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IMPLEMENTATION COMPLETION AND RESULTS REPORT
(TF-57107)

ON A

GRANT FROM THE

GLOBAL ENVIRONMENT FACILITY TRUST FUND

IN THE AMOUNT OF US$5.5 MILLION

TO THE

FORMER YUGOSLAV REPUBLIC OF MACEDONIA

FOR A

SUSTAINABLE ENERGY PROJECT

September 26, 2013

Sustainable Development Department
South East Europe Country Unit
Europe and Central Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective March 2013)

Currency Unit = US$
Euro 1.00 = US$ 1.30
US$ 1.00 = Euro 0.77

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

EA	Energy Agency
EE	Energy Efficiency
ESCO	Energy Service Company
FIRR	Financial Internal Rate of Return
FiT	Feed-in-Tariff
GEF	Global Environment Facility
GEO	Global Environment Objective
GHG	Greenhouse Gas
GoM	Government of Macedonia
GWh	Gigawatt-hour
ICR	Implementation Completion and Results report
ISR	Implementation Status and Results report
kWh	Kilowatt-hour
MBDP	Macedonian Bank for Development and Promotion
M&E	Monitoring & Evaluation
MoE	Ministry of Economy
MoU	Memorandum of Understanding
MWh	Megawatt-hour
NPEEBP	National Plan for Energy Efficiency in Public Buildings
PAD	Project Appraisal Document
PDO	Project Development Objective
PIU	Project Implementation Unit
PV	Photovoltaic
RE	Renewable Energy
SEFF	Sustainable Energy Financing Facility
TA	Technical Assistance

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FYR of Macedonia
Sustainable Energy Project

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D A T A S H E E T

H E R E

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1. Project Context, Global Environment Objectives and Design

1.1 Context at Appraisal (November 2006)

1. At appraisal, FYR of Macedonia was one of the countries in South East Europe with the fewest energy resources and with considerable untapped energy conservation potential. The main fossil fuel resource in FYR of Macedonia consisted of limited deposits of lignite. Lignite-fired plants provided over 70% of total electricity supply, followed by hydropower and imports, likely from lignite plants in neighboring countries. In order to reduce future dependence on imports, the Government was therefore interested in introducing Renewable Energy (RE) and Energy Efficiency (EE). FYR of Macedonia had promising indigenous resources of renewable energy, with the largest potential lying in small hydropower, at an estimated economic resource of about 150MW or 10% of total capacity. Geothermal, biomass, wind and solar were other potential sources of renewable energy. Energy intensity, expressed as total primary energy production divided by GDP, was on a level comparable with that of non-EU neighbors, but much higher than that of EU countries. This was due to the presence of energy-intensive metal processing industry; low-efficiency in power generation, supply and consumption; and prevalence of electric residential heating.

2. The Government of FYR of Macedonia started developing a framework to tackle the challenging energy context. In particular, a new Energy Law was adopted by Parliament in May 2006. However, while the law clearly stated the role of EE and RE, no implementation framework followed.

3. Furthermore, a number of barriers were likely to hamper investment in sustainable energy, defined here as EE and RE sources.
Barriers to investment in RE included a lack of incentive framework; a lack of capacity and experience in renewable energy project development; a lack of access to long-term finance; and non-existing, complex, and/or lengthy processes for allocation, permitting, licensing and approval of projects.
Barriers to investment in EE included a lack of awareness and confidence in the efficacy of energy efficiency investments and technologies; a lack of capacity and experience in project development, installation and monitoring; a banking sector with high risk perception of EE investments.
Financial barriers were significant, particularly as due to the limited experience in project finance, all lending would be based on the balance sheet of the borrower rather than the merits of the projects.
Institutional barriers included insufficient legislative framework; lack of capacity and accountability within the Ministry of Economy; and local administrations not allowed to take on debt obligations, unwilling to commit to multiple-year funding, and lacking project planning and implementing capacity.

4. The rationale for World Bank involvement in the project was founded on the interest expressed by the Ministry of Economy in obtaining GEF support for a Sustainable Energy Program, as well as on the direct continuation of the previous work on an Energy Efficiency Strategy, for which GEF support was considered a crucial implementation tool. Additionally, the considerable experience the World Bank had acquired in EE and RE project preparation and implementation in neighboring countries would add credibility to the GoM's effort to implement the required policies.

1.2 Original Global Environment Objectives (GEO) and Key Indicators

5. The Project's global environment objective was to reduce GHG emissions on a continuous basis by overcoming barriers to implementation of energy efficiency and renewable energy.

6. The development objective of the Project was to develop a sustainable market for energy efficiency and renewable energy, by supporting the development of an enabling framework, institutional

capacity and necessary financing mechanisms. The Project aimed to achieve this development objective by:

- Changing the unfavorable investment and incentive conditions, and creating and enabling environment in FYR of Macedonia that fostered the development of sustainable energy utilization through providing financial, methodological, informational and institutional support;
- Supporting a large increase in profitable energy efficiency investment through the development of a self-sustaining, market-based financing mechanism;
- Increasing the availability of financing for renewable energy investments, enterprises and intermediaries through the establishment of a financial facility with a long-term time horizon, which would provide seed capital for debt co-financing of renewable energy projects.

7. The performance indicators for the global objective were:

- Reductions in GHG emissions at the national and project levels;
- Increased share of "new" renewable energy in national energy supply.

The performance indicators for the development objective were:

- Introduction of an enabling regulatory and incentive framework for renewable energy, including tariff design, sub-laws on grid code, licensing and permitting procedures, stakeholders training;
- Total number of renewable energy projects reaching financial closure as a result of SEFF, including the capacity installed (MW) and amount of electricity and heat generated (MWh);
- Total number of energy efficiency projects reaching financing closure as a result of SEFF, including amount of energy (kWh) saved annually against baseline.

1.3 Revised GEO and Key Indicators, and reasons/justification

8. The objectives of the project were not revised. However, performance indicators were partially reviewed at a restructuring in June 2010, as indicated in section 1.7 below, in order to reflect the Project's heightened focus on barrier removal rather than construction.

1.4 Main Beneficiaries

9. The main beneficiaries from a RE standpoint would be local industries through increasing source of activity, incomes and jobs; electricity customers and the GoM through reduced imports and hence tariffs; the general public through reduced GHG emissions.

The main beneficiaries from an EE standpoint would include owners and occupants of buildings retrofitted, through improved comfort levels, reduced sickness and energy cost savings; the EE industry, including the building industry and energy service companies; local banks and municipalities, and in the longer term local industries through increase in competitiveness.

1.5 Original Components

10. The project was financed by a GEF grant of US$5.5m, and consisted of the following 3 components:

Component 1: Market framework (US$1.2million, of which US$1.0million GEF grant)

This component aimed at building capacity in the strategic/ legislative/ institutional arenas, as well as from a technical and advisory project development and investment standpoint, and at providing financial support for monitoring, evaluation, information dissemination and project administration.

Institutional capacity building focused on support in designing and implementing renewable energy policy and secondary legislation; creating the energy sector regulatory framework; and streamlining processes such as permitting.

Advisory capacity building concentrated on the development of a sustainable pipeline of potential projects as a deal flow basis for Component 3 and the creation of a Project Development Advisory Facility (PDAF) which would provide information and know-how to private developers and equipment suppliers. The implementing agency for this component was the newly established Energy Agency.

Component 2: Support to utility-based Energy Services Company or ESCO (US$0.8million GEF grant)
This component would support the development and startup of a utility-based ESCO under the umbrella of the system operator MEPSO, which would be the implementing agency for the component. The project would provide startup capital for business development and financing of the first deals (on a revolving fund basis). MEPSO would prepare business and financing plans, and develop contractual and modeling tools with the support of an ESCO-specialized consultant. The ESCO would help stimulate the market for energy services by providing turnkey and performance-based contracting for energy efficiency, and by demonstrating the financial performance of such projects. Early focus would be on energy upgrades of school buildings, in close coordination with planned support to the educational sector from the World Bank, the Dutch Government, and USAID.

Component 3: Sustainable Energy Financing Facility (US$6.2million, of which US$3.7million GEF grant)
The third component would be a financing facility called Sustainable Energy Financing Facility or SEFF. The SEFF would be housed within the implementing agency MBDP and consist of a loan guarantee facility and a loan facility, on a co-financing basis with commercial institutions and the MBDP. The MBDP would co-finance the SEFF with an amount not less than US$2.5million.

11. The guarantee facility (US$1.2million GEF grant) would focus on energy efficiency projects, and provide partial credit guarantees covering 50-70% of the principal of the loans made by commercial banks.

12. The loan facility (US$2.5million GEF grant) would be applied to both energy efficiency and renewable energy projects. Loans would likely be structured as subordinated debt in order to attract additional commercial credit, with tenors adapted to the projects.

1.6 Revised Components

13. The Project underwent a major restructuring in June 2010 without changes to the Project objectives, motivated by:

- For the Market Framework component, slow progress and unsatisfactory implementation management by the Energy Agency;
- For the ESCO component: non-signature of MoU establishing the ESCO and triggering fund disbursement, as well as several barriers relating to the public procurement law and ability of municipalities to commit to multi-year investments;
- For the SEFF component: lack of demand for planned guarantee facility and limited operations financed using the SEFF credit line (US$163k of the total US$2.5million grant).

14. While a level 1 restructuring was discussed, it was rightly dismissed as both the GEO and the PDO remained highly relevant to the Macedonian energy sector strategic priorities.

15. The Project was restructured with a focus on changing the implementing agency for the Market Framework component from the Energy Agency to the Ministry of Economy, eliminating the ESCO component and the guarantee facility, aligning the energy efficiency initiatives to the new Ministry of

Economy-led National Plan for Energy Efficiency in Public Buildings or NPEEPB, and reallocating funds from the ESCO component and within the SEFF. The restructured 3 components were as follows:
Component 1: Institutional support and technical assistance (US$1.75million)
The component would continue to support for the development of a regulatory and institutional framework and provide technical assistance for the preparation and implementation of the NPEEPB. The implementing agency would be a newly created PIU within the Ministry of Economy.
Component 2: Financial support for energy efficiency in public buildings (US$2.2million)
The component would provide grant support for energy efficiency retrofits in public buildings, focusing on municipal schools and kindergartens. A phased approach would start with 100% grant financing, followed by 50% co-financing from municipalities, moving towards a sustainable fund to be established after Project closure. The implementing agency for this component would be the newly created PIU.
Component 3: SEFF credit line for renewable energy and energy efficiency (US$1.55million).
The loan facility would continue with a budget of US$1.5million to be matched by MBDP. Additionally, an allocation of US$50,000 was proposed for MBDP to develop a project pipeline and undertake technical due diligence so as to quickly identify and process viable project proposals.
Closure date was also extended by eighteen months to September 2012.

16. During the second restructuring, In April 2012, US$328,000 was reallocated towards Component 2 to complete Phase 2 energy efficiency retrofits. Additionally, in August 2012 and again in January 2013, the project closing date was extended (to January 31, 2013 and March 30, 2013 respectively) in order to allow the completion of the Phase 2 energy efficiency retrofits.

1.7 Other significant changes

17. The performance indicators were revised in June 2010 in order to clarify their definition and reflect the Project's heightened focus on barrier removal and lifetime impact of RE/ EE projects.
At project development objective level, indicators were revised from "capacity installed", "electricity produced" and "electricity saved" to "capacity *licensed*", "*expected* electricity generation" and "*expected* electricity saved" (see Annex 10).
At global objective level, indicators were revised so that the reduced GHG emissions are monitored against expected project lifetime reduction rather than actual annual reduction, in order to capture the impact of the investments becoming operational after the closing date of the Grant.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

Soundness of background analysis

18. The Project preparation was adequate and prepared the ground to meeting the dual ambition of the Project to develop a framework to support EE/ RE and to implement effective EE/ RE measures. In particular, the Project benefited from (i) the analysis of 13 case studies to assess the market potential for EE/ RE; (ii) the initial preparation of required legal documentation as well as a preliminary market analysis for a utility-based ESCO; (iii) the review of alternative financing designs, taking into account the specificities of the local banking sector[1]; and (iv) lessons learnt from relevant projects implemented in the region such as the IFC/GEF-supported Hungary EE Co-Financing Program (HEECP), the Macedonian GEF Mini-Hydro project, and the utility-based ESCO experience in Croatia and Poland.

[1] The alternatives included the proposed SEFF; an equity investment mechanism; a dedicated credit line administered through financial intermediaries; and the housing of the SEFF in either a program unit within a Bank approved entity or a private bank.

Assessment of project design

19. ***At appraisal***, in November 2006, the development objectives of the Project were relevant and in line with the Energy Efficiency Strategy endorsed by the GoM in order to increase RE/ EE investments in the economy. The Project components were well designed with regards to their purpose, building blocks, and integration of lessons learnt from prior relevant projects. In particular, the Project took measured risks, informed by the experience in Croatia and Poland, in choosing innovative market mechanisms and concepts for increasing EE investments through risk mitigation instruments and performance contracting. However, the Project was also characterized by a high degree of complexity given the scale of investment anticipated. Each of the three components was to be implemented by a separate institution, each with limited capacity and / or experience in the RE and EE arenas. In particular, 2 key implementing agencies (the Energy Agency and the ESCO) were not fully established, staffed or resourced at the time of the PAD. Additionally, the Project was to interface with a large number of potential partners, including USAID and the European Commission's European Agency for Reconstruction. Finally, the scope encompassed a broad spectrum of RE projects and EE measures, although the PAD does mention an early focus of EE measures on the education sector.

The Project timescale was therefore ambitious given the complexity of the Project.

20. ***At restructuring***, in June 2010, the design of the RE framework was updated to take into account the results delivered thus far and with emphasis on the NPEEPB implementation, while also addressing issues of Project complexity and weak implementation capacity. The EE program was narrowed down to focus on municipal schools and kindergartens, which as a group represent over 50% of electricity and heat consumption in public buildings. Additional resources for technical assistance were allocated to all Components to enable successful implementation through capacity build-up and support for pipeline development, technical due diligence, preparation and delivery of EE/ RE projects. The institutional arrangements were greatly simplified with the elimination of the ESCO component and the unused SEFF guarantee facility, and the setup of a new PIU replacing the Energy Agency as overall implementing agency, with adequate resources and capability.

21. While addressing most of the issues encountered pre-restructuring, the new Project lacked some of the original thinking in terms of establishing long term, sustainable capacity for developing EE projects in Macedonia.

Adequacy of client commitment at entry

22. At the time of appraisal, the Project benefited from the endorsement of the MoE, which had originally expressed interest in obtaining GEF support for a Sustainable Energy Program in a letter to the World Bank dated March 25, 2004. The GoM had passed a law establishing an EA which would take over responsibilities from the Department of Energy in the MoE, and an EA Management Board and temporary Director had been appointed, confirming the GoM's commitment to building capacity.

Assessment of risks

23. The project was correctly assigned a substantial risk rating. In particular, the risks that (i) Government's commitment to streamlining state/local decision-making would fail over time; (ii) power sector restructuring would be slow; (iii) MEPSO would not stay committed to developing the ESCO concept; and (iv) the EA would fail to be established in time for the project to start or is under-funded, were correctly assigned a substantial risk rating. However, the lack of demand for guarantees offered under the SEFF was not identified as a risk, and was addressed through the project restructuring. Additionally, the potential for delays and risk to timescales of the project was not fully recognized and assessed.

2.2 Implementation

Implementation of Component 1

24. The ***original*** Component 1 (Market Framework) was successful in creating a comprehensive framework and engaging all stakeholders to enable the development of RE in Macedonia, albeit with delays against planned timescales. Rulebooks, guidance and procedures for electricity generation from RE sources were established and accompanied by the introduction of FiTs. Support was also provided to developing hydropower bidding packages, leading to concession contracts being signed for 6.4 MW of capacity currently in operations and 8.3 MW under construction. The main factors affecting the implementation of the component in terms of timescales included the lack of resources allocated by the Government to the EA; however the team provided strong, effective and sustained TA to deliver the expected outcomes.

The ***restructured*** Component 1 focused on RE projects implementation, in particular through a wind measurement program designed to feed into the pipeline of RE projects under Component 3.

The PIU provided adequate resources and accountability, and benefited from extensive TA support.

Implementation of Component 2

25. The ***original*** Component 2 (ESCO) did not succeed in implementing a national, sustainable, large scale EE program. No activities were initiated as part of this Component, primarily due to (i) a reduced commitment from the implementing agency and the Government; (ii) the complex ESCO setup, founded on a joint venture between 2 partners with limited experience in the sector; and (iii) barriers such as provisions in the Law on Public Procurement (e.g. municipalities not being allowed to take on debt) making it impractical to operate on an ESCO model to channel funds to public sector EE projects.

The ***restructured*** Component 2 successfully focused on implementing EE measures in municipal schools and kindergartens, and benefited from extensive technical assistance and strong alignment with the NPEEPB. Additionally, the Project supported the MoE in assessing alternative designs for a sustainable funding mechanism and implementing agency for the NPEEPB. Delays in implementation were primarily driven by some municipalities delaying contract signatures and raising concerns over the availability of budget for committed co-financed EE retrofits, and complex MoE decision making processes.

Implementation of Component 3

26. Under the ***original*** Component 3, three years into the 4.5-year project, only 2 operations totaling US$163,000 had been financed. Factors affecting implementation were mostly driven by a lack of ownership from MBDP, slow EA procedures and lack of technical assistance beyond the pipeline of projects developed at appraisal stage. Additionally, no interest had been expressed in the guarantee component of the SEFF due to the absence of market for this product, although an initial market analysis completed at appraisal stage was more favorable, the proposal of guarantees was considered a good practice as part of EE programs within the Bank at appraisal stage, and the GEF also encouraged the proposal of guarantee instruments as part of their grants to EE programs.

27. The ***restructured*** Component 3 addressed these issues through implementing systematic and extensive technical assistance for project identification, due diligence, etc., and eliminating the guarantee component. As a consequence, SEFF disbursement 4 years into the project reached $1.4 million, mostly focused on the financing of a large 1MW solar PV plant.

28. In the light of reduced commitment from a number of implementing agencies, and limited resources made available by the Government, the Bank demonstrated its commitment to delivering the highly relevant GEO and PDO through flexible implementation. One area of improvement could have been a much shorter restructuring process, which took almost 1.5 years to finalize.

29. The achievement of the GEO and Implementation Progress were rated as moderately unsatisfactory in 2009 and unsatisfactory in 2010, prior to the restructuring.

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

30. M&E design: The Project included adequate outcome indicators for the development and global environment objectives, as well as for the intermediate results M&E. Targets were defined for Project end, and an annual trajectory was also proposed as part of Annex 3 of the PAD. One potential area of improvement for the design of the outcome indicators could have been a shorter periodicity for monitoring and reporting, in particular during the first 2 years of the project, so as to identify and address blocking points sooner rather than later. The original GEO indicators focused on RE capacity and EE measures delivered by the Project, without fully taking into account the more global impact of the comprehensive RE and EE framework delivered by the Project. Accordingly, the GEO indicators were amended at the June 2010 restructuring to reflect the heightened focus on barrier removal to EE and RE, and account for the RE capacity and EE measures enabled by the Project.

31. M&E Implementation: According to the project ISRs, before the June 2010 restructuring, only 4 out of 6 outcome indicators, and 3 out of 12 intermediate results indicators were reported on a regular basis. Additionally, one outcome indicators' definition was inconsistent with the Project definition. These issues were fully addressed post-restructuring, with all relevant data adequately collected and reported.

32. M&E Utilization: The outcome and intermediate results indicators were used to identify underperforming components and sub-components and the need to restructure the Project. Post-restructuring, the indicators were used to re-allocate funds dynamically where most appropriate, anticipate potential delays in completion of EE activities and identify potential liquidity issues.

2.4 Safeguard and Fiduciary Compliance

33. Safeguards: The overall safeguard compliance was rated as Satisfactory throughout the project. The Project was subject to the following Safeguard Policies: Environmental Assessment (OP/BP/GP 4.01), Involuntary Resettlement (OP/BP 4.12) and Projects on International Waterways (OP/BP/GP 7.50). The Project Environment category rating was assessed as FI due to the exact nature of EE/RE projects not being known at the time of the PAD. An Environmental Management Framework Document (EMFD) was prepared, which (i) described the screening procedures to be applied by the financial intermediary, (ii) specified the procedures to be undertaken before support can be granted to a project, and (iii) included the requirement to prepare project specific Environmental Management Plans (EMP) which would require Bank approval. A Resettlement Policy Framework was prepared, which described the screening mechanisms to be applied to projects involving municipalities, so as to ensure compliance with national law. As the International Waterways safeguard was triggered, notification was sent to the riparians and no objections were received.

34. No major safeguard issues were encountered during Project implementation, and during an environment safeguards review end 2012, the EMPs were found to be implemented properly.

35. Financial Management: The financial management of the Project was consistently rated as Satisfactory except in 2010, when it was rated as Moderately Satisfactory.
The overall financial management risk for the project was rated as Moderate, with the overall EA-related risk rated as Substantial. The MEPSO-related risks on accounting policies and procedures, information systems, and internal audit respectively rated as Substantial, Substantial and High, and addressed accordingly. The restructuring eliminated some of these issues, with the financial arrangements at the MoE and MBDP deemed acceptable to the Bank for staffing, budgeting and planning, information systems, accounting and reporting, internal control procedures, external auditing and fund flows.

36. Procurement: The procurement arrangements were consistently rated as Satisfactory throughout the Project. Procurement capacity had been adequately built within the EA ahead of the pre-restructuring phase of the project, and transferred to the MoE PIU after the 2010 restructuring, under simplified

procurement arrangements. The only procurement issues encountered were related to delays, in particular at contract signature for EE projects with municipalities, and the December 2012 mission confirmed that the performance of project procurement by the implementation team was satisfactory.

2.5 Post-completion Operation/Next Phase

37. The Project successfully addressed the main barriers to RE projects in Macedonia by establishing a comprehensive framework, engaging all stakeholders, and demonstrating implementation through a large solar Photo-Voltaic (PV) project. As a result, a larger than expected 110 MW of small hydropower, small solar PV and wind capacity had been licensed by Project closure, laying the foundations for future RE development. About 60 MW of the licensed projects are now built or under construction and more RE initiatives are expected especially following the recent increase of FiT for biomass energy. On the EE front, the Project's ambition to set up a national, sustainable, large scale EE program was not fully met. The municipal schools and kindergartens retrofits did raise awareness, demonstrated the viability of EE measures and created a market for EE in the public sector. However, the restructured Project lacked a clear path of transition toward a sustainable strong EE implementing agency. Additionally, while the NPEEPB represents a key opportunity for ensuring the continuity of EE initiatives in Macedonia, its implementation is still some way off and the nascent EE market could face a financing gap. This could be mitigated by a pro-active approach from MBDP, which despite having developed the capability and experience to finance private EE projects through the SEFF, has yet to finance a project with the reflow of funds from the SEFF on-lending (more than US$1.2 million).

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

Rating: *Moderately Satisfactory*

38. Global Environment Objective and Project Development Objective: The GEO and PDO remain highly relevant to Macedonia's priorities in the energy sector. The Strategy for Energy Development in the Republic of Macedonia until 2030 stresses the need to address the renewable energy potential of the country in order to reduce dependency on imported fuels and meet the EU targets, and recognizes the opportunity of energy efficiency measures, in particular in buildings and household appliances. In a context of progressive closure of the ageing lignite power plants and increasing demand, the GEO and the PDO will continue to be relevant to the Greener Growth pillar of the Country Partnership Strategy.

39. Design and Implementation: After restructuring, the Project remains relevant to the energy sector RE needs and public sector EE potential. Specifically, the MoE is currently engaging with the Bank to develop a sustainably funded NPEEPB, building on the Project success, with a scope extended to all other municipal and state buildings including the health sector. The initial Project design issues such as (i) inadequacy of the EA as implementing agency, (ii) lack of readiness for an ESCO business model, (iii) lack of interest in a guarantee instrument to encourage private investment in EE measures and (iv) complexity were addressed during implementation of the project. Post-restructuring, a possible area of improvement could have consisted of focusing more on developing an institution outside the MoE that could be implementing agency for EE measures beyond public buildings, within the scope of Component 1 or 2.

3.2 Achievement of Global Environmental Objectives

Rating: *Moderately Satisfactory*

40. The achievement of the GEO is assessed based on the three equally important and cross-supporting outcomes as defined at Project approval. The foundational Outcome 1 requires indeed

adequate corresponding financing mechanisms for both EE (Outcome 2) and RE (Outcome 3) in order to become effective.

41. Outcome 1: Change the current unfavorable investment and incentive conditions and create an enabling environment in Macedonia that fosters the development of sustainable energy utilization through providing financial, methodological, informational and institutional support. The outcome was achieved with very minor to no shortcomings. The Project successfully supported the development of a ***comprehensive institutional framework*** to incentivize the development of sustainable energy, including FiTs, preparation of rulebooks on certificates of origin, procedures for land and resources use and acquisition, bidding packages for hydropower and a licensing framework.

42. Additionally, the Project provided ***extensive methodological support*** to all stakeholders, thereby building the capacity to deliver RE/ EE projects in the MoE, the MBDP and other commercial banks involved in the Project.

43. ***Information dissemination*** focused on communication of the EE benefits gained at the schools and kindergartens targeted during the first phase of the restructured Project. The dissemination was successful in raising awareness and securing the co-financing for the Phase 2 projects as well as creating momentum for the NPEEPB.

44. The ***financial support*** for the Project initiatives was also adequate and well-targeted after the restructuring, with 99% of funds being disbursed or committed at project closure.
Institutional support. The Project financed a successful wind measurement program that already has created one year time series of high quality data on the wind resource available in FYR Macedonia and established an institutional framework for collecting and analyzing wind data. This will be a key to developing the country's wind potential through attracting potential wind developers. Furthermore, through technical assistance on a framework for wind power investments, an RE grid integration study, interpretation of wind measurement results and initial discussions with the state-owned utility ELEM the Project supported the concept for the country's first wind farm in Bogdanci (37 MW under construction and an additional 8 MW planned) financed by KFW.

45. Additionally, through the FiTs framework, the development of hydropower bidding packages for the Ministry of Economy and the Ministry of Water, and the establishment of a licensing process with the help of IFC acting as a private sector sounding board, the Project enabled the licensing of 58 MW of new small hydropower plants and about 8.5 MW of new solar PV plants, mostly financed through the private sector.

46. Finally, a 1MW solar plant was pioneered and partly financed by the project.
The total added RE capacity in Macedonia enabled by the Project reaches about 110MW, the majority of which is already under construction. This is well in excess of the modest 8.4MW licensed capacity target anticipated at restructuring, and demonstrates the success of the Project in establishing a favorable investment and incentive environment for sustainable energy in FYR Macedonia.

47. Outcome 2: Support a large increase in EE investment in Macedonia through the development of a self-sustaining, market-based financing mechanism based on a principle of commercial co-financing.
There were significant shortcomings in the Project's achievement of the outcome. On the positive side, the Project enabled the delivery of EE retrofits in over 40 institutions, mostly municipal schools and kindergartens, through a targeted and phased program supported by extensive TA. The ***impact was substantial*** as the education sector represented about 50% of energy demand in public buildings, which in turn represented 10 to 20% of total energy demand in Macedonia. The lifetime savings achieved were below original target, due to a conscious choice to implement deep EE measures (e.g. wall insulation,

window replacement, etc.) as opposed to cherry-picking the shortest payback retrofits, and due to a need to deliver adequate comfort levels in schools and kindergartens. However, the EE retrofits implemented performed well, with an actual average payback shorter than that estimated at audit stage. While the first of the two EE financing phases focused on grant financing, the second phase of the EE retrofits was founded on a 50% grant and 50% co-financing approach. The second phase confirmed the demand for EE in the public sector, demonstrated the ***viability of co-financing*** and paved the way towards fully loan-financed projects. The Project therefore triggered an initial market for EE which can be measured by the demand for more EE retrofits from municipalities (for instance, as part of the Bank's MSIP project). Additionally, the Project sowed the seeds of a sustainable financing mechanism supported by an enduring agency through the planned National Program for Energy Efficiency in Public Buildings (NPEEPB), which the MoE is currently preparing. Finally, the Project also demonstrated the value of a procurement process based on competitive bidding and performance contracting, which could become the basis for future EE contracting in the MoE and the marketplace. Given the difficulty in implementing a first-of-a-kind EE program, the overwhelmingly positive response from both Client and beneficiaries and the perspectives for further extension of the implemented measures through the NPEEPB, the achievements of the Project are significant.

48. However, the Project did not lead to the establishment of a sustainable EE implementing agency, and only delivered the first building blocks for a sustainable market-based financing mechanism. The Bank provided significant support to MoE in developing a detailed program plan supported by an assessment of sustainable financing options for the NPEEPB, which was submitted to the GoM for adoption in June 2013. The GoM has asked for additional explanations on alternative financial mechanisms and is expected to continue with the adoption procedures. On the private side, despite substantial training and TA support, the MBDP has lacked pro-activity in financing EE projects through the SEFF.

49. Overall, outcome 2 was not fully met, although some significant awareness was raised, the viability of co-financing was demonstrated and implementation progress was accomplished in a context of difficult implementation.

50. Outcome 3: Increase the availability of financing for RE investments to enterprises and intermediaries through the establishment of a financial facility with a long-term horizon, which will provide seed capital for debt co-financing of RE projects. The outcome was achieved with moderate shortcomings.

51. The Project SEFF credit line provided first-of-a-kind financing tailored to ***meet the need of RE projects through a subordinated loan structure, longer tenors and a grace period on principal repayment***. Additionally, the Project provided extensive TA and training support to participating banks so as to increase capacity and awareness in implementing loan transactions for RE projects, which should support the financing of at least part of the licensed renewable capacity. As a result, the SEFF loan facility financed two solar PV plants, including the first large RE project through the 1MW MEGA Solar plant. This latter project demonstrated the availability of adequate financing to potential investors and developers, and led to numerous small solar PV and hydropower projects being developed by the private sector (the large wind farm currently under construction is being developed by state-owned utility ELEM). The large amount of RE under construction or licensed demonstrates that ***investors' confidence in securing financing on adequate terms has dramatically increased*** since Project inception. In this sense, the Project succeeded in creating a market for and increasing the availability of RE financing.

52. However, when the original SEFF loan facility was expected to fund 5 RE projects, the actual realized RE projects consisted of only two PV plants, with the large 1MW MEGA Solar absorbing over 90% of the credit line. In this sense, at project closure, the SEFF was yet to demonstrate a wide-ranging

appeal to RE developers. More importantly, the MBDP is also yet to show the needed pro-activity to sustain the revolving fund in the future: there could be a risk that the SEFF does not finance any further projects despite funds being available, market demand being present and institutional capacity having been built. Additionally, the guarantee products offered by the SEFF failed to achieve traction due to lack of market demand. While the offering was seen as a good practice by the Bank and the GEF at appraisal time, a number of projects involving EE measures in the region reached the same result (e.g. Poland, Croatia).

3.3 Efficiency
Rating: *Satisfactory*

53. At appraisal, an incremental cost analysis assessed the Project incremental cost for GEF funds and the resulting incremental reduction in CO2 emissions, against a baseline scenario; additionally, an economic and financial analysis focused on the ESCO Component and the SEFF Component.
At completion, a financial analysis of the large solar PV plant delivered under SEFF, a benefits-cost analysis of the EE retrofits and an incremental GEF cost analysis were carried out.

54. Financial analysis: Based on projections from 2011 and 2012 actual output over a lifetime of 15 years, the 1MW GEF-financed solar plant delivered a FIRR of 13.5% pre-tax and 12.5% post-tax, vs. a FIRR of 10.4% pre-tax and 9.6% post-tax at feasibility. This is due to the actual output being about 20% higher than anticipated at feasibility study stage.

55. Benefits-cost analysis: The actual total value of EE retrofits financed under the Project, under Components 2 and 3, including loan and equity components, as well as audit and consultant costs, stands at about US$4.2 million or about 7% higher than the value expected at first restructuring. Additionally, the expected lifetime savings from the EE retrofits is about 110 GWh, or about 50% of the target at first restructuring, and about 40% of the target at appraisal. In this sense, the EE retrofits under-delivered against targets, due to a conscious choice to implement deep EE retrofit measures in the schools and kindergartens needing them the most, as opposed to cherry-picking the lowest payback measures in a larger sample of institutions.

56. However, looking at the detail of the measures implemented in the selected schools and kindergartens, the Project performed well. This is evidenced by the about 7.5 years average payback time expected from the retrofits recommended at audit stage, against the (estimated) 6.5 years average payback time for the retrofits actually implemented. When the payback times are adjusted for the higher temperatures achieved in the buildings post-retrofit, the (estimated) actual average payback improves to about 4.5 years.

57. Incremental cost analysis: GEF only accounts for grants which are passed through to the end-users on a “one-off” basis. GEF funds participating in debt financing schemes, such as those in the SEFF loan facility, are not considered incremental costs because they will collect reflow that can be used to finance future EE/RE opportunities. Based on this classification, the GEF incremental cost increased substantially from an estimated US$1.855 million at appraisal to US$4.200 million at project completion as result of the restructuring. In addition to the 1MW solar plant and EE retrofits directly funded, the Project enabled the licensing of about 110 MW of RE, of which about 10 MW is in operation, about 50 MW is under construction, and about 50 MW is at planning stage. Assuming that 50% of the capacity at planning stage is actually built, we assumed that the Project catalyzed the delivery of about 85 MW of RE capacity, which needs to be factored into the incremental cost analysis.

58. The incremental benefits of the project consisted of the reduction in CO2 emissions enabled by these RE and EE projects, which amount to about 3.78 million tCO2 over the projects lifetime. The

incremental cost was associated with the development of the market framework, the various TA and coordination activities, and the investment in RE/ EE projects, through GEF funds for an actual incremental cost of about US$4.20 million. The analysis therefore indicates that overall Project GEF costs of CO2 abatement of US$1.11/tCO2, versus an estimated US$1.08/tCO2 at appraisal. This actual cost is mostly driven by the RE capacity enabled by the Project.

59. Overall, the Project efficiency is on target, driven by the significant RE licensed capacity that was enabled by the comprehensive framework, TA and stakeholder engagement delivered under Component 1. Additionally, the 1MW solar plant directly GEF-funded by the Project delivered above target FIRR, while the EE retrofits under-delivered against target but performed well against audit forecast. The Project efficiency is therefore rated as Satisfactory overall.

3.4 Justification of Overall Outcome Rating

Rating: *Moderately Satisfactory*

60. The Project GEO and PDO remain highly relevant to the energy sector in Macedonia. While the GEO was mostly met through the successful RE framework delivered under the Project, the EE retrofit activities also played a role in raising awareness of the benefits and stressing the leadership role of the public sector. The overall GHG emissions reductions achieved are in line with the target.

61. The June 2010 restructuring successfully turned the Project around, and performance against PDO indicators was strong by Project closure, except for the already mentioned EE targeted lifetime savings. The project did provide the required financial, methodological, informational and institutional support to foster sustainable energy utilization, particularly through the comprehensive framework delivered for RE. The Project did not fully succeed in supporting a large increase in EE through a sustainable, market-based financing mechanism. However, by targeting the largest energy consumers in the public sector in a significant program targeting about 40 schools and kindergarten in over 10 municipalities, the Project made a critical step towards establishing a business case and hence demands for EE measures. The public sector interest for further EE measures was confirmed both in the post-retrofit survey and by the MSIP Director within the Macedonian Ministry of Finance. Additionally, while a sustainable, market-based mechanism wasn't fully achieved during the Project, the team did deliver and discuss extensively an options paper considering such mechanisms, and the MoE is currently engaging with the Bank to reach a conclusion on a sustainable financing mechanism and implementing agency.

62. The Project succeeded in increasing the availability of financing for RE projects. Although the SEFF fund is at risk of not being actively managed by the MBDP, the large RE licensed capacity demonstrates the investors' confidence in securing financing on acceptable terms, a possible consequence of the SEFF example setting for commercial banks.

63. The overall outcome is therefore rated as Moderately Satisfactory.

3.5 Overarching Themes, Other Outcomes and Impacts

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

64. Macedonian electricity customers would benefit from (i) reduced dependency on costly electricity imports and (ii) reduced energy consumption in schools and kindergartens, which is charged to customers through their electricity bills. Additionally, the retrofits in over 40 schools and kindergartens delivered improved working conditions due to more comfortable indoor temperatures, reduced polluting fumes from old heating stoves and more aesthetic buildings.

(b)Institutional Change/Strengthening

65. The Project successfully implemented an enduring framework for the development of RE, supported by adequate capability within the Energy Regulatory Commission of Macedonia and commercial banks.

The Project also strengthened the EE program management capability within the MoE, as reflected in the NPEEPB and the ongoing MoE discussions for the establishment of a sustainable financing mechanism for EE in public buildings. Additionally, the Project contributed to kick-starting an EE services industry through building confidence in the transparency and fairness of EE public procurement processes. For instance, the company Konstruktor d.o.o., which built part of the retrofit program, stated that they started a new EE business line because of the Project.

66. However, the Project came short of establishing an enduring institution to support the development of EE measures in Macedonia. Additionally, while the Project built extensive capability within the MBDP and some commercial banks, more pro-activeness is required to finance private EE projects.

(c) Other Unintended Outcomes and Impacts

Not applicable to the Project.

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

67. A beneficiary survey was conducted by the PIU post-Project completion. Stakeholders from all 12 municipalities involved in the EE retrofits were interviewed using a pre-set questionnaire: 30 principals, 39 teachers and caretakers, 27 students and parents, and 11 mayors. Overall, about 90% of stakeholders were completely satisfied with the retrofits process and results. While principals were most satisfied with the energy savings achieved, teachers and students were most satisfied with increased room temperature, associated health benefits and improved aesthetics of the buildings. A consistent area of improvement related to avoiding construction during school hours. Mayors consistently expressed high satisfaction with regards to the impact of the retrofits on the municipality image and stated their interest in continuing EE initiatives on a loan-financed basis, as well as the newly prominent role of EE in their priorities. Besides remaining schools and kindergartens, mayors identified hospitals, sport centers, as well as street lighting as areas of interest.

4. Assessment of Risk to Development Outcome

Rating: *Moderate overall*

68. Sustainability of RE / EE projects implemented: The generated electricity, reduced CO2 emissions, and energy savings delivered by the individual projects funded under the Project are expected to be sustained over the lifetime of the RE and EE measures implemented i.e. more than 15 years. The post-implementation survey conducted by the MoE PIU demonstrated that the payback times for EE retrofits implemented were lower than the paybacks anticipated for the retrofits recommended at audit stage. It is unlikely that these outcomes will change over time.

69. Sustainability of RE incentive framework: The framework demonstrated its effectiveness and sustainability in attracting RE investments through the previously mentioned small hydropower, solar PV and wind farms in operations, under construction and at planning stage. To maximize its impact, the framework will require further parallel institutional improvements to clarify for instance land property rights, and simplify and streamline further the licensing and permitting processes.

70. Continuation of EE program: While the Project did create a market for EE retrofits in the public sector, there is still a gap in terms of a sustainable implementing agency and financing mechanism. The NPEEPB could address the EE potential in public buildings in a sustainable manner, however full design

and implementation will probably take a few years, potentially creating an EE investment hiatus and halting the momentum gathered by the Project. Beyond the public sector, there is currently a market and capacity gap which remains to be addressed, but which could be catalyzed by widespread communication of the successes achieved in the public buildings sector.

71. Continuation of RE financing: The risk that RE projects cannot continue to be financed under adequate terms is limited. The SEFF successfully built capacity within commercial banks and demonstrated the commercial viability of RE projects. The 10 MW of RE in operations, as well as the 50 MW under construction and 50 MW at planning stage, confirm that the Project contributed to creating a sustainable market for RE financing.

5. Assessment of Bank and Borrower Performance

5.1 Bank

(a) Bank Performance in Ensuring Quality at Entry

Rating: *Moderately Satisfactory*

72. At appraisal, substantial effort went into Project preparation and design, including the analysis of RE/ EE case studies, the consideration of a number of alternatives for the fund, and the inclusion of lessons learnt from relevant projects in the region. All appropriate project aspects were duly completed, such as technical, financial, economic, institutional and fiduciary arrangements, safeguards policies and guidelines. However, the project would have also benefited from (i) a more advanced stage in the establishment of a sustainable EA and ESCO, which would have demonstrated the commitment from the implementing agencies, (ii) a more focused scope and less complex institutional set-up and (iii) a more comprehensive assessment of risks inherent to the Project, including potential for implementation delays. Overall, the Bank's performance in ensuring quality at entry was moderately satisfactory.

(b) Quality of Supervision

Rating: *Moderately Unsatisfactory*

73. The Bank conducted regular implementation support missions, and key issues were highlighted in the ISRs which rated the performance of the Project appropriately. The team was adequately staffed, and benefited from the right expertise, local presence and sufficient resources.

Pre-restructuring, the Bank's supervision performance started as Moderately Satisfactory and moved towards Moderately Unsatisfactory as several attempts were made to kick-start the EA and ESCO-driven Components. Once the decision was made to restructure the Project, over a year passed before restructuring was finalized; the performance during this protracted decision making process was Unsatisfactory.

Post-restructuring, the Bank demonstrated proactive supervision and reactiveness, and Satisfactory performance. This was evidenced by the Project's fast response to changes of scope as requested by the client (inclusion of an information campaign on EE gains from the first phase of restructured Component 2, for instance), required re-allocation of funds towards further EE projects, or solutions to Project liquidity issues due to payments due exceeding the Special Account ceiling.

Overall, the Bank's quality of supervision is rated Moderately Unsatisfactory.

(c) Justification of Rating for Overall Bank Performance

Rating: *Moderately Satisfactory*

74. While the original Project design incorporated best practices from neighboring countries, the Project preparation would have benefitted from a fully established ESCO and EA, as well as deeper

market analysis to assess the demand for a guarantee instrument. During implementation, post-restructuring, the Bank showed flexibility to adjust to the needs of the implementing agencies and provided ample TA to support capacity building. A direct consequence is the success of the RE framework, which catalyzed the licensing of about 110MW of wind, small hydropower and solar plants, and enabled to deliver strongly against the GEO. The overall performance of the Bank is rated Moderately Satisfactory.

5.2 Borrower
(a) Government Performance
Rating: *Moderately Unsatisfactory*

75. ***Before restructuring***, the Government's performance directly impacted on the EA's ability to fulfill its role as an implementing agency. In particular, the Government could have taken more ownership over fulfilling essential basics such as timely nomination of a Director, adequate allocation of staff, and suitable allocation of resources including office premises. Additionally, other ongoing issues such as lack of communication between the MoE and the EA, lack of clarity over respective accountability (e.g. tendering of concessions for small hydropower plants), absence of follow-up on actions required from the MoE, further demonstrated the lowered commitment to the Project. While an institutional framework for incentivizing investments in RE was successfully set up, it suffered from significant delays in implementation.
Post-restructuring, the Government's commitment to the Project proved much stronger through the NPEEPB and the quick set-up of an adequately resourced PIU within the MoE, which enabled the delivery of EE measures in over 40 schools and kindergartens. However, complex decision making procedures contributed to further delaying the Project. For instance, significant delays were incurred at the time of finalizing the selection of municipalities for the second phase of the EE program as well as when required to sign contracts for the supply and installation of wind measurement equipment, which could have led to the cancellation of the grant elements of the fund.

76. Delayed decision making on the next stages of the NPEEPB may also impact on the momentum generated by the Project for implementation of further EE measures in the public sector. Additionally, essential measures towards simplifying the licensing, permitting and land ownership issues/ process for RE projects remain to be undertaken. However, the Government's capacity building and increased commitment to RE and EE were clearly demonstrated over the lifecycle of the Project.
Overall, the Government's performance is rated as moderately unsatisfactory.

(b) Implementing Agency or Agencies Performance
Rating: *Moderately Satisfactory*

77. Pre-restructuring, the EA failed to deliver the required outcomes from the Project, mostly due to inadequate resources being provided by the Government. Post-restructuring, the new PIU established within the MoE served as an effective and flexible implementation agency which quickly came up to speed with the Project to deliver the restructured Components 1 and 2 of the Project with the support of extensive technical assistance from the Bank including training, construction supervision, and overall project implementation and management. Through the PIU, the long-delayed wind measurement program was implemented, a RE grid integration study was completed as well as rulebooks to support FiTs for combined heat and power and RE plants. Under the EE Component, the PIU led the energy audits in public buildings, and overall satisfactorily managed the implementation of EE projects. One area of improvement could have been more proactive communication of delays in the project, including the 1 year delay in contract signature from one of the municipalities, leading to a last-minute cancellation of the related projects and reallocation of funds. More pro-activeness could also have been shown in areas

immediately related to the project beyond implementation of the defined scope, such as earlier identification of opportunity for an EE information campaign.

78. The SEFF was successfully established and the MBDP built strong relationships with four commercial banks. However, in the three first years of the Project, while the financing facility under the MBDP was fully operational, only two projects totaling US$163,000 had been financed over its credit line. While the need for technical assistance in the identification and preparation of projects for investment was one driver and was subsequently addressed, the MBDP could have demonstrated more pro-activeness in using the allocated funds to stimulate demand for commercial RE/ EE projects.
Overall, the implementing agencies' performance is rated as moderately satisfactory.

(c) Justification of Rating for Overall Borrower Performance
Rating: Moderately Satisfactory
79. Based on the above and the overall outcome rating of the Project, the overall Borrower performance is rated as Moderately Satisfactory.

6. Lessons Learned
80. The main lessons for the Project are summarized below:

- ***RE sector development can be successfully achieved through establishing a comprehensive framework*** including (i) developing all relevant policy, legislation, incentive scheme, rulebooks, land acquisition procedures, bidding packages, licensing processes; (ii) engaging with all relevant stakeholders such as Regulator, MoE, MBDP, EA; and (iii) demonstrating implementation through a project such as the 1MW solar PV plant delivered under the SEFF.
- ***Delivering an EE program takes time and requires flexibility.*** However, significant measurable results can be achieved in a first-of-a-kind EE initiative in the public sector, through a strong implementation unit backed by extensive training and TA. Actually seeing the tangible results of such initiative through implementation at a significant scale (e.g. about 40 schools and kindergartens in over 10 municipalities) is a powerful driver for further EE initiatives, as can be evidenced by the newly dominant importance of EE on municipalities' agendas. A final step ensuring success in the long run would consist of establishing a sustainable financing mechanism such as the one currently discussed between the Bank and the MoE for the NPEEPB.
- Based on the GEF's expectations from EE projects, including e.g. guarantee products, ***a standalone GEF grant may not be a flexible enough instrument for Bank EE projects***. A more effective approach could involve a blend of GEF grant and Bank loan, or a planned approach whereby a Bank loan would be activated one to two years into the project.
- ***Looking back at the lessons learnt reflected in the Project design*** at appraisal stage, the guarantee instrument proposed as part of the SEFF based on the success from the IFC/GEF-supported Hungary EE Co-Financing Program failed to attract interest not only in the Project, but also in other EE initiatives such as the Poland Energy Efficiency project. The market's interest in guarantee instruments to support EE programs therefore needs to be reconsidered in future EE projects. The other main lesson learnt discussed at appraisal considers the advantages of an ESCO model and recognizes that some trial and error, flexibility, and additional time may be required during implementation. The experience of the Project shows that this lessons stands, and that in the case of FYR Macedonia, may apply to a period following a successful implementation of measures in the public sector.

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

(a) Borrower/implementing agencies

81. The Bank concurs with the lessons learnt highlighted in the implementing agencies ICRs, including (i) the value of consistent strong TA to support the implementing agencies; (ii) the impact of promotional activities in raising interest in EE/ RE investments; and (iii) the determining role of transparent selection criteria to select municipalities eligible for the EE retrofits, and of a fair competitive contractor procurement process. However, it is questionable whether the 2 RE projects financed through the SEFF over 6 years "prove the strong interest in RE investment" in Macedonia as stated by the MBDP (the number of projects licensed is a much stronger indicator). Additionally, no mention is made of the future of the SEFF.

Similarly, a PIU within the MOE may not be "the most appropriate arrangement for implementation of EE projects" in terms of sustainability, as suggested by the MoE, and the alternative setups discussed as part of the NPEEPB are better fit for purpose.

(b) Cofinanciers

82. Not applicable.

(c) Other partners and stakeholders

83. Not applicable.

Annex 1. Project Costs and Financing

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

Component	Appraisal estimate US$	Actual/ Latest estimate US$	Percentage of Appraisal %
Component 1: Market Framework and Institutional support and TA	$1,000,000	$1,065,249	107%
Component 2: Utility-based ESCO	$800,000	$0	0%
Component 2: EE in public buildings	$0	$3,120,052	n/a
Component 3: SEFF loan RE	$2,000,000	$1,196,000	60%
Component 3: SEFF loan EE	$500,000	$63,700	13%
Component 3: SEFF guarantee EE	$1,200,000	$0	0%

(b) Financing

Source of funds	Appraisal estimate US$	Actual/ Latest estimate US$	Percentage of Appraisal %
GEF	$5,500,000	$5,460,000	99%
Financial intermediaries and private investors	$26,500,000	$3,851,966	15%

Annex 2. Outputs by Component

Component 1: Market Framework at Appraisal, Institutional Support and Technical Assistance at Restructuring

The Component delivered a comprehensive framework to enable RE investment, including rulebooks, guidance and procedures for electricity generation from RE sources, the introduction of FiTs, and the development of hydropower bidding packages.

The restructured Component focused on implementation. It continued to support the development of a regulatory and institutional framework for RE and delivered new activities such as technical assistance on a framework for wind power investments, an RE grid integration study, interpretation of wind measurement results and initial discussions with the state-owned utility, ELEM, eventually leading to the licensing of about 45 MW of new wind capacity, 37 MW of which are under construction at Bogdanci and financed by KfW.

Additionally, the restructured Component provided extensive support to build capacity within the MoE PIU for the preparation and implementation of EE retrofits at schools and kindergartens, during energy audit stage, construction supervision, commissioning and post-retrofit audits. Beyond the delivery of the EE retrofits program funded under GEF, the Project also provided extensive technical assistance with the preparation and implementation of a National Program for EE in Public Buildings or NPEEPB, and with proposals for a sustainable financing mechanism. The Government has yet to decide the way forward for the NPEEBP in terms of financing mechanism, institutional setup and actual program of EE measures to implement in public buildings.

Component 2: Utility-based ESCO at Appraisal, and Financial Support for EE in Public Buildings at Restructuring

While the ESCO never materialized, the restructured Component successfully delivered deep EE retrofits in over 40 schools and kindergartens. These included wide-ranging measures including replacement of lighting with more efficient bulbs, boiler retrofits from wood-fired to pellet-fired, wall insulation and replacement of doors and windows. The delivered measures not only over-performed the measures recommended at audit stage in terms of economics and payback time, they also allowed for elimination of under-heating and wood stove fumes, with associated health benefits.

Beyond the results achieved at the schools and kindergartens benefiting from the retrofits, the Component contributed to increased awareness of EE benefits among municipalities, leading to an increased demand for EE and a much more prominent place of EE on the municipalities' agendas. This can be evidenced from the higher demand for EE investments from municipalities as part of the MSIP program.

Additionally, the Component also contributed to creating a market for EE. The transparent procurement process followed throughout the Project encouraged contractors to bid, leading to both the budding of a new industry and price discovery of EE measures.

Component 3: Sustainable Energy Financing Facility for RE and EE

Market demand for the Guarantee component of the SEFF never materialized, and fewer RE/ EE projects than anticipated were funded, however, the SEFF proved a key demonstration tool to finance first-of-a-kind renewable projects in Macedonia.

The SEFF financed a small EE private project at a hotel and a small solar PV plant, and more importantly the large MEGA Solar 1 MW solar PV plant.

Additionally, the Component provided extensive technical assistance support to the MBDP and on-lending partner banks to build capacity for RE projects pipeline development and due diligence. The fact that about 110 MW of RE capacity has been licensed by Project completion, including about 10 MW in operation and about 50 MW under construction, demonstrated that the Component successfully contributed to lowering the financial barriers to RE investment in Macedonia.

Annex 3. Economic and Financial Analysis

This annex comprises four sections. Section I is a benefit-cost analysis of the Energy Efficiency (EE) for public buildings component funded in part by GEF grant. Section II is a financial analysis of the Mega Solar Plant financed by the Sustainable Energy Financing Facility (SEFF) under the Project. Section III is a lifecycle impact assessment of the renewable energy (RE) capacities *catalyzed* by the institution support and technical assistance efforts funded by the Project. Section IV is an incremental cost analysis to assess the Project's global impact on CO_2 emissions reduction and the incremental cost associated with that impact as a result of both direct and indirect GEF interventions. In each section, the analytical outputs are compared against relevant benchmarks established either at appraisal, or by feasibility studies, or by energy audits carried out before the implementation of the component.

I. EE for Public Buildings

This component provided grant support for EE retrofits in public buildings, focusing on municipal schools and kindergartens. The implementation of this component was carried out in two phases, with Phase I fully funded by GEF grant, followed by Phase II half financed by the grant, and half by the municipal budget. At project completion, a cost-benefit analysis was carried out to assess the impact of the EE measures financed by the project. The outputs of the assessment were compared against the estimates by the energy audits carried out before the implementation of the EE retrofits.

Costs and Benefits

The costs of the project are the up-front investment costs. Based on the responses to the stakeholder survey (Annex 5), the primary benefits of the project are i) improved comfort due to higher indoor temperature during the heating season, and ii) energy and cost savings. Other mentioned however less quantifiable benefits include i) health benefits associated with lower incidences of cold and respiratory illness; and ii) overall aesthetic boost to the buildings' ambience.

Energy Audits

Before the implementation of the EE retrofits, 38 energy audits were carried out, based on which, 140 individual EE measures were recommended to the participating institutions. The recommended measures belonged to 9 general categories such as installation of thermostatic valves or roof insulation. In some cases, the same category of measure was recommended twice, even thrice, for different structures from the same institution. The payback period was calculated based on the estimated investments of a measure, divided by the expected dollar amount in energy savings it would yield on an annual basis.

Based on the energy audits, the 9 types of EE measures had average payback periods, ranging from as short as 1.27 years for simple thermostatic valve installations to 7-9 years for building exterior insulation and window/door replacements. The average payback estimated for all measures recommended at audit stage was 7.6 years. Several findings came out of this assessment::

- The EE measures with short payback periods tend to be only applicable to a small subset of institutions;
- Window/door replacement and building exterior insulation are the most commonly applicable EE measures although they tend to have longer payback periods;
- Due to the differences in scale and pre-conditions of the structures examined, the payback period of the same type of EE measure may vary, evident from the sizable standard deviation of the average estimated paybacks.

Table A3-1 provides a summary of the estimated payback periods of the EE measures proposed to the 39 institutions audited.

Table A3-1 Individual EE Measure Payback Period Estimates Based on the Energy Audits

EE Measure	*Number*	*Average Payback* *(years)*	*Standard Deviation* *(years)*
Installation of thermostatic valve	8	1.4	6.1
Stove replacement	3	3.8	5.5
Radiator cover replacement	6	4.1	3.1
New control - district heating	2	4.6	1.0
Roof insulation	21	5.4	7.0
Lighting	14	6.1	5.2
Boiler improvements	5	6.6	41.2
Exterior wall insolation	31	7.4	15.7
Window and door replacements	36	8.6	12.7
Miscellaneous	5	9.8	26.4
Central heating	9	n.a.	n.a.
All Measures	**140**	**7.6**	**12.8**

Benefit-Cost Analysis at Project Completion

Source Data and Format

A large dataset on the participating institutions was collected at the project completion to allow more precise estimates of the project impact.

- ***Energy consumption data*** was based on the actual reported amount in the energy bill and/or fuel purchase receipts. Prior to project implementation, energy audits were carried out on all participating institution, during which 3 heating-season worth of energy consumption data was collected, allowing for more precise estimates of the consumption level before project implementation. Phase 1 has been completed for nearly 2 years. All participating institutions in the phase have a full-year (2 half heating seasons) of energy consumption data. Phase 2 was only recently completed. Most participating institutions in the phase have at most a few months of energy consumption data;

- ***Heating degree days (HDDs)*** vary across municipalities and the time period measured. Data on the number of HDDs in a standard year in each municipality was collected from a public source. The specific number of HDDs for the consumption periods measured was collected during the energy audits and/or post-program monitoring by the PIU;

- ***Incidence of under-heating*** in attempt to conserve fuels is prevalent among institutions using firewood and/or oil fuels. Thus, the post-program survey had collected data on the severity of under-heating.

Table A3-2 provides a summary of the "raw data" collected for the calculation of thermal energy savings resulted from the project.

Heating Data Normalization to ensure the estimated annual energy savings resulted from the project interventions are representative of the saving amount in any given year during the project lifecycle, the energy consumption data in the "raw dataset" would need to be normalized to taken into accounts the idiosyncratic variations in the consumption data, such as i) unique temperature conditions during the measured periods; ii) different utilization levels of the building facility; and iii) different comfort (temperature) levels before and after project implementation. The following *normalization process* was therefore followed to arrive at the final estimate of an *average* annual energy saving amount:

- Energy savings adjusted for utilization levels (e^*). For the project dataset, this adjustment had been carried out in the field with more general estimates of facility utilization levels

$$e^* = \frac{e}{\text{utilization}\%}$$

- Energy saving in a standard year (Δe^*) adjusted for heating degree days (HDD)

$$\Delta e^* = \frac{e^*_{Pre} \times HDD_{standard\ year}}{HDD_{Pre}} - \frac{e^*_{Post} \times HDD_{standard\ year}}{HDD_{Post}}$$

- All institutions participating in the EE retrofitting program have reported indoor temperature improvements (between 1-5 degrees) after project implementation (see Annex 5). Among institutions using firewood and/or oil fuels, the temperature difference is primarily due to deliberate under-heating in the past in order to save costs on fuel. For institutions with district heating, the difference is due to better insulation after project implementation. Therefore, energy saving in a standard year adjusted for room temperature differences and under-heating (ΔE^*) is calculated as

$$\Delta E^* = \frac{e^*_{Pre} \times HDD_{standard\ year}}{HDD^*_{Pre}} - \frac{e^*_{Post} \times HDD_{standard\ year}}{HDD_{Post}}$$

  where HDD^*_{Pre} is the equivalent number of heating degree days if the average room temperature during the period before the project implementation was the same as that after.

Table A3-2 and A3-3 provide summaries of the thermal energy consumption data before and after the normalization process described above.

Table A3-2 "Raw" Data on Thermal Energy Consumption before and after retrofits

Phase I	Actual Investment (USD)	Fuel Used		HDD Standard Year	Before				After			Construction Completion
		Before	After		Consumption (kwh)	Expenditure (USD)	HDD	Reported Underheating	Consumption (kwh)	Expenditure (USD)	HDD	
D.Cara - Bogovinje	61,797	Firewood	Pellet	2,662	560,943	17,897	7,986	high	50,000	3,190	2,662	12/17/2011
11 Oktomvri - Bogovinje	66,311	Firewood	Pellet	2,662	381,345	11,333	7,986	high	32,500	1,932	2,662	12/17/2011
S.Bajrami - Bogovinje	82,104	Firewood	Pellet	2,662	583,011	16,621	7,986	medium	55,000	1,518	2,662	12/17/2011
S.Pindzur-Ces.Obl.	81,718	Firewood	Pellet	2,271	1,277,841	37,562	6,813	high	101,107	5,889	2,271	12/31/2011
S.Pindzur Sokolarci - Ces.Obl.	18,887	Firewood		2,271	617,013	17,925	6,813	high	49,500	1,438	2,271	12/31/2011
K.Ohridski - Ces.Obl.	80,549	Firewood	Pellet	2,271	736,086	21,161	6,813	high	91,100	5,238	2,271	12/31/2011
D.Daskalov-Kavad.	36,639	Firewood		2,303	1,281,951	37,923	6,909	medium	192,200	5,282	2,303	1/23/2012
Gaberot - Kavadarci	35,500	Firewood		2,303	584,196	17,299	6,909	medium	84,800	2,511	2,303	1/23/2012
T.Velkov-Kavad.	78,524	Firewood	Pellet	2,303	1,660,479	55,908	6,909	high	172,880	11,642	2,303	1/23/2012
F.Konica - Zajas	76,052	Firewood	Pellet	2,662	659,328	57,948	7,986	medium	95,000	16,699	2,662	12/17/2011
F.Konica(podracno) - Zajas	94,931	Firewood	Pellet	2,662	471,534	20,146	7,986	medium	31,200	1,778	2,662	12/17/2011
R.Rusiti - Zajas	63,684	Firewood	Pellet	2,662	311,889	10,602	7,986	medium	34,700	2,359	2,662	12/17/2011
P.Zografski - K.Voda	116,634	District heating		2,536	1,510,314	289,399	7,608	low	119,469	22,266	2,536	1/13/2012
Peperutka-K.Voda	116,136	Light Fuel Oil		2,536	2,206,989	251,814	7,608	medium	479,592	54,721	2,536	1/13/2012
Sinolicka-K.Voda	45,827	District heating		2,536	339,684	62,484	7,608	low	46,330	8,522	2,536	1/13/2012
Sinolichka-G.Baba	85,532	Light Fuel Oil		2,536	733,485	83,627	7,608	medium	218,000	24,634	2,536	1/6/2012
Sonce-G.Baba	166,983	Light Fuel Oil		2,536	1,655,136	189,682	7,608	medium	376,960	43,200	2,536	1/6/2012
Soncogled-G.Baba	90,248	District heating		2,536	1,142,604	206,651	7,608	low	149,719	27,078	2,536	1/6/2012
Phase I	**1,398,056**			**44,910**	**16,713,828**	**1,405,982**	**134,730**		**2,380,057**	**239,897**	**44,910**	

Phase II	Actual Investment (USD)	Fuel Used		HDD Standard Year	Before				After			Construction Completion
		Before	After		Consumption (kwh)	Expenditure (USD)	HDD	Reported Underheating	Consumption (kwh)	Expenditure (USD)	HDD	
J.Sandandski-Chair	82,137	District heating		2,536	2,563,515	494,835	7,608	low	408,795	78,910	1,525	12/12/2012
Lirija Cair	301,439	Light Fuel Oil		2,536	2,641,086	301,910	7,608	medium	391,189	44,718	1,845	11/16/2012
V, Glavinov - Cair	116,972	Light Fuel Oil		2,536	1,814,136	205,824	7,608	medium	119,069	12,704	910	1/31/2013
N,Vapcarov	333,468	Light Fuel Oil		2,536	2,560,800	289,370	7,608	high	202,709	22,906	910	1/31/2013
Snezana Cair	87,042	District heating		2,536	1,319,442	249,941	7,608	low	143,673	27,216	1,845	11/16/2012
Pashko Vasa, Ciflik - Zhelino	7,482	Firewood		2,536	262,890	7,790	7,608	high	27,420	120	1,525	12/12/2012
Pashko Vasa - Zelino	8,231	Firewood		2,536	732,903	22,676	7,608	high	86,905	2,689	1,525	12/12/2012
G.Delcev - Konce	91,063	Firewood		2,388	919,347	30,334	7,164	high	106,919	3,528	1,857	11/15/2012
Bratstvo, Konjari - Petrovec	26,212	Firewood	Pellet	2,536	98,040	4,654	7,608	medium	3,146	299	996	1/24/2013
Bratstvo, Susica - Petrovec	27,364	Firewood	Pellet	2,536	84,759	2,981	7,608	medium	2,441	172	996	1/24/2013
JBT - Valandovo	58,146	Light Fuel Oil		2,364	609,558	70,497	7,092	medium	9,641	1,115	185	3/30/2013
G.Delcev - Pirava, Valandovo	40,405	Light Fuel Oil		2,364	218,880	25,049	7,092	medium	5,011	573	185	3/30/2013
G.Delcev - Valandovo	110,008	Light Fuel Oil		2,364	791,379	90,686	7,092	medium	12,924	1,481	185	3/30/2013
7mi septemvri - Pehcevo	34,874	Light Fuel Oil		2,932	398,490	45,754	8,796	medium	27,930	3,207	910	1/31/2013
Vanco Kitanov - Pehcevo	106,690	Firewood		2,932	949,887	32,563	8,796	medium	72,384	2,481	910	1/31/2013
unaudited												
KG Detelinka	52,635	Light Fuel Oil		2,303	400,125	45,214	6,909	medium	26,878	3,037	910	1/31/2013
HS Dobri Daskalov - Kavadarci	66,849	Firewood		2,303	988,506	101,802	6,909	medium	75,962	7,823	910	1/31/2013
KG Snezana	24,493	Light Fuel Oil		2,303	400,125	45,214	6,909	medium	30,986	3,501	910	1/31/2013
PS Goce Delcev	89,524	Light Fuel Oil		2,303	1,047,600	118,379	6,909	medium	84,850	9,588	910	1/31/2013
K.Spandov - Kavadarci	87,967	Light Fuel Oil		2,303	911,412	102,990	6,909	medium	83,558	9,442	910	1/31/2013
Phase II	**1,753,001**			**49,683**	**19,712,880**	**2,288,466**	**149,049**		**1,922,389**	**235,510**	**20,860**	

Phase I + II	**3,151,057**			**94,593**	**34,221,159**	**3,780,187**	**282,882**		**3,044,793**	**347,393**	**38,350**	

Table A3-3 Data Normalization and Savings Calculation for Heating-Related EE Investments

	Phase I	Actual Investment (USD)	Energy Savings (before adj. for underheating)			Cost Savings (before adj. for underheating)				Energy Savings (after adj. for underheating)			Cost Savings (after adj. for underheating)			
			Before (kWh/HDD)	After (kWh/HDD)	%	Before ($/HDD)	After ($/HDD)	%	Payback	Before (kWh/HDD)	After (kWh/HDD)	%	Before ($/HDD)	After ($/HDD)	%	Payback
1	D.Cara - Bogovinje	61,797	70.24	18.78	73%	2.24	1.20	47%	22.26	92.90	18.78	80%	2.96	1.20	60%	13.15
2	11 Oktomvri - Bogovinje	66,311	47.75	12.21	74%	1.42	0.73	49%	35.92	63.16	12.21	81%	1.88	0.73	61%	21.64
3	S.Bajrami - Bogovinje	82,104	73.00	20.66	72%	2.08	0.57	73%	20.41	87.18	20.66	76%	2.49	0.57	77%	16.10
4	S.Pindzur-Ces.Obl.	81,718	187.56	44.52	76%	5.51	2.59	53%	12.32	248.06	44.52	82%	7.29	2.59	64%	7.66
5	S.Pindzur Sokolarci - Ces.Obl.	18,887	90.56	21.80	76%	2.63	0.63	76%	4.16	119.78	21.80	82%	3.48	0.63	82%	2.92
6	K.Ohridski - Ces.Obl.	80,549	108.04	40.11	63%	3.11	2.31	26%	44.36	142.89	40.11	72%	4.11	2.31	44%	19.69
7	D.Daskalov-Kavad.	36,639	185.55	83.46	55%	5.49	2.29	58%	4.98	221.58	83.46	62%	6.55	2.29	65%	3.73
8	Gaberot - Kavadarci	35,500	84.56	36.82	56%	2.50	1.09	56%	10.91	100.97	36.82	64%	2.99	1.09	64%	8.11
9	T.Velkov-Kavad.	78,524	240.34	75.07	69%	8.09	5.05	38%	11.23	317.86	75.07	76%	10.70	5.05	53%	6.04
10	F.Konica - Zajas	76,052	82.56	35.69	57%	7.26	6.27	14%	29.06	98.59	35.69	64%	8.67	6.27	28%	11.94
11	F.Konica(podracno) - Zajas	94,931	59.05	11.72	80%	2.52	0.67	74%	19.23	70.51	11.72	83%	3.01	0.67	78%	15.21
12	R.Rusiti - Zajas	63,684	39.05	13.04	67%	1.33	0.89	33%	54.21	46.64	13.04	72%	1.59	0.89	44%	34.22
13	P.Zografski - K.Voda	116,634	198.52	47.11	76%	38.04	8.78	77%	1.57	216.08	47.11	78%	41.41	8.78	79%	1.41
14	Peperutka-K.Voda	116,136	290.09	189.11	35%	33.10	21.58	35%	3.97	346.42	189.11	45%	39.53	21.58	45%	2.55
15	Sinolicka-K.Voda	45,827	44.65	18.27	59%	8.21	3.36	59%	3.72	48.60	18.27	62%	8.94	3.36	62%	3.24
16	Sinolichka-G.Baba	85,532	96.41	85.96	11%	10.99	9.71	12%	26.38	115.13	85.96	25%	13.13	9.71	26%	9.88
17	Sonce-G.Baba	166,983	217.55	148.64	32%	24.93	17.03	32%	8.34	259.80	148.64	43%	29.77	17.03	43%	5.17
18	Soncogled-G.Baba	90,248	150.18	59.04	61%	27.16	10.68	61%	2.16	163.48	59.04	64%	29.57	10.68	64%	1.88
	Phase I	**1,398,056**	**125.87**	**53.44**	**58%**	**10.37**	**5.30**	**49%**	**6.15**	**153.31**	**53.44**	**65%**	**12.11**	**5.30**	**56%**	**4.57**

	Phase II	Actual Investment (USD)	Energy Savings (before adj. for underheating)			Cost Savings (before adj. for underheating)				Energy Savings (after adj. for underheating)			Cost Savings (after adj. for underheating)			
			Before (kWh/HDD)	After (kWh/HDD)	%	Before ($/HDD)	After ($/HDD)	%	Payback	Before (kWh/HDD)	After (kWh/HDD)	%	Before ($/HDD)	After ($/HDD)	%	Payback
1	J.Sandandski-Chair	82,137	336.95	268.03	20%	65.04	51.74	20%	2.43	366.77	268.03	27%	70.80	51.74	27%	1.70
2	Lirija Cair	301,439	347.15	212.03	39%	39.68	24.24	39%	7.70	414.55	212.03	49%	47.39	24.24	49%	5.13
3	V, Glavinov - Cair	116,972	238.45	130.85	45%	27.05	13.96	48%	3.52	284.75	130.85	54%	32.31	13.96	57%	2.51
4	N,Vapcarov	333,468	336.59	222.76	34%	38.04	25.17	34%	10.22	445.17	222.76	50%	50.30	25.17	50%	5.23
5	Snezana Cair	87,042	173.43	77.87	55%	32.85	14.75	55%	1.90	188.78	77.87	59%	35.76	14.75	59%	1.63
6	Pashko Vasa, Ciflik - Zhelino	7,482	34.55	17.98	48%	1.02	0.08	92%	3.12	45.70	17.98	61%	1.35	0.08	94%	2.31
7	Pashko Vasa - Zelino	8,231	96.33	56.98	41%	2.98	1.76	41%	2.67	127.41	56.98	55%	3.94	1.76	55%	1.49
8	G.Delcev - Konce	91,063	128.33	57.57	55%	4.23	1.90	55%	16.33	169.73	57.57	66%	5.60	1.90	66%	10.30
9	Bratstvo, Konjari - Petrovec	26,212	12.89	3.16	75%	0.61	0.30	51%	33.13	15.39	3.16	79%	0.73	0.30	59%	23.99
10	Bratstvo, Susica - Petrovec	27,364	11.14	2.45	78%	0.39	0.17	56%	49.16	13.30	2.45	82%	0.47	0.17	63%	36.51
11	JBT - Valandovo	58,146	85.95	52.25	39%	9.94	6.04	39%	6.31	102.64	52.25	49%	11.87	6.04	49%	4.22
12	G.Delcev - Pirava, Valandovo	40,405	30.86	27.16	12%	3.53	3.11	12%	40.30	36.86	27.16	26%	4.22	3.11	26%	15.40
13	G.Delcev - Valandovo	110,008	111.59	70.05	37%	12.79	8.03	37%	9.78	133.26	70.05	47%	15.27	8.03	47%	6.42
14	7mi septemvri - Pehcevo	34,874	45.30	30.69	32%	5.20	3.52	32%	7.09	54.10	30.69	43%	6.21	3.52	43%	4.43
15	Vanco Kitanov - Pehcevo	106,690	107.99	79.54	26%	3.70	2.73	26%	37.31	128.96	79.54	38%	4.42	2.73	38%	21.48
	unaudited															
17	KG Detelinka	52,635	57.91	29.53	49%	6.54	3.34	49%	7.13	69.16	29.53	57%	7.81	3.34	57%	5.10
18	HS Dobri Daskalov - Kavadarci	66,849	143.08	83.46	42%	14.73	8.59	42%	4.73	170.86	83.46	51%	17.60	8.59	51%	3.22
19	KG Snezana	24,493	57.91	34.04	41%	6.54	3.85	41%	3.94	69.16	34.04	51%	7.81	3.85	51%	2.68
20	PS Goce Delcev	89,524	151.63	93.22	39%	17.13	10.53	39%	5.89	181.07	93.22	49%	20.46	10.53	49%	3.92
21	K.Spandov - Kavadarci	87,967	131.92	91.80	30%	14.91	10.37	30%	8.43	157.53	91.80	42%	17.80	10.37	42%	5.14
	Phase II	**1,753,001**	**132.00**	**82.07**	**38%**	**15.35**	**9.71**	**37%**	**6.26**	**158.76**	**82.07**	**48%**	**18.11**	**9.71**	**46%**	**4.20**

	Phase I+ II	**3,151,057**	**129.10**	**68.51**	**47%**	**12.99**	**7.62**	**41%**	**6.21**	**156.18**	**68.51**	**56%**	**15.27**	**7.62**	**50%**	**4.36**

Table 3A-4 provides a summary of the thermal energy and cost savings realized, and the investment payback periods by the participating institutions using different fuel types. Before the impact of under-heating was adjusted for, the participating institutions have achieved, on average, 47% savings on their thermal energy consumption as a result of the EE measures implemented. After the impact of under-heating was adjusted for, the average energy savings is around 56%.

In general, institutions using district heating have realized the greatest amount of cost savings and the shortest payback periods. Although institutions with firewood-based heating have seen the greatest percentage of energy savings (69%), the cost savings realized is somewhat less (57%) because out of the 19 institutions with wood-fired stoves/boilers, 11 switched to higher efficiency, lower emissions but more costly pellet fuel.

Table 3A-4 Summary of Thermal Energy Savings and Payback Periods

	Investment (US$)	*Before Under heating Adjustment*			*After Under heating Adjustment*		
		kWh Savings (%)	Cost Saving (%)	Payback Period (yrs)	kWh Savings (%)	Cost Saving (%)	Payback Period (yrs)
Phase I	**1,398,056**	**58%**	**49%**	**6.15**	**65%**	**56%**	**4.57**
Firewood	776,696	67%	45%	16.19	74%	56%	10.30
Light Fuel Oil	368,651	30%	30%	7.02	41%	41%	4.26
District heating	252,709	68%	69%	1.97	71%	71%	1.75
Phase II	**1,753,001**	**38%**	**37%**	**6.26**	**48%**	**46%**	**4.20**
Firewood	333,891	43%	48%	10.20	54%	59%	6.76
Light Fuel Oil	1,249,931	23%	23%	12.10	36%	36%	6.42
District heating	169,179	36%	36%	1.91	41%	41%	1.53
Phase I & II	**3,151,057**	**47%**	**41%**	**6.21**	**56%**	**50%**	**4.36**
Firewood	1,110,587	62%	46%	13.81	69%	57%	8.92
Light Fuel Oil	1,618,582	20%	21%	12.64	34%	34%	6.37
District heating	421,888	56%	56%	1.72	60%	60%	1.49

Results of the BCA analysis – thermal measure payback period

At project completion, the payback period for the EE public building retrofit component was estimated at 6.2 years before under-heating adjustment, and 4.4 years after under-heating adjustment, compared with an average of 7.5 years estimated by the energy audits.

Electricity Savings Resulted from Investments in Light Improvements

Due to the generally high awareness of the benefits of lighting related EE improvements, most institutions had invested in this area with or without GEF grant. Of the 39 institutions audited, 14 institutions financed lighting improvements with full or partial GEF grants. To avoid over-claiming the overall impact of the project, this analysis used the investment estimates by the energy audits, instead of the amount actually financed by the project, to calculate the payback period at project completion. After this necessary adjustment, the average payback period for lighting related EE measures undertaken under the project was

around 6 years. Institutions in Phase 1 have seen realized substantially shorter payback periods (3.5 years) compared with those in Phase 2 (7.5 years).

Table 3A-5 Savings Calculation for Lighting-Related EE Investments

		Investment	Savings		Payback
		[$]	[kWh/yr]	[$/yr]	[year]
1	D.Cara - Bogovinje	3,425	4,548	837	4.09
2	11 Oktomvri - Bogovinje	878	2,119	414	2.12
4	S.Pindzur-Ces.Obl.	5,095	6,150	1,290	3.95
5	S.Pindzur Sokolarci - Ces.Obl.	2,055	2,480	622	3.30
6	K.Ohridski - Ces.Obl.	4,196	1,314	803	5.23
7	D.Daskalov-Kavad.	1,070	2,584	459	2.33
8	Gaberot - Kavadarci	1,285	3,101	596	2.15
10	F.Konica - Zajas	2,787	31,155	931	2.99
Phase I		**20,792**	**53,451**	**5,953**	**3.49**

		Investment	Savings		Payback
		[$]	[kWh/yr]	[$/yr]	[year]
1	J.Sandandski-Chair	2,290	10,626	2,100	1.09
2	Lirija Cair	38,810	13,962	3,650	10.63
3	V, Glavinov - Cair	29,800	15,391	3,050	9.77
5	Snezana Cair	620	1,562	200	3.10
15	Vanco Kitanov - Pehcevo	810	2,981	590	1.37
Phase II		**72,330**	**44,522**	**9,590**	**7.54**

Phase I + II		**93,122**	**97,973**	**15,543**	**5.99**

II. Sustainable Energy Financing Facility

A financial analysis was carried out to assess the financial internal rate of return (FIRR) on the MEGA Solar Plant.

The MEGA Solar Plant was commissioned in August 2011 with an installed capacity of 1 MW. It was the first renewable energy project under a feed-in-tariff scheme in Macedonia. The agreed feed-in-tariff was 41 euro cents per kWh, nearly more than three times the current feed-in-tariff (12 euro cents per kWh) for solar plants of a similar scale. The total upfront investment was 3.07 million euros. A feasibility study was carried out and projected an average annual output of 1,277MWh from the plant. The actual annual output turned out higher at around 1,500MWh. Table A3-6 provides a summary of the key parameters of the MEGA Solar Plant based on the Feasibility Study and actual output levels from its first 17 months of operations.

Table A3-6 Annual Performance Parameters of the MEGA Solar Plant

Tariff (Euro c/kWh)	Month	Irrid/day (kWh/m2/day)	Efficiency (%)	Output Feasibility Study (kWh/kWp installed)	Income (Euro)	Installed Capacity (MWp)	Actual output (MWh)		Standard Year	
							2011	2012	(MWh)	(Million Euro)
41	jan	2.7	75%	63	26			83	83	33.8
41	feb	3.4	75%	79	32			84	84	34.4
41	mar	4.3	75%	100	41			139	139	57.2
41	apr	5.4	75%	122	50			120	120	49.3
41	may	5.8	75%	135	55			157	157	64.2
41	jun	6.3	75%	142	58			189	189	77.7
41	jul	6.5	75%	151	62			188	188	77.1
41	aug	6.4	75%	149	61		154	172	163	66.9
41	sep	5.7	75%	128	53		143	139	141	57.7
41	oct	4.4	75%	102	42		113	124	119	48.7
41	nov	3.0	75%	68	28		81	59	70	28.8
41	dec	1.7	75%	40	16		49	45	47	19.3
	Full year			**1,277**	**524**	1.00	**541**	**1,499**	**1,500**	**615.1**

The financial analysis indicate that based on its actual output level, the investment on the MEGA Solar Plant will yield a pre-tax FIRR of 13.5% compared with 10.4% and an after tax FIRR of 12.5% compared with a pre-tax FIRR of 10.4 and an after-tax FIRR of 9.6% based on the projected output level in the Feasibility Study. (see Table A3-8 for detailed analysis.)

Table A3-7: FIRR of MEGA Solar Plant

	Based on Feasibility Study	***Actual***
Pre-tax	10.4%	13.5%
After tax	9.6%	12.5%

Table A3-8 Financial Analysis – 1 MW Solar Plant

1 MW Solar PV Plant - Financial Analysis

	Unit	2010	2011	2012	2013	2014	2105	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Investment	*thousand euro*	(3,070)															
Sales	*MWh*		541	1,499	1,500	1,485	1,470	1,456	1,441	1,427	1,413	1,398	1,384	1,371	1,357	1,343	1,330
Revenue	*thousand euro*		222	615	615	609	603	597	591	585	579	573	568	562	556	551	545
Expenses	*thousand euro*																
O&M	*thousand euro*		(54)	(54)	(54)	(54)	(54)	(54)	(54)	(54)	(54)	(54)	(54)	(54)	(54)	(54)	(54)
Depreciation	*thousand euro*		(55)	(154)	(154)	(154)	(154)	(154)	(154)	(154)	(154)	(154)	(154)	(154)	(154)	(154)	(154)
Interest on new LTL	*thousand euro*	(155)	(155)	(138)	(120)	(103)	(86)	(69)	(52)	(34)	(17)	-	-	-	-	-	-
Profit before tax	*thousand euro*	(155)	(42)	270	287	298	309	321	332	343	354	366	360	354	349	343	338
Income tax @ *10%*	*thousand euro*	-	-	(7)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(37)	(36)	(35)	(35)	(34)	(34)
Tax carry-over	*thousand euro*	15	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net profit	*thousand euro*	**(155)**	**(42)**	**262**	**258**	**268**	**278**	**288**	**298**	**309**	**319**	**329**	**324**	**319**	**314**	**309**	**304**
Financial flow - before tax		(3,070)	168	561	561	555	549	543	537	531	525	519	513	508	502	497	491
Financial flow - after tax		(3,070)	168	553	532	525	518	511	504	497	490	483	477	472	467	462	457

FIRR - Before Tax	***13.5%***
FIRR - After Tax	***12.5%***

III. Licensed Renewable Energy

A projection was carried out to estimate the lifetime output of the licensed RE capacities associated with the project intervention in Macedonia to date. The analysis conservatively assumed only 50% of the licensed RE capacity that are not currently under construction will be actually constructed. The assessment suggested that a total of 3.9 GWh of power will be generated over the lifetime of the 111.9 MW licensed RE capacity in Macedonia to date, among which 2.4 GWh will come from small hydro, 1.3 GWh from wind and 0.2 GWh from solar.

Table 3A –8 Licensed RE Capacity in Operations, under Construction or in the Pipeline

	Capacity Factor[2]	Licensed Renewable Capacity (MW) [3]				Generation (GWh)				
		In Operation[4]	Under construction	Planned Capacity	Total	In Operating	Under construction	Planned Capacity	Annual	Lifecycle
Wind	30%		36.8	8.2	45.0	-	80.6	9	**89.6**	**1,344**
Small Hydro	40%	6.4	8.3	43.2	57.9	27.9	36.5	94.6	**159**	**2,385**
Solar	20%	3.8	4.6	-	8.4	5.6	6.8	-	**12.5**	**187**
Total		**10.2**	**49.7**	**51.4**	**111.8**	**33.6**	**123.9**	**103.6**	**261.1**	**3,916**

IV. Incremental Cost Analysis

GEF allocation. While the overall GEF contribution remained unchanged at US$ 5.5 million, its allocation across various project components has changed substantially due the subsequent project restructurings: (i) the original market framework component was replaced by a more general category of institution support and technical assistance with increased allocation from US$1 million at appraisal to US$1.75 million at project completion; ii) the Sustainable Energy Financing Facility (SEFF) was scaled down considerably. Its loan component with a planned allocation of US$2.5 million (US$2 million and US$ 0.5 million on RE and EE respectively) was scaled down to $1.2 million (US$1 million and US$0.2 million RE and EE). The guarantee facility for EE was cancelled. The remaining funds were reallocated to finance a new component on EE in public buildings; iii) the utility-based ESCO with a planned allocation of $0.8 million was cancelled with the remaining fund also allocated to EE in public buildings; iv) a new component on EE in public buildings was created and became the largest component of the program with US$2.55 million in total allocated funds.

The baseline investment level was not reassessed at the project completion because the analysis focused primarily on assessing the incremental impacts of the GEF project.

GEF incremental costs only accounts for grants that passed through to the end-users on a "one-off" basis. GEF funds participating in debt financing schemes, such as those in the SEFF loan facility, are not considered incremental costs because they collecting reflows that can be used to

[2] Source: MANU
[3] Source: ERC 2012 Annual Report
[4] Source: Table VI.2, ERC 2012 Annual Report

finance future EE/RE opportunities. Based on this classification, the total incremental cost to GEF was estimated at around US$1.855 million at appraisal, including i) an estimated US$555,000 in losses on bad loans associated with the guarantee facility; and ii) US$1.3 million non-refundable cost to GEF under the Market Framework component and the twinning arrangement in the ESCO component. At project completion, the total incremental cost to GEF went up substantially to US$4.2 million, including US$1.08 for institution support and technical assistance and US$3.12 million for EE in public buildings. Table A3-1 provides a detailed breakdown of the GEF fund allocation and associated incremental costs at project appraisal and completion:

Table A3-1 Allocation and Incremental Costs of the GEF Activities (US$)

Component	*Appraisal*		*Completion*	
	Allocation	*Incremental*	*Allocation*	*Incremental*
Market Framework	1,000,000	1,000,000		
Institution Support & Technical Assistance			1,080,249	1,080,249
Utility-Based ESCO	800,000	300,000		
EE in Public Buildings			3,120,052	3,120,052
SEFF Loan Renewable Energy	2,000,000		1,196,000	
SEFF Loan Energy Efficiency	500,000		63,700	
SEFF Guarantee Energy Efficiency	1,200,000	555,000	-	
Total	**5,500,000**	**1,855,000**	**5,460,000**	**4,200,300**

Global Benefits The project contributes to the reduction of CO_2 emissions globally. At appraisal, the lifecycle GEF CO_2 emissions avoided were estimated for both the baseline scenario and for the Project, resulting in an estimate of the net global benefit of the project. At project completion, only the Project GEF lifecycle emissions were estimated. To be consistent with the appraisal, the lifecycle for both EE/RE projects were assumed to be 15 years although the project life-cycle for larger scale RE projects tends to longer, in the range of 20 years.

Methodology

The following methodology was applied for estimating the lifecycle CO2 abatement resulting from the GEF investments from the project at completion. To be consistent with the methodology applied at appraisal, life-cycle CO_2 abatement was estimated as the simple summation of annual abatement amounts without discounting.

- For EE investments, life-cycle emission reduction
  $= \sum_{n=1}^{15} (Actual\ Energy\ Savings_n) * emission\ factor$

- For Mega Solar Plant, life-cycle emission reduction
  $= \left[Actual\ Output_{year\ 2011-12} + \ Projected\ Output_{year\ 2013-25}\right] * \ emission\ factor$

- For RE investments licensed under the Feed-in-Tariff regime, life-cycle emission reduction
  $= \sum_{n=1}^{15} (\text{Electricity Output}_n) * emission\ factor$

- Emission factors for heating vary according to the type of fuel used. To be consistent with the appraisal, the emission factor for grid-based electricity generation is assumed at 1.0 tCO_2/MWh. Table A3-2 provides a summary of the emission factors for heating with different fuel/ energy sources

Table A3-2 Emission Factors

Fuel Type	***Conversion Factor***
Heating	
– Residual fuel oil[5]	0.270 tCO_2/MWh
– Biomass (firewood and pellet)[6]	0.039 tCO_2/MWh
– District heating[7]	0.260 tCO_2/MWh
Electricity Generation	1.000 tCO_2/MWh

Results of the Incremental Cost Analysis

The GEF investment contributed to substantial CO_2 emissions reduction, both through direct GEF grant contribution to finance EE and RE projects in the public and private sectors, and through the mechanisms developed under the catalyzing RE development in Macedonia.

The Project directly GEF-funded components contributed to a total of 40,477 tons of CO_2 emissions reduction through the lifetime of the project. The incremental cost to GEF to fund those investments was US$3.74 million, translating to an incremental CO_2 abatement cost of US$77.08 per tCO_2.

Assuming that 50% of the RE capacity licensed is actually built, the global benefits directly *attributed to* and *catalyzed by* the Project are 3,740,446 tCO_2 emissions avoided, compared with 1,743,243 tCO_2 estimated at appraisal. The total incremental cost of the project was US$4.20 million at project completion compared with US$1,885,000 at appraisal, translating to an incremental CO_2 abatement cost of US$ 1.11 per tCO_2 at project completion, on par with the estimate of US$1.08 at appraisal. The Table A3-3 provides a summary of the results of the incremental cost analysis.

[5] Source: "2012 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting: Methodology Paper for Emission Factors", Department for Environment, Food and Rural Affairs, www.defra.gov.uk

[6] Source: PIU based on reported Macedonia country average.

The emission factor was estimated based on firewood usage. No estimates were made for pellet-based heating. However, based on a paper (source: "Emission of PCDDF, PCB, and HCB from Combustion of Firewood and Pellets in Residential Stoves and Boilers, published in Environmental Science Technology 2006, 40, 4968-4975), the CO_2 emission factor of pellet-based heating is on par with that of firewood-based heating.

[7] Ibid

Table A3-3: Summary of Results of the Incremental Cost Analysis

	Appraisal	*Completion*
Incremental cost (US$)		
– Project directly funded		3,120,052
– Licensed RE		1,080,249
Total	**1,885,000**	**4,200,300**
Lifecycle CO_2 Abatement (tCO_2)		
– Project directly funded		40,477
– Licensed RE		3,740,446
Total	**1,743,243**	**3,780,924**
Increment cost / CO_2 abatement (US$/$tCO_2$)		
– Project specific		77.08
– Licensed RE		0.28
Total	**1.08**	**1.11**

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Peter Johansen	Sr. Energy Specialist	ECSEG	Team Leader
Zarko Bogoev	Operations Officer	ECSEG	Economist
Anders Halldin	Environment Specialist	ECSEG	Environment Spec
Satoshi Ishihara	Social Development Specialist	ECSEG	Social Dev't.
James Sayle Moose	Consultant	ECSEG	Energy Specialist
Rick Renner	Consultant	ECSEG	Energy Specialist
Jennifer M. Ngaine	Program Assistant	ECSIE	
Supervision/ICR			
Zarko Bogoev	Operations Officer	ECSEG	Economist
Husam Beides	Energy Specialist	ECSEG	Energy Specialist
Mustafa Zafir Hussain	Energy Specialist	ECSEG	Energy Specialist
Denis Boskovski	Operations Officer	ECCMK	Economist
Aleksandar Crnomarkovic	Sr Financial Management Specialist	ECSO3	Financial Management
Denis Colenut	Consultant	ECSEG	Energy
Karl Gruber	Consultant	ECSEG	Energy
Angelica A. Fernandes	Consultant	ECSO2	Procurement
Surekha Jaddoo	Consultant	ECSEG	TTL Support
Jasneet Singh	Senior Energy Specialist	ECSEG	Energy
Liljana Sekerinska	Operations Officer	ECCMK	Economist
Rozena Serrano	Program Assistant	ECSEG	

(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		
FY05	1.40	16.54
FY06	13.61	80.94
FY07	6.17	69.87
Total:	22.18	167.35
Supervision/ICR		
FY07	7.32	2.50
FY08	24.77	141.76
FY09	11.55	73.11
FY10	11.49	88.60
FY11	26.96	90.66
FY12	17.23	92.73
FY13	10.53	53.12
Total:	109.85	542.48

Annex 5. Beneficiary Survey Results

A stakeholder survey was carried out in June 2013 to assess the impact and quality of the GEF-funded public building energy efficiency (EE) retrofitting among 41 public institutions in 12 municipalities in Macedonia. The program was carried out in two phases during the period of 2010-13. The participating institutions are public schools and kindergartens in those 12 municipalities. The survey consisted of two questionnaires, one targeting the end-users, i.e., principals, teachers, technical staff, and students, from all 41 participating institutions; the other targeting the mayors of the 12 municipalities. The survey interviewed in total 11 mayors and 96 end-users (30 principals, 39 teachers and caretakers, 29 students and parents) from 41 institutions in 12 municipalities. During the ICR mission in July 2013, the task team visited 4 municipalities and interviewed the local stakeholders, including mayors, school principals and contractors. The following is a summary of the key findings from the stakeholder survey along with supplemental findings from the field visit.

I. Executive Summary

- The overall response to the GEF-funded EE building retrofitting program is overwhelmingly positive among all stakeholder segments.
- While energy savings had been used as the main justification for the program initially, improved indoor temperature and comfort level are perceived as the most important benefit of the program by its end-users. The program is also seen as generating important health and aesthetic benefits.
- From the perspective of the municipalities, the program's impact has also gone well beyond merely generating budget savings to broader categories. The mayors universally agree that most salient positive impacts of the program are on promoting the image of the municipality and generating awareness for the benefits of EE.
- The qualitative reports from the field visit suggest there is an important attitude shift among the stakeholders toward the importance of EE. In particular, while EE was very low on the municipal agenda before, it has rose to one of the top priorities in the municipal agenda. All mayors interviewed indicated that they will *certainly* continue the EE efforts in their municipalities.
- With respect to project implementation, the feedback was generally positive. The PIU was perceived to have performed an especially satisfactory role in overall project management and bringing technical expertise to the local contractors.
- One criticism was regarding the construction timing that, in some cases, coincided with school's winter semester and caused some disruptions to the classes. To minimize these disruptions, a recommendation is to schedule the retrofits during school summer and winter breaks.

II. Summary of Findings

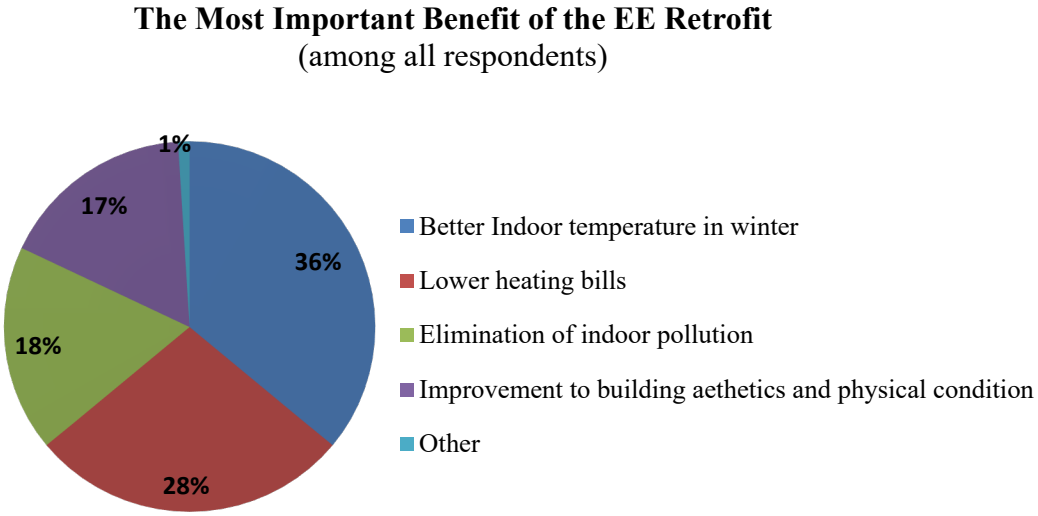
The survey responses suggest that the building retrofits had a positive impact for the benefiting municipalities. The majority of the respondents (around 90%) answered that they are completely satisfied with the primary and secondary benefits of the energy efficiency retrofits in the selected schools and kindergartens. Different groups of respondents have prioritized different project benefits. While energy savings is the most important benefit for the mayors or

school/kindergarten principals, the increased indoor temperature and the improved educational environment are among the top benefits for the direct beneficiaries - teachers and students.

Regarding the secondary benefits of the project, a large majority of the end-users considered that the building retrofits were substantially beneficial for improving the health of the students and decreasing the absentee days. This was in particular the case in schools using wood-fired stoves for heating, such as those in Bogovinje, Zajas, Cheshinovo-Obleshevo, Konche, Zhelino, Pehchevo and Kavadarci. In these schools the installation of efficient pellet-fired stoves or new central heating systems has led to significant reduction of smoke and elimination of indoor pollution and increase of the low room temperature by four to five degrees from the pre-retrofit level. The teachers and students were satisfied that by having warm and clean classrooms, the lost time of sick students and the costs of health treatments will be reduced.

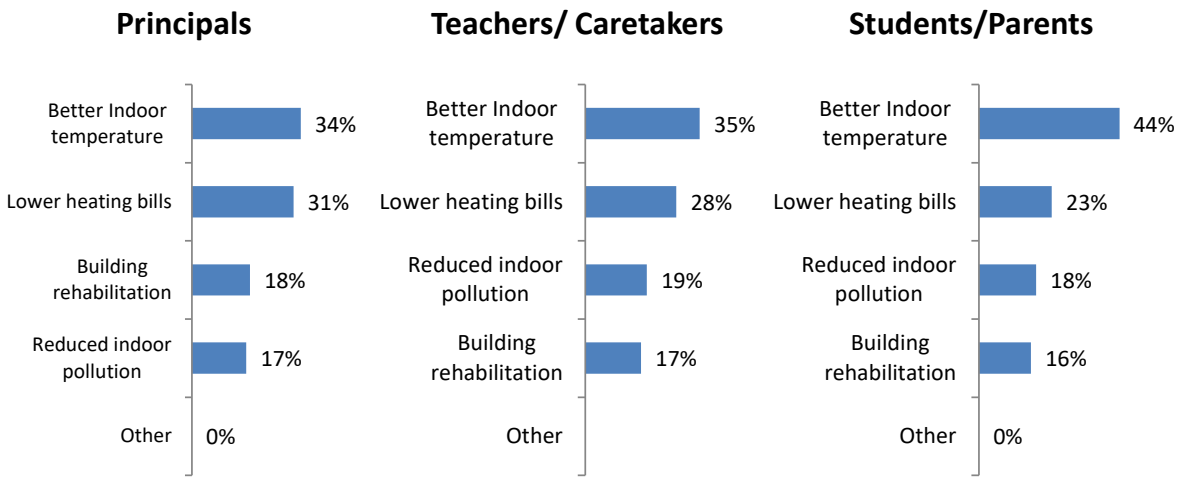
Satisfaction among program end-users

The results of the survey show that the project brought important benefits to the end-users in the retrofitted schools and kindergartens. Besides reconstructing the building, the retrofits have significantly improved the working and study environment: increased the classroom temperature, eliminated the indoor pollution, and led to significant energy savings and lower energy bills.



A breakdown in different groups of respondents (principals, teachers/caretakers, students/parents) gives the following results of the prioritization of different benefits among them:

Perceived Benefits of the Project among End-User Segments



Comments from program end-users

- ***Increased Comfort Level due to higher indoor temperature in winter***

Building retrofits were particularly beneficial in schools and kindergartens with severe underheating in winter. Before the retrofits, the old wood-fired stoves were unable to maintain the necessary comfort level during winter months, when the indoor temperatures often drop below 15˚C. According to the testimonies of students, having well heated classrooms was only a dream for them. They had to sit with their coats on, and could not concentrate on learning. Moreover, they were often absent from school, either because it was cold to follow classes, or because they were getting sick.

The building retrofits helped to improve the overall learning environment and helped eliminate the health hazards, which is as significant as savings from energy bills. One year after the implementation of the EE measures, students and teachers are happy with the warm classrooms and the improved learning environment. The replacement of the wood stoves with more efficient pellet-fired stoves or a central heating system increased the indoor air temperature to 20˚C. Hence, the number of absentee days has significantly dropped. The students say that now they are eager to go to school even on the coldest winter days because the classrooms are warm.

- ***Lower heating bills***

One third of the end-users stated that the decreased energy costs, i.e., lower heat bills, is one of the most important benefits of the EE retrofits. According to the comparative energy data before and after the EE measures, the energy savings in the retrofitted schools and kindergartens are significant, reaching up to 75-80% of the pre-retrofit level. Prior to the retrofits, many buildings experienced high energy losses due to their poor conditions, particularly during the heating season. After the retrofits – installation of new EE heating system and change of the fuel type, thermal insulation and replacement of windows – the amount of energy consumption was reduced to a great extent. Calculated on an annual basis, the heat bills have been lowered, in some cases to as low as 20% of the pre-retrofit costs.

- ***Health benefits due to reduction in indoor pollution and reduced sickness***

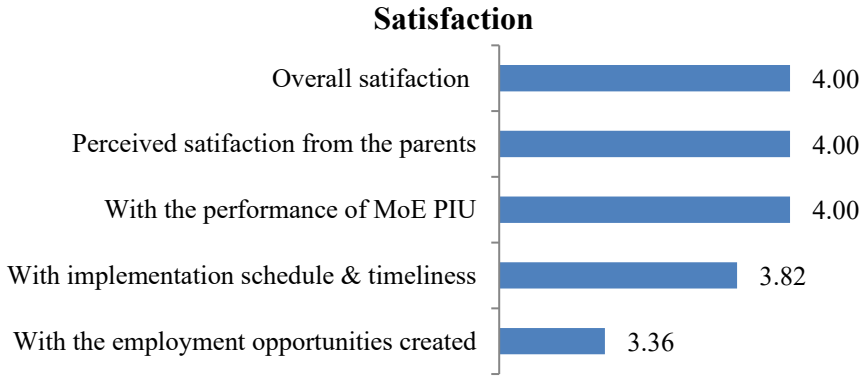
According to the survey, the elimination of smoke in the classrooms is the most important benefit for schools that used to have individual wood stoves for heating. Before the retrofits, nineteen schools (half of the total number of retrofitted buildings), in seven rural and urban municipalities, were heated by individual, highly inefficient and polluting wood stoves. The toxic fumes produced from these woodstoves were causing respiratory issues, coughs, headaches, and eye and throat irritation. Moreover, the smoke contains different chemical compounds, many of which are harmful and potentially carcinogenic. According to the teachers, the replacement of the old wood stoves with more efficient and less emitting heating systems has helped to eliminate the health hazards caused from the indoor pollution and to improve the working conditions. They stated that due to the higher efficiency, cleaner combustion and improved exhaustion of the new stoves, the release of smoke and harmful air pollutants into the classrooms has been virtually eliminated. The students are equally satisfied that the bad smell and irritating smoke are no longer their everyday reality at school.

- ***Aesthetic of the building***

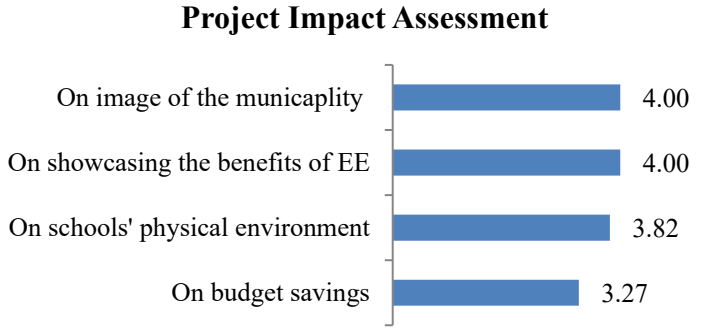
Another important benefit of the buildings retrofits is the improved aesthetic of the building. Many of the schools/kindergartens were built almost half a century ago and had never been upgraded before the retrofit, which led to decline in the enrollment over the years. According to the school principals and the mayors, the newly constructed buildings are better looking and more inviting for new students, because they can offer a better framework for educational activities than before. This is very important for increasing the rate of enrollment, especially in the rural areas, where the experience in the past has shown that it is difficult to attract new students without new and well-functioning infrastructure. Moreover, parents have stated that after the rehabilitation and the reconstruction, the comfort and the aesthetics of the schools and kindergartens have improved and they are happy to send their children to study there.

Benefits for the municipalities

The project had a positive impact on the benefiting municipalities. The mayors of the municipalities stated they were very satisfied with the results of the building retrofits the project had financed.



Note: Satisfaction scale: 4–Completely satisfied; 3–Somewhat satisfied; 2–Neither satisfied nor dissatisfied; 1– Somewhat dissatisfied; 0–Dissatisfied



Note: Impact scale: 4–To a very large extent; 3–To a large extent; 2–To some impact; 1– Not much impact; 0–No impact

Only two mayors expressed some dissatisfaction with project implementation, one with respect to retrofitting only part of a building, and the other to the oil-fired boilers left unreplaced in some schools.

Comments from the mayors

- ***Improved image of the municipality***

The improved image of the municipality is considered as an important benefit of the project. Investing in EE in schools and kindergartens has helped the local authorities to show their residents and the rest of the country that first, they are working for the benefit of the people living in the municipality, and second, they are dedicated to the implementation of sustainable development policies. Moreover, the project has indirectly helped revitalize the rural regions that have long felt neglected by the Government.

- ***Changing attitude toward EE***

The survey also demonstrated that the EE project itself has helped generate awareness about the benefits of energy efficiency. Through the project, the municipal leadership came to the realization that public sector EE projects could serve as i) a catalyst for overall public sector investment, and ii) a vehicle for generating positive PR. The building retrofits results, such as the realized savings, the local employment and the image of the municipality, made the investment highly justified among the mayors, and encouraged a general attitude change regarding EE – once a neglected item. The mayors were more convinced to recognize the full benefits of EE projects, and to bring EE as one of the top priorities on the municipal agenda, which is a step forward to reaching general support for and promotion of EE on a country level.
The successful implementation of the building retrofits financed by the project is an important benefit for further development of EE project throughout the country. The satisfaction with the project results has increased the interest of the mayors to support new EE programs. Even though some of the mayors are more interested in grant supported projects, almost all mayors expressed willingness to support future EE programs through credit financing and provided TA.
Moreover, due to the implementation of the project, the general public in the municipality has also become more aware of the benefits of EE. As the mayors have explained, several public and private institutions have taken initiatives to implement some EE measures using their own funds.

- ***Aesthetics of the buildings***

The mayors were satisfied with the improvements of the physical state of the renovated buildings – new roof and new façade, new PVC windows and doors. The improved aesthetic of the schools and kindergartens for the mayors is a visible sign that the municipality cares about the younger generations and signals commitment to development of the education sector.

- ***Budgetary and energy savings***

Energy and financial savings are important in terms of re-using the financial savings for other purposes. All interviewed mayors were particularly satisfied with the energy savings that the project demonstrated. All mayors said that the project increased the budgetary savings to a large extent. Only months after the retrofits were implemented, schools realized substantial savings from their energy bills. One year after the implementation of the retrofits, even the schools/kindergartens that reported high under heating and subsequently high energy costs before the retrofits, have also reached substantial energy savings, close to or even higher than those with medium under heating before the retrofits.

- ***Local employment***

The large majority of mayors are satisfied with the opportunities for local employment that the project has created. In every municipality, at least one local company was sub-contracted for the implementation of EE measures, allowing a total of around 350 workers to be employed during the implementation phase. Furthermore, the local economies benefited also from the usage of locally produced materials, such as plasterboards, adhesive plaster, high efficiency windows and thermal insulation. Eight out of eleven mayors responded that they are completely satisfied with the employment opportunities created by the project. In all municipalities, at least one local subcontractor was hired for the construction works. Moreover, locally produced products were used across the country, such as windows produced in Kavadarci.

- ***Future opportunities***

All mayors interviewed responded with certainty that they would continue the building retrofit efforts in their municipality.

Besides measuring the satisfaction level of the direct benefits of the project, the survey also demonstrated that the project benefits improved the image of the municipality. The positive results have generated higher interest in EE by the municipal governments. On the basis of the experience with the building retrofits financed by the project, the mayors identified future priority areas for building retrofits in their municipality, including mostly public buildings:

- schools and kindergartens,
- hospitals,
- sport centers,
- theaters and museums.

Several among them expressed interest to invest in EE projects in alternative areas:

- street lighting,
- centralized energy supply system using solar panels (PV),
- large consumers (residential buildings),
- large private consumers.

Project Implementation

The interviewed beneficiaries of the project were satisfied with project implementation. According to their responses to the survey: i) the MoE PIU was supportive and professional throughout the project; ii) the construction process was timely and well managed; and iii) training for operating newly installed systems was sufficient and tailor-made.
Regarding the lessons learned from the project implementation, the survey results show that the building retrofits were implemented in a reasonable timeframe and in a rather successful way. The beneficiaries have been satisfied with the overall management of the project and the provided engineering and managerial expertise. They appreciated the proactive approach by the Project Implementation Unit, within the Ministry of Economy, which helped coordinate the entire process responsibly and diligently, while providing training and building capacity on the local level.

Besides the positive aspects of implementation of EE retrofits, several activities were identified as areas for improvement when implementing EE projects in the future:

- ***Better scheduling of EE measures implementation***

The bulk of the construction works of the project took place during the winter break, sometimes even during school hours. In order to avoid disruption of the teaching, as well as to save energy, in the future, the building retrofits should be implemented during summer breaks, when the weather is better, and the available period for construction works is longer.

- ***Better coordinated cooperation between the stakeholders (municipality-institution-construction company)***

The poor institutional capacity for management of EE projects on the local level was considered one of the main shortcomings in the implementation of the project. Because of limited number of contact persons for the project, the construction companies had difficulty communicating about the technical, organizational and financial aspects of the retrofits with the municipality and the schools. A lesson for future implementation of similar projects is to have professional and dedicated project management teams lead the project implementation at the local level.

The beneficiaries have also identified several areas where the implementation of the building retrofits should be improved:

- ***Better scheduling of EE measures implementation***

In order to avoid construction works disrupting the teaching, as well as to save energy, the building retrofits should be implemented during the summer breaks, when the weather is better, and the available period for construction works is longer.

- ***Better coordinated cooperation between the stakeholders (municipality-institution-construction company)***

In order to better communicate the technical, organizational and financial aspects of the retrofits between the construction company and the institutions, the municipalities should improve the project management, and establish a professional team that would lead and manage diligently the project activities.

- ***Better dissemination of the know-how for operation of the new techniques***

In order to improve comfort, resulting usually from the inadequate room heating, the dissemination of know-how for operation of the new techniques should reach the final beneficiaries i.e. the teachers, at the level necessary for their daily work and for maintenance of the comfort in the buildings.

Annex 6. Stakeholder Workshop Report and Results

Not applicable.

Annex 7. Summary of Borrower's ICR
(a) MBDP ICR

Component III: Sustainable Energy Financing Facility (SEFF) – Credit line for RE/EE

General information
A separate Agreement for establishing a Sustainable Energy Financing Facility (SEFF) was signed by the International Bank for Reconstruction and Development (IBRD, hereinafter: "the World Bank") and the Macedonian Bank for Development Promotion (MBDP) on February 26, 2007. This Component was aimed at facilitating private sector investments in renewable energy (photovoltaic, hydro, biomass, etc.) and energy efficiency projects. As per the Agreement a Loan facility and Guarantee facility were established as follows:

In million US$

	Loan facility	Guarantee facility	Total
MBDP	2.5		2.5
World Bank	2.5	1.2	3.7
Total	5.0	1.2	6.2

This component was restructured twice:

1. First, on June 29, 2010 due to the smaller-than-anticipated market response and the little interest, the SEFF guarantee facility was discontinued and the funds originally provided were reallocated for activities in the first two components. With the aim of intensifying the identification and development of commercially viable project proposals, a technical assistance in the amount of US$50,000 was also envisaged in this component. The total amount allocated to the EE/RE Credit Line after this restructuring equaled US$ 1.5 million.
2. Secondly, on April 13, 2012, with the aim of re-allocating the unused funds to increase the funds for the co-financing of energy efficiency retrofits in public buildings with the municipalities.

The Credit Line was de facto managed with found on-lending banks[8] that MBDP signed Framework Agreements with.

Loans realized

MBDP, in close cooperation of the on-lending banks, approved three loans, of which two loans were intended for renewable energy and one loan for energy efficiency. The financing of the projects is shown in the table below, in more details.

Types of loans:

8) Komercijalna banka AD Skopje, Ohridska banka AD Ohrid, HALK banka AD Skopje, UNI banka AD Skopje

	terms	Project amount	Financing structure
1.Energy efficiency	Up to 6 years	max. 500.000 US$	10% own equity 30% on-lending bank 30% MBDP 30% World Bank
2.Renewable energy	Up to 10 years with max.3 years grace period included	max. 4.000.000 US$	10% own equity 30% on-lending bank 30% MBDP 30% World Bank

The loans were nominated in EUR with counter value in MKD, the interest rate for the loan users was defined by the on-lending banks, and the average rate was 6.5%p.a. The interest rate for MBPD part is 3% p.a.

in EUR

Final beneficiaries	On-lending bank	MBDP part	World Bank part	Total loan (MBDP+WB)
1.SIETO-Skopje	Komercijalna banka Skopje	5.000	5.000	10.000
2.Hotel GRANIT-Ohrid	Ohridska banka Ohrid	49.010	49.010	98.020
3.MEGA SOLAR-Skopje	Ohridska banka Ohrid	915.000	915.000	1.830.000
	Total	**969.010**	**969.010**	**1.938.020**

1. SIETO Skopje (RE project)

The company is situated in village Kadino, near the entrance to Skopje. The project related to a small solar power plant on an area of 1.200m^2. The project was financed in March 2009, through Komercijalna banka AD Skopje and the loan was approved with a maturity of up to 5 years (2 years grace period included). However the loan was prematurely terminated in the same year.

2. Hotel GRANIT-Ohrid (EE project)

The loan was realized through Ohridska banka AD Ohrid for energy efficiency for Hotel GRANIT located on the shores of Lake Ohrid. The hotel is situated 5km from the city of Ohrid, with a 4 star category with over 100 rooms, 3 conference rooms, fitness club etc. The investment itself was used for replacement of the old and installation of energy efficient heating and cooling, as well as lighting of the hotel that will significantly reduce the costs of operating of the hotel. The loan in total amount of 98.020 EUR was granted October 2009, with maturity up to 3 years.

3. MEGA SOLAR-Skopje (RE project)

MEGA SOLAR is a company situated in Skopje. The investment project represented a photovoltaic power plant with a capacity of 1 MW, located in a non-populated area near the Macedonian-Greece border (village Germijan in the Municiplaity of Novaci) on an area of 18.516 m^2. A loan of EUR 1.830.000 was approved in 2010 (MBDP-50% and World Bank-50% part), with maturity of up to 10 years and a grace period of 1 year included. The last payment date of this loan is 31.03.2021.

year	Principal (in EUR)
2011	-
2012	152,500
2013	203,333
2014	203,333
2015	203,333
2016	203,333
2017	203,333
2018	203,333
2019	203,333
2020	203,333
2021	50,833
total	**1,830,000**

MBDP performance

For the purposes of implementing the Grant Agreement with the World Bank and for managing the EE/ RE Credit Line, MBDP assigned a Fund manager and a Financial specialist, created a Designated account for the transfer of funds (as well as counter denar account), and maintained separate accounting and financial data.

For the promotion of the credit line, MBDP held presentations on various occasions such as seminars, conferences, meetings, events, exhibitions and etc. As a result of this, MBDP was contacted by numerous potential clients who were mainly interested in investments in renewable energy, especially in photovoltaic power plants. Some national and international institutions also showed interest in MBDP's activities in RE and EE (EBRD, KfW etc).

These activities supported the development of an appropriate knowledge and environment for investing in renewable energy. At the beginning of the Project, the interest and familiarity with the possibilities of investing in renewable energy, in particular the SEFF was low. MBDP's information activities (commercials, ads, leaflets, seminars etc.) contributed to a significant increase of the understanding and interest in investing in renewable energy.

From the experience gained through the contacts with the clients, it can be concluded that even though the feed-in tariff was decreased, the interest in RE, particularly in photovoltaic power plants remained high. In addition, the common difficulties many of the clients faced in the development of RE project were related to the obtaining of licenses.

Some of the clients also noted problems with startup capital in order to finalize their projects and lack of collateral when applying for loans in the commercial banks. It should be noted that the global financial crisis that broke out during the implementation of the Project made significant impact to the lending activities of the banks in Macedonia, resulting in more rigorous procedures and criteria for the clients applying for loans in the banks. Considering that MBDP and the on-lending banks manager to finance RE projects from the SEFF proves the strong the interest for the RE investments.

On an operational level, in any further projects or cooperation with the World Bank, the MBDP suggests the usage of EURO, to which the Macedonian Denar is pegged, in order to simplify the project management.

World Bank performance

During the SEFF project implementation, MBDP had a close cooperation with the representative of the World Bank. This cooperation was noted in few areas-implementation of the project (selection of on-lending banks, obtaining World Bank's No objection to the investment projects), financing of the projects and on-site visits and technical support from the World Bank.

The representatives of the World Bank provided assistance, knowledge and support whenever required to define the best solutions for any situation. The World Bank's technical assistance in the EE and RE projects was essential to MBDP, since it does not have proper in-house expertise in these areas.

(b) MoE PIU ICR

GEF SUSTAINABLE ENERGY PROJECT
(TF 057 107)

Implementation Completion and Results Report

for the implementation period starting on September 6, 2010 through January 31, 2013

Prepared by: **Trajce Andreevski**
Project Manager, Project Implementation Unit
Ministry of Economy

January 31, 2013

List of acronyms

BoQ	=	Bill of quantities
GEF	=	Global Environment Facility
Grant Agreement	=	Global Environment Facility Trust Fund Grant Agreement for the implementation of the Sustainable Energy Project between the Republic of Macedonia and the International Bank for Reconstruction and Development, signed on February 26, 2007 and amended subsequently
MoE	=	Ministry of Economy
MoF	=	Ministry of Finance
NO	=	No objection
NPEEPB	=	National Program for Energy Efficiency in Public Buildings
KG	=	Kindergarten
PS	=	Primary School
PIU	=	Project Implementation Unit
ToR	=	Terms of reference
WBI	=	World Bank Institute

(i) Assessment of the operation's objective, design, implementation, and operational experience;

The Project has been supported by a Grant from the Global Environment Facility (GEF) in the amount of US$5.5 million, through the International Bank for Reconstruction and Development (IBRD, hereinafter: "the World Bank") that acted as the Implementing Agency of the GEF. The Project's development objective consisted in the development of a sustainable market for energy efficiency (EE) and renewable energy (RE) by supporting the development of an enabling framework, institutional capacity, and necessary financing mechanisms.

The Project has been structured in the following three components[9]:

1. Institutional Support, Technical Support and Project Management;
   - Project management
   - Preparation of technical documentation
   - Preparation of strategic documents
   - Wind development program
   - Information dissemination
2. Financial Support for EE in Public Buildings;
   - Phase 1: Grant financing
   - Phase 2: Co-financing
3. Sustainable Energy Financing Facility (SEFF) – Credit line for RE/EE.

The simplicity of the Project's structure contributed largely to the overall success of the Project.

The Project was restructured twice:

3. First, on June 29, 2010 due to the insufficient implementation progress and a smaller-than-anticipated market response. As a result of this restructuring, the Project's components were re-defined, and the Project was transferred from the Energy Agency to the Ministry of Economy, and
4. Secondly, on April 13, 2012, with the aim of re-allocating the unused funds from the 3rd component to the 2nd Component to be utilized for the co-financing of energy efficiency retrofits in public buildings with the municipalities. Along with this restructuring, the Grant Agreement was also amended to increase the Authorized Allocation from US$ 200.000 to $800.000, which was supposed to improve the Project's liquidity and allow more dynamic payments.

The Project's closing date was postponed three times:

1. From March 31, 2011 to September 30, 2012 to allow the implementation of all activities of the restructured Project,
2. From September 30, 2012 to January 31, 2013, to allow a greater degree of utilization of the Grant funds and to finalize all construction works pertaining to Phase 2, and
3. From January 31, 2013 to March 30, 2013, to anticipate the delays of the construction works in the winter period.

9) This is following the Project restructuring in June 2010

The Project was de facto implemented by a Project Implementation Unit (PIU), hosted at the Ministry of Economy. The PIU was composed of a Project Manager, Senior Energy Efficiency Technical Expert, Financial Expert, Junior Expert and a Junior Technical Expert. The PIU consultants were selected and hired in a competitive procedure, following the World Bank's procurement guidelines (selection of individual consultants). The Project Manager, the Senior Energy Efficiency Technical Expert, Financial Expert, Junior Expert represented the core of the PIU and were hired throughout the duration of the Project; whereas the Junior Technical Expert and a Project Assistant were hired in November and December 2011, respectively, and represented part-time positions.

The PIU and its members proved to be essential to the successful implementation of activities and to the overall effectiveness of the Project.

The work of the PIU was directed by a Project Coordinator, appointed by the Minister of Economy. The Project had two Coordinators, a State Advisor on Energy and Mining that was replaced with the replacement of the Minister in mid-2011 by a trusted member of the Minister's cabinet. The Project Coordinator's position was critical in the decision-making on the side of the Ministry of Economy, since he/she ensured close communication with the Minister and his support to the PIU operations. Nevertheless, the Minister's intervention was required in several occasions to speed-up the decision making and the implementation of the activities.

The procurement of goods, consultant services and works was carried out by a Permanent Evaluation Committee, composed of the Project Coordinator, the PIU Manager and an employee in the MoE's Energy Department; each member had an appropriate deputy. The Permanent Evaluation Committee was responsible on behalf of the Ministry of Economy, for all procurements in accordance with the World Bank's procurement rules throughout the Project's duration. Its continuous communication and consultation with the World Bank was a key element for the success of its operations.

(ii) Assessment of the outcome of the operation against the agreed objectives, updated performance indicators for the project;

The PIU was generally successful in the implementation of the Project activities. However, there were significant delays vis-à-vis the planned and agreed target dates, which were mostly due to the complex decision-making procedures in the MoE, prolonged correspondence and consultation with the World Bank during the procurements, and the early parliamentary elections in 2011.

The following sub-sections elaborate on the implementation of the Project activities and achievement of the agreed objectives.

Component I: Institutional Support, Technical Support and Project Management;

Preparation of technical documentation

Four consultant companies were separately selected and hired to conduct energy audits that identified the most sustainable energy efficiency measures to be implemented, and to prepare

the technical specifications for the materials and equipment to be installed. Considering the scope of works, it was decided to select and hire two consultant companies for each of the Phases; thus, each consultant company had to audit a package of around nine buildings. The technical specifications and the Bills of quantities (BoQs) prepared by the consultants were used by the PIU to prepare the bidding documentation for each package. These companies were also obliged to supervise the construction works, which ensured stronger integrity between the project design and supervision aspects.

A separate licensed company was selected to ensure the mandatory revision of the project design documentation for all buildings encompassed in both Phases 1 and 2. This company also provided the Adjudicator for all construction contracts.

A Senior Energy Efficiency Advisor was competitively selected and hired to assist the PIU in the preparation of the bidding documents and monitoring the implementation of works and commissioning.

Preparation of strategic documents

The National Program for Energy Efficiency in Public Buildings (NPEEPB) was of particular interest to the Project. It was also one of the main reasons for the major Project restructuring in 2010 since the Government expressed interest to pursue an ambitious 6-year program for energy efficiency in public buildings. The NPEEPB is not mandated by any law, but its implementation will greatly contribute to the achievement of Macedonia's strategic targets, set forth in the National Energy Strategy, National Energy Efficiency Strategy and the appropriate Action Plans. Moreover, the implementation of an NPEEPB would achieve multiple benefits:

- Savings in energy, which would in turn have positive effects on Macedonia's lagging competitiveness and would improve the security of energy supply,
- Financial savings, releasing funds for other purposes with greater developmental impact,
- Reduction in greenhouse gases,
- Improvement of comfort and working conditions in the public buildings; this has indirect effect to the quality of education, public health and overall work productivity,
- Create local employment, as many energy efficiency measures rely on locally produced equipment and materials and are labor intensive.

The World Bank provided significant support to the PIU/ Ministry of Economy in preparing the Terms of reference for the assignment, which basically consisted in determining:

- The investment needs for the public buildings retrofits (schools, kindergartens, hospitals, administrative buildings and other social care buildings) with the aim of achieving sustainable energy and financial savings,
- The eligible energy efficiency measures,
- The financing sources and mechanisms,
- The implementation arrangements and mechanisms, and
- The timeline for implementing the Program.

A consortium of consultant companies was competitively selected to implement the assignment and prepare the NPEEPB document, which needs to be approved and adopted by the Government. The consultants did not submit a fully satisfactory document, which, in particular, failed to adequately explore and elaborate the financing and implementation mechanisms.

These aspects were further developed by consultants of the World Bank Institute (WBI). They proposed three financing and implementation mechanisms for the NPEEPB: (i) an EE Fund, which is supposed to lend to municipalities, but also offer Energy Service Agreements to the institutions that are unable to borrow, (ii), a Credit line for EE, or (iii) a specific project structure, tentatively hosted at the Ministry of Finance. The PIU/ Ministry of Economy adequately synthesized the contributions of all consultants into one single NPEEPB document and submitted it to the Government for approval and adoption.

The financing and implementation of the NPEEPB is expected to be one of the major areas of cooperation in the energy portfolio between the Government of the Republic of Macedonia and the World Bank in the next six years.

The Implementation Program of the Energy Strategy for the 2013-2017 period was also of particular interest to the Ministry of Economy. The Macedonian Academy of Sciences and Arts (MANU) was competitively selected to implement the assignment. MANU prepared the document in a transparent manner and in continuous consultation with the competent institutions and the relevant stakeholders in the energy sector. The Implementation Program determines all activities and measures that contribute to the realization of the National Energy Strategy and to the achievement of the strategic commitments and targets in the energy sector, including the adoption of legislative and regulatory acts, determining the priority investments, implementation of programs and specific projects and measures, as well as promotional activities.

Wind development program

Five sites[10] were selected for installation of wind measurement equipment, based on a study prepared by a competitively selected consultant company that identified the most sustainable sites for wind power plants development. The PIU updated the technical specifications for the wind measurement equipment that was procured from a U.S.-based supplier, which was competitively selected by the Energy Agency. The PIU also collected all documents and permits required for the installation of the wind measurement equipment. All five measurement masts were installed on the sites in August 2012; they immediately started emitting signals on the wind power potential.

The Faculty of Electrical Engineering and Information Technologies (FEIT) was selected to prepare (i) instructions for the use of the wind measurement equipment, (ii) specifications for the reporting format and the content of analysis of wind energy potential for each measurement site, (iii) database design for each measurement site and database manual, (iv) to host and manage the wind power potential database, (v) to assist the installation and commissioning of the wind measurement equipment, and (vi) to prepare a three-year maintenance plan.

The preliminary results of the wind measurement suggest sustainability and profitability of wind power plants development on all five locations. This is the first systematic wind potential

10) The sites are located in the municipalities of Staro Nagoricane, Sopishte, Berovo, Sveti Nikole and Mogila

analysis and measurement in Macedonia, and therefore, it is of fundamental value for the future development of wind power plants.

In addition, a study on the integration of wind power plants in the Macedonian transmission system was prepared by a consultant company, which was competitively selected by the Energy Agency. The Macedonian power transmission system and market operator (MEPSO) was the direct beneficiary of this study. The study contained:

- Analyses of the data related to the Macedonian electricity system,
- Comparison of the Macedonian Grid Rules for power transmission with the relevant grid rules of the countries in the region and the EU, as well as recommendations for modifications of the Grid Rules for effective integration of wind power plants,
- Methodology for determining the maximum level of integration of wind power plants,
- Training program for the personnel of MEPSO, power plants, Energy Regulatory Commission, Energy Agency and other stakeholders on the conditions and modalities for integrating and managing wind power plants.

This study has been essential for the prospective development of wind power plants and their integration in the power transmission system. It is significant from a technical and regulatory standpoint, but also from policy-making and investment standpoints.

Information dissemination

The information and promotional activities consisted in:

- The development of a documentary film and a TV spot on the benefits of energy efficiency retrofits of public buildings; it was based on the energy efficiency measures implemented in Phase 1,
- Flyers, which showcased the measures and results achieved in each of the 18 public buildings (schools and kindergartens) retrofitted in Phase 1,
- Brochures presenting all activities and achievements of the Project in the implementation of energy efficiency measures in public buildings, as well as the benefits of it,
- A municipal workshop and a conference on energy efficiency.

The Ministry of Economy reckons that the information and promotional activities could have been better planned and implemented in order to achieve better promotion of the Project's results and the benefits of energy efficiency in public buildings.

<u>Component II: Financial Support for EE in Public Buildings;</u>

The implementation of energy efficiency measures in public buildings (schools and kindergartens) was the Project's main focus. 18 buildings (13 schools and 5 kindergartens) in six municipalities[11] were retrofitted on grant financing arrangement in Phase 1 for a total of 65,695,415 Macedonian denars (approximately 1.46 million US dollars). 23 buildings (17 schools

11) Three buildings per municipality

and 6 kindergartens) were retrofitted on a co-financing arrangement (50:50) with seven municipalities in Phase 2 for a total of 111,410,278 Macedonian denars (approximately 2,48 US dollars).

The following energy efficiency measures were implemented in Phase 1:

1. Façade thermal insulation,
2. Replacement of windows,
3. Replacement of external doors,
4. Roof thermal insulation,
5. Floor thermal insulation,
6. Improvement/Installation of central heating system,
7. Installation of freestanding burning wood stoves,
8. Replacement of incandescent lights bulbs with CFL lights,
9. Improvement of radiator heat emission.

The table below provides an overview of the EE measures implemented in each building in **Phase 1**.

Municipality/ institution	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5	Measure 6	Measure 7	Measure 8	Measure 9
Bogovinje									
PS Sabedin Bajrami	✓	✓	✓	✓		✓		✓	
PS Dervish Cara (v.Palchishte)	✓	✓	✓	✓		✓		✓	
PS 11 Oktomvri (v.Novo Selo)	✓	✓	✓	✓	✓	✓		✓	
Contractor: AK Invest									
Gazi Baba									
KG Sonchogled	✓	✓	✓			✓		✓	✓
KG Sonce	✓	✓		✓				✓	✓
KG Sinolichka	✓	✓	✓					✓	✓
Contractor: Bazdak Inzenering									
Zajas									
PS Redjo Rushit Zajazi (v.Zajas)	✓	✓	✓		✓	✓			
PS Faik Konica (v.Greshnica)	✓	✓	✓				✓	✓	
PS Faik Konica (v.Bachishta)	✓	✓	✓	✓		✓			
Contractor: Perparimi									
Ceshinovo-Obleshevo									
PS Stasho Pindzur (v.Cheshinovo)	✓			✓		✓		✓	
PS Stasho Pindzur (v.Sokolarci)	✓	✓	✓	✓				✓	

PS Kliment Ohrdiski (v.Obleshevo)	✓			✓		✓		✓	
Contractor: Simak Inzenering									
Kisela Voda									
KG Sinolichka	✓	✓	✓					✓	✓
PS Partenie Zografski	✓	✓							
KG Peperutka	✓	✓	✓			✓		✓	✓
Contractor: Konstruktor dooel.									
Kavadarci									
PS Dobri Daskalov		✓		✓		✓	✓	✓	
PS Tosho Velkov Pepeto		✓	✓			✓			
PS Dimkata Angelov Gaberot (V.Sopot)	✓	✓	✓	✓				✓	
Contractor: Konstruktor Renata doo.									

The table below provides an overview on the invested amount, energy and financial savings, payback period and reductions in CO_2 emissions for each building retrofitted in Phase 1.

Municipality/ institution	Invested amount (in MKD)	Invested amount (in US$)[12]	Savings (in MWh)	Savings (in MKD)	Savings (in US$)	Reductions In CO_2 (kg of CO_2)
Bogovinje	**11,027,020**	**245,045**	**320**	**619,700**	**13,250**	**15,246**
PS Sabedin Bajrami	3,061,997	68,044	111	233,700	5,000	4,346
PS Dervish Cara (v.Palchishte)	3,790,480	84,233	113	200,000	4,250	6,552
PS 11 Oktomvri (v.Novo Selo)	4,174,543	92,768	95	186,000	4,000	4,738
Gazi Baba	**15,792,046**	**350,934**	**513**	**2,722,000**	**57,550**	**123,135**
KG Sonchogled	4,151,400	92,253	160	854,000	18,200	38,387
KG Sonce	7,693,276	170,962	225	1,200,000	25,150	53,920
KG Sinolichka	3,947,370	87,719	128	668,000	14,200	30,828
Zajas	**10,966,339**	**243,696**	**342**	**1,241,400**	**26,300**	**34,402**
PS Redjo Rushit Zajazi (v.Zajas)	2,929,423	65,098	69	411,400	8,700	2,501
PS Faik Konica (v.Greshnica)	3,670,075	81,557	150	660,000	14,000	27,078
PS Faik Konica (v.Bachishta)	4,366,841	97,041	124	170,000	3,600	4,823
Ceshinovo-	**8,205,924**		**588**	**1,231,000**	**26,100**	**32,716**

12) Based on a MKD-US$ exchange rate of 1:45

Obleshevo		**182,354**				
PS Stasho Pindzur (v.Cheshinovo)	3,696,707	82,149	279	510,000	10,800	18,850
PS Stasho Pindzur (v.Sokolarci)	857,084	19,046	150	288,000	6,100	7,048
PS Kliment Ohrdiski (v.Obleshevo)	3,652,134	81,159	159	433,000	9,200	6,818
Kisela Voda	**12,867,011**	**285,933**	**433**	**2,233,300**	**48,500**	**107,003**
KG Sinolichka	2,111,634	46,925	35	187,000	4,000	8,424
PS Partenie Zografski	5,365,129	119,225	158	846,300	18,000	41,206
KG Peperutka	5,390,248	119,783	239	1,200,000	26,500	57,373
Kavadarci	**6,837,075**	**151,936**	**274**	**1,776,481**	**37,966**	**15,626**
PS Dobri Daskalov	1,471,984	32,711	117	1,384,481	30,766	8,019
PS Tosho Velkov Pepeto	3,612,131	80,270	114	154,000	2,200	4,462
PS Dimkata Angelov Gaberot (V.Sopot)	1,752,960	38,955	42	238,000	5,000	3,145
TOTAL:	**65,695,415**	**1,459,898**	**2,470**	**9,823,881**	**209,666**	**328,128**

The following energy efficiency measures were implemented in Phase 2:

1. Façade thermal insulation,
2. Replacement of windows,
3. Replacement of external doors,
4. Roof thermal insulation,
5. Installation of freestanding burning wood stoves,
6. Improvement/Installation of central heating system,
7. Replacement of incandescent lights bulbs with CFL/LED lights,
8. Installation of domestic hot water solar collectors.

The table below provides an overview of the EE measures implemented in each building in **Phase 2**.

Municipality/ institution	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5	Measure 6	Measure 7	Measure 8
Cair								
PS Liria	✓	✓	✓	✓		✓	✓	
KG Snezana	✓	✓	✓	✓		✓	✓	✓
PS VasilGlavinov	✓	✓	✓	✓		✓	✓	
PS Nikola Vapcarov	✓	✓	✓	✓				
KG Petar Pan		✓						
Contractor: KonstruktorRenata doo.								

PS Jane Sandanski		✓	✓				✓	
Zhelino								
PS Pasko Vasa (v. Grupcin)		✓	✓	✓				
PS Pasko Vasa (v.Ciflik)		✓	✓					
Contractor: Perparimi								
Valandovo								
HS GoceDelcev	✓	✓	✓			✓		
PS Josip Broz Tito	✓	✓	✓			✓	✓	
PS GoceDelcev (v.Pirava)	✓					✓	✓	
Contractor: KonstruktorRenata doo.								
Konce								
PS GoceDelcev (Konce)		✓	✓	✓		✓		
Contractor : KonstruktorRenata doo.)								
Petrovec								
PS BratstvoEdinstvo (v. GornoKonjari)	✓	✓	✓		✓		✓	
PS BratstvoEdinstvo (v. Susica)	✓	✓	✓		✓		✓	
Contractor: BonorInzenering/ Drvo Prom								
Pehcevo								
PS VancoKitanov	✓	✓	✓				✓	
KG 7 Septemvri	✓	✓	✓					
Contractor: Perparimi								
Kavadarci								
KG Izvorce	✓							
KG Grozdoberce	✓							
KG Snezana	✓							
PS DAG (v. Vatasa)	✓							
KG Detelinka	✓	✓	✓					
HS DobriDaskalov	✓							
PS KiroSpandzovBrko	✓	✓	✓					
PS GoceDelcev	✓						✓	
Contractor: KonstruktorRenata doo.								

The table below provides an overview on the invested amount, energy and financial savings, payback period and reductions in CO_2 emissions for each building retrofitted in Phase 2.

Municipality/ institution	Invested amount (in MKD)	Invested amount (in US$)[13]	Savings (in MWh)	Savings (in MKD)	Savings (in US$)	Reductions In CO_2 (kg of CO_2)
Cair	**58,828,285**	**1,307,295**	**1,084**	**8,054,100**	**178,980**	**316,618**
PS Liria	20,621,822	458,263	343	2,205,450	49,010	86,169
KG Snezana	5,890,291	130,895	121	1,021,500	22,700	67,738
PS Vasil Glavinov	8,565,565	190,346	273	1,736,550	38,590	69,802
PS Nikola Vapcarov	18,100,640	402,236				
PS Jane Sandanski	5,649,967	125,555	347	3,090,600	68,680	92,959
Zhelino	**818,765**	**18,195**	**103**	**130,185**	**2,893**	**4,357**
PS Pasko Vasa (v. Grupcin)	428,878	9,531	61	74,385	1,653	2,361
PS Pasko Vasa (v.Ciflik)	389,887	8,664	42	55,800	1,240	1,996
Valandovo	**13,133,414**	**291,854**	**203**	**1,481,524**	**18,632**	**48,672**
HS Goce Delcev	7,150,406	158,898	98	714,918	1,587	23,568
PS Josip Broz Tito	3,605,353	80,119	80	585,021	13,000	19,118
PS Goce Delcev (v.Pirava)	2,377,655	52,837	25	181,585	4,045	5,986
Konce	**5,508,367**	**122,408**	**126**	**169,650**	**3,770**	**6,590**
PS Goce Delcev (Konce)	5,508,367	122,408	126	169,650	3,770	6,590
Petrovec	**2,908,086**	**64,624**	**81**	**99,900**	**2,219**	**5,509**
PS Bratstvo Edinstvo (v. Gorno Konjari)	1,422,766	31,617	41	51,673	1,148	3,886
PS Bratstvo Edinstvo (v. Susica)	1,485,320	33,007	40	48,227	1,071	1,623
Pehcevo	**9,224,021**	**204,979**	**151**	**612,000**	**13,670**	**24,497**
PS Vanco Kitanov	7,331,020	162,912	109	346,500	7,770	14,216
KG 7 Septemvri	1,893,001	42,067	43	265,500	5,900	10,281
Kavadarci	**20,989,340**	**466,431**				
KG Izvorce	618,940	13,754				
KG Grozdoberce	796,530	17,701				
KG Snezana	1,329,459	29,544				
PS DAG (v. Vatasa)	2,124,743	47,217				
KG Detelinka	2,857,075	63,491				
HS Dobri Daskalov	3,628,382	80,631				
PS Kiro Spandzov Brko	4,774,835	106,107				
PS Goce Delcev	4,859,376	107,986				
TOTAL:	**111,410,278**	**2,475,786**	**1,748**	**10,547,359**	**220,164**	**406,243**

13) Based on a MKD-US$ exchange rate of 1:45

The criteria for selection of municipalities, selection of EE measures to be implemented, as well as the criteria for determining the ceiling amounts for investing in each municipality are explored in greater detail in Chapter III.

Component III: Sustainable Energy Financing Facility (SEFF) – Credit line for RE/EE.

(iii) Evaluation of the borrower's own performance during the preparation and implementation of the operation, with special emphasis on lessons learned that may be helpful in the future;

The Project's procurement and disbursement operations were carried out in accordance with the respective World Bank's rules and guidelines. The PIU had a key role in ensuring compliance with the with the World Bank's procurement and disbursement guidelines.

Both the Ministry of Economy and the World Bank were obliged to adhere to transparent, objective and non-discriminatory criteria for selection of municipalities to participate in the Project, for selection of measures to be implemented and for determining the level of grant funds to be allocated to each municipality. This is important to ensure that the funds are used in the most effective and most equitable manner, as well as to prevent any allegations of corruption and political favoritism. The selection criteria were jointly defined by the Ministry of Economy and the World Bank.

It was decided that the Project should interact with the municipalities for the implementation of energy efficiency measures in public buildings because (i) the municipalities are responsible for ensuring the functioning and maintenance of public buildings and bearing the costs for it, (ii) the municipalities are ideal for grouping projects from an organizational, administrative and territorial standpoint and because (iii) the interaction with municipalities contributes to the development of their capacity for independent implementation of energy efficiency projects. All municipalities were invited to propose a number of buildings[14] to be retrofitted, along with data on the energy savings potential of the proposed buildings.

The selection of municipalities to participate in the grant financing (Phase 1) was carried out in accordance with a set of combined criteria, as follows:

1. Status of decentralization (20/ 100 points): The idea was to award the maximum score for this criterion (20 points) to the municipalities that were in the least advanced stage of fiscal decentralization i.e. to allow greater chances to the municipalities that are less able to independently implement energy efficiency projects.
2. Level of preparedness (25/ 100 points), rated by the availability of energy audits and other documentation for retrofitting the proposed buildings. A maximum score for this criterion (25 points) was awarded to the municipalities that had energy audits and/or other documentation for all three proposed buildings. This proved the interest of the municipality to independently implement energy efficiency projects, from one side, and on the other side, facilitated the work of the PIU and energy auditors.

14) The municipalities were invited to propose three buildings for Phase 1, and at least two buildings in Phase 2

3. Energy savings potential (55/ 100 points), was the heaviest weighted criterion since energy savings were the main objective of the retrofits. This criterion distinct the projects that had strong energy efficiency dimension from those that represented simple structural interventions. The energy savings potential was calculated as the total annual energy consumption (in MWh) divided by the total heated area of the building.

The energy efficiency measures to be implemented were proposed and developed by independent energy auditors that were competitively selected and hired by the Ministry of Economy. The proposed measures were ranked by their estimated payback period. The shorter the payback period, the greater the energy savings potential and hence, the higher implementation priority.

The amount of grant funds allocated to each municipality in Phase 1 was based on an energy consumption ratio, which was calculated as a quotient from the available investment amount divided by the total energy consumption of all municipalities (in MWh). This approach proved to equitably reflect on the other parameters as well, such are the municipalities' size, size of buildings, number of pupils etc.

The selection of municipalities to participate in Phase 2 (co-financing) was carried out on the basis of the municipalities' committed amounts for co-financing. Nevertheless, with the aim of ensuring functional equality between the municipalities with big and small budgets, the committed amounts were expressed and ranked by their absolute value and relative value (expressed as percentage of their 2010 budget). Furthermore, it was decided to cap the municipal commitments at 250.000 US dollars and to allocate equal total amounts to co-finance the energy efficiency retrofits with the municipalities selected under each criterion (absolute/ relative value).

These criteria were clearly defined in the call for expressions of interest that was submitted to all municipalities.

The Ministry of Economy believes that these criteria largely contributed to the overall success of the Project, to the elimination of allegations of misuse of public funds and that the same criteria may be used in similar contexts of using public funds for energy efficiency projects.

(iv) Evaluation of the performance of the Bank, any co-financiers, or of other partners during the preparation and implementation of the operation, including the effectiveness of their relationships, with special emphasis on lessons learned

(v) Description of the proposed arrangements for future operation of the project, sustainability of investments.

The Ministry of Economy reckons that, under the present state of development of the Ministry's proper capacity, a specially established Project Implementation Unit is the most appropriate arrangement for implementation of projects.
The position of Project Coordinator, as foreseen and exercised under this project, may be re-defined. The Project Coordinator may replace the Project Manager, or the function of a Project Coordinator should be exercised directly by the Minister.

The Minister should be more involved in the definition and planning of project activities, and should be informed of the project's progress in a more regular manner. The Minister should ensure effectiveness of the PIU's operations and quick decision making.

The solution of co-signing of payment orders with the Project Manager, or between the Project Coordinator and the Project Manager, as alternative to the Minister's signature, should be maintained because it relieves the Minister from signing too many minor payment orders and balances his exposure, increasing the accountability of the Project Coordinator/ Project Manager. The alternative co-signing of payment orders has additional advantage of streamlining the payments.

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

Not applicable.

Annex 9. List of Supporting Documents

- Project Appraisal Document
- Restructuring papers
- Aide Memoires
- Implementation Status and Results report
- Financial Monitoring reports
- Official correspondence
- Law on Energy, Republic of Macedonia, 2007
- First National Energy Efficiency Action Plan 2010-2018, Republic of Macedonia, 2010
- Financing options for the National Program for Energy Efficiency in Public Buildings (NPEEPB) in the Former Yugoslav Republic of Macedonia, 2012-2018, World Bank Institute, 2012
- Strategy for energy development in the Republic of Macedonia until 2030, Ministry of Economy, 2010
- Strategy for utilization of renewable energy sources in the Republic of Macedonia until 2020, Ministry of Economy, 2010

Annex 10. List of indicators from Restructuring 1 paper

ANNEX 1:
Results Framework and Monitoring
MACEDONIA, FORMER YUGOSLAV REPUBLIC OF: SUSTAINABLE ENERGY GEF PROJECT

Project Development Objective (PDO): To develop a sustainable market for EE and RE by supporting the development of an enabling framework, institutional capacity, and necessar financing mechanisms

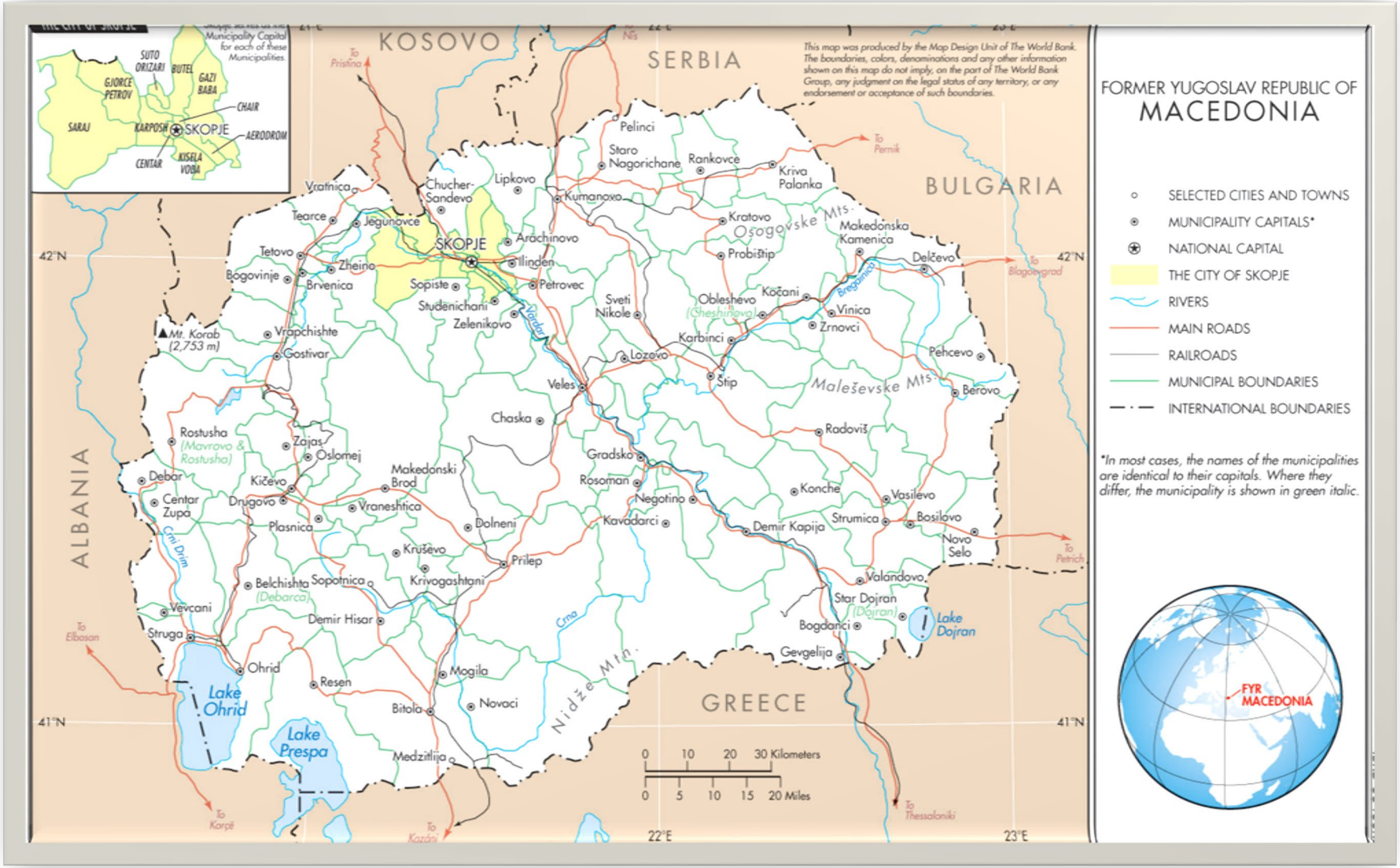
Revised Project Development Objective: The PDO remains unchanged

PDO Level Results Indicators*	Core	D=Dropped C=Continue N= New R=Revised	Unit of Measure	Baseline	Cumulative Target Values**						Frequency	Data Source/ Methodology	Responsibility fo Data Collectio
					YR1	YR2	YR3	YR4	YR5	YR6			
Indicator One: Introduction of an enabling regulatory and incentive framework for RE	☐	C	Framework in place	n/a	Framework in place						Annual	PMR	Energy Agency
Indicator Two (OLD): Capacity installed from new RE (MWe)	☐	D	MWe	0	0	2.5	2.5	2.5	2.5		Annual	M&E consultants report	M&E consultan
Indicator Two (NEW): Total RE capacity licensed	☐	N	MWe	0	0	0	0.75	1.0	6.6	0.04	Annual	Energy Regulatory Commission (ERC)	PIU
Indicator Three (OLD): Electricity generation from new RE (MWh)	☐	D	MWh	0	0	10,950	21,900	32,850	43,800		Annual	M&E consultants report	M&E consultan
Indicator Three (NEW): Expected electricity generated from new RE,	☐	N	GWh	0	0	0	54.8	41.2	530	2.1	Annual	Energy Regulatory Commission	PIU

PDO Level Results Indicators*	Core	D=Dropped C=Continue N= New R=Revised	Unit of Measure	Baseline	Cumulative Target Values**						Frequency	Data Source/ Methodology	Responsibility fo Data Collection
					YR1	YR2	YR3	YR4	YR5	YR6			
lifetime												(ERC)	
Indicator Four (OLD): Electricity saved (MWh)	☐	D	MWh	0	3,037	25,978	41,498	55,331	67,476		Annual	M&E consultants report	M&E consultan
Indicator Four (NEW): Expected energy saved from EE, lifetime	☐	N	GWh	0	0	0	7.2	98.9	110.9	2.3	Annual	MoE, MBDP	PIU
Indicator Five (OLD): Increased share of "new" RE in national energy supply	☐	D	%	0	0	0.16	0.33	0.50	0.66		Annual	PMR	Energy Agency
Indicator Five (NEW): Value of EE projects financed	☐	N	US$ million	0	0	0	0.21	1.75	1.96	0.04	Annual	PIU, MBDP	PIU
Indicator Six (OLD): Reduction in CO_2 emissions at the national and project level (t/y)	☐	D	tCO2/y	0	3,725	45,298	70,582	94,109	115,880		Annual	PMR	Energy Agency
Indicator Six (NEW): Reduction in CO_2 emissions at the national and project level, lifetime	☐	N	tCO2	0	0	0	56,753	128,201	586,442	3,997	Annual	ERC, MoE, MBDP	PIU
INTERMEDIATE RESULTS													
Intermediate Result (Component One): Increased in-country knowledge and improved framework and market for EE and RE development													
Revised Intermediate Result (Component One): Intermediate Result remains unchanged													
Intermediate Result indicator One: Training of stakeholders	☐	D	Completed	n/a	Compl. 1st train.	Compl. 2nd train.	Compl. 3rd train.	Compl. 4st train.	Compl. 5st train.		Annual	PMR	Energy Agency
Intermediate Result indicator Two: TA for Establishment of	☐	R	Completed and approved	n/a	Compl. and approved						Annual	ERC	PIU

PDO Level Results Indicators*	Core	D=Dropped C=Continue N= New R=Revised	Unit of Measure	Baseline	Cumulative Target Values**						Frequency	Data Source/ Methodology	Responsibility fo Data Collection
					YR1	YR2	YR3	YR4	YR5	YR6			
feed-in tariff for RE													
Intermediate Result indicator Three: TA for Development of pipeline of EE and RE projects	☐	D	Completed and approved	n/a		Compl. and approved					Annual	PMR	Energy Agency
Intermediate Result indicator Four: MoU between PIU and municipalities signed	☐	N	Number	-	0	0	0	3	5	-	Annual	PIU	PIU
Intermediate Result (Component Two): Establishment of an operating utility-based ESCO													
Revised Intermediate Result (Component Two): Contracts under Financial Support for EE in Public Buildings are awarded													
Intermediate Result indicator One (OLD): Number of staff	☐	D	Number	-	3	5	7	10	12		Annual	PMR	ESCO
Intermediate Result indicator Two (OLD): Capital deployed by owners	☐	D	1000 US$	-	300	560	820	1,300	1,740		Annual	PMR	ESCO
Intermediate Result indicator Three (OLD): Number of performance guarantees signed	☐	D	Number	-	3	5	7	10	12		Annual	PMR	ESCO
Intermediate Result indicator Four(OLD): Volume of performance contracts signed (US$)	☐	D	1000 US$	n/a	180	300	420	600	720		Annual	PMR	ESCO
Intermediate Result indicator One (NEW): Volume of energy audits and S&I contracts signed under the Financial Support for EE in Public Buildings	☐	N	1000 US$	-	0	0	0	1,296	1,160	-	Annual	PIU	PIU

PDO Level Results Indicators*	Core	D=Dropped C=Continue N= New R=Revised	Unit of Measure	Baseline	Cumulative Target Values**						Frequency	Data Source/ Methodology	Responsibility fo Data Collection
					YR1	YR2	YR3	YR4	YR5	YR6			
Intermediate Result indicator Two (NEW): Volume of energy audits and S&I contracts co-financed	☐	N	1000 US$	-	0	0	0	0	348	-	Annual	PIU	PIU
Intermediate Result (Component Three): Increased investment in RE and EE projects													
Revised Intermediate Result (Component Three): Intermediate Result remains unchanged													
Intermediate Result indicator One: Volume of loans guaranteed	☐	D	1000 US$	-	0	1,500	1,750	1,750	1,000		Annual	M&E consultant reports	M&E consultants
Intermediate Result indicator Two: Volume of loans made from SEFF	☐	R	1000 US$	-	0	0	142	550	550	50	Annual	MBDP	PIU
Intermediate Result indicator Three: Volume of additional co-financing	☐	R	1000 US$	-	0	0	163	1,850	1,850	150	Annual	MBDP	PIU
Intermediate Result indicator Four: Total financing of RE	☐	R	1000 US$	-	0	0	97	1,950	1,950	160	Annual	MBDP	PIU
Intermediate Result indicator Five: Total financing of EE	☐	R	1000 US$	-	0	0	210	450	450	40	Annual	MBDP	PIU


FORMER YUGOSLAV REPUBLIC OF
MACEDONIA
KOSOVO
SERBIA
BULGARIA
GREECE
ALBANIA
SKOPJE
Municipality Capital for each of these Municipalities.
SUTO ORIZARI
BUTEL
GAZI BABA
GJORCE PETROV
CHAIR
SARAJ
KARPOSH
AERODROM
CENTAR
KISELA VODA
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SELECTED CITIES AND TOWNS
MUNICIPALITY CAPITALS*
NATIONAL CAPITAL
THE CITY OF SKOPJE
RIVERS
MAIN ROADS
RAILROADS
MUNICIPAL BOUNDARIES
INTERNATIONAL BOUNDARIES
*In most cases, the names of the municipalities are identical to their capitals. Where they differ, the municipality is shown in green italic.
FYR MACEDONIA
Osogovske Mts.
Maleševske Mts.
Nidže Mtn.
Lake Ohrid
Lake Prespa
Lake Dojran
Mt. Korab (2,753 m)
Vardar
Crni Drim
Crna
Bregalnica
0 10 20 30 Kilometers
0 5 10 15 20 Miles
42°N
41°N
22°E
23°E