		GEF-3	
Lead GEF Agency (include all for joint projects)		World Bank	
Project name		Renewable Energy Project	
Country/Countries		Armenia	
Region		ECA	
Focal area		Climate Change	
Operational Program or Strategic Priorities/Objectives		6- Promoting adoption of renewable energy by removing barriers	
Executing agencies involved		Ministry of Energy and Energy Resources	
NGOs/CBOs involvement		through consultation	
Private sector involvement		one of the beneficiaries	
CEO Endorsement (FSP) /Approval date (MSP)		2/27/2006	
Effectiveness date / project start		8/4/2006	
Expected date of project completion (at start)		12/31/2010	
Actual date of project completion		6/30/2011	
Project Financing			
		At Endorsement (US $M)	**At Completion (US $M)**
Project Preparation Grant	GEF funding	0.25	0.25
	Co-financing		
GEF Project Grant		3.00	2.77
Co-financing	IA/EA own		
	Government	0.45	0.42
	Other*	21.60	23.88
Total GEF funding		3.25	3.02
Total Co-financing		22.05	24.3
Total project funding (GEF grant(s) + co-financing)		25.30	27.32
Terminal evaluation/review information			
TE completion date		01/30/2012	
TE submission date			
Author of TE		Arthur Kochnakyan	
TER completion date		02/14/2014	
TER prepared by		Nelly Bourlion	
TER peer review by (if GEF EO review)		Joshua Schneck	

*Includes contributions mobilized for the project from other multilateral agencies, bilateral development, cooperation agencies, NGOs, the private sector, and beneficiaries.

2. Summary of Project Ratings

Criteria	Final PIR	IA Terminal Evaluation	IA Evaluation Office Review	GEF EO Review
Project Outcomes	S	S	S	S
Sustainability of Outcomes	N/A	L	L	L
M&E Design	N/A	N/A	S	S
M&E Implementation	N/A	N/A	S	S
Quality of Implementation	N/A	S	HS	HS
Quality of Execution	N/A	S	S	S
Quality of the Terminal Evaluation Report			S	S

3. Project Objectives

3.1 Global Environmental Objectives of the project:

The global environmental objective is to reduce greenhouse gas emissions by overcoming barriers to the development of renewable energy.

Armenia is a small landlocked country with limited energy resources to satisfy its needs. Armenia imports nearly all its energy, comprised of oil and oil products from Georgia, Iran, Russia, and Europe. According to the PD, Armenia is estimated to have significant renewable energy resources, including 740 MW of small hydropower, wind and geothermal resources, but these play a limited role in the country's energy supply. Hydropower and wind resources were estimated to be the most attractive. Over 250 MW of capacity could be added through small hydropower plants (SHPPs) that could be competitive with other forms of new generation. A wind resource assessment estimated the wind energy potential of Armenia at 470 MW with an estimated annual generation of 1360 GWh.

3.2 Development Objectives of the project:

The Project Development Objective is to increase privately owned and operated power generation utilizing renewable energy. The key performance indicators of the project are:

- Installed capacity (MW) of renewables added to the power grid;
- Renewable generation (GWh) added to the generation mix; and
- Carbon dioxide emission reductions.

The project has 2 components: assistance to remove barriers and support project implementation, and financing of investments. The first component involves improvement of legal and regulatory framework and capacity building for state agencies, facilitating investments in renewable sub-projects, mechanisms to leverage additional financing, and project implementation and monitoring. The second component enables private investors to access financing for the development of renewable energy projects. Based on comparative analysis of economic and financial viability of different types of renewable projects, it is expected that the financing would be mainly targeted at SHPPs on natural (run-of-the-river) and artificial (drinking water, irrigation pipes and canals) water flows and wind power projects.

3.3 Were there any **changes** in the Global Environmental Objectives, Development Objectives, or other activities during implementation?

The Global Environmental Objective, Project Development Objective and the key performance indicators were not revised. However two changes were recorded; (1) the reallocation of grant proceeds and (2) project closing date extension.

According to the TE, the grant proceeds were reallocated from "training" and "unallocated" categories of the project to "incremental operating costs." The reallocation was necessary because the R2E2 Fund exhausted the original allocation of funds for incremental operating costs due to significant depreciation of the US$/AMD exchange rate. In particular, the AMD depreciated by over 30 percent since project appraisal in December of 2005. Additionally, those funds were needed to cover the incremental operating costs of the 6-month project closing date extension.

Given that implementation of some activities under the GEF funded TA component was progressing slowly, the Government requested the Bank to extend the closing date of the project from December 31, 2010 until June 30, 2011. The Bank concurred with the Government's request and the proposed changes were approved by the Country Director in June 2010.

4. GEF EO assessment of Outcomes and Sustainability

Please refer to the GEF Terminal Evaluation Review Guidelines for detail on the criteria for ratings.

Relevance can receive either a Satisfactory or Unsatisfactory rating. For Effectiveness and Cost efficiency, a six point rating scale is used (Highly Satisfactory to Highly Unsatisfactory), or Unable to Assess. Sustainability ratings are assessed on a four-point scale: Likely=no or negligible risk; Moderately Likely=low risk; Moderately Unlikely=substantial risks; Unlikely=high risk. In assessing a Sustainability rating please note if, and to what degree, sustainability of project outcomes is threatened by financial, sociopolitical, institutional/governance, or environmental factors.

Please justify ratings in the space below each box.

4.1 **Relevance**	Rating: **Satisfactory**

The project is aligned with the strategic objectives of the Government as stipulated in the Poverty Reduction Strategy Paper (PRSP) adopted by the Government in October 2003. The PRSP emphasized the need for policy reforms in five key areas, including promotion of private sector development and improvement of public infrastructure. The PRSP also emphasized the importance of maintaining and strengthening energy independence by developing indigenous and alternative energy sources and promoting energy efficiency. The project is also consistent with the CAS objective of promoting private sector growth by strengthening the financial sector and reducing infrastructure bottlenecks. The project is well aligned with the Energy Sector Strategy (2006) and the National Program on Renewable Energy and Energy Efficiency (2007), which prioritize development of renewable energy as a means of improving the country's energy security and ensuring sustainable energy supply. Finally, the project objective is consistent with the current development priorities as reflected in the Country Partnership Strategy (CPS) with Armenia for FY

2009-2012. One of the key objectives of the current CPS is to strengthen the foundations for competitiveness through investments in new power generation capacity, including renewable energy based.

4.2 **Effectiveness**	Rating: **Satisfactory**

Overall, the effectiveness of the project is rated Satisfactory. According to the TE, the project exceeded all of the target outcome indicators, despite some delays with implementation of the Technical Assistance (TA) component given the Government delays in deciding which critical activities to finance.

The project made significant progress in meeting its objectives and exceeded all of the outcome indicators:

(1) 133 MW of renewable capacity was added to the power grid compared to the project target of 127 MW.
(2) 417 GWh of renewable generation was added to the generation mix compared to the project target of 336 GWh.
(3) Carbon dioxide emission reductions were 270,770 tCO_2 compared to the project target of 218,400 tCO_2.

The project also met the development objective through:

(1) Financing of investments in new SHPPs. The project increased the small renewable capacity, connected to the power grid, by providing financing for construction of new SHPPs. The demand for funds was strong given the lack of long-term financing for renewable projects and excessive collateral requirements as a result of high perceived risks by financial institutions. Cascade Credit CJSC (CC) provided sub-loans to project developers with maturity of 7-8 years and annual rate of 11 percent for US$ denominated sub-loans and 12.5 percent for AMD denominated sub-loans. The local financial institutions did not offer such loans except for those involved in the KfW financed project. In total, the project financed 26 SHPPs with a total cost of US$28.6 million. The total installed capacity of plants financed was 44.5 MW with total estimated annual generation of 159 GWh.
(2) Assistance to remove the barriers for development of renewable energy. The project supported scale-up of small renewable energy power plants in the country due to substantial contribution to:
    a. Improvement of regulatory environment for renewable energy. Specifically, the project supported preparation of legislative amendments to remove obstacles to development of renewable energy in the country.
    b. Development and adoption of technical standards for renewable energy and regulations for dispatching and load regulation of grid-connected renewable energy plants. Those enabled to ensure smooth absorption of new small renewable energy plants by the grid.

c. Support in removal of information barriers to investments in renewable energy. In particular, the project contributed to development of GIS of renewable energy resources in the country and an associated database, which were made publicly available. Additionally, the project supported the update of the SHPP Scheme, which provided critical information/data on potential SHPPs. The updated SHPP Scheme was made publicly available. Moreover, the R2E2 Fund prepared a detailed guide for investors/project developers with key legislation and regulations pertaining renewable energy sector.

4.3 **Efficiency**	Rating: **Satisfactory**

The efficiency of the project is rated Satisfactory.

According to the TE, the economic costs to achieve the project objectives were reasonable. The financing of provided funding for 26 SHPPs and demonstrated the financial and technical viability of such investments. The demonstration effect coupled with the Technical Assistance component, which contributed to improvement of the regulatory environment for renewable energy, facilitated leveraging of around US$56.4 million of investments in renewable energy. At completion, the project was estimated to have an NPV of US$71 million and an EIRR of 22 percent, compared to appraisal stage NPV of US$30 million and an EIRR of 17 percent. Improvement of the post-completion economic viability of the project is primarily due to higher actual total investments in SHPPs and, thus, larger economic benefits from displacement of more expensive and polluting gas-based thermal generation and related GHG emission reductions.

The post-completion financial analysis of the project realized by the TE was conducted for three types of demand-driven sub-projects financed under the financing of investments component of the project: (a) run-of-the-river SHPP, (b) SHPP on irrigation network and (c) SHPP on water supply network. The post-completion analysis showed that the project was financially sound despite a substantial increase in key factors affecting the financial viability of the project. At completion, the TE found that an average run-of-the-river SHPP was estimated to have an NPV of US$225,147 and an FIRR of 14 percent, compared to an appraisal stage NPV of US$400,000 and an FIRR of 21 percent. The deterioration of financial viability of run-of-the-river SHPPs was primarily due to an estimated 70 percent increase in nominal investment costs. At completion, an average SHPP on irrigation network was estimated to have an NPV of US$131,639 and an FIRR of 13 percent. At completion, an average SHPP on water supply network was estimated to have an NPV of US$97,794 and an FIRR of 13 percent. The appraisal stage NPV was estimated at US$155,297 and the FIRR at 15 percent. Deterioration of financial viability was due to an estimated 30-35 percent increase in nominal investment costs for SHPPs on artificial water flows and 2 percent lower that estimated plant factor.

4.4 **Sustainability**	Rating: **Likely**

The sustainability of this project is rated as Likely.

According to the TE, the regulatory environment for development of SHPPs has limited political interference. The feed-in tariff is automatically adjusted for changes in inflation and US$/AMD exchange rate to compensate the owners for changes in the local currency denominated costs of imported equipment and inflation. The SHPPs are run in a technically sound manner with adequate operation and a maintenance budget.

5. Processes and factors affecting attainment of project outcomes

5.1 Co-financing. To what extent was the reported co-financing essential to the achievement of GEF objectives? If there was a difference in the level of expected co-financing and actual co-financing, then what were the reasons for it? Did the extent of materialization of co-financing affect project's outcomes and/or sustainability? If so, in what ways and through what causal linkages?

According to the TE analysis, EBRD financing was part of a US$15 million Armenian Renewable Energy Project, with a US$5 million loan provided by the World Bank (administered by the R2E2 Fund) and US$3 million in equity provided by Cascade Credit CJSC (CC). EBRD and Cafesjian Family Foundation (CFF) provided funds to co-finance the "financing of investments" component of the project.

Implementation of the TA component of the project was coordinated with USAID, which provided some technical assistance to the private sector for appraisal of renewable energy projects and to the PSRC for improvement of the regulatory framework for renewable energy.

The success of SHPP sub-projects encouraged private sector investment and demonstrated the viability of renewable energy generation in Armenia. Additionally, CC acted as a bundling organization under the Clean Development Mechanism (CDM) framework in order to aggregate and monetize carbon credits, allowing Armenian developers to tap into the international emissions trading market. EBRD's Multilateral Carbon Credit Fund (MCCF) was to be the off-taker. Revenues generated from CDM were expected to provide additional incentive to attract private capital. All the necessary approvals (CDM registration, validation etc) were obtained by the ICF consultants, and the draft Agreement with MCFF was agreed with Cascade Bank and subsequently revitalized with Ameribank post-merger.

5.2 Project extensions and/or delays. If there were delays in project implementation and completion, then what were the reasons for it? Did the delay affect the project's outcomes and/or sustainability? If so, in what ways and through what causal linkages?

The TE states that the 6 month delay in implementation of the project was caused by slow decision-making by the Government on spending directions of TA funds in the final years of project implementation. Those delays resulted in US$230,000 of unspent GEF grant funds, which were cancelled at project closing. The delays were primarily due to absence of consensus within the Government on spending directions for the remaining TA funds. The Government initially planned to use those funds to finance preparation of a pilot solar PV project, technical and

economic/financial assessments for the Loriberd hydropower project, and a study on innovative financial mechanisms for financing of renewable energy projects. However, the Government found a private investor for the pilot solar PV project and decided to pursue construction of the Loriberd power plant as a private project. Moreover, the Government decided not to finance the study on innovative financial mechanisms given sufficient long-term financing available on the market for small renewable energy projects.

5.3 Country ownership. Assess the extent to which country ownership has affected project outcomes and sustainability? Describe the ways in which it affected outcomes and sustainability, highlighting the causal links:

According to the TE, the Government commitment to project objectives and ownership of the project were strong. Overall, the Government was committed to implement the activities under the project given its commitment to development of renewable energy as specified in the Energy Sector Strategy (2006) and the National Program on Renewable Energy and Energy Efficiency (2007).

6. Assessment of project's Monitoring and Evaluation system

Ratings are assessed on a six point scale: Highly Satisfactory=no shortcomings in this M&E component; Satisfactory=minor shortcomings in this M&E component; Moderately Satisfactory=moderate shortcomings in this M&E component; Moderately Unsatisfactory=significant shortcomings in this M&E component; Unsatisfactory=major shortcomings in this M&E component; Highly Unsatisfactory=there were no project M&E systems.

Please justify ratings in the space below each box.

6.1 **M&E Design at entry**	Rating: **Satisfactory**

The M&E design at Entry is Satisfactory. According to the PD, the Board of Trustees and the management of the Renewable Resources and Energy Efficiency Fund (R2E2 Fund) had the overall responsibility for monitoring of project outcomes. A management information system for Project monitoring and evaluation was to be developed by the R2E2 Fund. The CC would present periodic financial reports to the R2E2 Fund, and the Fund would present its own report quarterly and annually to the BOT and the Bank. The financial statements of the R2E2 Fund and CC were to be audited annually by an independent firm. Also, comprehensive evaluation of the project results would be undertaken during the project mid-term review. The lessons learnt from Project implementation and related monitoring results would be disseminated by the R2E2 Fund through a regional conference and through a documentary film.

Overall, the key outcome indicators for the project were well defined and relevant to the PDO and consistent with the project components. The baseline data for all outcome indicators was available at appraisal. The R2E2 Fund had overall responsibility for monitoring and evaluation of the project and developed a management information system meeting the project needs.

6.2 **M&E Implementation**	Rating: **Satisfactory**

M&E implementation is rated Satisfactory. The management information system created by R2E2, provided information and data on the pipeline of renewable energy sub-projects; types of sub-projects; disbursed, committed and invested amounts, cost-sharing with financing partners; repayment delays; and fund reflows. Based on that information system, the R2E2 Fund submitted regular and on-demand implementation progress reports to the Bank, which also contained the key outcome and intermediate results indicators. According to the TE, the data on key outcome indicators was reliable. The R2E2 Fund received most of it from the PSRC. Specifically, data on installed capacity of renewable generation added to the power grid and renewable energy generation added to the generation mix was provided by the PSRC – an independent multi-sectoral regulator with well-established data collection and reporting systems. Additionally, CC submitted to the R2E2 Fund quarterly reports on pipelines of projects, disbursements, repayments, etc.

7. Assessment of project implementation and execution

Quality of Implementation includes the quality of project design, as well as the quality of supervision and assistance provided by implementing agency(s) to execution agencies throughout project implementation. Quality of Execution covers the effectiveness of the executing agency(s) in performing its roles and responsibilities. In both instances, the focus is upon factors that are largely within the control of the respective implementing and executing agency(s). A six point rating scale is used (Highly Satisfactory to Highly Unsatisfactory), or Unable to Assess.

Please justify ratings in the space below each box.

7.1 **Quality of Project Implementation**	Rating: **Highly Satisfactory**

Quality of Project Implementation is rated as Highly Satisfactory.

According to the TE, the project design was sound. In particular, the project did not prescribe application of specific renewable energy technologies, but rather relied on a demand-driven approach. The project included substantial TA components aimed at creating enabling environment for renewable energy investments. The project was underpinned by sound economic and financial analysis. The fiduciary arrangements under the project were sound. The financial management assessment was detailed and identified the key FM risks and proposed adequate mitigation measures. The procurement arrangements reflected the project design and, according to the TE, were overall appropriate for a project of this nature.

The implementation arrangements of the project were well-elaborated and considered the lessons learned from other similar Bank projects. The monitoring and evaluation arrangements were adequate. The outcome indicators were clear and the numerical targets were easily measurable. The risk assessment was thorough and contributed to identification of appropriate mitigation measures.

The Bank team included specialists with required expertise to prepare the project. Several of the key staff members were based in the field, which allowed for cost-effective preparation of the project and provision of timely advice and guidance to the Borrower. Additionally, during project preparation, the team effectively relied on the expertise of Quality Enhancement Review panel members and peer reviewers.

The Bank team carried out 12 supervision missions during implementation of the project. The implementation issues encountered were flagged and appropriate actions undertaken to address them. The skill mix of supervision missions ensured that all the key issues arising were adequately handled and the Government received the needed advice and guidance. The project team proactively observed the situation on the ground to ensure that the project design remained relevant. During the project implementation, the task team composition did not change, which increased efficiency of support provided to the Government. During supervision, the task team closely coordinated with EBRD and CC to discuss issues and develop a unified approach in handling them.

The fiduciary and safeguards aspects of the project were adequately supervised. The financial management supervisions and procurement ex-post reviews were conducted as scheduled. The implementation issues were discussed with the Government counterparts in a constructive manner and appropriate action plans were developed and agreed with the Government.

7.2 **Quality of Project Execution**	Rating: **Satisfactory**

The execution of the project is rated satisfactory. The Government had a strong commitment to achievement of the PDO and GEO and its substantial supporting role during project preparation and execution. There was close coordination and dialogue between the Government counterparts and the Bank during execution of the project.

The R2E2 Fund performance was also Satisfactory. According to the TE, the R2E2 Fund was adequately staffed and professionally managed to execute the project. The key staff turn-over at the R2E2 Fund was small, which ensured seamless execution of the project. The R2E2 Fund effectively managed both the investment and TA components of the project. The R2E2 Fund provided guidance and support to the PFI, implementing the financing of investments component of the project. There have been no major issues associated with fiduciary aspects of the project. The R2E2 Fund had an environmental consultant to review the project-specific EIAs/EMPs for SHPPs and the R2E2 Fund engineers supervised construction and operation of SHPPs through random site visits. Overall, the

TE notes that there were no major short-comings in the performance of the R2E2 Fund during the project execution. The R2E2 Fund was adequately managed and efficiently handled most of the technical, fiduciary, legal and safeguards aspects of the project.

8. Lessons and recommendations

8.1 Briefly describe the key lessons, good practices, or approaches mentioned in the terminal evaluation report that could have application for other GEF projects.

The following lessons are reported in the TE:

(1) Market-driven development of renewable energy. The project did not prescribe financing of only one type of renewable energy technology. It rather specified the eligible types of market ready renewable energy technologies, considering capacity of the industry, cost-effectiveness and regulatory framework, and relied on demand-driven allocation of investment funds for specific sub-projects.
(2) Comprehensive TA is instrumental for sustainability and scaling up of project results. The TA component of the project focused on removing key policy/regulatory and information barriers and improving the capacity of relevant state agencies (PSRC, MENR) and the private sector in order to ensure sustainability of outcomes and contribute to replication through larger private sector investments in renewable energy.
(3) Well-designed financing mechanisms for renewable energy projects are important for scale-up of renewable energy investments. Introduction of project financing coupled with capacity building support to CC on project financing, technical, environmental and other aspects of renewable energy projects helped to introduce to the market a new lending product, thus, explicitly displaying the viability of commercial lending for renewable energy projects and eliminating unwarranted perceptions of risks associated with such projects.

8.2 Briefly describe the recommendations given in the terminal evaluation.

As mentioned in the part on project's sustainability, the following is recommended by the TE, as the project post-completion operations:

(1) Improved enforcement of compliance with minimum environmental flow requirements of rivers
(2) Adoption of remaining legislative amendments to promote development of renewable energy in the country
(3) Revision of tariffs.

In order to ensure sustainability of project results, the following key activities need to be implemented:

(1) The Government needs to improve enforcement of rules regulating minimum environmental flow of rivers. According to the TE, some rivers have low annual average flow rates and strong seasonal fluctuations of those rates. Therefore, the daily flows might be well below the water required to operate the SHPPs at full capacity. This creates strong

economic incentive for SHPP owners to utilize the technically possible maximum of river volume and not honor the minimum environmental flow regulations. Therefore, monitoring and enforcement of the minimum environmental flow requirements by the water authorities should be improved. Besides, the Government needs to expedite adoption of the revised methodology for calculation of the environmental flow of rivers and maximum allowed intake from surface waters since the existing methodology is not sufficiently clear and creates room for misinterpretations.

(2) The Government needs to adopt the legislative amendments to the Water Code and the Law on Environmental Impact Assessment as recommended by the Inter-Sectoral Committee established to pursue enactment of legislative changes proposed under the project to further improve the regulatory framework for renewable energy. Specifically, the Government needs to extend the validity period of water use permits from the current period of 3 years, which is short and creates regulatory risks for investors. Moreover, the review period allowed for the Ministry of Nature Protection for the reports on Environmental Impact Assessment should be reduced from the current maximum of 12 months, so not to hinder timely development of projects due to bureaucratic delays.

The project contributed to realization of economically and financially most attractive small hydropower potential. The SHPP projects with estimated high rates of return at current tariffs were mostly developed. The existing tariffs for SHPPs will start becoming increasingly unattractive for utilization of remaining small hydropower potential. Therefore, to inform the Government thinking on potential feed-in tariffs required to promote realization of remaining renewable energy potential, the project supported preparation of the Renewable Energy Roadmap. The Roadmap recommended targets for penetration of renewable energy, including SHPPs, and proposed policy instruments, including estimates of required feed-in tariffs, to achieve those targets. The Roadmap will help the Government to make informed decision on feed-in tariffs required for further utilization of small hydropower potential

9. Quality of the Terminal Evaluation Report

A six point rating scale is used for each sub-criteria and overall rating of the terminal evaluation report (Highly Satisfactory to Highly Unsatisfactory)

Criteria	GEF EO comments	Rating
To what extent does the report contain an assessment of relevant outcomes and impacts of the project and the achievement of the objectives?	The outcomes, impacts, achievements are well assessed. A lot of details are given and the actual results against the expected results are well described.	**HS**
To what extent is the report internally consistent, the evidence presented complete and convincing, and ratings well substantiated?	The report is consistent and evidence is given for all the achievements. Some evidence could be more detailed (e.g. quality of execution). Moreover, some ratings are missing (e.g. M&E design, and implementation)	**MS**
To what extent does the report properly assess project sustainability and/or project exit strategy?	The project sustainability is assessed but is not detailed enough. The exit strategy and the post completion operations are well described. However, there is no detailed analysis of the potential risks on the project	**MS**

	results.	
To what extent are the lessons learned supported by the evidence presented and are they comprehensive?	The lessons learned are supported by the evidence described in the report. However, there are very few recommendations.	**MS**
Does the report include the actual project costs (total and per activity) and actual co-financing used?	The report includes a detailed financial analysis in Annex. The actual costs vs. the expected costs are given, as well as the costs per component, and co-financing is also given.	**S**
Assess the quality of the report's evaluation of project M&E systems:	The M&E system is not rated. A quick analysis is realized, but there are not enough details and evidences.	**MS**
Overall TE Rating		**S**

TE Quality = (.3*(6+4)) + (.1*(4+4+5+4)) = 4.7 = S

10. Note any additional sources of information used in the preparation of the terminal evaluation report (excluding PIRs, TEs, and PADs).