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The World Bank

Report No: ICR00003835

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(TF-12163)

ON A

GRANT FROM THE GLOBAL ENVIRONMENT FACILITY TRUST FUND

IN THE AMOUNT OF US$1.82 MILLION

TO THE

REPUBLIC OF ARMENIA

FOR AN

ENERGY EFFICIENCY PROJECT

November 18, 2016

Energy and Extractives Global Practice
South Caucuses Country Department
Europe and Central Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective June 2016)

Currency Unit = Armenian Dram
1.00 AMD = US$ 0.002
US$ 1.00 = AMD 477.53

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

BOT	Board of Trustees
CFL	compact fluorescent lamp
CO_2	carbon dioxide
EBRD	European Bank of Reconstruction and Development
EE	energy efficiency
EMP	Environmental Management Plan
ESA	energy service agreement
GEF	Global Environment Facility
GEO	global environmental objective
HVEN	High Voltage Electric Network
IFI	international finance institutions
IFR	Interim Financial Report
IP	implementation progress
ISR	Implementation Status Report
kWh	kilowatt hour
LED	light emitting diode
MEINR	Ministry Energy Infrastructures and Natural Resources
MoF	Ministry of Finance
NCB	National Competitive Bidding
NEEAP	National Energy Efficiency Action Plan
NPV	net present value
OM	operations manual
PDO	project development objective
PSRC	Public Services Regulatory Commission
R2E2 Fund	Armenia Renewable Resources and Energy Efficiency Fund
RE	renewable energy
TA	technical assistance
UNDP	United National Development Program
USAID	United States Agency for International Development

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ARMENIA
Energy Efficiency Project

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A. Basic Information

Country:	Armenia	Project Name:	Energy Efficiency Project
Project ID:	P116680	L/C/TF Number(s):	TF-12163
ICR Date:	11/14/2016	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	REPUBLIC OF ARMENIA
Original Total Commitment:	USD 1.82M	Disbursed Amount:	USD 1.82M
Revised Amount:	USD 1.82M		
Environmental Category: B		**Global Focal Area: C**	
Implementing Agencies: Armenia Renewable Resources and Energy Efficiency Fund			
Cofinanciers and Other External Partners:			

B. Key Dates

Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	02/18/2010	Effectiveness:		08/10/2012
Appraisal:	04/04/2011	Restructuring(s):		03/16/2015
Approval:	03/27/2012	Mid-term Review:	07/09/2014	01/31/2014
		Closing:	06/30/2015	06/30/2016

C. Ratings Summary

C.1 Performance Rating by ICR

Outcomes:	Highly Satisfactory
Risk to Global Environment Outcome	Low or Negligible
Bank Performance:	Satisfactory
Borrower Performance:	Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance

Bank	Ratings	Borrower	Ratings
Quality at Entry:	Highly Satisfactory	RA Government:	Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Highly Satisfactory
Overall Bank Performance:	Satisfactory	**Overall Borrower Performance:**	Satisfactory

C.3 Quality at Entry and Implementation Performance Indicators			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA):	None
Problem Project at any time (Yes/No):	No	Quality of Supervision (QSA):	None
GEO rating before Closing/Inactive status	Highly Satisfactory		

D. Sector and Theme Codes

	Original	**Actual**
Sector Code (as % of total Bank financing)		
Energy efficiency in Heat and Power	100	100
Theme Code (as % of total Bank financing)		
Climate change	100	100

E. Bank Staff

Positions	**At ICR**	**At Approval**
Vice President:	Cyril E. Muller	Philippe H. Le Houerou
Country Director:	Mercy Miyang Tembon	Asad Alam
Practice Manager/Manager:	Ranjit J. Lamech	Ranjit J. Lamech
Project Team Leader:	Ani Balabanyan	Ani Balabanyan
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F. Results Framework Analysis

Global Environment Objectives (GEO) and Key Indicators(as approved)

The project development objective is to reduce energy consumption of social and other public facilities. The global environmental objective is to decrease greenhouse gas emissions through the removal of barriers to the implementation of energy efficiency investments in the public sector.

Revised Global Environment Objectives (as approved by original approving authority) and Key Indicators and reasons/justifications

(a) GEO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Energy savings in retrofitted social and other public facilities (kWh)			
Value (quantitative or Qualitative)	0	215,692,640	215,692,640	540,240,000
Date achieved	07/31/2012	06/30/2015	06/30/2016	06/30/2016
Comments (incl. % achievement)	Estimates were based on previous projects which used conventional procurement. The Project used NPV-based procurement, and other innovations which resulted in more savings per dollar invested. Thus the Project achieved 250% of the original target.			
Indicator 2 :	CO_2 emission reductions in retrofitted social and other public facilities through energy efficiency investments (tons of CO_2 equivalent)			
Value (quantitative or Qualitative)	0	50,549	50,549	145,739
Date achieved	07/31/2012	06/30/2015	06/30/2016	06/30/2016
Comments (incl. % achievement)	See above. The Project achieved 288% of its target CO_2.			

(b) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Cumulative investments in social and other public facilities (USD)			

Value (quantitative or Qualitative)	0	8,700,000	6,000,000	10,197,863
Date achieved	07/31/2013	06/30/2015	06/30/2016	06/30/2016
Comments (incl. % achievement)	The original target was downgraded at MTR due to slow progress. However, after MTR, the subproject pipeline improved, along with a focus on larger subprojects and one-year extension. Thus the final investments exceeded the revised target by 70%, and the original target by 17%.			
Indicator 2 :	Number of public sector projects commissioned			
Value (quantitative or Qualitative)	0	85	85	124
Date achieved	07/31/2013	06/30/2015	06/30/2016	06/30/2016
Comments (incl. % achievement)	At MTR, the number of projects was defined as the number of buildings to avoid confusion. The Project achieved 146% of the target value as several subprojects included multiple buildings, and the Project exceeded its original investment target.			
Indicator 3 :	Regulations, legislative amendments, guidelines to further promote energy efficiency (yes/no)			
Value (quantitative or Qualitative)	No	Yes	Yes	Yes
Date achieved	07/31/2013	06/30/2015	06/30/2016	06/30/2016
Comments (incl. % achievement)	The R2E2 Fund completed analysis of the first National Energy Efficiency Action Plan (NEEAP), and the Ministry of Energy Infrastructures and Natural Resources (MEINR), based on this analysis, has prepared the draft Protocol Decision "On approving the second phase of the Republic of Armenia 2016-2018 Energy Efficiency Action Plan" and submitted to the RA Government for consideration.			

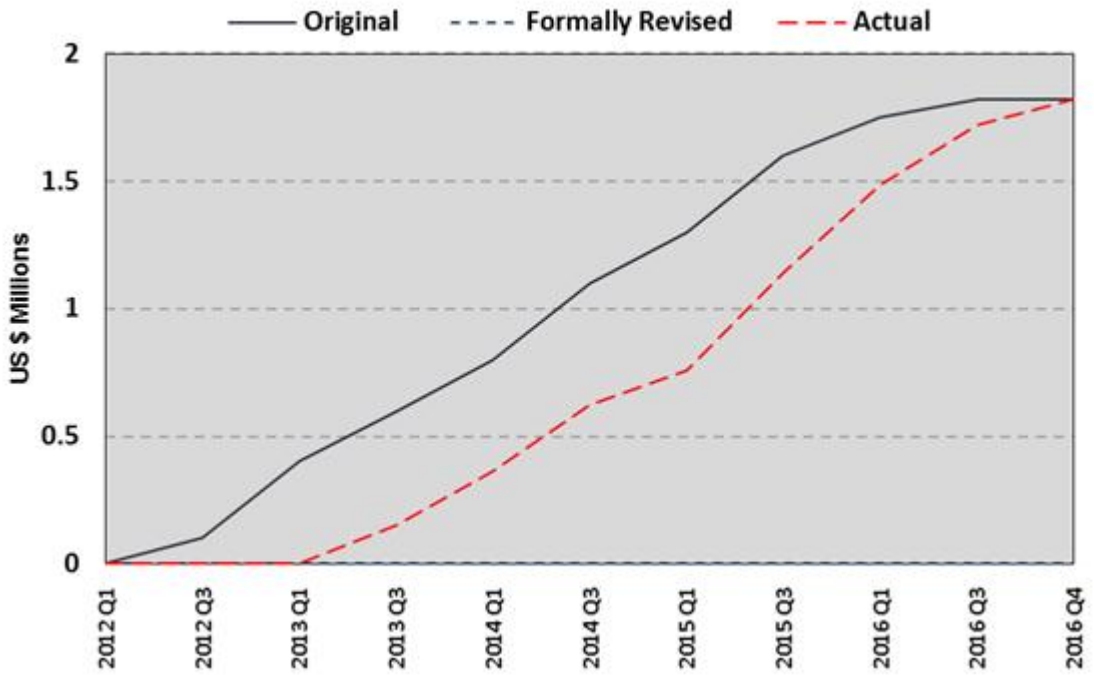
G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	GEO	IP	Actual Disbursements (USD millions)
1	08/10/2012	Satisfactory	Satisfactory	0.00
2	01/26/2013	Moderately Satisfactory	Moderately Satisfactory	0.15
3	09/04/2013	Moderately Satisfactory	Moderately Satisfactory	0.36
4	04/04/2014	Satisfactory	Satisfactory	0.62
5	11/02/2014	Moderately Satisfactory	Moderately Satisfactory	1.08
6	04/08/2015	Satisfactory	Satisfactory	1.14
7	10/27/2015	Satisfactory	Satisfactory	1.48
8	06/09/2016	Highly Satisfactory	Highly Satisfactory	1.72

H. Restructuring (if any)

Restructuring Date(s)	Board Approved GEO Change	ISR Ratings at Restructuring		Amount Disbursed at Restructuring in USD millions	Reason for Restructuring & Key Changes Made
		GEO	IP		
03/16/2015	N	MS	MS	1.14	Project restructuring to extend the Project closing date by one year, and revise investment IR end target based on progress at MTR.

I. Disbursement Profile



1. Project Context, Global Environment Objectives and Design

1.1 Context at Appraisal

Country Background: At the time of appraisal, utilities (energy, water and gas supply) accounted for around 3.5 percent of the country's GDP and the energy sector contributed the largest share of about 3 percent. Energy and infrastructure reforms had contributed significantly to Armenia's success through the 2000s, directly via investments, and indirectly through increased reliability of energy supply and elimination of large quasi-fiscal deficit. The energy sector was essential for the sustainable economic development of the country and investments in the energy sector underpinned growth prospects.

Sectoral and Institutional Context: Despite successes in the sector evidenced by strong payment discipline, absence of explicit or implicit subsidies, and a competent regulatory agency, the energy sector faced a number of challenges: (a) emerging power supply gap; (b) threatened energy security; and (c) increasingly unaffordable energy tariffs.

(a) Emerging power supply gap: A shortage of 800-1100 MW to meet peak demand was expected to emerge after the planned shut-down of the nuclear power plant and phasing out of inefficient and old (>40 years) thermal power plants.

(b) Threatened energy security: Armenia was dependent on imports for all of its transport fuel, all gas used for heating and cooking, and gas and nuclear fuel used to generate over two-third of the country's electricity. More than 90 percent of the country's energy was imported. This heavy reliance on imported fuels, and the under-maintained transmission and distribution assets put Armenia at risk of supply interruptions, price fluctuations, and possible outages.

(c) Unaffordable energy tariffs: Rising fuel prices and the need for new, more expensive generating units made the energy tariffs less affordable for the poor. In 2009, the poor Armenian households spent roughly 8 percent of their total household budgets on electricity and gas.

The Energy Sector Strategy and the Sustainable Development Program of the RA Government recognized these challenges, and the RA Government prioritized realization of economically viable energy efficiency (EE) potential as one of the ways of solving the challenges. A 2008 World Bank Study had also found that Armenia could save 4.3 percent of its 2009 GDP through EE investments, and EE investments in public facilities had the highest returns with paybacks between two and ten years. Thus, the RA Government requested the Bank to support the improvement of EE in public facilities, in partnership with the Renewable Resources and Energy Efficiency Fund (R2E2 Fund). The R2E2 Fund was established by the RA Government in 2005 as a non-profit organization with a mandate to promote the development of renewable energy (RE) and EE markets in Armenia, and to facilitate investments in these sectors. The R2E2 Fund is governed by a Board of Trustees (BOT) which is chaired by the Minister of Energy Infrastructures and Natural Resources, and has Ministry of Finance (MoF), Ministry of Nature Protection, Ministry of Urban Development, Ministry of Territorial

Administration and Development, and the Central Bank of Armenia represented. The R2E2 Fund administers a number of RA Government and donor-funded programs in the area of RE and EE.

Rational for Bank assistance: The rational for Bank's assistance was rooted in the Bank's: (i) knowledge and experience with EE projects globally, (ii) long history of successful engagement in the energy sector in Armenia, and (iii) important role in reforming the sector in Armenia. In addition, the Bank had significant experience implementing GEF-supported projects. Specifically, the Bank implemented the International Development Association (IDA) financed Urban Heating and IDA-GEF Renewable Energy Projects, and was implementing the GeoFund 2 - Geothermal Project supported by the GEF as well. The Bank's comparative advantage also lay in its strong operational capacity, which was built on fiduciary standards, environmental and social safeguards, and portfolio quality assurance and monitoring system.

GEF involvement in the Project was critical to help remove some of the barriers to realizing economically and financially viable EE potential. Without GEF participation, the RA Government and the private sector would not have been able to make sustainable investments in EE that would bring benefits to public facilities and the country at large. The barriers included limited incentives to implement EE projects, restrictive public budgetary and procurement rules, and limited borrowing capacity of public sector organizations. Also, without the GEF involvement, there would be lack of resources to build knowledge about EE among various stakeholders, including policy-makers, financial institutions, public, residential and private sector energy consumers and other stakeholders.

The Project was also consistent with the GEF Climate Change Focal Area, in particular with GEF Operational Program 5 – Energy Efficiency, and strategic programs under GEF-4: SP1 "Promoting EE Technologies and Practices in Appliances and Buildings." The GEF incremental financing would not only create national benefits, but also global environmental benefits in the form of reduced GHG emissions.

Preparation of the Energy Efficiency Project was originally initiated in April 2009 under the Electricity Supply Reliability and Energy Efficiency (ESREE) Project. Unfortunately, in 2011, the transmission component of the ESREE Project required more financing than originally budgeted, so the EE component was dropped. In late 2011, the RA Government and the Bank decided to resurrect the EE Component as a stand-alone GEF Project, with cofinancing from reflows from earlier Bank investment projects with the R2E2 Fund.

Higher Level Objectives to which the Project Contributes: The Project addressed the high level objectives of reducing energy consumption and increasing the country's energy security, outlined in the Energy Sector Strategy of Armenia. The Project was also in line with the Sustainable Development Program of the RA Government, which prioritized increasing EE in all sectors of the economy. Lastly, the Project was consistent with the FY 2009-2013 Country Partnership Strategy (CPS) for Armenia as it centered on

the second pillar of the CPS to "Support economic competitiveness and growth through improvement of energy efficiency."

1.2 Original Global Environment Objectives (GEO) and Key Indicators

The project development objective (PDO) was to reduce energy consumption of social and other public facilities. The global environmental objective (GEO) was to decrease greenhouse gas emissions through the removal of barriers to the implementation of EE investments in the public sector.

The key indicators linked to the PDO/GEO were:

- Energy savings (in kWh) in the retrofitted social and other public facilities; and
- CO_2 emission reductions (in tCO_2) in retrofitted social and other public facilities through EE investments.

1.3 Revised GEO (*as approved by original approving authority*) and Key Indicators, and reasons/justification

The PDO/GEO were not revised.

Because the Project's Closing Date was extended by one year, the PDO and IR indicators were revised accordingly. The "cumulative investments in social and other public facilities" indicator target was revised at the Mid-Term Review from US$8.7 million to US$6.0 million based on the slow implementation progress and projected investments for the remaining Project period. However, this change did not impact the PDO indicators for energy savings and emission reductions since the energy savings per dollar invested were higher than the estimated at value at Appraisal.

1.4 Main Beneficiaries

The direct beneficiaries of the Project were students, patients in hospitals, employees in administrative buildings, and prison staff and occupants. These groups particularly benefited from improved comfort, lighting and general conditions of their facilities. They also benefited from financial (budgetary) savings.

A beneficiary survey was conducted towards the end of the Project. 69 percent of the beneficiaries surveyed, representing 4,317 staff and users of public facilities, were women, and 31 percent were men. Except for branch offices of "High Voltage Electric Networks" (HVEN), there were more women beneficiaries in the institutions that participated in the Project. This aspect of the Project contributed to the Bank's gender inclusion goals.

The RA Government benefitted from reduced energy demand, and the successful piloting and demonstration of a new mechanism for capturing the energy cost savings, thus creating a sustainable EE financing mechanism in Armenia. This was achieved using a new scheme called energy service agreements (ESAs) and net present value-based (NPV) procurement in the public sector (see descriptions of both in next section). The Project

resulted in lower energy demand, reduced the volume of imports, and delayed the need for new investments in power generation. The Project also reduced RA Government expenditure, both for energy bills and rehabilitation in public facilities, as the public facilities paid for their refurbishments from energy cost savings. Additionally the technical assistance (TA) component helped the RA Government by supporting the EE policy framework, including an assessment of the implementation progress of the first National Energy Efficiency Action Plan or NEEAP (2010 -2013), and developing the Second NEEAP (2016-18).

The general public benefitted from the availability of better public service facilities - schools, administrative offices and hospitals through renovated facilities, and improved comfort and functionality. They also benefited from positive environmental impacts from reduced energy use, and reduced CO_2 emissions as originally designed.

Beneficiaries of the investments also included private construction companies and equipment suppliers who benefitted from increased demand for their goods and services. 20 different contractors participated in the Project, and they hired 3,000-4,000 temporary workers. The staff also benefitted from improved skills which were necessary for the successful Project implementation. The market also benefitted from the development of a local ESCO industry that can continue to provide EE services in all sectors going forward.

1.5 Original Components

Component 1: EE investments in public facilities (estimated cost of US$8.7 million, including US$8.0 RA Government funding and US$0.7 million GEF grant). This component supported EE investments in social and other public facilities, e.g. schools, kindergartens, hospitals, administrative buildings, street lighting. Client eligibility criteria include: (a) confirmation of public ownership of facility; (b) structural soundness of the facility (absence of major structural damages that may jeopardize integral stability of the building); (c) absence of plans for closure, downsizing or privatization of the facility; and (d) comfort level of more than 50%[1].

Subproject criteria involve: (i) at least 20% energy savings; (ii) simple payment period less than 10 years; (iii) investment size should be US$50,000-500,000, and (iv) the borrowers should be in good financial standing. The Project primarily financed insulation of walls, basements and attics, repair/replacement of external doors and windows, window optimization[2], reflective surfacing of walls behind radiators, as well as improvements/ replacement of boilers and heating systems, replacement of mercury vapor lamps with high-pressure sodium vapor lamps (or light emitting diodes, LEDs) and of incandescent bulbs with compact fluorescent lamps (CFLs).The portfolio of subprojects financed is shown in Table 1.

[1] The comfort level ratio is defined as the actual energy consumption over the estimated energy consumption required to meet all heating/lighting national norms.

[2] Window optimization involves partial replacement of existing windows with walls while complying with day-lighting requirements.

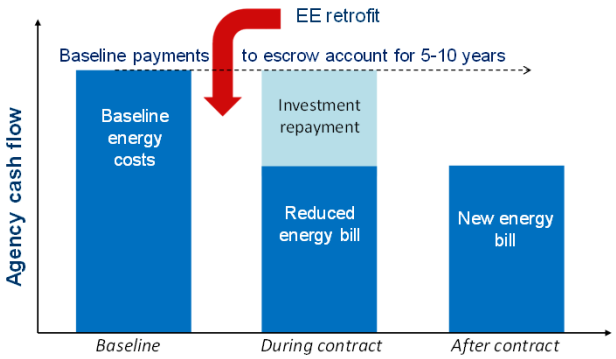
Table 1: Subproject portfolio

	Number of subprojects	Total investments (US$)
Schools/universities	25	2,391,987
Hospitals/Medical centers	6	1,683,734
Penitentiary institutions	11	3,879,827
Kindergarten	2	456,126
Street lighting	9	501,932
Other (offices, theater, etc.)	10	614,790
Total	63	9,585,545

Under the project, the R2E2 Fund provided turn-key services (energy audit, procurement, detailed design, financing, construction and monitoring) for EE upgrades in eligible public buildings. The project was designed to develop, test and disseminate replicable and sustainable models for EE service provision through the use of a new instrument, an energy service agreement, or ESA (Box 1).

Box 1. Energy Service Agreements

Under the ESA, the R2E2 Fund offers a full package of services to identify, finance, procure, implement and monitor EE projects for clients. The client is only asked to pay what it is currently paying for energy, i.e., its *baseline energy costs*, from which the Fund uses to make the new (lower) energy payments and recover its investment cost and associated fees until the contract period ends.



The figure on the right illustrates the basic idea of a client's cash flows under the ESA, with payments equal to their baseline energy bill. This allows them to maintain a constant cash flow while retaining their energy cost savings for the duration of the ESA. In some cases, the contract duration is fixed; in other cases, the contract is terminated after an agreed level of payment has been made, which encourages the client to save more energy.

For public clients, ESAs were not classified as debt, but rather long-term service contracts, thereby allowing financing of central RA Government entities that are typically not allowed to borrow, and municipalities that may have already reached their debt limits or otherwise have borrowing restrictions. This provides a dual advantage to the client of being relatively simple to implement with very little risk.

Under Component 1, the GEF grant was used to finance the first five ESAs GEF financing of the first ESAs allowed the R2E2 Fund to pilot the innovative ESA and refine their processes and documents without shouldering all the risks of failure to receive the funds back from the clients. However, in all cases, the ESAs supported by the GEF grant required full repayment. It was agreed that all repayments from the GEF-supported ESAs would be converted to R2E2 Fund equity, which it would use to finance further EE investments, thereby revolving in perpetuity.

Component 2: Technical assistance (estimated cost of US$1.96 million, including US$1.12 million GEF grant, US$0.54 million R2E2 Fund, (the project implementing

entity) co-financing, and US$0.3 million RA Government co-financing). This component helped remove existing barriers to realizing EE potential by supporting the enabling environment for EE in the public sector. The component primarily financed: (a) capacity building of the R2E2 Fund, including training and basic audit and monitoring equipment; (b) pipeline development and capacity building of participating public agencies, to address knowledge gaps on EE, build the demand for program financing, and improve the prospects for the sustainability of energy savings generated under the project; (c) policy development support, including efforts to support budgeting, procurement and financing of EE projects in the public sector, as well as select policy measures and energy statistics; (d) for analysis of progress of implementation of the Energy Efficiency Action Plan or EEAP 1 (2010-2013) and elaboration of the second EEAP (2016-2018); (e)market development and capacity building of various market actors, including ESCOs, banks, construction firms; and (f) project management, including monitoring, reporting and financial audits.

1.6 Revised Components

Components were not revised.

1.7 Other Significant Changes

There were no significant changes in design and scope. However, the GEF Grant closing date was extended by one year from June 30, 2015 to June 30, 2016 due to a slower than expected start.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

Adequacy of RA Government commitment. The RA Government was strongly committed to the Project from the beginning. The request for the Project came from Ministry of Finance (MoF), and the Board of Trustees (BOT, which governed the R2E2 Fund) was chaired by the Minister of Energy and Natural Resources, and had the following ministries represented: MoF, Ministry of Nature Protection, Ministry of Urban Development, Ministry of Territorial Administration, and the Central Bank of Armenia. The RA Government also agreed to US$8.0million in co-financing for the Project, the majority of EE investments financing, from reflows from previous World Bank projects with the R2E2 Fund.

Lessons from earlier operations. The Project design incorporated lessons learned from various Bank-financed EE projects in Armenia and elsewhere. The projects included Serbia EE Project (2004), the Montenegro EE Project (2008), Belarus Social Sector EE Project (2001), Croatia EE Project (2003), and the Armenia Urban Heating Project (2006). The design also included lessons learned from the World Bank's Energy Sector Management Assistance Program (ESMAP) work on EE in the public sector. Specifically:

- Robust pipeline development mechanisms were put in place to ensure the existence of a strong and high quality subproject pipeline.

- Effective monitoring and evaluation was designed to assess the impact of EE improvements in targeted buildings.
- TA was included in the Project design in order to help create an enabling environment for EE, to ensure Project sustainability.
- TA also supported ongoing policy dialogue in order to address emerging budgeting, procurement, legal and other issues.

Risks and mitigation measures. Table 2 summarizes risks which were identified in the project appraisal document, their mitigation measures and the result of the mitigation. No other risks emerged during Project implementation.

Table 2: Summary of risks, mitigation measures and results

Original Risk	Rating	Identified at Preparation?	Risk Materialization	Mitigation Appropriateness	Result
STAKEHOLDER RISK: Stakeholder failing to see how the Project is aligned with their needs	Low	Yes	Stakeholders did not immediately see the benefits of EE investments; hence the slow implementation at the beginning of implementation.	Mitigation measures were appropriate. The R2E2 Fund raised awareness about EE and actively marketed the ESAs; the Bank continued dialogue with the RA Government and other key stakeholders	The Project surpassed its original investment and energy savings targets.
IMPLEMENTING AGENCY RISK					
- Capacity: Delayed procurement due to limited procurement expertise within the R2E2 Fund	Moderate	Yes	R2E2 Fund procurement capacity was not an issue. However, initial tenders failed due to lack of understanding from bidders.	Mitigation measures were appropriate. R2E2 Fund hired a procurement specialist with substantial experience. Several additional trainings were provided to construction firms/prospective bidders on the innovative procurement schemes used in the Project.	Procurement expertise supplemented with training, led to an improvement in Project procurement.
- Governance: Slow and ineffective decision making by the R2E2 Fund	Moderate	Yes	No significant delays were experienced.	Mitigation measures were sufficient. The Project team maintained close dialogue with the key RA Government counterparts to ensure that the BOT of the R2E2 Fund made effective and timely decisions regarding Project matters.	R2E2 was largely able to make timely and effective decisions under the governance of the BOT.

PROJECT RISK					
- Design: Public sector potential clients not interested in the EE investments	Moderate	Yes	Potential clients were not interested in EE investments at the beginning of the Project or preferred grant/budget support for EE rather than ESAs. This resulted in the slow progress during the first 18 months of Project implementation. Investments for only 15 clients were initiated during the first year of Project implementation.	Mitigation measures were appropriate. The R2E2 Fund conducted public awareness activities, intensive marketing, publicized early successes, highlighted benefits and co-benefits to potential clients, and supported the RA Government in creating a more supportive policy environment.	The Project surpassed its original investment and energy savings targets.
- Social and Environmental: Minimal environmental impacts resulting from noise, dust, vehicle emissions; and from disposal of mercury vapor lamps	Low	Yes	There were a few cases of noise and dust mentioned during the beneficiary survey.	Mitigation measures were appropriate. Impacts were managed with the "Checklist Environmental Management Plan (EMP)."	There were no significant social and environmental impacts. Replaced mercury vapor lamps were put to safe storage by municipal authorities until in-country facilities are available for their recycling.
- Program and donor: EE projects financed by multiple donors might lack coordination	Low	Yes	Risk was higher than anticipated. Some donors had some grant programs for EE, which competed with the R2E2 Fund.	The Project team, and R2E2 maintained dialogue with all donors to agree on target markets and minimize competition. Since most grants were partial, cofinancing was still	Grant financing was limited, and dialogue among donors worked to segment market and avoid competition where possible.

				needed, so fewer grants disbursed than planned.	
- Delivery, monitoring and sustainability: Energy savings in retrofitted social and other public facilities may not be sustained.	Moderate	Yes	All subprojects under the Project were able to sustain their energy savings at Project closing.	Measures were appropriate. ESAs included one-year O&M to ensure persistence of savings and proper training of O&M practices. The Fund monitors energy bills for the life of the ESA.	Fund monitoring reports show sustained savings.

Overall, risk assessment at Project appraisal was largely accurate and the risk mitigation measures proved to be adequate. The flexibility in the project design allowed the R2E2 Fund and the Bank to implement the mitigation measures and, ultimately, exceed the original performance targets.

Innovations in design. Because the RA Government did not have the opportunity to continue with grant or budget financing for EE investments in the public sector, and there was no appetite for private or commercial financing for such investments, the Project introduced several innovative design features which increased the risks but were also important for its success:

- *Energy service agreements (ESAs).* In order to allow the public clients to finance EE investments without taking loans, given the debt restrictions for budget entities and municipalities, and retain their energy cost savings for the duration of the contracts, the Bank and R2E2 Fund teams developed the ESA (see Section 1.5).
- *NPV-based, performance-based procurement.* The ESAs did introduce additional risks to the R2E2 Fund, in terms of subproject design and technical performance risk. To mitigate this, the Project introduced the use of modified National Competitive Bidding (NCB) design/works contracts with three modifications: (i) it specified the minimum energy savings but allowed bidders to propose their best technical solutions in order to maximize energy savings and value to the client; (ii) selection was based on the highest NPV rather than the lowest cost; and (iii) a commissioning test was performed and linked to the contractor payment, thus introducing a performance-based approach. NPV-based procurement had the benefit of encouraging bidders to be innovative in their technical solutions while maximizing the EE benefits per dollar invested as it factored both investment cost and energy savings. This procurement approach resulted in the introduction of new, improved technologies such as the condensing boiler used at the State University of Economics and light emitting diodes (LEDs) at the Yerevan State Puppet Theater.
- *Repayment obligations.* The absence of grant funding for EE subprojects required the Project to introduce repayment obligations based on energy savings. The use of ESAs helped minimize negative feedback from the introduction of repayments, since clients were only asked to pay their baseline energy bills. These repayment obligations were critical for Project sustainability. At Project closing in June 2016, repayments to the R2E2 Fund were being made in a timely manner, and 20 clients (40%) had made one or more early payment. Only 10 clients had some minor payment delays (all under 15 days) due to timing of budget allocations from the central RA Government.

2.2 Implementation

While the Project identified an initial subproject pipeline during Appraisal, of about five subprojects, delays in the finalization and signing of the ESAs along with early setbacks on procurement (first five tenders failed, with one or fewer responsive bids) were experienced. Since the Fund had intended to use its initial subproject successes in its marketing efforts, and wanted to wait to disseminate them as successes until one full heating season had passed, these delays proved costly. As a result, subproject pipeline development remained very slow through the first 18 months. The Mid-Term Review (MTR) was conducted in January 2014, and both ‘progress towards achievement of

Global Environmental Objective', and 'implementation progress' (IP) were rated as *Satisfactory*. However, based on progress, the Project was restructured to extend the grant Closing Date by one year and adjust the investment target (IR1). Once the initial subprojects were disseminated, combined with increasing awareness about EE and increased energy tariffs, demand for EE investments grew and the R2E2 Fund was ultimately able to surpass its PDO indicator targets and even its original investment target. The Fund's marketing included more focused marketing campaigns to target clients, lobbying through line ministries, television and radio advertisements, and other media outlets, Project implementation improved significantly. During the first two years with limited marketing, signed ESAs totaled only US$3.54 million (34 projects) but investments almost doubled to US$6.18 million (29 projects) in the last two years.

A key design element, the ESA, was instrumental in the Project's success, although it had to be adjusted to reflect implementation realities. While the initial design involved the use of an escrow account to capture the baseline payments and then make the beneficiary's new energy payments and remit the rest to the Fund, the R2ER2 Fund amended the design given the high transaction costs of using escrow accounts in Armenia. First, the Fund proposed having the client pay its new energy bills and paying the Fund the difference between the baseline and new bills. However, most clients found this to be complex and wanted to have fixed payments to the Fund, so they could properly budget for them in the subsequent budget years. So it was agreed that clients would just make fixed payments to the Fund once the subproject was implemented and the investment costs and savings were confirmed. While this transferred some of the risks back to the beneficiary, it was much easier for all parties. Still, the R2E2 Fund continued to monitor energy bills and the client could consult with the Fund in the event their energy bills and fixed repayments to the Fund rose above the agreed levels (i.e., the original baseline energy payments). At the time of the Project's closing, there were no issues with repayments or complaints about the repayment scheme.

The following factors affected Project implementation:

- *Strong RA Government commitment.* The RA Government was strongly committed to the Project as described in Section 2.1. Additionally, the RA Government enhanced its EE legal framework as described in Section 2.5.
- *Tariff increase*. The substantial increase in gas and electricity tariffs, 18.2% and 26.7% respectively, in 2014 increased the financial viability of EE investments, and helped improve the pipeline of EE investments.
- *Availability of EE grants.* While there were no EE grant programs when the Project began, some donors started offering partial grants for EE investments in the public sector. This affected the R2ER2 Fund's subproject pipeline in the early period. However, the available grant funds were limited and many potential clients struggled to mobilize the required co-financing needed for the grants; hence the competition was limited in scope.
- *High rejection rates.* The R2E2 Fund received 326 applications of which 209, or about 64%, were rejected due to not meeting the eligibility criteria, mostly in relation to low baseline energy use (i.e., underheating). The high rejection rate increased the transaction costs for the Project, as the R2E2 Fund spent a lot of time assessing

subprojects that were deemed ineligible. However, as this requirement became better understood by potential clients, the rejection rate fell. During the last year of the Project, the rejection rates dropped to about 30%.

- *Inadequate construction firm capacity*. The Project was also negatively affected by low capacity of the construction firms, particularly during the first year of implementation, to deal with the new procurement approach. The R2E2 Fund had to put significant effort into capacity building of construction firms on the more flexible but complex NPV, performance-based procurement.

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

M&E design. M&E was critical for this Project, particularly as the Project was the first of its kind in Armenia. Investment repayments and contractor payments were dependent on energy savings, thus the M&E systems (and measurement and verification, or M&V, systems) had to be well-developed. The R2E2 Fund developed systems for collecting, monitoring and reporting on Project progress and impacts; the BOT monitored Project outcomes. In addition, the Bank developed a results framework which the R2E2 Fund used for reporting purposes. During Project preparation and throughout implementation, the R2E2 Fund developed its internal M&E capacity and systems and was able to track the pipeline of subprojects; subproject screening and audits; disbursed, committed and invested amounts; energy savings and CO_2 reductions; repayment progress and delays/defaults; etc.

The M&E design adequately allowed the team to evaluate progress towards both the PDO and the GEO using both key and intermediate indicators (see Section 1.2). The successful realization of energy savings through the use of sustainable financing mechanisms such as the ESA, and sustainability of EE investments by the R2E2 Fund (see Section 2.5), demonstrate the removal of barriers to the implementation of EE.

M&E implementation. At the subproject level, data for M&V was collected by the R2E2 Fund, the beneficiary and the contractor in order to monitor, verify and evaluate progress towards outcome indicators. The R2E2 Fund first collected ex-ante energy consumption and comfort data in order to develop a clear subproject baseline. This included electricity and gas payments, indoor temperature and humidity, lighting intensity, operating conditions and utilization of facility, outdoor temperatures, etc. Once a subproject was completed, the R2E2 Fund, together with the beneficiary and contractor conducted a 2-week commissioning test, where the actual energy performance was measured against the energy savings proposed by the bidder to achieve their promised NPV. This test compared the "normalized" baseline (adjusted to take into account full heating and lighting norms) with the ex-post energy consumption, taking into account external temperatures and other factors. The R2E2 Fund also monitored energy use and indoor conditions for a full heating season to ensure that the quality of service and energy savings persisted. If any anomalies were identified, the R2E2 Fund, together with the beneficiary and contractor, would discuss and jointly resolve any issues. The R2E2 Fund also conducted a beneficiary survey at the end of the Project to document social impacts and client satisfaction with the investments.

M&E utilization. The data was used to monitor progress towards meeting project indicators, make payments to contractors and adjust implementation plans as necessary. For instance, from monitoring the pipeline, the Bank and the R2E2 Fund agreed to intensify marketing efforts.

2.4 Safeguard and Fiduciary Compliance

Safeguards. The Project triggered OP/BP 4.01 Environmental Assessment and was classified as environmental Category B. According to the framework, an Environmental Management Plan (EMP) was developed as part of the Project preparation, and site-specific EMPs were drafted and shared with the Bank for approval and publicly disclosed in Armenian and English languages for each individual investment. Stakeholders were given sufficient time and opportunity to share their comments, if any, on the draft EMPs. Environmental risks of the investments were minor, and the applied mitigation measures were confined to proper handling of construction waste and adherence to workplace safety rules. Amounts of construction waste were minimal and got disposed at the municipal landfills. Mercury-containing street light bulbs that were replaced with energy-efficient and non-toxic bulbs went to adequate municipal storage until relevant facilities for safe destruction/disposal of such waste are available in the country.

The Project retained *Satisfactory* rating on safeguards performance throughout its life. R2E2 Fund's environmental performance was excellent: EMPs were produced on time and were of high quality. All agreements/permits required for specific types of works were obtained from the national authorities. Field supervision of works was performed on regular basis and good record or environmental monitoring outcomes was kept. No damage to the natural environment has been recorded.

Procurement. The Project used the innovative NPV-based procurement (see Section 2.1), and there were no major procurement issues during implementation. Procurement was rated *Satisfactory* in all the Implementation Status Reports (ISR) throughout the Project. Post reviews were conducted during the life of the Project. The compliance risk rating was initially moderately satisfactory due to some minor deviations. However, the last post review conducted earlier this year, which included site visits, was rated low risk.

Unlike traditional procurement, which is based on lowest cost, the R2E2 Fund used an output-based, performance-based contract. Under this scheme, the Fund conducted a *walk-through* energy audit to identify typical EE measures and estimate energy savings. A modified works (design and build) tender was issued (following the Bank's NCB procedures) with a required minimum energy savings level without requiring specific EE measures or technologies. Bids were required to include preliminary designs to show their proposed measures, technologies, costs and expected energy savings; all bids were required to meet or exceed the minimum energy savings level, which was usually around 30 percent. The Fund evaluated bids and awards the contract to the bidder with a technically viable solution and the highest NPV (combining investment, energy cost savings and equipment lifetimes). Payments were then made based on both milestones and performance. An indicative payment schedule was as follows: 10% advance payment, 10% after approved final design, 50% approved after delivery of project per design, 20%

after a commissioning test to verify the actual energy savings (against the promised savings/NPV in the contractor bid), and 10% after a 12-month defects and liability period (to allow for performance monitoring over one full heating season).

Financial management (FM). The FM arrangements under the Project (including planning and budgeting, accounting, reporting, funds flow, staffing and external audits) were rated as *Satisfactory* during first two FM missions. However, the FM rating was subsequently downgraded from *Satisfactory* to *Moderately Satisfactory* due to the deterioration of the contract management and transaction processing system. Although the R2E2 Fund undertook steps to improve the internal controls, results of the last FM missions indicated that they still needed improvement. The level and timeliness of RA Government co-financing was satisfactory throughout the Project implementation. The R2E2 Fund prepared semi-annual interim financial reports (IFRs), which were always received on time, and in general were found to be acceptable. The auditors issued unmodified (clean) opinions on annual financial statements of the Project, which were received by the due date. The R2E2 Fund complied with public disclosure requirement for the audited financial statements of the project.

2.5 Post-completion Operation/Next Phase

Transition and post completion. During the final supervision mission, the R2E2 Fund was finalizing a new operations manual (OM) for the next 3-5 years. The OM covered the 2016-2020 period, in order to ensure sustainability of the business model developed under the Project. This included identification of target markets, client eligibility criteria, indicative investment plan, financing requirements and potential sources, revisions to its financing and implementation modalities, fee structure, and staffing needs. It also included necessary revisions to its ESAs, repayment schedules, and proposed revisions to existing legislation/regulations that would enable operations beyond the expiry of the GEF Grant Agreement. The R2E2's own financial projections showed that the Fund could be sustainable over this period by investing US$1.3-1.5 million per year without additional capital infusion. For longer-term growth, additional capital into the Fund was required since ESAs tied up the capital for a long period. If the funds were not available, the Fund would need to limit itself to its current public building and street lighting target market.

Given that only 5% of the estimated 5,800 public buildings in Armenia had applied to participate in the Project, there was significant potential for the R2E2 Fund to continue its business model within its current target market. However, there was also interest by the RA Government to expand the scope to include private social buildings, structural improvements, seismic safety and comfort improvements, although such investments may have to be done with grant/budget financing since these investments would not result in any repayable cash flows. Thus the RA Government had entered into a framework agreement with KfW to borrow €18 million for school renovation, and KfW had applied for partial grant funding from E5P (€3-5 million) to allow beneficiaries with lower comfort and/or structural renovations to participate in the program. Discussions with the Asian Development Bank and European Investment Bank were also ongoing.

Sustaining reforms and institutional capacity. The RA Government made significant progress in developing the EE regulatory framework. Key development milestones included: passing of the Law on Energy Savings and Renewable Energy in 2004, the adoption of the National Program on Energy Savings and Renewable Energy, and the adoption of a time-bound 1st NEEAP (for 2010-2013) which prioritized EE measures for various sectors. During the Project, the RA Government made changes to 13 provisions of the Law on Energy Savings and Renewable Energy which further supported EE, and developed the 2nd NEEAP. The RA Government also issued Decree No. 728N, dated 25 June 2015, which formalized the adoption of ESAs as sample agreements for EE procurement. At the same time, it also adopted quality-based procurement (e.g. stipulating minimum savings, maximum consumption). However, the NPV procurement approach had not been formally adopted at Project Closing. The Fund itself had developed capacity to operate in a sustainable manor, and the MEINR had confirmed its very strong support for the Fund to continue the investment program. Thus there appears to be institutional capacity to sustain the reforms.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

Rating: *Substantial*

The objectives were substantially relevant for Armenia given that the country was facing: (a) an emerging power supply gap; (b) threatened energy security; and (c) increasingly unaffordable energy tariffs. The Energy Sector Strategy of Armenia prioritized solving these challenges, and the PDO, *reducing energy consumption of social and other public facilities*, directly contributed towards the objective. Likewise, the GEO, *decreasing greenhouse gas emissions through the removal of barriers to the implementation of energy efficiency investments in the public sector*, contributed towards the same objective. This fit well with the Bank's CPS (see Section 1.1), and global priorities as other global organizations such as European Bank of Reconstruction and Development (EBRD), USAID, UNDP, and the International Finance Corporation (IFC) were supporting EE in Armenia.

The design was relevant as well as it provided a delivery model for EE in public and social facilities. Before the Project, similar investments would have required grant or budget funding from the RA Government which was limited. Thus the Project developed a sustainable mechanism for delivering reduction in energy costs, reducing CO_2 emissions, and improving comfort levels without additional investment from the RA Government.

Project implementation was slow at the beginning (see Section 2.2), and this necessitated Project closing date extension, and a change in intermediate indicator 1, but did not affect the key indicators as the investments were yielding higher savings per invested dollar than estimated at appraisal (see Section 3.3).

3.2 Achievement of Global Environmental Objectives

Rating: *High*

The Project exceeded its performance targets substantially by reaching 250% of the energy savings target, and 288% of the CO_2 emission reductions target, as summarized in Table 3. 47 subprojects (or signed ESAs) were completed and commissioned, and 16 were ongoing at Project closure. Collectively, these 63 subprojects (representing 124 buildings) were estimated to result in lifetime energy savings of about 540.2 million kWh and CO_2 emission reduction of about 145.7 thousand tons (see details in Annex 2).

The original performance targets were estimated at Project appraisal based on similar World Bank projects implemented in the Europe and Central Asia region and past building renovations undertaken by the R2E2 Fund in Armenia. One reason behind the Project exceeding the targets was the use of NPV-based procurement. While other projects in the region relied on conventional procurement which use the lowest-priced bids based on an agreed design, this Project incentivized bidders to present the best technically viable solution and maximize the NPV. This had the effect of encouraging suppliers and contractors to propose the most cost-effective EE investments for the lowest price. In addition, because the focus was on repayable investments, less funding was allocated to structural improvements than is typical for building renovation programs. Also, the requirement for full repayment ensured cost discipline on the part of the beneficiaries and the avoidance of unnecessary measures.

Table 3: Summary of indicators and Project performance

Indicators	End Target	End Actual	Achievement
Energy savings in retrofitted social and other public facilities (million kWh equivalent)[3]	215.7	540.2	250%
CO_2 emission reductions in retrofitted social and other public facilities through EE investments (thousand tons CO_2)[4]	50.5	145.7	288%

Likewise the Project exceeded both IR 1 and 2. The original target for IR 1 (investment) had been downgraded at the MTR stage due to the slow progress at the time (see Section 1.3). However, the subproject pipeline improved after the MTR, and the R2E2 Fund shifted focus to larger subprojects. Thus the final cumulative investments exceeded the revised target by 70%, and the original target by 17% (see Data Sheet).

Additional Project achievements from both EE investments and the TA include:

- *Improved EE policy and regulatory framework.* (see Section 2.5)
- *Development of EE market and industry*. The Project helped develop the EE market and industry in three key ways: (a) it demonstrated EE technologies such as LED

[3] Cumulative energy savings over 20-year useful life of investments.
[4] Cumulative CO_2 reductions over 20-year useful life of investments.

lighting, condensing boilers, heat pumps, and more cost-efficient insulation such as perlite, which were not widely used. Likewise it introduced new services and financing mechanisms in the market; (b) the financing and delivery methodologies pioneered by the Project with GEF funding became the norm for implementing EE in Armenia. For example, the MEINR has since requested other international finance institutions (IFIs) to use similar schemes in all RA Government-supported EE projects; and, (c) the Project demonstrated the viability of the public sector and social facilities as a new market for EE financing with full cost recovery. Before the Project, many services providers were not keen to serve the public sector clients who could not borrow or easily raise financing.

- *Improved EE capacity in the industry*. The GEF-funded TA provided capacity development for the RA Government, R2E2 Fund, design/construction firms and beneficiaries involved in the Project. The NPV procurement encouraged firms to be adept at cost-effective designs that maximize NPVs in order to develop more competitive bids. The RA Government understood the benefits of EE and the need to sustain its implementation. The beneficiaries gained capacity in working with service providers to implement EE investments, and make payments from energy savings. Feedback from the service providers also indicated that 3,000-4,000 temporary workers were hired to implement the investments under the Project. Thus there is a sizable trained workforce which gathered experience under the Project.
- *Satisfied end users*. Beneficiaries were satisfied with the outcome of the EE investment. Those who participated in the survey at the end of Project reported significant improvements in temperature, outlook and comfort levels of the facilities. Many beneficiaries also realized financial savings as a result of the investments. They reported lower energy and operations and maintenance (O&M) cost, and many used the savings to invest in internal repairs and renovations not included in the EE investments under the Project.

3.3 Efficiency

Rating: *High*

The Project investments were highly cost effective. The 47 completed and commissioned subprojects had impressive results. Specifically, the payback period for all these subprojects was less than nine years (ranging from 2.6 to 8.8 years), and energy savings ranged from 27 to 80%, with an average of 50.9% (Table 4). Further, due to the requirement for full repayment and special NPV-based procurement, the investment cost required to achieve these savings were very low—at only about US$24.4/m^2 (in the buildings sector - about one-half the investment required for Bank projects in other countries)—and at an impressively low cost of only 1.94 US¢/kW (for all subprojects). However, due to the relatively low grid emission factor[5] and baseline heating fuel (natural gas), the cost per ton of CO_2 emissions reduction was somewhat higher than other projects (US$72.2/ton CO_2) although the cost per ton of CO_2 for the GEF Grant was lower, at only US$29.8/ton CO_2.

[5] The grid emissions factor for Armenia is 0.234 kgCO_2/kWh.

Table 4: Key Aggregate Data for Completed and Commissioned Subprojects

	Amount	Units
Total investment	4,354,438	US$
Number of projects	47	Number
Average investment	92,647	US$
Average energy savings	50.9	%
Average payback period	6.6	# of years
Average investment per square meter*	24.4	US$/$m^2$
Energy savings*	71.2	kWh/m^2
Cost of energy savings (lifetime)	0.0194	US$/kWh
Cost of CO_2 savings (lifetime)	72.2	US$/ton CO_2
Average building energy use (before)	138.8	kWh/m^2
Average building energy use (after)	67.6	kWh/m^2

**These subprojects exclude all lighting projects*

Results of the economic and financial analysis of representative facilities were impressive as well. While these were improved with the tariff increases during the Project period, they decreased somewhat in USD terms due to the local currency devaluation by 26 percent. The results at Project appraisal are shown in Table 5 and the ICR results are shown in Table 6. The realized EIRRs of the representative facilities ranged from 22 to 57 percent while the realized FIRRs ranged from 10 to 38 percent. The realized economic payback periods ranged from 2 to 5 years, and the realized financial payback periods ranged from 3 to 7 years.

The actual results were better than the estimated results. For instance, the average estimated financial payback period was 6.2 years while the average realized financial payback period was 5.2 years (16% better). The School N2 of Masis was used as representative facility at Project appraisal, and after the EE investments were implemented. Its realized economic NPV was 13 percent higher than the estimated economic NPV, and the economic payback period was 19 percent lower (better). However, the economic and financial analysis results of the Dilijan street lighting subproject were lower than was estimated at appraisal. This is mostly because the subproject realized 45 percent energy savings compared to the estimated 56 percent.

Table 5: Results of economic and financial analysis of EE investments at appraisal

	Economic NPV (US$)	EIRR (%)	Payback (years)	Financial NPV (US$)	FIRR (%)	Payback (years)
Hospital*	170,330	36	3.8	14,479	14	7.7
School**	68,860	37	3.7	6,992	14	7.7
Kindergarten***	23,969	31	4.3	8,075	17	6.6
Street lighting****	76,929	77	2.3	24,048	24	5.0
Municipality building*****	23,666	66	2.5	12,869	32	4.2

*Martuny Hospital; **School N2 of Masis; ***Nor Norq Kindergarten; ****Dilijan street lighting***** Vedy Municipality Building

Table 6: Results of economic and financial analysis of EE investments at ICR

	Economic NPV (US$)	EIRR (%)	Payback (years)	Financial NPV (US$)	FIRR (%)	Payback (years)
Hospital*	95,972	22	5	192,223	29	4
School**	77,667	50	3	822	10	6
Kindergarten***	10,711	22	5	5,476	15	7
Street lighting****	58,066	57	2	47,464	38	3
Prison*****	248,171	24	5	142,813	16	6

* Masis Medical Center CJSC; **School N2 of Masis; ***Kindergarten N3 of Vayk; **** Dilijan street lighting***** Erebuni penitentiary institution

3.4 Justification of Overall Outcome Rating

Rating: *Highly Satisfactory*

The overall outcome rating of the Project is *highly satisfactory*. Both the GEO and the PDO were substantially relevant, the Project exceeded its target performance by over 200% at half the typical investment cost per square meter. The Project also introduced several innovative aspects, was implemented well, helped improve the EE policy and regulatory framework, provided a number of additional benefits and has a high likelihood of being sustained.

3.5 Overarching Themes, Other Outcomes and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

Gender aspects. The Project contributed to the gender inclusion aspects of development as 69 percent of the beneficiaries were women. The women worked in hospitals, schools, kindergartens, administrative buildings and scientific and cultural facilities. According to the beneficiary survey, the increased comfort levels improved their work environment and enabled them to work more efficiently. Public lighting studies by ESMAP have shown that better lighting improves the sense of safety and security, and allows more women to participate in economic or social activities in the evenings. As identified in the beneficiary survey, the same applied to the nine street lighting subprojects.

Social impacts. The social benefits of the investments in schools, hospitals, and street lighting projects were substantial. The facilities that participated in the Project ended up with more comfortable temperature, hot water, and better lighting. These improvements contributed to the increased use of the facilities. Three public service facilities increased the area they used to serve clients; one school increased the number of classrooms used during the winter, and six communities increased the number of illuminated streets. The educational beneficiaries reported an increase in the number of students attending the renovated schools or kindergartens, and the hospitals reported an increase in the number of patients. Additionally, more than half of the respondents mentioned that the EE investments improved the image/perception of their facilities.

(b) Institutional Change/Strengthening

Enhancement of the R2E2 Fund. Prior to the Project, the R2E2 Fund effectively served as a RA Government project implementation unit (PIU). However, with the introduction of repayments, etc. the Fund has evolved into a more commercial service provider, marketing its services, taking on repayment and performance risks, and charging fees. The institutional development of the Fund under the Project was substantial.

Long-term industry capacity development. (see Section 3.2).

EE regulatory framework. By analyzing the implementation progress of the 1st NEEAP (2010-2013), submitting the 2nd NEEAP by the MEINR to the RA Government for approval, supporting changes to the provisions of the EE Law, and supporting the formal adoption of ESA works and contracts, the Project contributed towards strengthening the EE regulatory framework for the long term.

(c) Other Unintended Outcomes and Impacts

Additional investments. Beneficiaries tended to do more non-EE improvements after the renovations by the R2E2 Fund. Money for these investments came from resources that they previously used to temporarily improve comfort e.g. by using temporary insulation such as transparent taps or thin sponges, during the winter. They also invested in buildings that were not covered by the Project.

Access to finance. The Project facilitated access to finance provided by local banks for clients that could legally borrow. Local banks were able to appreciate EE investments made by clients through the Project, and the clients developed a better appreciation of the benefits of EE investments. The history of repayments under the Project also demonstrated that institutions can make credit repayments; hence availed financing opportunities for some. After Project Closing, one of the local banks offered to collaborate with the R2E2 Fund to finance municipal EE investments using its financial resources.

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

A non-scientific beneficiary survey was conducted in April 2016, a few months before the Closing Date. About 136 people participated in the survey of which 43 were representatives of social facilities, 82 were staff members and recipients of services offered by the facilities, and 11 were contractors. The respondents scored the Project highly on a variety of categories as shown in Figure 1. The beneficiaries were particularly pleased with the improvement in comfort levels, and in particular the improvement in temperature inside the facilities. Financial efficiency was scored highly as well. However, tariff increases implemented in the 2013-14 heating season reduced the financial savings slightly as the RA Government did not adequately compensate the facilities for the increase.

The beneficiaries also gave the R2E2 Fund - which was the 'face' of the Project to many –high scores. For instance, "Fund's expertise, support and training" was scored at 4.6 out of 5, and "Supervision by the R2E2 Fund of construction works" was scored at 4.5 out of 5 Figure 2. Similarly, contractors gave the R2E2 Fund high scores. For instance, "Process of raising awareness of the tender" was scored at 4.7 out of 5, and this can be attributed to the targetted marketing implemented by the R2E2 Fund.

Figure 1: Scoring of the Project on a scale of 1 (very poor) to 5 (excellent) by beneficiary survey respondents

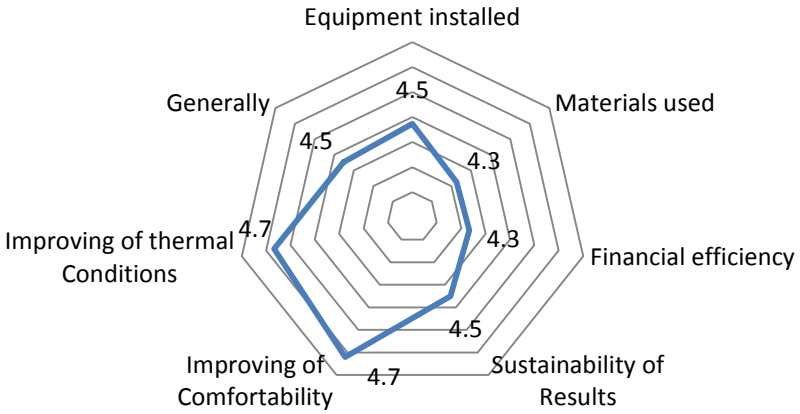
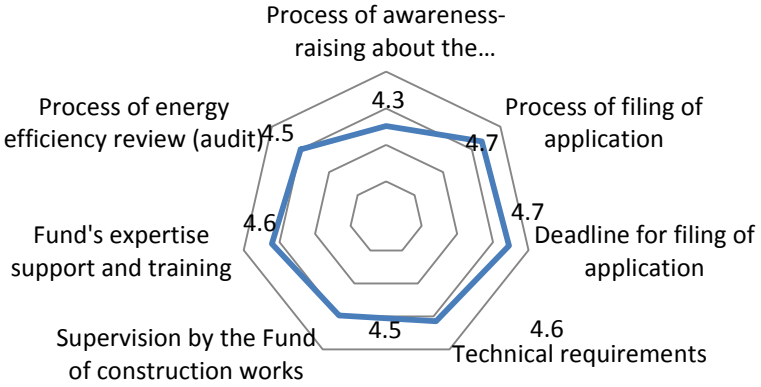


Figure 2: Scoring of the R2E2 Fund on a scale of 1 (very poor) to 5 (excellent) by beneficiary survey respondents



The majority of beneficiary employees and visitors (73%) did not report any problems with the Project. However, 7 percent experienced disruption of normal work routines, and a few experienced noise, relocation during construction, and switching to two-shift educational system when classes were being renovated. These were necessary measures to facilitate the renovation process.

4. Assessment of Risk to Development Outcome

Rating: *Low*

The energy savings and reduction in CO_2 emissions are likely to last through the lifetime of the technology; hence there is negligible risk to the achievement of the development outcomes. At an institutional level, the R2E2 Fund is expected to be sustainable over the next 3-5 years, even without additional capital, making investments of US$1.3-1.5 million per year based on their new OM. These strong prospects for sustainability mitigate the risk to additional development outcomes such as EE market developed, industry capacity built, access to financing enhanced, and EE policies further enhanced. Additionally, the RA Government strongly supported the implementation mechanisms developed under the Project, particularly ESAs, and is requiring other IFIs to use the 'pay from savings' approach. It also adopted the use of ESAs on June 25, 2016, but has not yet adopted the use of NPV-based procurement. Overall, the ICR team rates the risk to the development outcomes as *low*.

5. Assessment of Bank and Borrower Performance

5.1 Bank

(a) Bank Performance in Ensuring Quality at Entry

Rating: *Highly Satisfactory*

The Bank's performance at entry was *highly satisfactory*. The Bank effectively worked with the RA Government, the R2E2 Fund, and other key stakeholders to deliver an innovative Project, utilizing experience with similar Projects in the region. However, this Project is distinguished from previous projects by introducing several innovative features – including ESAs and NPV-based procurement. The Project also represented the first energy saving performance contract using World Bank procurement guidelines, and involved extensive discussions with the Regional Procurement Advisor. Therefore, it has set an important precedent. The risks associated with the innovative nature of Project were analyzed and appropriate mitigation measures put in place. Nevertheless, there was an under-estimation of the slow start-up period, which necessitated an extension of the GEF Grant's Closing Date.

(b) Quality of Supervision

Rating: *Satisfactory*

The Bank's performance during supervision was *satisfactory*. Having delivered a high quality Project at entry, the Bank worked closely with the RA Government and the R2E2 Fund to ensure successful implementation of the Project. The Bank conducted periodic implementation support missions and provided operational advice and technical support when needed. When issues materialized, the Bank supported the R2E2 Fund in resolving them.

The Project was in compliance with fiduciary and safeguard policies. The risks were moderate and low respectively throughout Project implementation, and the Bank staff appropriately advised the client when requested.

(c) Justification of Rating for Overall Bank Performance

Rating: *Satisfactory*
The Bank's overall performance was *satisfactory* based on its performance in ensuring quality at entry, and supervision phases of the project. The Bank's guidance was critical in assisting the client to overcome challenges encountered during the design and supervision of the innovative Project which was able to exceed its PDO indicators.

5.2 Borrower
(a) RA Government Performance
Rating: *Satisfactory*
The RA Government demonstrated strong commitment to the Project by: (i) pledging the reflows from the investments of two closed World Bank projects as co-financing to the GEF grant; (ii) ensuring that the R2E2 Fund had highly qualified staff; (iii) participating in the BOT; (iv) supporting line ministries and other public facilities that participated in the Project; and (v) strengthening the EE regulatory framework (see Section 2.2). However, the RA Government could have adopted the NPV-based procurement scheme pioneered under Project in its Public Procurement Law and draft 2nd NEEAP developed under the Project.

(b) Implementing Agency or Agencies Performance
Rating: *Highly Satisfactory*
The performance of the R2E2 Fund was *highly satisfactory*. Highlights of the R2E2 Fund's accomplishments include: (i) successful introduction and implementation of ESAs; (ii) demonstration of NPV-based procurement in an industry accustomed to least-cost procurement; (iii) introduction of repayment obligations among clients accustomed to grant-based financing and ensuring full and timely repayment; (iv) establishment of performance-based payments for contractors who were used to output-based payments; and (v) exceeding all of the Project indicator targets. The R2E2 Fund also succeeded in providing capacity building to contractors, helping the RA Government strengthen the EE institutional and regulatory framework, and helping to develop the EE market in Armenia.

While Project implementation lagged during the first two years, the R2E2 Fund was able to implement aggressive marketing campaigns and accelerate implementation progress which enabled it to ultimately exceed the PDO and GEO indicator targets.

(c) Justification of Rating for Overall Borrower Performance
Rating: *Satisfactory*
The overall borrower performance was *satisfactory*. The RA Government was committed to the Project and enhanced its success. The R2E2 Fund was effective at collaborating with the Bank in designing and implementing innovative mechanisms for EE implementation. All PDO/GEO indicators and intermediate indicators were exceeded. However, the Project Closing Date had to be extended to meet the investment target, and some of the policy and regulatory measures proposed under the Project had not been adopted prior to the Project's Closing Date.

6. Lessons Learned

The Project introduced several innovations in EE financing and implementation in Armenia. Given its success, there are a number of lessons that can be applied for EE projects in Armenia and beyond.

Project design and eligibility criteria

The Project developed, tested and demonstrated the use of ESAs (see Section 1.5) and NPV-based procurement (see Section 2.1) to introduce and help scale-up sustainable financing for EE in the public sector. The ESA allows public institutions to finance EE without incurring debt, retain energy cost savings for the duration of the ESA, and outsources procurement, management and risks to a third party. NPV-based procurement encourages innovation and new technologies to be deployed, and contributed significantly to the cost efficiency of the Project. Other design elements that helped ensure the Project's success and sustainability included: (i) the demand-based approach, which assured commitment of clients to the Project; (ii) repayments obligations which increased ownership, cost efficiency, accountability and quality of energy management by the client; (iii) the use of grant financing, which helped reduce the risks to the R2E2 Fund in the use of new instruments; and (iv) the provision of policy support to help the RA Government improve its EE policy and regulatory framework.

Eligibility criteria (e.g. 10-year payback period, structural soundness, 50% comfort level, see Section 1.5 for details) were important aspects of the design as well. The 10-year simple payback period for EE investments, for example, was critical to ensuring that the energy cost savings would be sufficient for beneficiaries to fully repay the investment costs within the duration of the ESA. When the R2E2 Fund negotiated the ESAs, they did allow some non-EE investments requested by the beneficiary as long as the ESA could be fully repaid from energy cost savings within the 10-year limit. Given that there are over 5,800 public buildings in Armenia, and only 327 applied to be funded under the Project, the eligible market remains vastly untapped. However, 64% of the applications received in the first two years were deemed ineligible, mostly due to low baseline comfort or heating levels. For these applications, some grant funding may be necessary. However, even 20-30% grant or budgetary funding (with cofinancing from the Fund under an ESA) would be more efficient use of public funding than having the RA Government cover 100% of the investment cost as is currently the case.

RA Government/institutional commitment and strength

The RA Government/institutional commitment to the Project was critical for its success. The RA Government set-up the R2E2 Fund, governed it through the BOT (see Section 2.1), ensured it was properly staffed for the Project, co-financed the Project with US$9.8 million from previous project reflows (see Annex 1), and strengthened the EE regulatory and policy framework (see Section 2.5). The relative independence and strong management of the R2E2 Fund, along with its willingness to try new approaches and determination to make them succeed, cannot be over-emphasized as a critical success factor.

Marketing and pipeline development

Early marketing and pipeline development are always critical for such demand-driven programs. Due to the early dropping of this Project and initial delays, the R2E2 Fund was reluctant to market the program until the funding was in place. Also, given the innovative financing mechanisms, many clients were reluctant to move forward until some initial successes had been achieved. Given the very long lead time to fully complete these early subprojects (from signing of the ESA through commissioning and one full heating season), some of the most critical content of the marketing was substantially delayed. With limited marketing in the first 18 months of Project implementation, signed ESAs totaled only US$3.54 million (34 projects) but investments almost doubled to US$6.18 million (29 projects) in the last two years. One option could have been to implement 1-2 subprojects on a pilot basis during preparation, so the Project could have begun with these experiences and successes already gained.

Value of strong procurement and capacity building

Due to the new performance-based contractor payment scheme, and NPV-based procurement, strong procurement capacity of the R2E2 Fund and support by the Bank team were critical for the Project's success (see Section 2.4 for details on Project procurement). The first five tenders failed because there was one or fewer responsive bids. However, once the R2E2 Fund more broadly advertised, and held workshops to explain and train potential contractors on the new procurement methods, these issues were remedied. The capacity buildings included technical assistance on determining NPVs, finding design company partners, and mobilizing working capital. The capacity building was effective to the extent that 20 different construction companies had participated and won contracts under the Project. It will be important for the RA Government to adopt this procurement method within its new Public Procurement Law in order to further benefit from this procurement option. If not, this capacity building benefit may be lost.

Need for strong M&E/M&V plans and implementation

The Project developed and implemented a comprehensive M&V plan (see Section 2.3) which was essential for the ESA and NPV-based procurement mechanisms to work effectively. The M&V was important for the proper baseline determination, investment repayments (under ESA), NPV assessments, and payments to contractors. The R2E2 Fund, beneficiary and contractor all monitored subproject performance indicators (indoor temperature, lighting intensity, energy bills, etc.), which helped minimize disputes among the stakeholders. It also helped build credibility of the Project and transparency to all.

Sustainability

The Project demonstrated that EE financing through a revolving fund structure was possible on a sustainable basis, even in social institutions that have budgetary constraints and are fully budget-dependent (see Section 2.5). This had done been done before. The Fund invested over $US9.8 million and showed full and timely beneficiary repayments

including the fees necessary for the Fund to fully cover its financing and administrative costs. The R2E2 Fund's overall projections showed that the Fund could be sustainable over the next 3-5 years by investing USD 1.3-1.5 million per year without additional funding. The next step now is for the Fund to implement EE at scale. To do this, there is a need to seek additional financial resources in order to grow, and the R2E2 Fund was in discussions with other donors at the time of ICR completion. While the methodologies pioneered during the Project were likely be sustained, it would have been better to secure financing before the Project closing. The period of uncertainty before securing another source of financing may impact pipeline development and thus future revenues.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

Comments from the R2E2 Fund have been incorporated into the ICR.

(b) Cofinanciers

Not applicable.

(c) Other partners and stakeholders

(e.g. NGOs/private sector/civil society)

No issues were raised by other partners or stakeholders.

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in USD Million equivalent)

Components	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
1. Energy efficiency			
1.1. Energy efficiency investments	9.40	9.83	104.57%
1.2. Technical assistance	3.08	1.49	48.38%
Total Baseline Cost	**12.48**	**11.32**	90.71%
Physical Contingencies	0.00	0.00	
Price Contingencies	0.00	0.00	
Total Project Costs	**12.48**	**11.32**	90.71%
Project Preparation Facility (PPF)	0.00	0.00	
Front-end fee IBRD	0.00	0.00	
Total Financing Required			
	12.48	**11.32**	90.71%

(b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Borrower		8.84	9.50	107.46%
Global Environment Facility (GEF)		1.82	1.82	100.00%

Annex 2. Outputs by Component

INDICATOR	Unit of Measure	Baseline	Cumulative Target Value							
			Y 1 target	Y1 actual	Y 2	Y2 actual	Y 3	Y3 actual	Y4	Actual by 30.06.2016
Indicator One: Energy savings in retrofitted social and other public facilities	kWh equivalent	0	13,250,672	-	66,028,350	85,802,174	215,692,640	415,688,463	215,692,640	**540,240,000**
Indicator Two: CO2 emission reductions in retrofitted social and other public facilities through energy efficiency investments	tCO2	0	3,095	-	15,474	19,159	50,549	103,741	50,549	**145,739**
INTERMEDIATE RESULTS										
Intermediate Result indicator One: Cumulative investments in social and other public facilities	USD	0	1,500,000	532,513	3,500,000	2,973,680	6,000,000	7,897,044	6,000,000	**10,197,863**
Intermediate Result indicator Two: Regulations, legislative amendments, guidelines to further promote energy efficiency		N/A	Diagnostic study completed	-	The relevant package is prepared	Diagnostic study completed	The package is submitted for enactment	Diagnostic study completed	The package is submitted for enactment	**NEEAP, ESA exemplary agreement**
Intermediate Result indicator Two: Number of public sector projects commissioned	Number	0	21	-	49	27	85	69	85	**124**

Annex 3. Economic and Financial Analysis

Ex-post economic and financial analyses of the Project were conducted on select completed and commissioned subprojects. The economic costs and benefits of the Project were calculated exclusive of taxes and subsidies, and the assessment of the financial costs and benefits was done inclusive of taxes. The economic and financial analyses rely on the following key assumptions:

Table 7: Key assumption of economic and financial appraisal

	At appraisal	**At ICR**
AMD/US$ exchange rate	380.0	477.3
Long-run marginal cost of power supply	AMD 40/kWh	AMD 45.5/kWh
Long-run marginal cost of power supply	US$ 0.079/kWh	US$ 0.095/kWh
Estimated effective electricity tariff	AMD 30/kWh	AMD 43/kWh
Estimated effective electricity tariff	US$ 0.079/kWh	US$ 0.090/kWh
Assessment period	20 years	20 years
VAT rate	20%	20%
Discount rate	10%	10%

All data was obtained from team updates of Armenia Power Sector Policy Note, World Bank, 2014. The tariffs are average effective tariffs.

Results of the economic and financial analysis of each type of public facility (a hospital, school, kindergarten, municipality building and street lighting) at appraisal are shown in in Table 8. The main quantifiable economic benefit from EE investments in public facilities was the economic value of saved energy. The energy savings were valued at the estimated long-run marginal cost of electricity supply and/ or gas supply, depending on the facility and the heating option used before implementation of the EE measures. The main economic costs of the Project were the capital investments. The main financial benefit of the EE investments was the reduction of the energy bills. The energy bill savings from EE investments were valued at the current effective electricity and gas tariffs, depending on the type of the facility and the heating option utilized by the facility. The financial costs of EE investments were the capital investments and incremental O&M costs.

Table 8: Results of economic and financial analysis of EE investments at appraisal

	Economic NPV (US$)	**EIRR (%)**	**Payback (years)**	**Financial NPV (US$)**	**FIRR (%)**	**Payback (years)**
Hospital*	170,330	36	3.8	14,479	14	7.7
School**	68,860	37	3.7	6,992	14	7.7
Kindergarten***	23,969	31	4.3	8,075	17	6.6

Municipality building****	23,666	66	2.5	12,869	32	4.2
Street lighting*****	76,929	77	2.3	24,048	24	5.0

*Martuny Hospital; **School N2 of Masis; ***Nor Norq Kindergarten; ****Vedy Municipality Building; ***** Dilijan street lighting

The ex-post economic and financial analysis results are shown in Table 9. In general, the investments were all economically and financially attractive. The EIRRs of the representative facilities ranged from 22 to 57 percent while the FIRRs ranged from 10 to 38 percent. The economic payback periods ranged from 2 to 5 years, and the financial payback periods ranged from 3 to 7 years. The actual results were also better than the estimated results at appraisal. For instance, the average estimated financial payback period was 6.2 years while the average realized financial payback period was 5.2 years (16% better).

Though representative tariffs increased by17 percent during the Project, the local currency was devalued by 26 percent. Therefore, the overall impact in US dollar terms was not as significant. The School N2 of Masis was used as representative facility at appraisal, and after the EE investments were implemented. The ex-post economic NPV is 13 percent higher than the appraisal estimate, and the economic payback period is 19 percent better. These findings are congruent with the finding that innovations implemented significantly enhanced the success of the Project. However, the economic and financial analysis results of the Dilijan street lighting subproject are lower than those estimated at appraisal. This is mostly because the actual subproject 45 percent energy savings was lower than the appraisal estimate of 56 percent.

Table 9: Results of economic and financial analysis of EE investments after EE investments

	Economic NPV (US$)	**EIRR (%)**	**Payback (years)**	**Financial NPV (US$)**	**FIRR (%)**	**Payback (years)**
Hospital*	95,972	22	5	192,223	29	4
School**	77,667	50	3	822	10	6
Kindergarten***	10,711	22	5	5,476	15	7
Street lighting****	58,066	57	2	47,464	38	3
Prison*****	248,171	24	5	142,813	16	6

* Masis Medical Center CJSC; **School N2 of Masis; ***Kindergarten N3 of Vayk; **** Dilijan street lighting***** Erebuni penitentiary institution

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Ani Balabanyan	Operations Officer	CFPTO	Task team leader
Arthur Kochnakyan	Energy Economist	ECSS2	Energy economics
Jas Singh	Sr. Energy Specialist	ECSS2	Energy efficiency
Anke Meyer	Consultant	ECSSD	Energy efficiency
Wolfhart Pohl	Sr. Environmental Specialist	ECSS3	Environment Expert
Arman Vatyan	Sr. Financial Management Specialist	ECSO3	Financial management
Garik Sergeyan	Consultant	ECSO3	Financial management
Alexander Astvatsatryan	Procurement Officer	ECSO2	Procurement
Armine Aydinyan	Procurement consultant	ECSO2	Procurement
Gevorg Sargsyan	Program Coordinator	ETWEN	Program Coordination
Anarkan Akerova	Legal Counsel	LEGES	Legal
Joseph Formoso	Sr. Finance Officer	CTRLA	Finance officer
Irina Tevosyan	Program Assistant	ECCAR	Program Assistance
Josephine A. Kida	Program Assistant	ECSSD	Program Assistance
Supervision/ICR			
Ani Balabanyan	Sr. Energy Specialist	GEE03	Task team leader
Jas Singh	Sr. Energy Specialist	GEE03	Task team leader
Pedzisayi Makumbe	Energy Specialist	GEEES	Primary author
Darejan Kapanadze	Senior Environmental Specialist	GEN03	Environment expert
Benedicta T. Oliveros	Procurement Analyst	GGO03	Procurement
Lusine Grigoryan	Consultant	GGO21	Financial Management
Irina Tevosyan	Program Assistant	ECCAR	Program assistance

(b) Staff Time and Cost

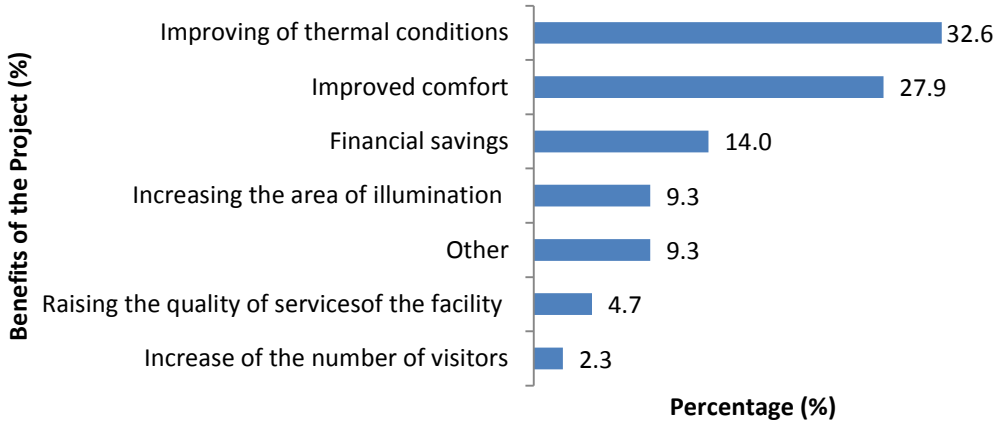
Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
Lending		
2010	6.12	54,797
2011	6.91	27,742
2012	6.39	26,044
Total:	19.42	108,583
Supervision/ICR		
2012	2.93	16,460
2013	1.91	45,824
2014	3.18	51,968
2015	1.44	14,383
2016	3.85	28,000
2017	0.32	39,000 (WPA Plan)
Total:	13.63	195,635

Annex 5. Beneficiary Survey Results

A beneficiary survey was conducted in April 2016, two months prior to the Project's Closing Date, using a qualitative, in-depth interview methodology. 136 interviews were conducted: 43 with the representatives of beneficiary facilities; 82 with staff members and visitors of the facilities (students, patients, community members, etc., depending on the type of facility), and 11 with the representatives of the contractors. The facilities had 4317 staff members of whom 69% were women and 31% were men. 33 of the 43 facilities predominantly conducted EE investments in buildings, and 10 in lighting retrofits.

Facility staff and their clients. 60.5% of the respondents cited the improvement in comfort levels as the most significant benefit of the Project as shown in Figure 3. This included improvements in indoor temperature (32.6%), and in general comfort levels (e.g., better illumination, safety, noise insulation etc.) (27.9%). A significant number of the respondents also cited financial savings as a key benefit of the Project. 25 facilities realized energy saving in both energy consumed and cost of the energy despite an increase in heated and lit area in three of the facilities. Ten facilities realized savings of energy consumed but not cost of the energy due to the increase in tariffs. Four of these also increased the heated and lit areas in their facilities. In five of the communities that conducted street lighting works, the number streets illuminated increased.

Figure 3: Responses to "Which is the most important benefit of the EE Project for your facility (%)"



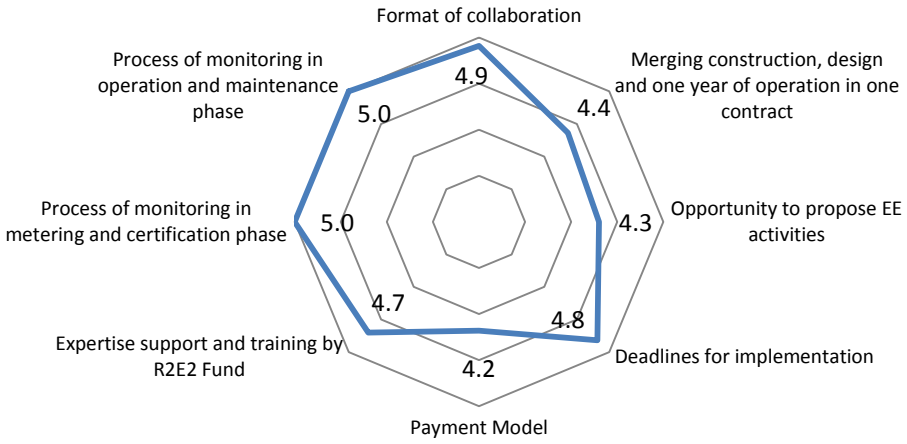
Many empolyees of facilities indicated that the improvement in comfort levels and convinience enabled them to work more efficiently. Beneficiaries of the street lighting investments mentioned that they were able to freely walk and drive in the evening: "…*We can go to shops without flashlights*…", and "…*Formerly it was very hard to drive, there were holes with water on the road, the road was degradated, so we did not know how and where to go, nothing could be seen*…"

Contractors. The 11 contractors (out of 20) that participated in the survey had 162 employees of whom 86% were male. Within the Project, these contractors had performed works which included installation of doors and windows, thermo-insulation of walls and

roofs, modernization of lighting, installation of EE equipment, etc. One contractor had implemented a lighting modernization subproject.

80% of the contractors scored the capacity building provided under the Project as "excellent" or "good", and the overall rating for the support provided by the R2E2 Fund was given a high score as shown Figure 4. One contractor mentioned the following: "*…We have obtained knowledge of ESAs, which [we] currently apply for ourselves…"* The contractors also gave the M&V processes a high score. However, the average score of the performance-based payment model was a 4.2, which is lower compared to other aspects of the Project. The contractors were concerned that the model did not allow them to receive advance payments to cover expenses for materials and equipment. The model also delayed the last 10% payment until a year after completion. Nonetheless, one contractor mentioned: *"…We have become more responsible, we think of not only assuring quality results, but also of assuring savings…"*

Figure 4: Scoring of collaboration with the Fund by the contractors (average rating, 1 – very poor, 5 - excellent)



Annex 6. Stakeholder Workshop Report and Results

No stakeholder workshop was undertaken.

Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR

Summary of Borrower's ICR

The Armenia Energy Efficiency Project was a joint WB-Armenia initiative with objective to reduce energy consumption of social and other public facilities thus contributing to strategic objectives of reducing energy consumption and increasing Armenia's energy security, outlined in the Energy Sector Strategy of Armenia.

The Project was implemented successfully and fully achieved its development objective as evidenced by the over-achievement of all outcome indicators and intermediate result indicators. At the end of the Project the actual indicators exceeded targets by 114 to 272 percent. This is significant success for such kind of project and it should be noted that the initial budget of the project was not changed.

The Project progress was rather slow during the first 1.5 years of operations due to innovative approaches in procurement and financing, particularly output based payments to contractors and obligatory repayments by beneficiaries. The R2E2 Fund, the Bank and the Borrower took necessary measures to settle the situation and ensure achievement of planned results and indicators. First of all, given the demand-based nature of the project, R2E2 implemented wide-scale awareness raising campaign to foster understanding of the benefits of the project, thus increasing number of applications. Secondly, the Fund conducted a number of trainings and pre-bid conferences for potential bidders/contractors to increase competitiveness. These actions, as well as the successful completion of first subprojects led to further increase of interest among potential beneficiaries and contractors. The closing date of the Project was also extended by an additional year to allow Project Implementing Entity fully utilize Project resources.

R2E2 conducted a beneficiary survey among clients and contractors of the Project to gauge their opinion on Project results and operation, as well as to understand whether the Project met their expectations. The results of the survey showed that the expectations of project clients were fully met. Moreover, contractors feel comfortable working with R2E2 Fund during all stages of project implementation. A number of side benefits were reported, such as increase of number of pupils in renovated schools, increase of number of patients in renovated hospitals, etc. In addition, the Project contributed to development of construction companies and now a number of construction companies have necessary capacities to provide ESCO services.

Plan for Sustainability of Fund Operations

The EE Project implementation process, as well as final results proves that applied procurement scheme and payment arrangements are workable, effective and result oriented. Within the framework of the EE project, the R2E2 Fund procured a consultancy for elaboration of a new Operations Manual, as well as Fund Development Strategy for the upcoming 10 years and Project Concepts. The Strategy is accompanied with the Activity Plan.

The Strategy includes Project Concepts for financing of EE reconstruction in public buildings directly by the Fund, as well as via financial institutions using Revolving Funds or other financial sources. Implementation of those project concepts will ensure sustainability of Funds operations. There are about 5,800 public buildings in Armenia and only about 326 have applied at the end of the EE Project, so significant market potential remains. The Fund has finalized a new Operations Manual which will allow it to continue signing ESAs in the years ahead. In terms of the Fund's overall finances, projections show the Fund can be sustainable over the next 3-5 years by investing USD 1.3-1.5 million per year. At the same time the Fund should seek possibilities for increasing financing via addition financial resources. To ensure sustainability of Fund operations and to create possibilities for continuation of EE project the Fund should concentrate its activities on the following:

1. The Fund should implement active steps for involvement of new financial resources from foreign financing institutions as continuation of EE Project operations in the upcoming 2-3 years,
2. The Fund should advocate and lobby adoption of ESA exemplary contract by the RA Government to use this contract for EE reconstruction works,
3. The Fund should advocate and lobby inclusion of ESCO procurement that could be done without competitive public procurement if the ESCO works under public offer (including financing opportunities). This will increase competition among ESCOs and will contribute to setting lower prices for EE reconstruction works,
4. The Fund should actively work with financial institutions to continue EE project via financial institutions. Currently, the Fund negotiates with ACBA Agricole Bank Armenia to initiate project aimed at financing of EE reconstructions in public buildings,
5. The Fund should actively work on development of its services to public and private clients. The most feasible services are already identified in the Fund Strategy; the Project Concept is developed. The Fund should actively work on development of its Client database, Client coverage and marketing of its services.

Lessons Learned

1. The innovated procurement scheme introduced by the Project ensured selection of most effective proposal which ensured the highest level of energy savings.
2. Nevertheless, capacities of construction companies to work within the framework of new procurement scheme was inadequate and capacity building/training activities were necessary for construction companies to ensure effective procurement process.
3. Procurement based on highest NPV encouraged deployment of innovation and new technologies; introduction of performance based payments contributed to highest quality of works and accountability of contractors.

4. The demand-based approach introduced by the Project ensured the highest commitment level of Clients. Repayments increased ownership, accountability and quality of energy management of Clients.
5. Strong and targeted marketing campaigns and availability of exemplary EE sub-project are will contribute to high level of interest on EE works and increased trust of potential clients, which in its turn will result in high demand of EE works.
6. Strong, dedicated institution (R2E2 Fund) which has a clear mandate, well trained and motivated staff with adequate compensation, and a strong marketing plan was critical for Project success and achievement of planned results and targets.
7. From one hand the demand is already rather high, but from the other hand large number public buildings does not comply with selection requirements. Introduction of grant/subsidy mechanisms will be necessary for inclusion of those building in the Project in future, since the savings in such buildings will not cover repayment amounts.
8. Close cooperation between the Borrower, the Bank and Implementing Entity is necessary for smooth and successful implementation of similar Projects.

Recommendations

1. The R2E2 should continue using new procurement scheme in its future operations. This system should be applied for donor funded and state funded project to ensure the highest level of effectiveness and good results.
2. The R2E2 should continue capacity building of construction companies to ensure that more construction companies capable to participate in similar tenders. Moreover, this will contribute to competition also.
3. R2E2 should continue advocating energy efficiency works and continue awareness raising targeted campaigns.
4. The results of the Project should be taken into account during programming of similar projects, especially for defining results, indicators and objectives. The experience showed that the targets, indicators and results could be more ambitious.
5. Experience of EE project could be duplicated in other countries, including project design and innovative procurement and repayment schemes.
6. The Fund and the Borrower should seek possibilities to implement sub-project in public buildings which do not meet selection criteria set by the Project.
7. The Fund should actively work on attraction of new and cheap financial resources for continuation of EE project. This should be done during the upcoming 2-3 years to ensure financial sustainability of the Fund also.

Comments from the RA Government

REPUBLIC OF ARMENIA

MINISTER OF ENERGY INFRASTRUCTURES

AND NATURAL RESOURCES

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To Mr. ALEKSAN HOVHANNISYAN
ACTING COUNTRY MANAGER FOR ARMENIA,
WORLD BANK COUNTRY OFFICE

In response to your Letter № WB-282/16

from 29.11.2016

Dear Mr. Hovhannisyan

In response to your Letter No WB-282/16 from November 29, 2016, we are pleased to share with you comments by the RA Ministry of Energy Infrastructures and Natural Resources (enclosed) on the draft Implementation Completion and Results Report for Global Environment Fund (GEF) Energy Efficiency Project, submitted by the World Bank.

We hereby send you the viewpoints shared by the RA Ministry of Economic Development and Investments, RA Ministry of Territorial Administration and Development, RA Ministry of Nature Protection and the State Urban Committee at the RA Government.

Enclosed: Comments from the RA Ministry of Energy Infrastructures and Natural Resources - 1 page
Letter from the RA Ministry of Nature Protection - 1 page
Letter from the RA Ministry of Economic Development and Investments - 1 page
Letter from RA Ministry of Territorial Administration and Development - 1 page
Letter from the State Urban Committee at the RA Government - 1 page.

Sincerely, ASHOT MANUKYAN

Executed by Vahagn Atayan
Tel: 011 52 68 47

REPUBLIC OF ARMENIA

MINISTER OF ENERGY INFRASTRUCTURES

AND NATURAL RESOURCES

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Sincerely, ASHOT MANUKYAN

Executed by Vahagn Atayan
Tel: 011 52 68 47

Comments on
Draft Implementation Completion and Results Report (ICR)

The Ministry of Energy Infrastructures and National Resources hereby conveys following on the Armenian version of ICR:

Notes stated in "Comments" column in Indicator 3 Table on page X should be edited as follows: "R2E2 Fund of Armenia has completed the analysis of the first Energy Efficiency Action Plan (EEAP), and the Ministry of Energy Infrastructures and Natural Resources (MEINR), based on this analysis, has prepared the draft Protocol Decision "On approving the second phase of the Republic of Armenia 2016-2018 Energy Efficiency Action Plan" and submitted to the RA Government for consideration.

The composition of the Board of Trustees and the names of government agencies presented in Paragraph 2 on page 2 should be matched with the existing composition of the Board and the names of agencies.

On page 9, subparagraph "d" in Paragraph 1 should be edited to read as follows: "for analysis of progress of implementation of the Energy Efficiency Action Plan or EEAP 1 (2010-2013) and elaboration of the second EEAP (2016-2018)".

In Paragraph 2 on page 16, the wording "Since the Government did not want to continue..." should be edited to read as follows: "Since the Government did not have the opportunity to continue...".

On page 33, the wording "developing and submitting the NEEAP2 to the Government for approval" should be replaced with "Analyzing the progress of implementation of EEAP-1 (2010-2013) and submitting EEAP-2 by the MEINR to the RA Government for approval".

In first Paragraph on page 58 we recommend deleting the wording "Ensuring reliable energy supply to consumers envisaged in the RA Energy Sector Strategy and", since the outcomes of energy efficiency initiative do not have direct impact on the reliability of energy supply.

We recommend replacing "Government" with "RA Government" throughout the ICR text.

REPUBLIC OF ARMENIA

DEPUTY MINISTER OF ECONOMIC DEVELOPMENT AND INVESTMENTS

5 M. Mkrtchyan str. 10, Yerevan 0010,
Tel: 011-59-72-07. Fax: 52-65-77
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Web page: www.mineconomy.am

Response to Letter № 01/22.1/6679-16
from 12.12.2016

RA MINISTRY OF ENERGY RESOURCES AND
NATURAL RESOURCES

RA Ministry of Economic Development and Investments, within its mandate, has no comments on the draft Implementation Completion and Results Report for Global Environment Fund (GEF) Energy Efficiency Project, submitted by the World Bank.

Sincerely,

EMIL TARASYAN

Executed by Bella Manukyan
011597121

REPUBLIC OF ARMENIA

MINISTER OF TERRITORIAL ADMINISTRATION AND DEVELOPMENT

Government Build. 3.

Yerevan 0010, RA

"....." ..... 2016 N.....

To Mr. A. Manukyan,
RA Minister of Energy
Infrastructures and Natural Resources

In response to your Letter
N 01/22.1/6679-16, from 12.12.2016

Dear Mr. Manukyan,

We have no comments on the draft Implementation Completion and Results Report for Global Environment Fund (GEF) Energy Efficiency Project, submitted by the World Bank. Meanwhile, our recommendation is to replace the map used in the draft report with another map more representative of the current political picture of the region.

Sincerely,

D. LOQYAN

Executed by A. Soghomonyan
Department of Territorial Administration
Tel: 010-51-13-34

CHAIRPERSON OF THE STATE URBAN COMMITTEE AT THE GOVERNMENT OF THE REPUBLIC OF ARMENIA

Government Build. 3, 0010, Yerevan, RA.
www.minurban.am, E-mail: info@minurban.am

---------- N ----------

To Mr. Ashot MANUKYAN,
RA Minister of Energy Infrastructures and
Natural Resources

Letter N01/22.1/6679-16,
from December 12, 2016

Dear Mr. Manukyan,

We have no comments on the draft Implementation Completion and Results Report for Global Environment Fund (GEF) Energy Efficiency Project (Grant No TF012163), submitted by the World Bank.

Sincerely,

Narek SARGSYAN

Tanya Aramyan, Department of Housing Policy
and Public Utility Infrastructures
(011) 621-724

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

Not applicable.

Annex 9. List of Supporting Documents

- Project Appraisal Document
- Project Legal Agreements
- Aide Memoires dated:
    - May 2, 2016
    - October 23, 2015
    - February 04, 2015
    - October 4, 2014
    - August 12, 2014
    - March 10, 2014
    - February 20, 2014
    - August 13, 2013
    - July 15, 2013
    - December 20, 2012
    - July 05, 2012
    - November 25, 2009
- Implementation Status Reports dated:
    - June 9, 2016
    - October 27, 2015
    - April 8, 2015
    - November 2, 2015
    - April 4, 2014
    - March 23, 2014
    - September 4, 2013
    - January 26, 2013
    - August 10, 2012
- Borrower Implementation Completion Report; October 24, 2016
- Survey of Opinion of Beneficiaries of Energy Efficiency Project; June 16, 2016
- R2E2 Post-Project Completion Operations Manual; June 30, 2016
- Armenia - Power sector policy note, December 1, 2014
- Subprojects technical data sheets
- Procurement plan; May 2, 2016
- M&V summary report
- Monthly Status Reports from August 2014 to June 30, 2016

Map of Armenia