

# **World Bank Group**

## **Progress on Renewable Energy and Energy Efficiency**

### **Fiscal Year 2005**





# **World Bank Group Progress on Renewable Energy and Energy Efficiency: Fiscal Year 2005**



**World Bank Group**



**Energy and Mining Sector Board**

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## Acronyms and Abbreviations

Fiscal Year: July 1 to June 30

AAAs	Analytical and advisory activities	ICSID	International Centre for Settlement of Investment Disputes
AAU	Assigned amount unit	IDA	International Development Association
AFR	Sub-Saharan Africa	IEA	International Energy Agency
APL	Adaptive Program Loan	IFC	International Finance Corporation
ASTAE	Asia Sustainable and Alternative Energy Program	kWh	Kilowatt hour
CAS	Country Assistance Strategy	LCR	Latin America and the Caribbean
CDCF	Community Development Carbon Fund	MDBs	Multilateral development banks
CDM	Clean Development Mechanism	MDGs	Millennium Development Goals
CFB	Carbon Finance Business	MNA	Middle East and North Africa
CO <sub>2</sub>	Carbon dioxide	MIGA	Multilateral Investment Guarantee Agency
CO <sub>2</sub> e	Carbon dioxide equivalent	MW	Megawatt
CRESP	China Renewable Energy Scale-Up Program	OECD	Organisation for Economic Co-operation and Development
DSM	Demand-side management	PCF	President's Contingency Fund
EAP	East Asia and Pacific	PCI	Participating credit institution
ECA	Europe and Central Asia	PCN	Project concept note
EE	Energy efficiency	PHRD	Policy and Human Resources Development Fund
EIR	Extractive Industries Review	PROGEDE	Senegal Sustainable and Participatory Energy Management Project
ERPA	Emission Reduction Purchase Agreement	PRSP	Poverty Reduction Strategy Paper
ESCO	Energy service company	PV	Photovoltaic
ESMAP	Energy Sector Management Assistance Program	RE	Renewable energy
ESSD	Environmentally and Socially Sustainable Development Network	REDP	Nepal Rural Energy Development Programme
ESW	Economic and sector work	REN21	Renewable Energy Policy Network for the 21st Century
FPN	Financing and policy network	RERED	Renewable Energy for Rural Economic Development
FY	Fiscal year	SAR	South Asia
G-8	Group of Eight	SEFI	Sustainable Energy Financing Initiative
GEF	Global Environment Facility	TA	Technical assistance
GIS	Green Investment Scheme	UN	United Nations
GVEP	Global Village Energy Partnership	UNDP	United Nations Development Programme
GW	Gigawatt	UNEP	United Nations Environment Programme
GWh	Gigawatt hour	US EPA	United States Environmental Protection Agency
HEP	Hrvatska Elektroprivreda d.d. (Croatian national power utility)	WBG	World Bank Group
IBRD	International Bank for Reconstruction and Development		



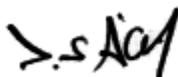
## Foreword

Renewable energy and energy efficiency can help meet increased demand for energy at the least economic, financial, and environmental cost, and they must be part of any strategy for sustainable economic development. Over the last two decades, the World Bank Group has been assisting partner countries in developing energy strategies that include identifying and exploiting opportunities to improve the use of renewable energy and efficiency of energy use, production, and distribution. In doing so, the World Bank Group makes flexible and innovative use of its wide range of assistance instruments—policy advice, technical assistance, investment and adjustment lending, and guarantees.

In June 2004, at the Bonn International Conference on Renewable Energies, the World Bank Group committed to scaling up its renewable energy and energy efficiency portfolio by an annual average of 20 percent over five years (FY05–09) and to reporting on its annual performance in supporting renewable energy and energy efficiency.

This report presents the progress that the World Bank Group has made in FY05, the first year of the Bonn commitment.<sup>1</sup> The World Bank Group, one of the largest financiers for renewable energy and energy efficiency investments, outperformed on its Bonn commitment last year. Implementation activities range from investment and capacity-building assistance to engaging partner countries in the exploration of the full potential of renewable energy and energy efficiency opportunities, building global partnerships, leveraging financial resources, and transferring know-how and good practices. The report details the work and achievements by the six regional energy units of the World Bank, International Finance Corporation, Multilateral Investment Guarantee Agency, and the World Bank Group Carbon Finance operations. In addition to the accomplishments, the report also reflects on the lessons learned and future challenges.

This report is a tribute to the dedication and hard work of the countries and their staff, the partners of the World Bank Group, and World Bank Group staff who have contributed to achieving the objectives in the past year.



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Director  
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Chair, Energy and Mining Sector Board  
The World Bank

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1. For WBG progress during the period 1990–2004, please see:  
[http://siteresources.worldbank.org/INTENERGY/Resources/335544-1111615897422/Annual\\_Report\\_Final.pdf](http://siteresources.worldbank.org/INTENERGY/Resources/335544-1111615897422/Annual_Report_Final.pdf), last accessed November 19, 2005.



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## Executive Summary

Renewable energy (RE) and energy efficiency (EE) development is an integral part of the World Bank Group (WBG) energy strategy as it strives to support sustainable economic development in its partner countries. Energy affects all aspects of development – social, economic, and environmental – including livelihoods, access to water, agricultural productivity, health, population levels, education, and gender-related issues. None of the Millennium Development Goals (MDGs) can be met without major improvement in the quality and quantity of energy services in developing countries. Renewable energy and energy efficiency are vital to meeting this development challenge.

In June 2004 the WBG committed to ensure that RE and EE are seen as economically viable and essential ingredients in the energy choices of our member nations; increase financing for new RE and EE<sup>2</sup> by at least 20 percent annually over the next five fiscal years (FY05–09); lead an RE and EE Financing and Policy Network for developing countries; and provide sector-specific information to better engage a wide range of stakeholders on trends in specific technologies. The Energy and Water Department (EWD) in the Infrastructure Vice Presidency and the Energy and Mining Sector Board are leading the implementation of a plan of action to meet these commitments.

WBG support for RE includes: (a) helping partner countries develop their legal and regulatory framework to promote RE markets and mainstream RE in national energy strategies, (b) increasing familiarity with and access to state-of-the-art renewable technologies, (c) developing competitive markets and improving nascent markets to justify investments in the industry, (d) providing financing and offering diverse financing mechanisms to increase access and affordability of renewable technologies, and (e) improving the quality and reducing the cost of RE equipment and services.

Support for EE has focused on: (a) strengthening demand management and distribution efficiency activities; (b) developing competitive markets for energy services and energy-efficient technologies; (c) setting up or strengthening national and local energy sector entities to provide training, disseminate EE information and technology transfer; (d) supporting adoption of EE standards and codes; and (e) providing financing and adapting flexible financing mechanisms.

The major accomplishments in FY05 are discussed below.

The WBG's financial support for RE and EE totaled US\$748 million in FY05, compared to US\$339 million in FY04. The commitments comprise of US\$449 million for hydropower greater than 10 megawatts (MW), US\$212 million for new RE, and US\$87 million for EE. Since 1990, WBG support for RE and EE has exceeded US\$9 billion. Forty RE and EE projects in 28 countries were supported. Importantly, each dollar of

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2. The commitment was made at the International Renewable Energies Conference held in Bonn, Germany (hereinafter referred to as the "Bonn Commitment"). The WBG supports all forms and scales of RE, but the Bonn Commitment applies to new RE and EE only. New RE is defined as energy from wind, solar, geothermal, biomass, and hydropower with a capacity of 10 megawatts (MW) or less per facility.

WBG financing for RE and EE projects leverages an average of nearly five dollars from private investors, governments, and others.

RE and EE commitments in the East Asia and Pacific (EAP) region increased more than six-fold to US\$314 million compared to FY04. This is driven by high growth in energy demand, environmental consideration, and energy security concerns. RE and EE commitments in Africa (AFR) more than doubled compared to FY04 to US\$101 million with support for biomass, geothermal, hydropower and EE. In Europe and Central Asia, with US\$227 million in commitments, emphasis continues to be for EE with projects in Bulgaria, Romania and Russia. In the other regions, FY05 commitments were US\$31 million in Latin America and the Caribbean (LCR), US\$65 million in South Asia (SAR), and US\$9 million in the Middle East and North Africa (MNA) region. The projects are diverse, ranging from large scale RE power generation to community-based projects as demonstrated by the few examples shown below.

#### **Selected Examples of FY05 World Bank Group Projects**

- China Renewable Energy Scale-up Project supports China's commitment to increase the share of RE in power generation to 15 percent by 2020 compared to 7 percent today. The first phase of the Adaptable Program Loan provides US\$87 million IBRD loan and a US\$40 million GEF grant to finance RE investments, build capacity, and assist in implementing China's Renewable Energy Law.
- Support for the Laos PDR Nam Theun 2 Project is part of an international effort to help increase incomes and living standards in one of East Asia's poorest countries. The project will enable Lao PDR to export 995 MW of electricity-generating capacity and electrical energy to the Electricity Generating Authority of Thailand. The hydroelectric power project will also supply 75 MW of electricity for domestic use in Lao PDR. If the revenues are spent efficiently, accountably, and transparently – in accordance with project agreements – NT2 could provide significant, incremental support to Lao PDR's poverty reduction and biodiversity conservation efforts.
- Improving end-user energy efficiency is supported in the Uganda Fourth Power Project. It provides assistance for energy audits for large industry and EE information dissemination to diverse end-user groups to raise awareness of the potential for energy savings.
- Bulgaria Energy Efficiency Project supports a large increase in EE investments through development of self-sustaining, market-based financing mechanisms. The project has a credit enhancement facility to mitigate investment risk, supports a Bulgaria Energy Efficiency Fund and provides capacity building and information dissemination services.
- The IFC signed an agreement with a private utility in the Dominican Republic to provide a loan and a guarantee for an 8.25 MW wind farm. The guarantee helps mitigate the risk to the commercial lender.
- The World Bank Community Development Carbon Facility supported the 4.1 MW Santa Rosa Hydro Project in Peru, the first small scale CDM project in the country. The project is a bundle of three small run-of-river hydropower plants located in the Santa Rosa Irrigation area of Sayán District. The project will assist in displacing expensive heavy diesel-fuel, coal and gas fired generation - and reducing carbon dioxide emissions to the atmosphere.
- ESMAP and ASTAE assisted the Shanghai Municipal Government develop a green electricity program called Shanghai Jade Electricity<sup>®</sup> to pass through the incremental cost of electricity generated using RE to consumers willing to pay and actively participate in protecting the environment.

The IFC's growing commitment to sustainable energy took several forms during FY05, including its first-ever direct financing of a wind power project, a growing portfolio of EE projects combining GEF and IFC financing, and GEF approval for a new technology for power generation from bagasse. The IFC's commitment to carbon finance also advanced with carbon emission reduction credits purchased from two RE projects and an

investment in an innovative animal waste management company with revenue generated by carbon credits. To further this goal, the IFC's Infrastructure and Financial Markets Departments have created new units to focus on investments in clean, environmentally friendly energy. MIGA is expanding its efforts to support more guarantee operations. Total loans, guarantees and other commitments by IFC and MIGA were US\$181 million in FY05.

In FY05, the WBG share of RE and EE financing was 26.2 percent of total energy sector commitments.<sup>3</sup> As a share of power sector commitments, RE and EE financing was 50.4 percent.<sup>4</sup> Total WBG support of new RE and EE was US\$299 million in FY05. This exceeds our commitment target of US\$251 million by end of FY05 that corresponds to the 20 percent per annum growth rate.

By end of FY05, the WBG mobilized and had under management approximately US\$1 billion in funds for investing in carbon emissions mitigation. These funds purchase greenhouse gas emission reductions in developing and transition countries on behalf of public and private sector entities requiring credits to meet their commitments under the Kyoto Protocol. The funds also support technical assistance to countries and the development of generic methodologies for projects to receive emission reduction credits.

The WBG actively assisted client countries in identifying RE and EE investment opportunities and developing them into projects. Over the last two years, a trend has emerged toward increased integration of RE and EE into strategic documents such as Poverty Reduction Strategy Papers (PRSP) and Country Assistance Strategies (CAS). The percentage of CAS and PRSP with substantive references to RE and EE grew to 66 percent of the 62 PRSP and CAS issued in FY04-05. Before FY04, there was hardly any reference to RE and EE in such planning documents. To take advantage of these opportunities and build the project pipeline, about US\$400,000 was mobilized from the President's Contingency Fund for the development of nine project concept notes for promising RE or EE investments.

The WBG provided extensive support to several countries for the passage and implementation of RE promotion laws and regulations to provide a more effective legal framework and create an enabling environment for RE development. These included support for China, Nicaragua and South Africa.

The WBG conducted a scoping study of an RE and EE Financing and Policy Network for developing countries. This culminated in a March 2005 international forum attended by 75 RE and EE practitioners and policymakers, including the Ministers of Energy from Brazil, Serbia, and Uganda. Given the many existing networks supporting RE and EE, the

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3. In FY05, total WBG financing was US\$2.857 billion for energy and US\$1.485 billion for power.

4. The WBG results can be contrasted with International Energy Agency's 2003 World Energy Investment Outlook, which forecasted that in the period 2001-2010, Organisation for Economic Co-operation and Development (OECD) countries will invest 8.3 percent of total energy sector investments in renewable energy. As a percentage of power sector investments, OECD countries' RE investment is expected to be 14.5 percent during the same timeframe.

forum concluded that a new policy network for developing countries was not warranted. The forum reached consensus on a number of important follow-up actions: The Renewable Energy Policy Network for the 21st Century (REN21) agreed to serve as a platform for enhancing collaboration among various partnerships; the Sustainable Energy Financing Initiative (SEFI) will help bring RE developers together with domestic financiers in developing countries; the Global Village Energy Partnership (GVEP) will help in mobilizing domestic capital and credit enhancement resources; the Renewable Energy and Energy Efficiency Partnership (REEEP) will fund policy and analytical work on RE and EE; and the Energy Sector Management Assistance Programme (ESMAP) will support RE and EE project identification and development, and capacity building.

Efforts were made to increase staff knowledge, capabilities, and effectiveness throughout the WBG. Work began on a Renewable Energy Toolkit (REToolkit) in FY05 and is expected to be released in December 2005. The operationally oriented REToolKit will help reduce the time and cost of preparing and implementing RE projects. A comparative cost and performance study of renewable energy and fossil-fired power generation technologies for grid, mini-grid and off-grid applications commenced in FY05. The report will be released in December 2005. The ESMAP Knowledge Series also was launched and continues to disseminate good practices throughout the WBG.

In FY06, the WBG will continue and build on the work begun in FY05 to support RE and EE scale-up. During the second year of our commitment, the primary objective of the work plan will be to continue to strengthen the “infrastructure” and provide the necessary support to meeting the scale-up commitment. Specific activities will include working with ESMAP to support upstream project development through the new RE Thematic Program, developing a regional GEF operations instrument to allow for a streamlined project development process, and developing a low transactions cost approach for increasing carbon financing for renewable energy in Africa.

Finally, the WBG is leading the development of a new investment framework for clean energy development in partnership with other multilateral institutions and partner countries. This work is fully in line with the WBG’s current energy strategy and its commitment to scaling up RE and EE programs. This work is being undertaken under the leadership of the Environmentally and Socially Sustainable Development (ESSD) and Infrastructure Vice Presidencies.

# 1. Introduction

## *1.1 Rationale for supporting RE and EE*

Energy is a key ingredient to sustainable development and poverty reduction efforts. It affects all aspects of development – social, economic, and environmental – including livelihoods, access to water, agricultural productivity, health, population levels, education, and gender-related issues. All the day-to-day activities that contribute to human development—production and trade, innovation, and social communication—rely on modern energy services. To be sure, none of the Millennium Development Goals (MDGs) can be met without major improvement in the quality and quantity of energy services in developing countries.<sup>5</sup>

Renewable energy and energy efficiency can and must become viable options to contribute to meeting this development challenge. The pressures on countries brought about by an increasingly volatile oil market coupled with high oil prices require paying even greater attention to renewable energy and energy efficiency. Consequently the World Bank Group (WBG) considers RE and EE a part of any strategy for sustainable economic development in its partner countries. RE and EE can help meet increased demand for energy at the least economic, financial, and environmental cost. Indeed, support for RE and EE is an integral part of the Bank’s Energy Strategy and is embodied in the four pillars of the strategy:

- 1) Helping the poor directly by facilitating access to modern services, reducing the cost and improving the quality of energy supplied to low-income households, and supporting the provision of affordable, sustainable energy services for social services and productive uses.
- 2) Improving macroeconomic and fiscal balances by rationalizing energy taxes, eliminating operating subsidies to state-owned enterprises, and improving procurement and marketing of imported and exported energy products, thus leveling the competitive playing field for RE and EE.
- 3) Promoting good governance and private sector development with the creation of objective, transparent, and nondiscriminatory regulatory mechanisms; introducing and expanding competition; and strengthening the capacity to finance the energy sector, thus improving the investment climate for RE and EE.
- 4) Protecting the environment by removing market and regulatory barriers to RE and EE technologies, promoting fuel-switching, strengthening environmental management capacity in the energy sector, and facilitating access to the carbon market by client countries, thus directly addressing environmental concerns at local, regional, and global levels.

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5. For a discussion of the role of energy in meeting the MDGs, see UN Energy (2005), “The Energy Challenge for Achieving the Millennium Development Goals,” <http://esa.un.org/un-energy/pdf/UN-ENRG%20paper.pdf>, last accessed November 16, 2005.

Renewable energy is energy that is derived from natural processes that are replenished constantly. In its various forms, it derives directly or indirectly from the sun, or from heat generated deep within the earth. Included in the definition is energy generated from solar, wind, biomass, geothermal, hydropower and ocean resources, and biofuels, and hydrogen derived from renewable resources. Energy efficiency comprises end-use thermal and electric efficiency activities, power sector rehabilitation, loss reduction in transmission and distribution, and improvements in the efficiency of district heating systems. It does not include EE activities in other consuming sectors, such as transport, industry, and urban utilities.

## ***1.2 The Bonn commitment***

The WBG committed to scale up assistance for RE and EE at the June 2004 International Renewable Energies Conference in Bonn, Germany. This commitment was endorsed as part of the conference's International Action Program, under which countries, multilateral agencies, and other institutions backed a wide range of both qualitative and quantitative targets for RE and EE. The commitment was later incorporated into the WBG Management Response to the Extractive Industries Review and affirmed by the Board of Executive Directors.<sup>6</sup> The key elements of the commitment are:

- Through programs and policies, The WBG's strategy will aim to ensure that RE and EE are seen as economically viable and essential ingredients in the energy choices of our member nations, not marginal considerations.
- With the aim of ensuring an institutional focus on the transition to cleaner energy sources, the WBG will commit to a target of at least 20 percent average growth annually in both EE and new RE commitments over the next five years (FY05–09). Thereafter, this goal will be reassessed.
- The WBG will lead a study to develop the concept of an RE and EE Financing and Policy Network that would address developing country issues.
- To foster greater collaboration across national and institutional lines, the WBG will commit to reporting its annual performance in RE and EE programs.
- The WBG will aim to provide sector-specific information to better engage a wide range of stakeholders on trends in specific technologies, whether those are hydroelectric, wind, solar, geothermal, or biomass.
- The WBG will increase not only its staff capacity but also the resources at their disposal and the incentives within their programs so that the WBG can more effectively help country and sector teams succeed in RE and EE projects, as well as more rapidly transfer best practice across sectors and regions.

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<sup>6</sup> World Bank Group Management Response to "Striking a Better Balance – World Bank Group and Extractive Industries: The Final Report of the Extractive Industries Review," September 17, 2004. <http://siteresources.worldbank.org/INTOGMC/Resources/finaeirmanagementresponse.pdf>, last accessed November 21, 2005.

### ***1.3 RE and EE scale-up action plan***

The WBG developed a plan of action to implement the commitments it made to help countries fully integrate RE and EE measures into energy development, in addition to making flexible and innovative use of its wide range of assistance instruments such as policy advice, technical assistance (TA), investment and adjustment lending, and guarantees. The action plan will support countries in conducting sector and policy work as well as project preparation; help improve staff capacities; lead to reduction in transaction costs and streamline preparation of RE and EE projects; monitor and report on WBG achievements in RE and EE; and collaborate more effectively with its development partners.

The primary objective of the WBG's action plan during FY05 was to strengthen and consolidate the infrastructure necessary to support the scale-up effort while simultaneously increasing investments. The action plan comprises five actions: (1) providing project pipeline development support; (2) improving instruments to mobilize financing; (3) enhancing international cooperation; (4) improving knowledge, learning, and analytics; and (5) enhancing communications.

### ***1.4 Report Outline***

This report provides an overview of the WBG activities in FY05 in support of RE and EE projects and programs, and thus in support of the World Bank's Bonn commitment. Chapter 2 reviews the FY05 project portfolio as a whole, including both lending activities and TA and analytic and advisory work. It also examines the effectiveness of integrating RE and EE into strategic planning from the standpoints of both the World Bank (Country Assistance Strategies [CASs]) and the governments (Poverty Reduction Strategy Papers [PRSPs]). Chapter 3 highlights the principal approaches that the WBG has taken to support the scale-up efforts thus far, and also provides a regional and institutional perspective on FY05 accomplishments, lessons learned, and challenges ahead in scaling up RE and EE support. Furthermore, this chapter includes perspectives of the six Regional operational units as well as those of the International Finance Corporation (IFC), Multilateral Investment Guarantee Agency (MIGA), and associated units and programs, including the Carbon Finance Business (CFB), Energy Sector Management Assistance Program (ESMAP), and Asia Sustainable and Alternative Energy Program (ASTAE). Chapters 4 and 5 describe the WBG's efforts over the past year in building global partnerships, disseminating knowledge, and strengthening in-house staff capacity—all of which are essential ingredients to the scale-up of RE and EE. Chapter 6 concludes with challenges and opportunities looking forward.

## **2. RE and EE Portfolio Overview**

In this section, the RE and EE portfolio in FY05 is examined in terms of both investment and TA activities. This section also examines the extent to which RE and EE have been integrated into country-owned development frameworks and how such opportunities have materialized into projects with WBG support.

## 2.1 FY05 RE and EE portfolio at the WBG

The WBG support for RE and EE in developing countries has grown in the past year, building on the Action Plan. In FY05, the WBG's financial support for RE and EE totaled US\$748 million, including US\$661 million for RE and US\$87 million for EE (Table 1). This is more than double the commitment amount of US\$339 million made in FY04.

**Table 1: FY05 Commitment Amounts for RE and EE**

(millions of U.S. dollars)

Sources	Total	Renewable Energy		Energy Efficiency
		Hydropower > 10 MW	"New" renewables Solar, wind, geothermal, biomass, & hydropower (< 10 MW)	
IBRD and IDA	445	283	139	23
IFC <sup>a</sup>	61	49	12	—
GEF-IBRD and IDA	100	—	47	53
GEF-IFC	8	—	1	7
MIGA	91	91	—	—
CFB-IBRD and IDA	23	15	4	4
CFB- IFC	21	11	10	—
Total	748	449	212	87

IBRD=International Bank for Reconstruction and Development; IDA=International Development Association; IFC=International Finance Corporation; GEF=Global Environment Facility.

Note: The total may not add up because of rounding.

a. The IFC's actual RE and EE investment commitments are underestimated. Some investments are not captured via the management information systems or are difficult to identify within larger IFC project investments, corporate loans, or capital market operations because they may be classified under other sectors (for example, industry, agriculture).

Among the various WBG institutions and units, IBRD and IDA were by far the largest contributors, with US\$445 million in commitments, including US\$139 million for new RE and EE and US\$283 million for hydropower greater than 10 MW. WBG-administered GEF commitments totaled US\$108 million—all for new RE and EE. The IFC made US\$61 million in commitments, of which US\$12 million was for new RE and US\$49 million was for hydropower greater than 10 MW. MIGA provided a US\$91 million guarantee for a large hydropower project, and the IBRD CFB provided US\$23 million in commitments. See Annex 1 for details.

In FY05, the WBG share of RE and EE financing was 26.2 percent of total energy sector commitments of US\$2.86 billion.<sup>7</sup> As a share of power sector commitments of US\$1.49

7. IBRD-IDA energy sector investments include oil, gas, and coal (including coal mine closing or rehabilitation; transmission and distribution of oil, gas, and electricity; power generation; district heating; plant rehabilitation; renewable energy; and energy efficiency and conservation. IFC investments in the energy sector include investments from the IFC's own account and syndications; MIGA investments refer to gross exposure. IFC and MIGA investments in energy sector consist of investments in the power sector, oil, gas, and mining as well as electricity and gas services. The IFC investments in the energy sector are a

billion, RE and EE financing was 50.4 percent. The WBG results can be contrasted with the IEA's 2003 *World Energy Investment Outlook*, which forecasts that in the period 2001–2010. Organisation for Economic Co-operation and Development (OECD) countries will invest 8.3 percent of total energy sector investments in RE. As a percentage of OECD countries' power sector investments, RE investment is expected to be 14.5 percent during the same time frame.

**2.1.1 Cofinancing.** WBG loans, grants, and guarantees leverage millions of dollars in additional financing from private investors, governments, and other donors. In FY05, WBG RE and EE projects leveraged an average of nearly five dollars for each dollar of WBG investment. As this cofinancing is critical to the development of RE and EE opportunities in developing countries, WBG attempts to maximize its ability to leverage financing from other sources.

As Figure 1 shows, the WBG has committed over US\$9 billion toward RE and EE since 1990. Of this amount, nearly US\$2.5 billion were for new RE and US\$2.2 billion for EE. Hydropower projects greater than 10MW per facility received US\$4.3 billion in commitments.

**2.1.2 Commitments by Region, FY05.** As shown in Figures 2 and 3, from a regional perspective, countries in the East Asia and Pacific (EAP) region received the highest level of commitments in FY05, with a total of US\$314 million, including US\$127 million for the China Renewable Energy Scale-Up Program (CRESP), as well as two guarantees for the Nam Theun 2 hydropower project in the Lao People's Democratic Republic (PDR) (US\$42 million from IDA and US\$91 million from MIGA). Europe and Central Asia (ECA) ranked second, with US\$227 million in commitments, and Sub-Saharan Africa (AFR) third, with US\$101 million. Both the AFR and EAP regions saw significant increases over their FY04 commitments, with AFR commitments more than doubling from US\$46 million to US\$101 million, and EAP commitments increasing more than six-fold, from US\$47 million to US\$314 million.

Year-to-year variations in WBG lending and support are not uncommon, but the magnitude of these increases suggests that the concerted efforts of the WBG to reengage in large hydropower and scale-up support for new RE and EE are having a positive impact.

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conservative estimate because there may be other energy-related investments occurring in other parts of the IFC portfolio that are not recorded or easily distinguishable as energy sector investments. An example of this is an "inside the fence" cogeneration plant located at a major industrial company that receives IFC financing or indirect IFC financing of energy projects through financial institutions to which IFC supplies capital, including private equity funds, leasing companies, and commercial banks.

Figure 1: WBG RE and EE Commitments, FY90–05

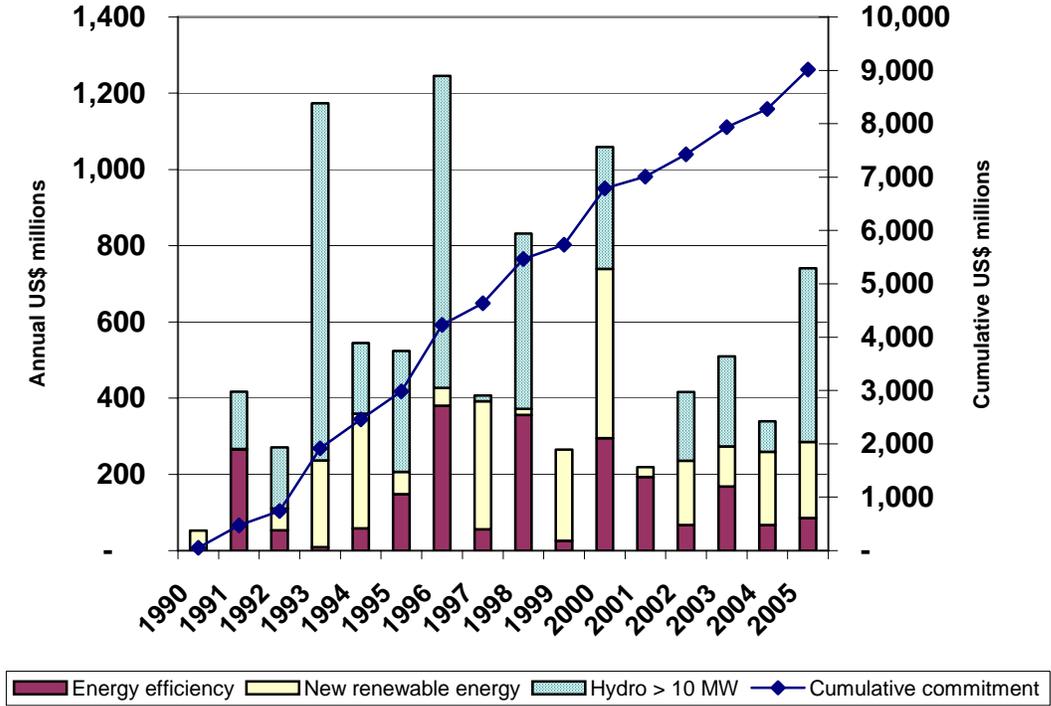
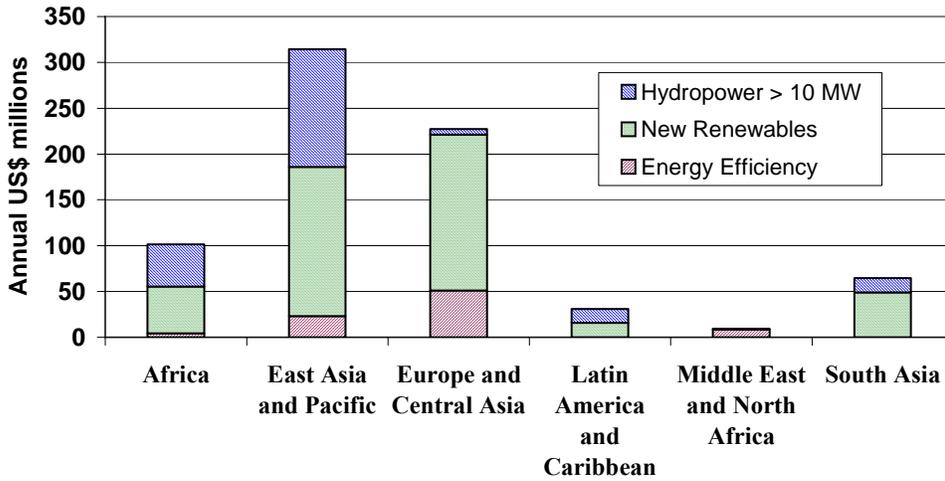
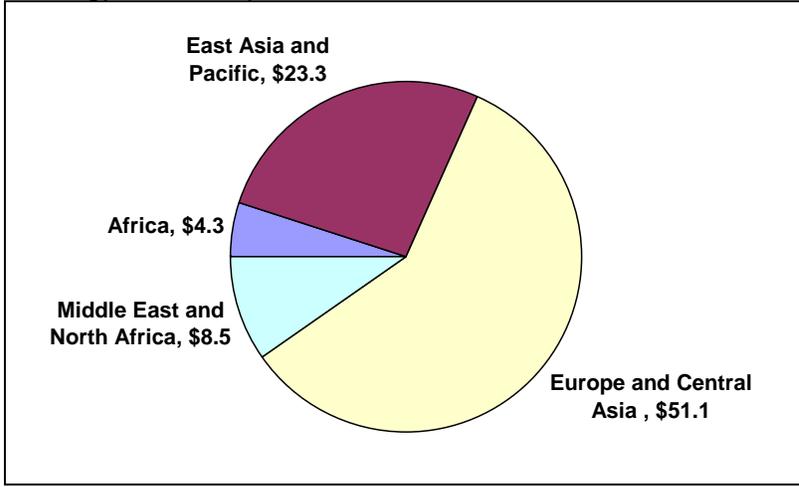


Figure 2: WBG RE and EE Commitments by Region, FY05



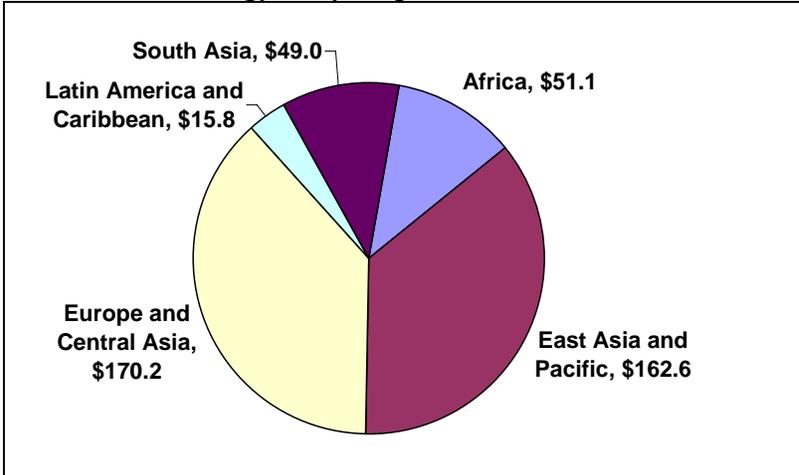
**Figure 3: FY05 Commitments by Region at a Glance**

**Energy Efficiency: US\$87 Million**



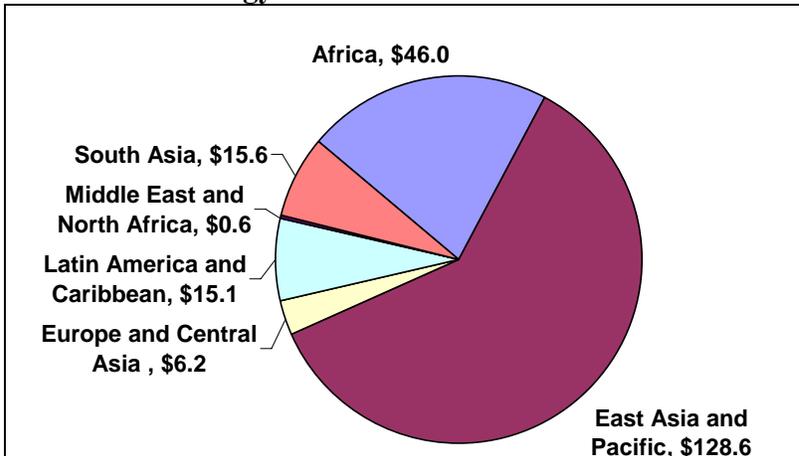
The ECA region had the highest EE commitments, with US\$51 million. The EAP, AFR, and Middle East and North Africa (MNA) regions also posted commitments for EE projects.

**Renewable Energy—Hydropower > 10MW: US\$449 Million**



Four projects in the ECA and EAP regions accounted for more than three-quarters of the nearly US\$449 million in commitments for hydropower greater than 10MW.

**Renewable Energy—New Renewables: US\$212 Million**



The EAP region dominated the WBG commitments for new renewables in FY05. This was due to CRESP, with US\$40 million from the GEF and US\$87 million from IBRD.

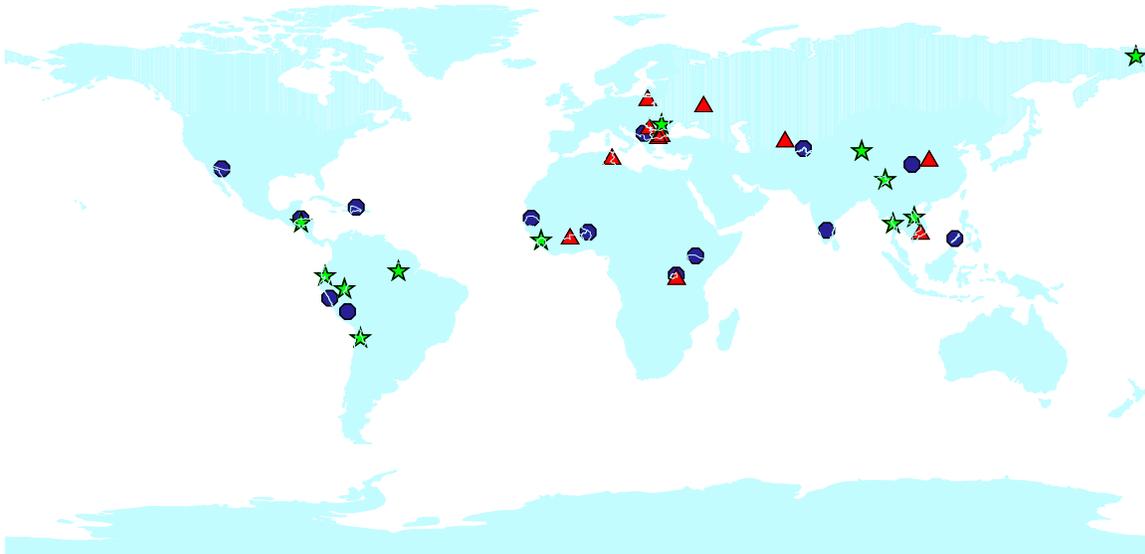
Although the level of commitments varied significantly among regions, the number of projects was somewhat more evenly distributed. As shown in Table 2, the ECA region had 10 projects with RE or EE components in FY05; the LCR region had 9, and the AFR and EAP regions were close behind with 8 projects each. The SAR and MNA regions had 3 and 2 projects, respectively. The high number of projects in LCR relative to its low total commitment level is due to the high proportion of CFB projects in the region (6 of the 9 projects in FY05), which are characterized by low financing amounts.

**Table 2: Number of Projects by Region, FY05**

Region	Total	Renewable Energy		Energy Efficiency
		Hydropower > 10MW	New renewables	
AFR	8	3	3.5 <sup>a</sup>	1.5 <sup>a</sup>
EAP	8	4	2	2
ECA	10	2	2	6
LCR	9	5	4	
MNA	2		1	1
SAR	3	1	2	
Total	40	15	14.5	10.5

a. The Rwanda Urgent Electricity Rehabilitation Specific Investment Loan Project had both EE and RE components and thus is counted as half a project for RE and half a project for EE to avoid double counting.

**Figure 4: Locations of the WBG Projects in RE and EE**



Note: Blue dots denote new renewables; green stars, hydro larger than 10MW; and red triangles, EE.

## 2.2 FY05 portfolio relative to the baseline

FY05 commitments for new RE and EE were US\$299 million and exceeded the first-year 20 percent per annum scale-up target of US\$251 million. As Table 3 shows, the baseline level for the Bonn commitment was US\$209 million.

**Table 3: Measuring the FY05 Progress in New RE and EE Commitments against the Baseline** (millions of U.S. dollars)

<i>FY02</i>	<i>FY03</i>	<i>FY04</i>	<i>Average</i>	<i>FY05 target</i>	<i>FY05 Actual</i>
204	178	245	209	251	299

The baseline is set as the average annual lending commitment for new RE and EE made by IBRD and IDA, CFB-IBRD, and the GEF (IBRD and IDA) in FY02, 03, and 04. The baseline comprises exclusively new RE and EE. New RE is solar energy for heat and power, wind energy for mechanical and electrical power generation, geothermal and biomass energy for power generation and heat, and hydropower of 10MW or less per installation. EE comprises end-use thermal and electric efficiency activities (for example, buildings, appliances, and so on), power sector rehabilitation, loss reduction in transmission and distribution, and improvements in the efficiency of district heating systems. It does not include EE activities in other consuming sectors, such as transport, industry, and urban utilities. This report does not include loss reduction due to rehabilitation of transmission or distribution networks toward meeting the 20 percent growth commitment if the share of transmission and distribution investments cannot be clearly disaggregated from other objectives, such as network expansion and load increase.

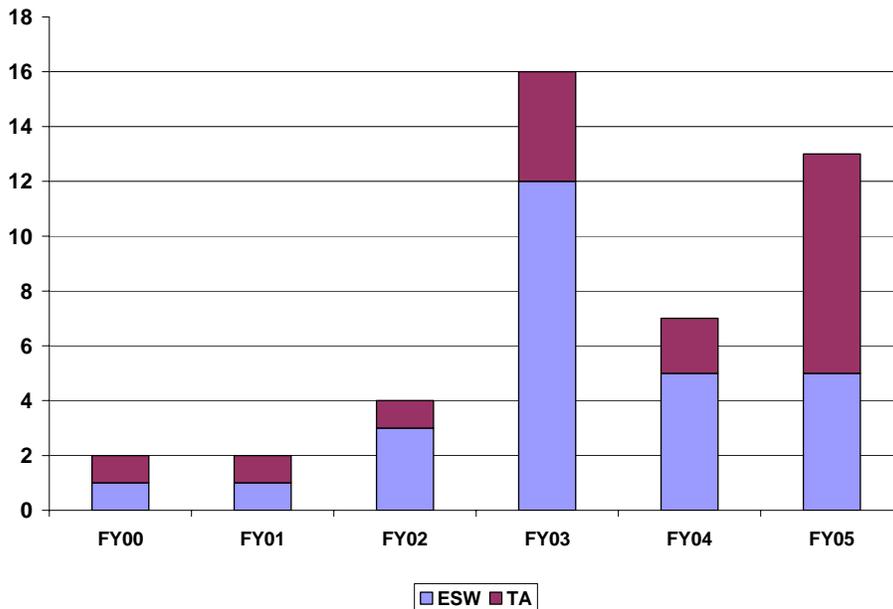
## 2.3 Analytic and advisory activities and TA for RE and EE

An integral part of the WBG's scale-up program for RE and EE are upstream analytical and advisory activities (AAAs). These activities include economic and sector work (ESW) and non-lending TA. ESW products, such as strategy documents, diagnostic reports, sector studies, policy notes, and informal country dialogue products, set the stage for incorporating RE and EE into country programs and developing future lending projects. TA is necessary because the new RE and EE applications are often innovative and suitable country-specific models have to be developed. Particular highlights of FY05 are the national strategy studies for China and a report on rural electricity access and renewable energy for Indonesia.

TA, which is integrated into nearly all investment projects, is also offered in the form of stand-alone activities that assist countries in implementing reforms and strengthening institutions. TA activities include workshops, consultations, training events and programs, and similar activities aimed at building capacity. Among the TA activities completed in FY05 were a carbon finance assistance study for India and an energy dialogue with the government of Madagascar.

As Figure 5 shows, the number of World Bank–funded TA activities grew significantly in FY05, with ESW remaining level with the previous year. Overall, AAA for RE and EE has increased compared to FY00–02; this increase bodes well for the scale-up of RE and EE lending in the coming years.

**Figure 5: AAAs with RE and EE Focus, FY00–05**



A number of programs funded by the Bank-managed trust funds undertake analytical work for RE and EE, in addition to WBG-funded AAA products. Studies and reports created by trust fund-financed programs such as ASTAE and ESMAP form a vital body of knowledge and lessons on which Bank staff and RE-EE practitioners can draw. In FY05, these products included the design of a REToolkit, an interactive Web-based tool for RE practitioners and policymakers, and the RE Financing and Policy Network study and forum. In addition, the following ESMAP reports, issued in FY05, provide a representative sample of such ongoing analytical work: “Advancing Bioenergy for Sustainable Development: Guideline for Policymakers and Investors;” “Renewable Energy Potential in Selected Countries;” “Bolivia Country Program Phase II: Rural Energy and Energy Efficiency Report on Operational Activities;” and “Handbook for the Preparation of Landfill Gas to Energy Projects in Latin America and the Caribbean.” These reports and studies are available on the ESMAP Web site (<http://www.esmap.org>).

## 2.4 Integrating RE and EE into PRSPs and CASs

To ensure that RE and EE investments are given full consideration in energy investment decisions, the WBG has worked to raise the profile and demonstrate the rationale of RE and EE as development priorities and to integrate RE and EE into country-owned development frameworks. Through the scale-up action plan, the WBG has provided assistance in identifying promising RE and EE prospects and in garnering the support needed to develop such opportunities into projects.

A review of selected PRSPs and CASs<sup>8</sup> issued before FY04 and accompanied by interviews with Bank staff, found that PRSPs and CASs generally gave little or no attention to energy.<sup>9</sup> Where energy was

The UN-Energy report (July 2005), “The Energy Challenge for Achieving the Millennium Development Goals” also acknowledges the importance of incorporating energy issues in national development strategies:

Achieving the MDGs requires explicit costing of energy inputs required to reach each goal. A number of countries have started to factor energy considerations and service delivery strategies into national development frameworks, due to the critical importance of energy as a facilitator of sustainable development. These issues are conspicuously absent, however, from the strategies prepared to date. Moreover, the limited references to energy issues in the PRSPs focus on large infrastructural developments, and they tend to neglect rural energy and the small-scale developments that are critical for widening access to modern fuels and electricity for the poor.

mentioned, the references tended to focus on large infrastructure. Specific references to RE or EE were rarer still. The World Bank, as part of its strategy to scale up the use of RE and EE, has identified the need to assist country teams in incorporating RE and EE components into planning documents such as PRSPs and CASs where such components are appropriate, logical, and economic.

To continue measuring its progress, the Bank conducted a review of 62 CAS and PRSP documents completed in FY04–05. References to RE and EE were categorized as either “specific,” “none,” or “passing” according to the context in which they were used. Specific references refer to those that address RE or EE development goals or propose projects. For example, a specific reference to RE is illustrated by this quote taken from a PRSP: “A rural electrification project using solar and wind energy was developed to satisfy the scattered demand for electricity in rural areas. The project will reach 12,000 households that are isolated and technically excluded from conventional grids.”

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8. PRSP and CAS provide the basis for World Bank lending to client countries. PRSP are prepared by IDA governments through a participatory process involving civil society and development partners, including the World Bank and the International Monetary Fund. They describe a country’s macroeconomic, structural, and social policies and programs to promote growth and reduce poverty, as well as associated external financing needs. CAS represents the Bank’s business plan, developed and agreed with each client country, summarizing the status of the country in a development context and the priorities for Bank operations over the near term. The PRSP process is intended to serve as a guide for CAS development.

9. See Kennedy and Zhang (2004), “Assessment of Energy Access and Renewable Energy in PRSP and CAS Process,” World Bank, Washington, DC.

Over the course of the last two years, a trend has emerged toward increased integration of RE and EE into these strategic documents. The percentage of CAS and PRSP documents that include substantive reference to RE and EE has grown from 60 percent in FY04 to 74 percent in FY05 (Table 4). These results suggest a growing awareness among the Bank staff and their country counterparts of the potential role RE and EE can play in development. Before FY04, there was hardly any reference to RE and EE in such planning documents. To take advantage of these opportunities and build the project pipeline, about US\$400,000 was mobilized from the President’s Contingency Fund for the development of nine project concept notes for promising RE or EE investments.

**Table 4: RE and EE References in CAS and PRSP Documents, FY04 and FY05**

<i>Region</i>	<i>Total</i>	<i>FY04 CAS and PRSP</i>		<i>FY05 CAS and PRSP</i>	
		<i>“None or passing” reference</i>	<i>“Specific” reference</i>	<i>“None or passing” reference</i>	<i>“Specific” reference</i>
AFR	22	7	7	3	5
EAP	8	2	1	2	3
ECA	12	—	7	1	4
LCR	11	3	3	1	4
MNA	6	1	2	—	3
SAR	3	1	1	—	1
<b>Total</b>	<b>62</b>	<b>14</b>	<b>21</b>	<b>7</b>	<b>20</b>

Burkina Faso provides a good example of how RE and EE can be better integrated into these planning documents. Like many of the documents reviewed, Burkina Faso’s 2004 PRSP included numerous and widespread references to energy; however, references to RE and EE were scarce. As a result of ongoing efforts to increase awareness of RE and EE benefits—including working directly with the country’s Ministry of Energy after the ESMAP-financed energy-poverty regional workshop—the 2005 CAS now contains numerous specific references to RE and EE.

The document review also revealed a few instances in which the opposite can occur. For example, Cambodia’s 2003 PRSP included several specific references to RE and EE. Yet the country’s 2005 CAS has no mention of RE or EE, although the IDA-financed rural electrification and transmission project approved in FY03 included an off-grid RE component. This example shows the need for ongoing efforts to ensure that RE and EE considerations retain their importance in country dialogue and strategic planning documents and do not appear simply as a passing fad.

In partnership with ESMAP, the Bank’s future efforts to support the systematic consideration of RE and EE options in these key planning documents will help to:

- Provide strategic advice for countries that have yet to realize the full benefits of RE and EE, including countries whose CAS or PRSP makes little or no reference to RE and EE and is due for an update within the next two years;

- Support upstream sector work and identification of opportunities to use RE and EE, including for further Bank involvement (these are countries whose CAS or PRSP included specific references to RE and EE); and
- Support development of specific investment projects for countries whose CAS or PRSP identified potential projects involving RE and EE.

### **2.5 Jump-starting project preparation—the President’s Contingency Fund**

To accelerate project identification and build the RE and EE project pipeline for FY07 and beyond, the EWD obtained funding from the President’s Contingency Fund (PCF) for upstream project preparation work. The funds were intended to help build the pipeline for RE and EE projects where such projects were feasible, appropriate, relevant to the CAS. The EWD disbursed nearly US\$400,000 to regional energy operations units to conduct exploratory and planning work to prepare project concept notes (PCNs). This support was aimed at offsetting the incrementally higher cost of RE and EE project preparation, particularly the first project in a country.

As of June 30, 2005, a total of nine PCNs in eight countries were under preparation or completed. Table 5 illustrates the results from the PCF support.

**Table 5: Awards for PCN Preparation**

<i>Country</i>	<i>Project title</i>
Brazil	Rio de Janeiro Landfill Gas Umbrella Project
Ghana	Ghana Renewable Energy Component within the Ghana Energy Project
Guyana	Guyana Water Incorporated Energy Efficiency Project
Indonesia	(1) Electricity Access for Rural Transformation Project; (2) Geothermal Project
Nigeria	Renewable Energy Development in Nigeria National Electricity Development Project
Romania	Renewable Energy Project
Timor-Leste	National Rural Electrification Project
Turkey	Aydin Geothermal Project

The success of this approach in spurring development of RE and EE opportunities will be replicated with support for the RE thematic program funding managed by ESMAP.

### **3. FY05 Portfolio Highlights and Impacts**

The WBG offers assistance to help its borrowers overcome the regulatory, institutional, technological, and financing constraints for adoption of RE and improved EE. After years of engaging with partner countries, lessons and impacts from developing and implementing the projects are emerging. Some of the early lessons have been absorbed, leading to changes in approaches to developing RE and EE projects, a few of which are highlighted below. Each of the WBG’s Regional energy units and member institutions

also offers an overview of accomplishments in FY05 in scaling up RE and EE, lessons learned, and opportunities and challenges ahead.

### **3.1 RE highlights**

The focus of WBG support for RE is on the following areas: (a) helping partner countries develop their legal and regulatory framework to promote RE market penetration and mainstream RE in national energy strategies (see Box 1), (b) increasing familiarity with and access to state-of-the-art renewable technologies, (c) developing competitive markets and improving nascent markets to justify investments in the industry, (d) diversifying financing mechanisms to increase access and affordability of renewable technologies, and (e) improving the quality and reducing the cost of RE equipment and services, including improvements in after-sale services.

#### **Box 1: Development of Renewable Energy Laws and Regulations**

A number of developing countries recently have established RE laws and regulations to provide a more effective legal framework and create an enabling environment for RE development. As part of its RE scale-up strategy, the World Bank supported several countries in formulating and implementing these laws and regulations.

China passed the Renewable Energy Law in March 2005 to accelerate the development of its enormous renewable resources. The Government has committed to increase the share of RE in power generation to 15 percent by 2020 from 7 percent today. Furthermore, China is developing medium- and long-term plans for RE, such as integrating RE into the country's energy and economic development plans. The Bank provided assistance in formulating this law during preparation of China Renewable Energy Scale-up Program.

In South Africa, the World Bank assisted the government draft a white paper on RE that sets out the government's vision, policy principles, and strategic goals and objectives for promoting the potential of RE. Approved in 2003, the white paper also established a target of 10,000 gigawatt hours (GWh) of RE contribution to South Africa's total energy consumption by 2013. To help with implementation, the World Bank is preparing a GEF-funded project for barrier removal activities as well as a stand-alone project funded by carbon Finance. To date, the adoption of the white paper has generated private sector interest in developing RE projects.

In April 2005, the Nicaraguan National Assembly passed a new RE law that applies many of the recommendations made over the course of the two-year ESMAP study, "Development of a Policy/Strategy for the Promotion of Renewable Energy Resources in Nicaragua." The recommendations include leveling the economic playing field for RE (which had been strongly biased in favor of conventional energy sources), using sources of intermittent RE at ceiling prices that can be reduced through competition, and recognizing the benefits of energy source diversification.

The WBG has adopted a diversified approach to support RE activities. Stand-alone TA or investment interventions have been used to target a particular issue, which usually leads to wider applications. However, for countries at a more advanced level of RE development, the WBG has come up with a programmatic approach that combines TA and investments to ensure predictable, consistent support over the long term. CRESA is a prime example of this programmatic approach.

After the success of the pilot investment in wind and solar photovoltaic (PV) under the China Renewable Energy Development Project and the passage of the RE law in early 2005, China was poised to embark on a large-scale development of renewable energy. The first phase of the China Renewable Energy Scale-up Program (CRESP), an Adaptable Program Loan<sup>10</sup> with US\$140 million in GEF grants, was approved in June 2005 to play a catalytic role in helping the government meet its scale-up objective. The Bank's support is extended for not only policy and regulatory reform, but also for investment, capacity building and creation of an enabling environment for investment (see Box 2).

Several programs in the WBG have also applied regional or thematic approaches, which helps overcome the hurdle of high transaction costs for the GEF, the Bank, and the countries in developing and implementing projects. An example is the IFC-launched PV Market Transformation Initiative, which provides grant and quasi-commercial funding to renewable energy enterprises. Such an approach can also help tackle cutting-edge technologies with focused resources. The GEF-funded, IFC-executed Fuel Cell Financing Initiative for Distributed Generation Applications aims to reduce the long-term costs of fuel-cell technologies and promote their earlier introduction in developing countries.

### **Box 2: China Renewable Energy Scale-up Program (CRESP)**

China announced at the Beijing International Renewable Energy Conference in November 2005 that it would increase its RE share from 7 percent of its total power generation in 2005 to 15 percent by 2020—one of the largest state-sponsored commitments to RE, following the passage of China's new Renewable Energy Law in February 2005.

The Bank provides extensive support to the preparation of China's RE strategy and to its implementation under CRESP. The program will help expand RE supply in China efficiently, cost effectively, and on a large scale. The core of the three-phase program is to use a GEF grant of US\$140 million for institution and capacity building for the scale-up of RE-based electricity generation capacity. Phase I was approved in 2005 with a GEF grant of US\$40 million and, on an "as required" basis, with a World Bank loan of US\$87 million. The program is innovative in many ways, including:

- The programmatic approach in using the GEF grant to support the structural changes needed for sustainable and market-oriented development of renewable energy in China on a large scale helps to ensure the long-term engagement of the Chinese government in the RE scale-up and the sustained participation of the private sector.
- The mandated market policy adopted as part of China's Renewable Energy Law—which requires a share of electricity supply to be met from renewable resources—is the first of its kind for a developing country.
- The support for cost reduction of renewable energy equipment manufacturing increases the competitiveness of high-potential RE technologies over time.

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10. Adaptable program loans (APLs) provide phased support for long-term development programs. They involve a series of loans that build on the lessons learned from the previous loan(s) in the series. An APL involves agreement on (1) the phased long-term development program supported by the loan, (2) sector policies relevant to the phase being supported, and (3) priorities for sector investments and recurrent expenditures.

The WBG's large hydropower business began to recover in FY05 as the Bank Group recommitted itself to large hydropower as an important source of least-cost electricity and economic development in developing countries. Environmental and social safeguards remain a critical element of all WBG hydropower projects, which must be socially and environmentally sustainable (see Box 3 for a description of the Lao PDR Nam Theun 2 Hydroelectric Project).

### **Box 3: Lao PDR Nam Theun 2 Hydroelectric Project**

In March 2005, the WBG approved support for the Nam Theun 2 hydroelectric project as part of an international effort to help increase incomes and living standards in one of East Asia's poorest countries. Support from the WBG includes up to US\$50 million in IDA partial risk guarantees\*, a US\$20 million IDA grant to support social and environmental mitigation activities, and a total of US\$90 million in MIGA political risk guarantees.

With the Lao PDR having few options to generate income otherwise, this project provides a sound approach to selling hydroelectricity and is supported by improved government policies, thus increasing the amount of money it can invest in health, education, and basic infrastructure for the poor. The project is expected to generate annual revenues of US\$13 million in the first year of operation, with annual revenue growing to about US\$150 million by 2033. This would spur economic growth, help reduce poverty, and encourage positive social outcomes.

The project, if properly managed and implemented, could significantly benefit the Lao people by generating revenues that could be used for priority poverty reduction programs. Specifically, the project seeks to:

- Generate incremental revenues through environmentally and socially sustainable use of the project's hydropower potential to use for priority poverty reduction and conservation programs;
- Implement basic governance reforms, particularly in the area of public expenditure management and the delivery of key social services in order to make sure that project revenues are applied in a transparent and prudent manner for poverty reduction;
- Improve natural resource management and biodiversity conservation, mitigating the environmental and social impacts caused by the project and protecting the project watershed so that the project's hydropower facilities have an effective life far beyond the 25-year concession period.

\* The Board approved IDA partial risk guarantees up to US\$50 million. The final financing package for the project which took into account of all the financing needs and sources includes an IDA partial risk guarantees of US\$42 million.

### **3.2 EE highlights**

The WBG's lending and technical assistance for EE have been focused on (a) strengthening the demand management and distribution efficiency activities of energy supply enterprises; (b) developing competitive markets for energy services and energy-efficient technologies; (c) setting up or strengthening national, local, and energy sector entities to provide training and disseminate information on improving EE and facilitate the transfer of more energy-efficient technologies; (d) putting in place and monitoring compliance with standards and codes for energy efficiency; and (e) providing flexible financing mechanisms such as regular loans, loan guarantees, and concessions.

The Bank explores all relevant approaches for implementing EE measures, and over the past decade, it has moved from the conventional, utility-driven demand-side management (DSM) approaches to innovative energy service-driven institutional models (such as energy service companies [ESCOs]) (see Box 4) and financing mechanisms (Box 5)—for example, in China, Hungary, Poland, and Romania. In addition, multi-sector approaches have proved to be effective. For example, an urban project on water utilities in China featured a component on EE improvement.

#### **Box 4: “All Roads Lead to Rome”: Increasing EE**

**China Heat Reform and Building Energy Efficiency.** With GEF funding of US\$18 million, this project provides an integrated, “two-handed” mechanism to tap the abundant EE opportunities within China’s urban space-heating sector. On the one hand, the creation of a market mechanism is needed to ensure that consumers are not only able to pay for their actual energy consumption but also control how much heat they consume. On the other hand, major improvements in the thermal integrity of urban residential buildings are needed to substantially reduce building heat losses.

**Croatia Energy Efficiency Project.** Financed through an IBRD loan of €4.4 million and a GEF grant of US\$7 million, the project aims to facilitate the creation of an EE market in Croatia that will lead to greater efficiencies in energy use. Under this project, a core developer of EE projects was created within Hrvatska Elektroprivreda d.d. (HEP—the national power utility). This new company, HEP ESCO, develops, finances, and implements EE projects on a commercial, for-profit basis, using local businesses as key delivery agents.

**Vietnam Demand-side Management and Energy Efficiency Project.** This project is the second phase of a 12-year (1998–2010) IDA- and GEF-supported DSM and EE program designed to achieve significant and sustainable reductions in energy consumption and peak power demand in Vietnam. With US\$5.2 million of IDA funding and US\$5.5 million of GEF grants, the project consists of two components: (1) a second-phase DSM component under the Electricity of Vietnam and (2) a pilot commercial EE program under the Ministry of Industry. The DSM component of this project includes expanded time-of-use metering, a pilot program for direct load control, promotion of compact fluorescent lamps, fluorescent tube lamp market transformation, and supporting programs and TA.

#### **Box 5: Leveraging Local Financing for Energy Efficiency**

The unavailability of financing is a barrier to investments in energy-efficient equipment and services in many parts of the world. A lack of awareness and experience necessary to evaluate the rate of return and risk associated with loans tied to savings from reductions in energy demand has tended to keep developing countries’ banks out of this potentially profitable and environmentally beneficial market. The IFC initiated its first response to this problem in Hungary in 1995, using GEF funding to provide a partial risk guarantee and TA. As the concept demonstrated commercial success, the IFC coinvested an additional US\$12 million with about US\$1 million more in TA from GEF and bilateral donors. This model was subsequently refined and replicated several times, most recently in a new China project with US\$17 million from the GEF and a projected US\$30 million in proposed IFC credit lines and in the Russian Sustainable Energy Finance Program with US\$7 million from GEF for TA and partial risk guarantees and an initial commitment of US\$20 million in IFC credit lines.

Many projects in the energy sector, including rural electrification, transmission, and distribution rehabilitation, also have EE or DSM components or considerations. In some cases, the Bank has also provided support for important supply-side energy efficiency measures, including rehabilitation of existing power facilities to enhance efficiency of

generation and transmission and distribution to reduce losses. With respect to biomass use, the Bank has undertaken a number of projects that aim to promote more efficient use of biomass resources in the industrial and domestic sectors.

### 3.3 Region- and institution-specific contributions

**3.3.1 Sub-Saharan Africa (AFR).** More than 500 million Africans are living without access to electricity, and biomass resources account for 70 percent of the energy needed

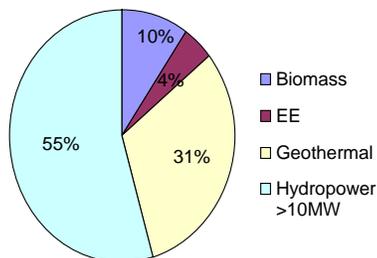
to meet the needs of households (cooking and heating) and small- and medium-scale enterprises. This situation varies from country to country, with the least biomass-dependent country being South Africa (40 percent) and the most, Burkina Faso (93 percent). Nevertheless, nearly 80 percent of the African population depends on traditional biomass

*"There is no question that there is an enormous, compelling moral urgency to the conditions of Africa and there is no question that there are needs. But there is a lot more going on than just need. Africa may be on the verge of being a continent of hope"*  
 –President Paul Wolfowitz, the World Bank, June 30, 2005.

energy for their daily energy needs. The lack of access to modern energy sources, particularly in rural areas, seriously constrains economic development. In many African countries, the energy sector is characterized by weak power utilities, a weak financial sector, lack of a credible and capable private sector, and high investment costs. Inadequate power supply has been identified as the most severe limitation to new business development and expansion.

Since early 2005, the development agenda has seen a marked shift in support of Africa’s development agenda. The Group of Eight (G-8) summit captured this worldwide momentum by doubling its aid commitment to Africa from US\$25 billion to US\$50 billion by 2010 and by providing complete debt relief to 14 African countries. An African Infrastructure Consortium was also set up to mobilize and employ existing infrastructure resources both at the country level and for cross-border regional projects.

**Figure 6: AFR Projects in RE and EE, FY05**  
 (% of total lending for RE and EE)



Total approved lending for RE and EE in FY05 was US\$101 million, with about US\$4 million for EE and about US\$97 million for RE. RE and EE accounted for approximately 15 percent of total approved energy projects in AFR in FY05. Compared to FY04, total lending for RE and EE more than doubled, up from US\$46 million. The GEF and CFB have in recent years provided needed additional finance that has enabled capacity building and facilitated the

implementation of RE projects, including off-grid solar PV and small hydropower.

*Renewable energy:* Hydropower greater than 10 MW made up a large share (55 percent) of total lending for RE in FY05 (Figure 6). The largest project approved was the Bumbuna Hydroelectric Project in Sierra Leone, with an installed capacity of 50MW. More micro and mini hydropower (10 MW and smaller) projects are expected to be financed under the Rwanda Urgent Electricity Rehabilitation Project. In addition to hydropower, a new activity in Kenya will help construct a geothermal power plant, and a feasibility study has been endorsed to explore geothermal power potential in Uganda. Also, new projects in Nigeria and Senegal are likely to include solar PV as a least-cost option for rural electrification in remote areas.<sup>11</sup> Newly approved biomass projects for Benin and Senegal will build on the successful Senegal Sustainable and Participatory Energy Management Project (PROGEDE).<sup>12</sup>

### **Box 6: RE and EE Projects in AFR**

**Improving End-User Efficiency in Uganda.** One component of the Uganda Fourth Power Project is the combined use of energy audits for large industry and targeted EE information packages for diverse end-user groups to raise awareness of potential savings. The motivation for Uganda to engage in these activities is twofold: (1) when consumers use electricity wisely, they receive manageable bills that they can pay on time, and (2) the rational use of electricity will help contain escalating power demand. The energy audits have highlighted a handful of key lessons for end-user efficiency in the industrial sector that might apply to AFR generally: (a) energy management is not integrated into the management process of many companies; (b) inefficient technologies are often installed, such as ordinary rather than efficient motors; (c) many industries adopt “breakdown maintenance” rather than preventive maintenance; and (d) poor concern for efficiency has led to larger motors and equipment.

**RE in Nigeria.** Nigeria’s National Economic Empowerment and Development Strategy emphasizes the rapid development of energy resources. To ensure that this strategy adequately considered the opportunities RE presents, a GEF component was integrated into a large energy sector project for the country. The principal elements of this GEF component (a) support the implementation of the National Renewable Energy Master Plan, (b) cofinance access expansion and electricity intensification pilot projects, and (c) support innovative cross-sectoral energy applications.

*Energy efficiency* is key to meeting the serious challenges the energy sector faces in many countries in AFR, given both the scarcity of modern energy supplies and services and the feeble energy purchasing power of the majority of the population. Energy efficiency is also key to ensuring the competitiveness of Africa’s manufacturing and service industries. Actions taken to enhance the efficiency of energy generation, transmission, distribution and end use can dramatically improve the performance of the sector. For example, energy audits undertaken in Uganda showed that firms could realize savings of up to 10 percent without any capital expenditure, 20 percent with modest capital expenditure, and, in some cases, savings up to 30 percent could be realized. In FY05, two

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11. However, these projects are not counted as renewable energy projects because uncertainty exists as to what the share of solar PV is likely to be.

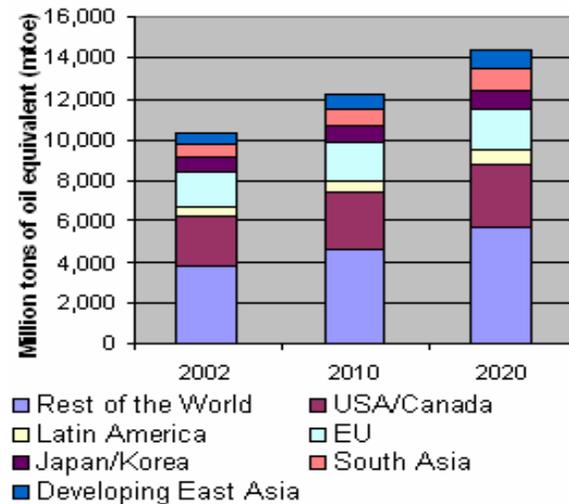
12. The achievements of PROGEDE include, among others, (a) the establishment of a permanent managed forest system capable of sustainably producing more than 300,000 tons of fuelwood per year, (b) the reduction of fuelwood-related deforestation by more than 35,000 hectares per year, (c) the reduction of net CO<sub>2</sub> emissions by 1.5 million tons per year; (d) the generation of significant employment and economic development opportunities in the 317 participating rural villages, and (e) the generation of more than US\$20 million in direct incremental revenues.

projects with EE components were approved by the World Bank Board in Burkina Faso and Rwanda. A number of projects, such as the Uganda Fourth Power Project, made clear progress in improving energy efficiency (see Box 6), and new projects are under preparation, including for Guinea.

**3.3.2 East Asia and the Pacific (EAP).** The EAP countries are expected to register the fastest rate of growth in energy consumption among all regions over the coming decade (Figure 7). The region is expected to account for nearly one-third of global energy demand growth between 2002 and 2020. The growth and size of EAP’s energy demand are already affecting global energy markets (particularly the fossil fuel markets), and are raising concerns about energy security and supply reliability, environmental sustainability, and high investment needs. This growth presents an opportunity for aggressive policy action, not only to address current challenges, but also to lay a foundation for the long term.

*Electricity:* The region’s electricity production was about 2,600 terawatt hours in 2002. That is nearly four times the electricity produced in SAR, more than three times the electricity produced in LCR, and nearly two-thirds of the electricity produced in the United States during the same period. China accounted for some 70 percent of the regional total. Electricity generation is dominated by coal: in 2002, roughly 73 percent of the region’s electricity was based on coal (60 percent in China alone), with oil and gas accounting for a little less than 10 percent each. The proportion of renewable energy is low, particularly given the region’s unexploited hydropower potential (Box 7).

**Figure 7: World Primary Energy Demand**



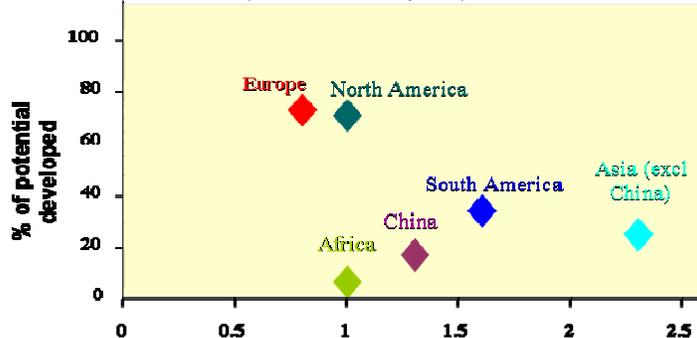
Source: IEA (2004), *World Energy Outlook*.

*Environmental impact:* The environmental impact of energy use in the region is not restricted to outdoor air quality. Household energy use for cooking and heating is a health hazard, particularly for the poor who use coal (mainly in China) or biomass (wood, dung, crop residues) for their energy needs. Nearly 1 billion people, more than 50 percent of the region’s population, relied on biomass for cooking and heating in 2000. If biomass energy demand is added to the region’s modern energy consumption, it would represent 17 percent of the total in 2000. This proportion is not expected to decline significantly in the coming decade. EAP is second only to AFR in its per capita use of biomass energy, placing the region’s poor and its forestry resources at great risk..

### Box 7: Greening EAP energy

EAP's substantial growth in energy demand opens the door for strengthening environmental sustainability through the promotion of hydropower and nonhydro renewables. EAP has yet to exploit most of its hydropower potential (see Figure 8)—hydropower's contribution to electricity generation (20 percent in 2002) is lower than in all developing countries (26 percent) and in the world (22 percent). In 2003, China's used 15 percent of the country's technically exploitable hydropower potential, while Indonesia, Malaysia, and Vietnam produced 2.5 percent, 6 percent, and 19 percent of their technical potentials, respectively. By comparison, France, Japan, and the United States used 91 percent, 74 percent, and 51 percent of their technical hydro potential, respectively. With high electricity demand growth expected over the next decade, the aggressive development of hydropower could bring considerable environmental and economic rewards. Nonhydropower renewables present a similar prospect, albeit at a smaller scale, in EAP. They accounted for 1.3 percent of EAP's generated electricity in 2002 (0.6 percent in China) compared to 12.8 percent in the European Union and 2.1 percent globally. EAP countries have the opportunity today to lay the foundations for significant scale-up of renewable energy over the coming decades.

**Figure 8: Hydropower Potential**  
(million GWh/year)



*RE and EE:* FY05 was an extremely productive year for investments in RE and EE. Total RE and EE investments in EAP reached US\$314 million, 11 percent of total energy investments for FY05. Of this amount, US\$128.6 million went to new renewables, US\$23.3 million to EE, and US\$162.6 million to hydropower greater than 10 MW.

As a result of high growth in energy demand, environmental impacts of energy use, and concerns about the security of oil supply during 2005–10, demand for natural gas transmission and distribution is rising among the region's major countries (e.g., China, Indonesia, and Vietnam). Similarly, demand for RE development support (including for hydropower) also is rising across the region.

Through its advisory activities, the WBG has helped advance power sector reform across the EAP countries. This policy advice has also made important contributions to advancing RE; most notably its extensive input to China's new RE law. The Bank is in dialogue with several countries in the region to facilitate similar regulations. Finally, the demand for RE and EE—combined with innovative financing mechanisms to attract private sector financing—is expected to increase across the region, but with newer business models suited to emerging players such as provincial-, municipal-, and community-level entities.

The EAP energy team will take a multi-sector approach to addressing urban energy use issues. Avenues for synergy exist and will be explored further in the areas of EE in water utilities, landfill gas use, energy service delivery in periurban areas, development of municipal-level energy companies, and environmental cleaning.

**3.3.3 Europe and Central Asia (ECA).** The ECA region generally has high connection rates to electricity and centralized heat supply networks. This is partly due to the fact that most of the countries used to be centralized, command economies that gave high priority to collective systems and universal coverage, but with disregard to economic cost benefit.

However, with the transition to market economies, many of the poorer ECA countries now struggle to maintain service levels with tariffs capped below the level of full cost recovery and poor collection due to affordability issues and the political sensitivity of sanctioning nonpayment. This is posing a threat to the reliability and financial sustainability of power and heat supply. At the same time, energy supply structures are based on old-fashioned, inefficient technologies and a highly energy-intensive supply pattern.

*Energy intensity and the environment:* Inefficient technologies and energy-intensive supply patterns result in energy intensities that are much higher in ECA than in Western Europe (see Box 8). In a number of ECA countries, the environmental challenges posed by high energy intensity are compounded by a high incidence of coal- or lignite-fired thermal power production and heavy industrial facilities burning coal or lignite. Furthermore, these plants often clean flue gas for particles, sulfur dioxide, and nitrogen oxides (NO<sub>x</sub>) to a lower level than required in most OECD countries. Coal constitutes more than 25 percent of the primary energy source for electricity produced in ECA.

**Box 8: Comparative Energy Intensities**

(metric tons of oil equivalent/'000 US\$ GDP)

Range for most countries in Western Europe:	0.1–0.2
Range for most countries in Central and Eastern Europe:	0.5–1.0
Range for most former Soviet Union countries:	1.0–4.0

*ECA's FY05 achievements* are due to the implementation of an ambitious RE and EE agenda. For example, the approval of four loans or credits for Albania, Romania, Serbia, and Turkey of about US\$200 million under the Energy Community of South East Europe Adaptable Program Loan<sup>13</sup> has already led to significant EE improvements. And, in addition to GEF approval of the Bulgaria Energy Efficiency Fund (US\$10 million) and the Croatia RE Resources project (US\$5.5 million), implementation of EE projects in Croatia, Poland, and Romania, where significant project pipelines are being built, has started. Total RE and EE investments in ECA reached US\$227 million, of which

13. This horizontal (multi-country) APL is financing projects that support the creation of a regional energy market in southeastern Europe. The projects implemented under the APL will lead to significant loss reductions in transmission networks and generation efficiency improvements through phase out of inefficient thermal power plants.

US\$170.2 million was for hydropower projects greater than 10 MW, US\$51.1 million for EE, and US\$6.2 million for new RE.

Some of ECA's most promising RE and EE scale-up initiatives are:

- Green Investment Schemes (GISs)—the GIS concept is being actively pursued in Bulgaria, Romania, the Russian Federation, and Ukraine because these countries have substantial head room in allowed emissions (called assigned amount units [AAUs]) for the first Kyoto Protocol period of 2008–12. The GISs will help arrange the sale of “green” AAUs to countries with a deficit of AAUs to reduce the emission of greenhouse gases or in other ways benefit the environment. The scheme can be combined with different types of Bank lending instruments.
- The Turkey RE project—this US\$200 million IBRD loan supports the development of electricity generation from RE sources by private companies in Turkey. Four projects—three hydropower plants and a geothermal power plant—are being financed under this loan so far. Another five projects are at an advanced stage of approval—three hydropower plants, one geothermal plant, and a large wind farm. The first generation plant financed by the project (geothermal) is planned to start in end of 2005.
- Geothermal Development Fund for the ECA region (GeoFund)—this fund has excellent potential for scaling up RE use in the region. The goal of this fund is to strengthen the use of geothermal energy for both power production and district heating. It consists of three “windows:” a TA window, a partial risk insurance window, and a direct grant window. During FY05, agreements have been reached with the IFC and United Nations Development Programme (UNDP) to jointly implement the GeoFund. It is envisaged to be operational at the end of 2005.
- Czech Republic EE project—this project uses two innovative mechanisms, which allow scaling up of EE and RE projects: (1) It uses the concept of an intermediary in charge of identifying and preparing subprojects, and (2) it has developed sector baselines, which drastically reduce the amount of time used to prepare projects because all subprojects use the same framework. Under the Prototype Carbon Fund facility, more than 10 small RE projects and several EE projects have been prepared and implemented.

*Looking ahead to FY06*, ECA will pursue other scale-up options such as lending for district heating schemes to sub-national entities without sovereign guarantee and promotion of ESCO or third-party financing and innovative financial mechanisms for EE investments.

**3.3.4 Latin America and the Caribbean (LCR).** LCR RE and EE activities have concentrated on (a) strengthening the enabling framework, (b) provision of market-based incentives (for example, carbon finance), and (c) off-grid electrification projects for nonelectrified households where grid extension is not economically feasible. The

activities are intended to overcome several challenges in improving energy services and the livelihood of the poor in the LCR countries. The energy challenge is to ensure adequate generation capacity for future growth while maintaining the momentum of scaling up access to affordable and clean energy services. The access challenge is to close the gap in availability and quality of infrastructure service provision among the rich and the poor and between urban and rural areas. The environmental challenge is characterized by the fact that total carbon dioxide emissions in LCR rose by more than 40 percent between 1990 and 2000 (per capita emissions rose by 20 percent) and the share of RE in the power generation mix has fallen over the last decade by 3 percent.

LCR actively pursued RE in FY05 as a means of enhancing off-grid electrification. Total investments in RE were US\$31 million, 5 percent of the region's total energy investments in FY05. The region saw steady progress in the implementation of its off-grid electrification portfolio in Bolivia, Ecuador and Nicaragua last year (see Box 9). In addition, one new project with a significant off-grid component, the Honduras Rural Infrastructure Project, was approved by the Board in FY05. The EE agenda was significantly advanced in FY05 with the addition of two EE projects in the Southern Cone. The Uruguay EE project—approved in FY04—became effective in January 2005, and has been established as part of the country's strategy to address energy supply and demand issues. Preparation of a new EE project in Argentina also is under way.

#### **Box 9: New Concepts in LCR's Off-Grid Electrification**

The Nicaragua Off-grid Rural Electrification Project provides electricity to remote villages and dispersed users in Nicaragua. It finances village minigrids (mostly mini hydro) and solar home systems via output-based aid schemes. The project works primarily with small, local service providers and integrates the delivery of electricity services with business development services and microfinance.

The Bolivia Decentralized Infrastructure for Rural Transformation Project is the most recent project in that country, with an ambitious output-based aid scheme that links subsidies to performance on various levels and out-sources a range of well-specified services to private sector operators. The project aims to electrify over 15,000 users with solar home systems. It also develops synergies with its telecommunications component, which finances the extension of cell phone, radio, and TV services to the same rural areas. In addition, the project provides a complementary fund for the productive use of electricity and telecommunications infrastructure.

The LCR region also saw an increased expansion of the CFB in FY05. Carbon trading now accounts for a significant share of the LCR energy portfolio, as the region delivered six Emission Reduction Purchase Agreements (ERPAs) in Ecuador, Honduras, Mexico, and Peru. The region prepared three additional projects and laid the groundwork for expansion in Brazil and Venezuela. Finally, FY05 saw the maturation and further mainstreaming of carbon trading in the region as LCR became the first region to track carbon finance deliverables in the same manner as for Bank lending.

*Some lessons learned:* Experience has shown that off-grid electrification projects tend to start slowly because the models are often new to both policymakers and markets. Also, although international best practices exist, models need to be adapted to local circumstances, and considerable capacity building is required. It is, therefore, important

to have realistic expectations and ensure that sufficient funds are available for supervision and hands-on transaction advice. It should be noted, however, that the LCR region has developed a variety of new models adapted to regional conditions that present an important avenue for faster replication and scale-up.

Another lesson comes from the experience of multi-sector project implementation, where the integration of energy with other services can represent an interesting opportunity to enhance project development and leverage the costs of service provision in rural areas. However, because significant coordination challenges can exceed cost savings, this trade-off needs to be carefully analyzed during project design.

*Challenges and opportunities:* Notwithstanding the achievements reflected above, a new approach is needed to produce a sizeable impact in reducing greenhouse gas emissions. More and larger RE projects are essential. This will require substantial financing (both public and private) and a coordinated approach among the public and private sector (both domestic and international), nongovernmental organizations, and local participants. New financing mechanisms need to be developed (for example, guarantees, more appropriate tariff schemes, output-based subsidies), and broad-based local capacity needs to be built to develop and implement alternative energy projects. Also, much work remains to be done to better integrate the carbon finance product line within the regular Bank business cycle for leveraging new Bank lending opportunities. This will include ramping up implementation of the US\$200 million Spanish Carbon Fund established in January 2005.

*Looking ahead to FY06,* most of the off-grid project design work has been completed for two additional rural electrification projects with significant investments, which are expected to be presented to the Board in FY06: Peru Rural Electrification and Mexico Integrated Energy Services for Small Rural Localities of the Southern States.

**3.3.5 Middle East and North Africa (MNA).** The MNA region is rich in fossil fuel resources, with 57 percent of the world's proven oil reserves and 41 percent of natural gas resources. The region also has abundant solar and wind resources. Per capita income ranges from US\$380 to US\$3,500 in borrowing countries, and rises to above US\$4,000 in nonborrowing Gulf States. With an average electrification rate of more than 90 percent (many countries reach close to 100 percent), regional access to electricity is among the best in the developing world. In addition, a vast majority of the urban and rural population in the region has access to modern energy services, including electric power and clean fuels for cooking and heating.

However, despite such resources and achievements, there are a number of important social and economic trends in the region that suggest the need for increased attention to RE and EE. In recent years, per capita revenues from oil and gas resources have been declining rapidly, primarily as a result of population growth—though the recent surge in crude oil prices may reverse this trend. The current average regional unemployment rate also is high at about 15 percent, with some 20 million people jobless. Overall, economic growth is poor.

In this context, the economic and social development of the region requires the financially sustainable delivery of energy services in line with population growth in an environmentally sustainable manner. RE and EE can play an important role in achieving this goal.

There is much room for improving EE in the electricity sector and increasing the role of RE in the overall energy portfolio of MNA countries. EE in several oil-producing countries, including Bahrain, the Islamic Republic of Iran, Kuwait, Lebanon, Oman, and Saudi Arabia, is low compared to both regional and world averages. Prices are distorted by subsidies, the effects of which percolate throughout the economy and result in disproportionately high consumption of fuels, environmental damage, and inefficiency, not only in the energy sector, but also in the transport, water, and agricultural sectors.

At this time, close to 90 percent of the region's electricity is generated from oil and natural gas.<sup>14</sup> However, the region has excellent solar and wind energy potential that could be tapped to reduce the environmental impact of fossil fuel-based electricity generation, provide modern energy services to rural populations (where extending the electric grid is not a viable option), and extend the life of fossil fuel resources.

MNA had two RE and EE projects approved in FY05, totaling US\$9 million or 22 percent of its total energy investment. An important achievement was made with the successful launching of an industrial EE project in Tunisia. Over the past few years, MNA has also worked closely with the GEF and other institutions to develop an EE and RE pipeline of projects. As the experience of the Tunisia EE project is disseminated (along with inputs from the Morocco Industrial Energy and Environment Project), several countries are exhibiting an interest in similar projects. Proposals for the preparation of EE projects for the Arab Republic of Egypt, Iran, and Jordan are expected in FY06; however, as is the case for many RE and EE projects, results on the ground often materialize slowly. One of the main challenges of FY06 is to bring them successfully to appraisal.

Past experience shows that RE projects have longer gestation periods because they involve new technologies that have not yet been proven commercially, require intensive institutional building, and call for policy reforms and specific incentives to promote long-term sustainability. For these reasons, the Jordan Wind Market Project has been delayed until the results of a study on the institutional environment for RE (financed by the Policy and Human Resources Development Fund [PHRD]) ensure an appropriate framework for wind energy to develop.

One of the challenges for FY06 is that the portfolio still relies heavily on grants from the GEF for operations, and from other donors (ESMAP, PHRD, and the Public-Private Infrastructure Advisory Facility) for studies and TA. Work on alternative sources of financing (government investment) and private sector participation will be necessary to reinforce the pipeline.

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14. Of MNA's total electricity production of 649 terawatt hours in 2001, 88.3 percent was produced from oil and gas (representing 38.9 percent and 49.4 percent, respectively, of total production). See IEA (2003), *Energy Statistics of Non-OECD Countries*, Paris.

**3.3.6 South Asia (SAR).** Access to modern energy services in SAR is among the poorest in the world. This exacts a large toll, particularly on the region's rural poor, who suffer from the lowest access rates. There are more people living without electricity—about 800 million—in SAR than in any other region. Only AFR has a higher proportion of its population without electricity service. Low levels of access to modern energy necessitate a heavy reliance on traditional biomass sources. In five SAR countries— Bangladesh, India, Nepal, Pakistan, and Sri Lanka—traditional fuels account for more than 80 percent of total household usage.

In rural India, traditional biomass accounts for 95 percent of primary energy consumption in households and up to 100 percent of rural industrial use.<sup>15</sup> This continued reliance on traditional fuels has tremendous social costs and livelihood impacts, including forest and soil degradation, the diversion of time of women and children from productive and social activities because of the drudgery of biomass collection, and indoor and outdoor air pollution with large consequent human health impacts. Indoor air pollution due to traditional fuels use is estimated to cause as many as 500,000 deaths annually in India, mostly among women and young children.<sup>16</sup>

Scaling up RE investments in SAR in FY05 has been achieved by mainstreaming RE into core operations; the current and planned operations include renewable or energy-efficient components in all countries in the region. Total RE investment in SAR was US\$65 million, of which US\$49 million went to hydropower projects greater than 10MW and US\$15.6 million to new renewables. A description of initiatives over the last year is provided below.

*Support to regional power utilities to promote environmentally and economically sound investment decision making:* An important step in the past year has been the Bank's reengagement in the hydropower sector in India. Dialogue is ongoing regarding Bank financing of a hydropower project that would demonstrate international good practice and promote the use of hydro as an economically and environmentally viable energy source.

In parallel, investment financing has been provided to reduce financial losses and generate energy savings (and carbon emission reductions) in both grid distribution and transmission systems in India and Nepal with positive outcomes. A Bank-financed renovation program in Rajasthan has successfully reduced losses by approximately 25 percent and is now being scaled up across the state. In Nepal, ongoing improvements in transmission and distribution systems are expected to result in a loss reduction from the existing levels of 23 percent to 17 percent by 2009.

Finally, ongoing and planned projects are supporting private sector-led development of a financially and environmentally viable market of small-scale, grid-connected, renewable generation. Investment financing and policy advice has been provided for this purpose in ongoing projects in India, Nepal, and Sri Lanka (Box 10) for small hydro, wind, and

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15. See ESMAP (2003), *India: Access of the Poor to Clean Household Fuels*, ESMAP Report 263/03, World Bank, Washington, DC.

16. See World Health Organization (2002), *World Health Report 2002*, Geneva.

biomass projects. A significant achievement in India, this year in particular, has been to upgrade the ongoing operation to satisfactory, thus reinvigorating the Bank's RE efforts in that country.

**Box 10: Sri Lanka: Renewable Energy for Rural Economic Development (RERED) Project**

The RERED Project aims to expand the commercial provision and use of RE resources, with a focus on improving the quality of life in rural areas by using electricity as a means to further income generation and social service delivery.

The project is funded by a US\$75 million line of credit from IDA and a US\$8 million grant from the GEF. Loans for individual investments (subprojects) are disbursed through participating credit institutions (PCIs). The PCIs make independent credit assessments to ensure that subprojects are financially viable and environmentally sound, meet required engineering standards, and are economically justifiable. Projects may be proposed and implemented by private enterprises, nongovernmental organizations, or individuals.

As of June 2005, micro hydro, biomass, and small, wind micro-grid projects were targeted to serve about 4,700 households. The project also has supported the installation of 50,000 solar home systems and financed about 119MW of grid-connected small hydro and biomass power installations that feed power to the national grid (which includes commissioned projects and work in progress). More details are available: <http://www.energyservices.lk/>, last accessed November 16, 2005.

*Development of renewable markets and technologies, particularly to meet rural access needs:* Ongoing projects in Bangladesh, Nepal, and Sri Lanka, as well as preparatory dialogue for an Indian power sector engagement, have promoted the use of renewable technologies for mini-grid, village, and household-level needs in rural areas. This has been accomplished by providing financing for wind, solar, and hydro mini-grids and solar household systems (via financial intermediaries), providing analytical support to policy development, and identifying and removing barriers to RE market development as an integral part of investment operations. In addition, a preliminary analysis undertaken in Afghanistan of options for improving rural access to electricity—where overall access to electricity is only 6 percent, and there is a very limited grid—showed that RE, such as micro hydropower and solar, is likely to be key to expanded access.

*Initiatives to improve end-use efficiencies and reduce carbon emissions:* Carbon finance is being integrated into the SAR regional power strategy, including through the exploration of options for mobilizing carbon finance for large-scale hydro and for hydro and thermal rehabilitation. Although incentives for EE remain weak in the absence of tariff reform, targeted efforts to promote this agenda continue, focusing on small industry, hospitality and tourism, and the public sector in India through the ongoing RE project.

*Lessons learned:* The establishment of RE and EE policies that support market development are critical to sustainable and scaleable impact in this sector. However, sectoral needs change and evolve over time: after a decade of RE investment in both India and Sri Lanka, a new range of more sophisticated second generation issues has emerged. This demands a rethinking of existing policy and institutional frameworks.

The promotion of private sector investment in RE and EE markets is imperative to sustainability but requires attention to business fundamentals (for example, viable and

predictable prices for grid-connected RE, simple contractual arrangements). It may also require the development of transparent and well-targeted subsidies and may need to be supported by interventions to develop and sustain consumer confidence (including after-sales service). Finally, experience in the region has shown that community participation contributes to ensuring the sustainability of investments—from environmental management of grid-connected RE, to ensuring cost-efficient design and management of community minigrids, to realizing the economic and social benefits of household PV systems.

**3.3.7 International Finance Corporation (IFC).** The IFC's growing commitment to sustainable energy took several forms during FY05, including its first-ever direct financing of a wind power project, a growing portfolio of EE projects combining GEF and IFC financing, and GEF approval for a new technology for power generation from bagasse. The IFC's commitment to carbon finance also advanced, with carbon emission reduction credits purchased from two RE projects and an investment in an innovative animal waste management company with revenue generated by carbon credits. The major achievements in FY05 are highlighted below.

The IFC signed an agreement to provide a corporate loan of up to US\$10 million and a guarantee of up to US\$13 million to Consorcio Energetico Punta Cana-Macao S.A., a privately owned utility in the Dominican Republic, to support construction of an 8.25MW wind power plant as well as distribution network upgrades. The project will be the first of its kind in the Dominican Republic, providing a cleaner source of electricity and saving on fuel costs by displacing part of the utility's existing diesel generation. The IFC has collaborated with the Danish International Development Agency through a program that provides subsidies to financially marginal but technically sound wind projects in developing countries. The IFC guarantee helps provide risk mitigation to the commercial lender, and the IFC's experience with this transaction makes the financing of additional wind projects more likely. The IFC is already evaluating other wind project financing opportunities across LCR and in other developing regions.

The IFC continues to develop and refine several models for promoting sustainable energy lending business by private commercial banks. In combining IFC investment with GEF and other donor support for credit enhancement and technical assistance, these pilot programs demonstrate new business models for private sector investment in sustainable energy. Highlights of the year included innovative biomass and gas cogeneration projects, industrial plant modernizations, and small run-of-river hydroelectric plants. Groundbreaking financings in FY05 also included the Czech Republic's first two commercially financed wind energy systems through an IFC-GEF facility.

Furthermore, with GEF and other donor resources, the IFC manages several projects aimed at commercializing promising new energy technologies, including stationary fuel cells and grid-connected solar PV systems. A new project approved by the GEF in June 2005 provides up to US\$44.5 million to support an 80MW plant using innovative technology for burning sugarcane residues to generate heat and power at a large sugar mill in Brazil. Pending the outcome of detailed engineering and financial analysis, the

IFC may be an investor on its own account. The Environmental Opportunities Facility, a fund created with IFC and donor support, is also exploring investments in innovative energy technology companies, including a new company established to manufacture microturbines in India.

The carbon market is another important instrument in IFC efforts to capture the environmental benefits from clean energy projects. The IFC is applying its experience and knowledge to help minimize the risks associated with delivery of emission reductions. With approximately US\$90 million in Dutch funding, the IFC is collaborating with private sector entities to design, launch, and manage two facilities with carbon finance products and services.

The IFC concluded purchase agreements of roughly US\$21 million for two RE projects in FY05, one for small-scale hydropower generation in Brazil and the other for cogeneration projects at two sugar producers in India (see Box 11). The IFC also invested US\$10 million in a firm managing pig and dairy wastes (a potential source of clean energy for farming) based solely on revenues from carbon credits. In the near future, the IFC expects to leverage its ability of taking long-term project and credit risks in emerging markets to introduce delivery guarantees as a credit enhancement product for this new market.

#### **Box 11: IFC Carbon Finance Projects**

**India: Bagasse Cogeneration Plants Projects.** Balrampur Chini Mills Limited constructed two 20MW cogeneration bagasse plants in Balrampur Haidergarh. Sale of certified emission reductions as a result of reduced greenhouse gas emissions caused by the cogeneration plant helps to reduce the risks of using a new, advanced technology and selling power to the grid. The plants are expected to export more than 200 million kilowatt hours (kWh) of electricity to the grid and reduce carbon dioxide emissions by about 200,000 metric tons per year.

**Brazil.** Brascan Energetica S.A. has developed six run-of-river projects whose capacities range from 15 to 30MW. The projects are in four states in Brazil (Paraná, Rio Grande do Sul, Minas Gerais, and Mato Grosso). The total capacity is 128MW. The projects will be supported by the sale of 1.6 million certified emission reductions to the IFC-Netherlands Carbon Facility. The projects help expand the country's capacity in small run-of-river projects with low environmental impacts, and they produce emissions reductions by partially displacing fossil fuel-based generation in the grid.

The IFC is increasingly emphasizing the importance of evaluating and reporting lessons learned from its projects. One example is the FY05 IFC-GEF Efficient Lighting Initiative publication, which describes the IFC's work with the lighting industry to accelerate the development of markets for energy-efficient lighting in seven countries. One important outcome of the program has been the establishment of a self-sustaining certification institute for quality lighting products, based in China, which supports market penetration of efficient lighting technologies in the global market.

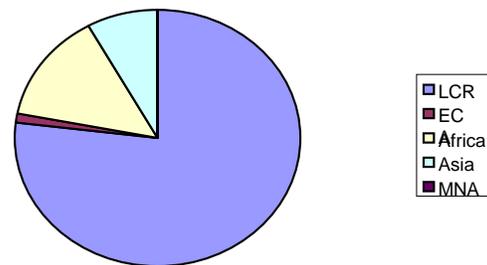
**3.3.8 Multilateral Investment Guarantee Agency (MIGA).** MIGA’s Guarantee Program focuses on supporting:

- Projects subject to subnational risks;
- Projects that promote regional integration through South-South investments; and
- Investments in frontier markets and conflict-afflicted environments.

*MIGA’s RE and EE portfolio:* Since its first US\$30 million coverage for a geothermal project in the Philippines in 1995, MIGA has issued more than US\$700 million of coverage for RE or EE projects in various parts of the world.

**Figure 9: MIGA’s Portfolio of RE and EE Projects by Region**

MIGA’s portfolio of RE projects, although well-diversified from a country perspective, is dominated by projects in the LCR region (Figure 9). Countries where MIGA has supported RE and EE projects include Argentina, Brazil, Bolivia, Czech Republic, Costa Rica, Guatemala, Ecuador, Kenya, Madagascar, and Nicaragua. Going forward, MIGA will be working toward increased participation in projects in other regions, particularly AFR. Geothermal and hydropower projects make up the majority of RE and EE projects supported by MIGA.



In FY05, MIGA provided a guarantee of US\$91 million against political risks to the Lao PDR Nam Theun 2 Hydroelectric Project. MIGA also focused on identifying other types of RE and EE projects that could benefit from political risk insurance. It also has been concentrating on sourcing sub-sovereign EE projects that could benefit from MIGA’s support. MIGA is already working on a project that involves an innovative technology for incineration of non-industrial solid waste for municipal heating and electricity generation. MIGA also has received several applications for wind power projects.

*Future opportunities:* Growing international demand for emission reductions due to Kyoto and European Union obligations increases the demand for foreign direct investments for EE projects. MIGA envisions that in close collaboration with the World Bank it can improve investor targeting and outreach, which would promote private sector participation in these projects. MIGA will also cooperate with the CFB to identify projects that may require MIGA’s support.

**3.3.9 The World Bank Carbon Finance Business (CFB).** The year 2005 saw the coming into force of the Kyoto Protocol and the onset of the European Union Emissions Trading Scheme. Carbon finance is proving to be a catalyst for the provision of new and

additional sources of revenue for projects that mitigate greenhouse gases, including traditional RE, energy generation from methane capture, and EE.

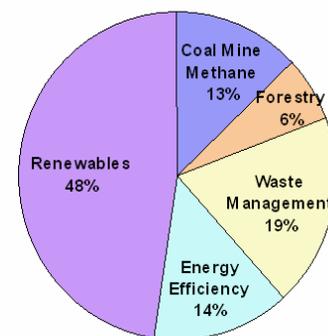
The World Bank CFB consists of eight carbon funds with more than US\$900 million under management for purchasing emission reductions from climate-friendly projects in developing countries and economies in transition. These projects must also contribute to sustainable development.

The World Bank’s carbon finance products help expand the carbon market by extending the frontiers of carbon finance to new sectors or countries that have yet to benefit from carbon finance and demonstrating how carbon finance can contribute to sustainable development and poverty alleviation. In this regard, the CFB has three strategic objectives:

- 1) To benchmark carbon asset creation and reduce market entry risks;
- 2) To address market failures and distortions by creating deliberate mechanisms to purchase emission reductions from less represented countries and markets, or where Bank intermediation is essential to bring assets to market; and
- 3) To build capacity in developing countries to directly access the carbon market.

*Performance toward RE and EE to date and in FY05:* As of July 2005, the CFB has signed 30 contracts for the purchase of greenhouse gas emission reductions from climate-friendly projects. Of these, 22 contracts are based on RE and EE projects (Figure 10). Carbon finance will bring US\$87.7 million of additional revenue to these projects for the purchase of more than 21 million metric tons of CO<sub>2</sub> equivalent reductions. For hydropower projects of less than 10MW, 1.56 million tons of CO<sub>2</sub>e have been purchased to date, equaling US\$4.94 million.

**Figure 10: Technology Share of Emission Reduction Projects in the World Bank’s Portfolio to Date**  
(% of carbon finance contracted)



In FY05, World Bank carbon funds signed 10 ERPAs for 10 projects in RE and EE, accounting for a carbon finance total of US\$33.3 million. Of these projects, two are specifically for energy-efficient district heating systems in Bulgaria, and eight are RE projects—hydro and wind power—in LCR and EAP. Hydropower (less than 10MW) accounts for 88.3 kilotons of CO<sub>2</sub> equivalent, a total of US\$0.44 million.

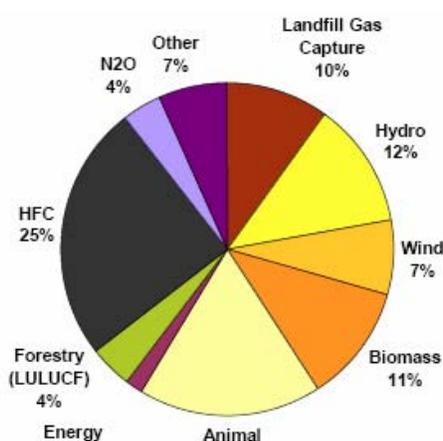
### Box 12: The Status of the Carbon Market

So far, the cumulative value of the carbon market has been established at US\$1 billion or more. In 2004, 107 million metric tons of CO<sub>2</sub>e created from projects were exchanged in the global carbon market. This represents a 38 percent increase relative to 2003. The European Union accounted for 60 percent of purchases, followed by Japan with 21 percent and New Zealand with 7 percent. Thirty-one percent of the projects were located in India, and 35 percent of the projects were Latin American countries (of which 13 percent were in Brazil). A variety of technologies are covered in Figure 11 below.

Market data show that the majority of these projects are located in a small number of middle-income countries, with Africa barely represented. One of the objectives of the Bank's involvement in the carbon market is to enable the participation of countries that have yet to benefit from carbon finance.

**Figure 11: Technology Share of Emission Reduction Projects Globally, January 2004–April 2005**

*(% of carbon finance contracted)*



To stimulate the carbon market, the World Bank (in partnership with the International Emissions Trading Association and Koelnmesse) hosted Carbon Expo 2005, an annual global trade fair that provides a business platform for buyers, sellers, and service providers to meet and discuss lessons learned and emerging issues in the carbon market. The event was highly successful, with the number of participants and exhibitors twice that of last year's inaugural event, and attendance is likely to increase in 2006.

Box 12 provides an overview of the status of the international carbon market, and Box 13 describes two recent projects.

**3.3.10 Energy Sector Management Assistance Program (ESMAP).** A partnership between the World Bank and several donors established in 1983, ESMAP aims to promote the role of energy in poverty reduction and economic growth in an environmentally responsible manner. Its work applies to low-income, emerging, and transition economies and contributes to the achievement of internationally agreed development goals.

**Box 13: Examples of Clean Development Mechanism projects in the World Bank portfolio**

**Honduras: La Esperanza Hydro Project.** La Esperanza is a 12.7MW run-of-river hydropower plant in a remote and mountainous area of Honduras. The project will be supported by the income from the sale of 310,000 metric tons of CO<sub>2</sub> emission reductions to the Community Development Carbon Fund (CDCF), one of the World Bank's eight carbon funds. The project improves electricity service for the entire town of La Esperanza (which has about 10,000 inhabitants), allowing for reliable, high-quality supply, 24 hours a day, by mid-2004.

**Peru: Santa Rosa Hydro Project.** The 4.1MW Santa Rosa Hydro Project is the first small-scale CDM project to be developed in Peru. The project will displace expensive heavy fuel-diesel, coal, and gas-fired generation, reducing CO<sub>2</sub> emissions to the atmosphere. The CDCF will purchase 88,300 metric ton of CO<sub>2</sub>e from the project for US\$0.44 million with an option to purchase an additional 62,000 metric tons.

RE has been prominent in the ESMAP portfolio of activities since the mid-1990s. In the new business plan for 2005–07, RE is one of the four thematic areas, and EE is emphasized as a key priority to ensure energy security. From FY97-04, ESMAP funded 60 RE and EE projects at a total cost of approximately US\$14 million (US\$9 million for RE and US\$5 million for EE). During FY05, ESMAP committed US\$0.3 million for three RE and EE projects and studies on knowledge generation, hydropower, and private sector participation, in addition to US\$1.1 million for the Global Village Energy Partnership (GVEP). Furthermore, ESMAP has a portfolio of US\$5.5 million in RE and EE projects under implementation. FY05 saw promising results from some of these ongoing projects, many of which attempt to develop RE policies and strategies and test innovative EE financing mechanisms.

*Renewable Energy:* ESMAP established an RE thematic program to develop RE as a least-cost energy supply option. This program, funded at US\$13.6 million for the FY06–09, has the following objectives:

- Increase access to modern energy services for the poor and the unserved;
- Diversify the primary energy supply portfolios as a means to improve energy security; and
- Contribute to the global shift to a low-carbon economy.

Under this program, ESMAP will develop innovative approaches, provide TA and operational support, and disseminate knowledge in support of scaling up RE sources.

Recognizing the importance of a suitable legal and regulatory framework to encourage RE development, ESMAP has provided TA to several countries in formulating RE policies, regulatory frameworks, and action plans. This includes development of a policy or strategy for the promotion of RE in Mexico and Nicaragua and a “green electricity” scheme for Shanghai (see Box 14).

#### **Box 14: Green Electricity Scheme for Shanghai**

The Shanghai municipal government, with assistance from ASTAE and ESMAP, has developed a green electricity program, called Shanghai Jade Electricity<sup>®</sup>, to pass through the incremental cost of electricity generated by RE sources to consumers who are willing to pay and actively participate in protecting the environment and developing more renewable-based electricity capacity in the municipality. The program will initially support wind and PV electricity only.

With support from ASTAE and ESMAP, a municipal government decree and an implementation plan have been prepared. The decree will provide the required legal basis to market green electricity in Shanghai. It has passed two approval stages and is awaiting final approval by the municipal government.

*Energy Efficiency:* ESMAP assisted in the development of innovative financing mechanisms for EE in Mexico and Poland, as well as the financing of intermediary mechanisms in Brazil, China, and India to overcome constraints, such as high transaction costs, perceived risks and a lack of financial and technical skills in commercial banks to appraise and finance EE investments.

The Mexico and Poland projects aimed to facilitate transparent and affordable financing mechanisms for bundling small-scale EE projects by developing financial intermediaries. In Mexico, for example, ESMAP is working with the North American Development Bank to design innovative EE financing products; in Poland, ESMAP identified potential EE activities in municipal buildings, hospitals, and housing cooperatives and designed innovative financing structures to finance them.

Another example includes the development of financing intermediary mechanisms in India, where specific EE lending schemes for small and medium enterprises have been launched at two of the largest banks: State Bank of India and Canara Bank. A third participating bank in India, Union Bank, has recently announced that it will launch a comparable scheme as well. Similar activities have also been supported in Brazil and China.

**3.3.11 Asia Sustainable and Alternative Energy Program (ASTAE).** One of ASTAE's objectives is to increase both the number of households with access to modern energy services and investments in RE and EE, with performance indicators shown in Table 6.

Among the more important ASTAE achievements in FY05 was its contribution to studies, workshops, and study tours, which led to the Chinese government's adoption of its RE law in March 2005. ASTAE is now providing preparation and implementation support to Bank and non-Bank projects as part of CRES (see Box 2), which will help the Chinese reach their target of deriving 15 percent of total electricity supply from RE by 2020.

**Table 6: ASTAE Performance Indicators**

<i>Performance indicator (FY04–06)</i>	<i>End FY06 target</i>	<i>Progress by end FY05<sup>a</sup></i>
Provide additional households with improved energy services	1 million	New access: 227,500 households Improved services: 1.9 million households
Install additional renewable electricity-generating capacity	1 GW equivalent	Direct: 0.138 GW Indirect: 4.9 GW
Avoid additional conventional electricity-generating capacity through efficiency improvements	1 GW equivalent	0.676 GW equivalent
Mitigate CO <sub>2</sub> emissions over a 20-year period	156 million metric tons CO <sub>2</sub>	Direct: 60.18 million metric tons CO <sub>2</sub> Indirect: 580 million metric tons CO <sub>2</sub>

a. Indirect outcomes resulted when the WBG projects provided credit guarantees to RE and EE projects financed by private investors. In these projects, the Bank funds are used not to directly finance the projects, but to make the investments and related outputs possible.

Although the potential impact of CRESF dwarfs that of other projects, ASTAE also contributed to small but important activities such as facilitating the preparation of a GEF medium-sized project that will provide teachers in remote areas of Papua New Guinea with access to financing, allowing them to purchase solar PV systems to replace kerosene for lighting. The financing package allows teachers to purchase these systems at a monthly cost of 50–60 percent less than they now spend on kerosene and batteries for lighting, thus creating actual savings for teachers while providing better-quality and safer lighting.

In FY05, four projects that received ASTAE support were approved by the World Bank Board of Directors, with a total RE and EE investment of US\$118 million, of which US\$87 million are IBRD-IDA commitments and US\$31 million are GEF grants.

The most prominent change in the ASTAE strategy is the shift from an opportunistic approach to one that focuses on the quality and scale of development impacts on energy poverty reduction and environmental protection. Stimulating innovation and suggestions from within client countries also will be emphasized. To fully realize the developmental impacts of RE and EE as well as achieve energy access on a larger scale, it is important that the sustainable energy concept be mainstreamed not only within the World Bank, but also in client countries. However, mainstreaming is no longer considered an objective in itself but rather a means to achieve an end.

#### **4. Strengthening Global Partnerships and Outreach**

Global partnerships allow the WBG to leverage resources, build awareness, and share expertise with partners committed to tackling energy challenges and achieving the MDGs. They are also vital to RE and EE scale-up. The WBG continues to strengthen existing partnerships, move forward with new partnership initiatives, and exert leadership

as justified. New partnerships and outreach, such as the financing and policy network and the CEO roundtable organized by the IFC, have more focused objectives.

#### ***4.1 Financing and policy network for scaling up RE and EE in developing countries***

At the 2004 Bonn International Conference for Renewable Energies, the idea of a global policy network was proposed with the objective of bringing together a range of stakeholders, including parliaments, local and regional authorities, academia, women's groups, and relevant partnerships worldwide to address the scale-up of RE and EE and to focus on key issues such as policies, capacity building, technology transfer, research and development, and financing. The WBG committed to lead a scoping study for a financing and policy network (FPN) related to scale-up of RE and EE in developing countries.

The objectives of the scoping study were (a) to identify the prospective need for and value added of an RE and EE financing and policy network and (b) to propose possible network configuration options as appropriate. The study results were presented at the Renewable Energy and Energy Efficiency Financing and Policy Network Forum held in Washington, DC, on March 11, 2005.

The scoping study and the forum concluded that there is no need to establish a new FPN institution given the existence of a large number of international networks and partnerships devoted to RE and EE. Nevertheless, the forum identified a number of activities and gap-filling that had to be done. There emerged a consensus for greater cooperation and leveraging of existing partnerships and networks in the area of financing and policy, building upon the work already begun in this area. Agreement was reached during the forum that:

- The Renewable Energy Policy Network for the 21st Century (REN21) with support from the Government of Germany would serve as a platform for enhancing collaboration and cooperation among the various partnerships;
- The GVEP will address the financing gaps noted in the scoping study in its activities at the country level, particularly mobilizing local capital and risk mitigation;
- The United Nations Environment Programme (UNEP) Sustainable Energy Financing Initiative (SEFI) will facilitate between developing country RE developers and sources of financing at the local level;
- The Renewable Energy and Energy Efficiency Partnership will finance policy and analytical work on issues related to both RE and EE; and
- The World Bank along with ESMAP will continue to contribute its knowledge and resources toward filling the gaps and increasing investment in RE and EE projects, particularly where they are linked to productive uses and poverty reduction.

## ***4.2 The IFC's private sector CEO roundtable on RE***

To strengthen the partnership with the private sector in RE investment, the IFC organized a private sector CEO roundtable on RE in November 2004. The IFC used the opportunity to share with the leading private sector players in RE the WBG strategy and long-term commitment as well as opportunities and issues in scaling up RE. It was an important event for both the IFC and the WBG to learn about and better understand the experiences, needs, and concerns of the private sector. It also provided an opportunity to discuss the potential for mutual cooperation. The 17 external participants came from the leading energy investment firms of 11 developing and developed countries, including China, the Philippines, and Uganda.

## **5. Disseminating Knowledge and Strengthening Staff Capacity**

The value of knowledge generation and sharing for achieving poverty reduction and scaling up RE and EE cannot be overemphasized. Knowledge sharing has been achieved through a combination of publications, thematic groups within the WBG that share experience and best practices across regions, Web-based communications, and the Energy Help Desk. In addition, publication of this report for FY05 fulfils the Bonn commitment of reporting the WBG's annual performance in RE and EE programs. These knowledge products serve to enhance the knowledge and capacity of not only its staff and partner countries but also the broader energy and development community.

### ***5.1 The REToolKit: An RE operational guide for electric services***

ESMAP and EWD have prepared "A Renewable Energy Operational Guide for Electric Services" (REToolKit). The grid-connected and stand-alone modules were presented at Energy Week 2005, where they were well received inside and outside the Bank. The web-based version will be released in December 2005 (see Figure 12 for a view of the interface).

The REToolkit purpose is to assist Bank staff and others in improving the design and implementation of RE for electricity supply projects. The REToolKit aims at reducing project preparation costs and time, as well as increasing project success rates by providing best practice knowledge and analytical tools via the Web and on CD-ROM. The REToolKit builds upon the practices and lessons learned from past and ongoing RE projects supported by the WBG and others. It is operationally oriented to address needs at each stage in the project cycle, from project identification, to preparation, to implementation. The REToolKit comprises five modules:

1. Three RE system types—grid-connected, minigrid, and stand-alone—provide guidance on key aspects of project design and implementation, policy and regulatory options, sustainable business models and financing mechanisms, and technology issues.
2. The RE rationale provides supporting materials to convince decision makers of the importance of RE, such as economic viability, cost-effectiveness, and environmental benefits.

- Project cycle provides steps and tools needed at each stage of the project cycle and guidance on working with the GEF and carbon finance and other cofinanciers.

Figure 12: REToolKit Interface



In addition, specific project tools provide: case studies, terms of reference, economic and financial analysis, technical specifications, examples of good practice documents (e.g., project appraisals, power purchase agreements, project operations manuals, model policy documents), and links to Web resources.

In a parallel effort, the RE industry requested that the Bank take the lead in preparing a “Business Handbook for Renewable Energy,” which may incorporate complementary content as a guide to international and domestic RE businesses, developers, investors and suppliers. An in-depth survey was conducted with more than 50 major RE companies and financial intermediaries in Africa, Europe, and North America to assess needs.<sup>17</sup> The RE business handbook will be developed in FY06-07.

<sup>17</sup> Anil Cabraal, Xiaodong Wang, Grayson Heffner and Yabei Zhang, *Renewable Energy Toolkit Needs Assessment*. ESMAP Technical Report 077/05, August 2005. [http://wbln0018.worldbank.org/esmap/site.nsf/files/077-05+Final\\_to\\_Printshop.pdf/\\$FILE/077-05+Final\\_to\\_Printshop.pdf](http://wbln0018.worldbank.org/esmap/site.nsf/files/077-05+Final_to_Printshop.pdf/$FILE/077-05+Final_to_Printshop.pdf), last accessed November 21, 2005

## ***5.2 Other knowledge products***

In FY05, the WBG conducted several technology studies that provide sector-specific information to better engage stakeholders with trends in specific technologies. These products include studies on RE and EE technologies and development of knowledge-based seminars and Web sites that contribute to enhancing RE knowledge. The technology studies completed during the past year covered electric power technology characterization, clean energy technology, EE and energy conservation, carbon financing baselines, and biomass and coal use technologies.

These knowledge products address the emerging and imminent issues related to RE and EE and help scale up efforts. The electric power technology characterization study provides an example. The study examined 22 generating technologies for their technical and economic prospects for electricity generation and delivery technologies to serve rural, peri-urban, and urban populations in developing countries. The assessed technologies included various renewable and fossil fuel technologies for grid as well as mini-grid and off-grid applications such as solar, wind, geothermal, biomass, hydro, coal, oil, and gas-fired power generation technologies. The findings of the study were presented at Energy Week 2005<sup>18</sup> (Figure 13). The final report will be issued in December 2005.

## ***5.3 Strengthening staff capacity***

To scale up RE and EE support, it is important to overcome the shortage of experienced and skilled RE and EE staff at the Bank. The World Bank is conducting a batch recruitment to increase its RE and EE staff complement. In addition, Bank task teams are being provided with knowledge tools and training opportunities to improve their effectiveness in adopting low transaction cost approaches to project development. Given the importance of RE and EE to the environment agenda, the EWD is working closely with the ESSD Network to support joint appointments. Secondment of experienced RE staff is also under way with support from several European donors.

## ***5.4 Other institutional initiatives, incentives, and recognition***

In addition to empowering its staff with enhanced capacity and more resources to help its clients, the WBG continues to support RE and EE use at its own facilities and recognize best practices throughout the Bank.

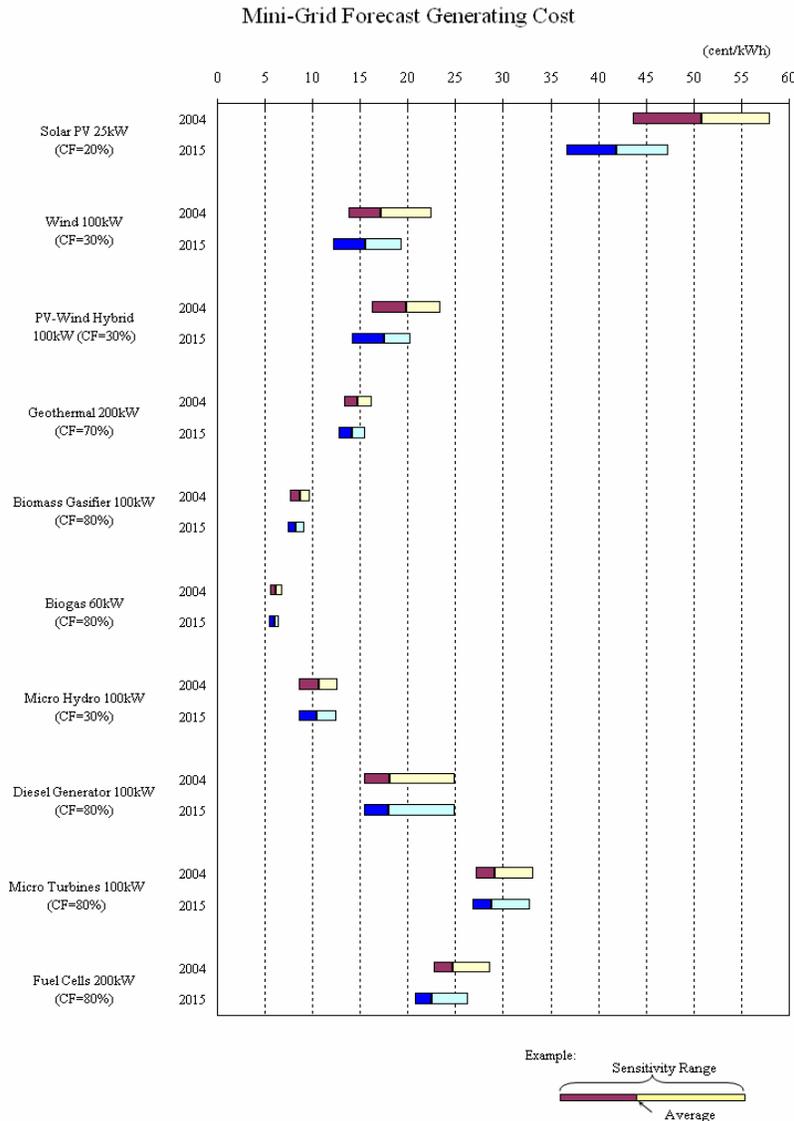
In December 2004, the World Bank announced the purchase of RE for 100 percent of its electricity usage at its Washington, DC offices. The power is supplied by WindCurrent, a Maryland-based company that sells wind power to the mid-Atlantic power grid in the United States. The WBG received the 2005 Green Power Leadership Award, which is sponsored by the US Environmental Protection Agency (US EPA), the US Department of Energy, and the Center for Resource Solutions and recognizes the WBG's leadership

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18. For details, see [http://iris37.worldbank.org/domdoc/PRD/Other/PRDDContainer.nsf/All+Documents/85256D2400766CC785256FFF00750825/\\$File/Takahashi\\_EW05.pdf](http://iris37.worldbank.org/domdoc/PRD/Other/PRDDContainer.nsf/All+Documents/85256D2400766CC785256FFF00750825/$File/Takahashi_EW05.pdf), last accessed November 16, 2005.

among the largest purchasers of green power in the United States. In addition, three office buildings at its headquarters are winners of the US EPA’s Energy Star award for their outstanding contributions to reducing greenhouse gas emissions through EE.

**Figure 13: Illustrative Example—Technology Assessment Study Findings: Generating Costs of Different Generating Technologies for Mini-grid Applications**



**Best practices.** The Sri Lanka Energy Services Delivery Project received the 2005 Best Practice award by the Operations Evaluation Department of the World Bank for its successful introduction of various innovative mechanisms. These include financing of village-based enterprises for micro hydro mini-grids and provision of output-based subsidies and financing for RE systems for off-grid consumers that encouraged both the participation by the poor and provision of quality services. The project, funded by the GEF and IDA, laid the basis for mainstreaming RE on commercial terms in Sri Lanka

through engaging the private sector, commercial banks and microfinance institutions, and nongovernmental organizations, building capacity and using a technology-neutral approach.

The Nepal Rural Energy Development Programme (REDP) also has won a number of awards, including the GLOBAL 100 Eco Tech Award from the Japanese Association for the 2005 World Exposition, second prize under the Public Investment Category of the Award for Sustainable Energy by Energy Globe 2000 (Austria), a featured mention in “Projects around the World” by the EXPO 2000 Project (Germany), a Best Practice Award from the UNDP Sub-Regional Resource Facility (Islamabad, Pakistan), and the Pearl of Knowledge Award from the UNDP Regional Bureau of Asia and the Pacific (Bangkok, Thailand) in 2005. The REDP is a joint effort of the government of Nepal, UNDP, and World Bank to provide access to affordable alternative energy for the poor in remote areas of Nepal. The Bank supports the scale-up of the REDP to extend village electrification to more areas through its Nepal Power Development Project.

In addition, the quality of supervision in FY03–04 for the China Renewable Energy Development Project was rated highly satisfactory by the Quality Assurance Group of the World Bank in its annual quality of supervision review in 2005. The project demonstrated good practice in several areas, with highly proactive identification and resolution of threats to achieving the operation’s development objectives. After a significant restructuring of the wind farm component in June 2001, the supervision strategy focused on implementing the critical steps needed to attain the revised project objectives—namely, demonstrating the commercial viability of wind energy and developing a sustainable market for PV technologies. The effectiveness of the team’s strategy lay in addressing, at an early stage of implementation, areas of vulnerability that could undermine the sustainability of the project. The impact of this strategy has been enhanced ownership, tangible progress in capacity building, and better implementation performance overall.

**Staff recognition.** Last year, Anil Cabraal, lead energy specialist in the WBG’s Energy and Water Department, received the Robert Hill Award for the Promotion of Photovoltaics for Development. This award, presented at the 20th European Photovoltaic Solar Energy Conference in Barcelona, Spain, acknowledged that “his efforts over the past ten years at the World Bank, along with those of his colleagues, have contributed to making photovoltaics a credible option for rural energy service provision in the developing world.”

## **6. The Road Ahead**

The RE and EE work plan for FY06 will continue and build on the work begun in FY05 to support the RE and EE scale-up commitment. During this second year, the primary objective will be to continue to strengthen the “infrastructure” and provide the necessary support to operations unit to achieve scale-up. Going forward, the specific activities will include:

- Working with ESMAP to support upstream project development through the new RE thematic program;
- Increasing RE and EE business development activities through IFC's newly created business units;
- Developing a regional GEF operations instrument to allow for a streamlined, low transaction cost approach to develop and implement similar, smaller-scale projects in several countries;
- Examining streamlined approaches to scale up Carbon Finance funding for RE projects in Africa;
- Undertaking follow-up activities to the RE and EE Financing and Policy Network Forum with partners who are leading this work;
- Organizing jointly with the GEF, ESMAP and the Government of Mexico, a Global Forum on Policies for Grid-connected Renewable Energy;
- Completing and disseminating the REToolKit and beginning preparation of the "Business Handbook for Renewable Energy," as well as the technology characterization database and report; and
- Communicating the Bank's RE and EE efforts via an enhanced Bank Web site on RE, publishing a newsletter on RE and energy access issues, contributing to the ESMAP Knowledge Series, and publishing papers and other articles.

The WBG has a leading role in creating a new investment framework for clean energy and development in partnership with other multilateral development organizations and client countries. The initiative has led to an increased dialogue with borrowers on energy issues and is expected to result in specific proposals to:

- Make the best use of existing resources and financing instruments and develop a framework for energy investment to accelerate the adoption of technologies that enable cleaner, more efficient energy production and use;
- Explore opportunities within existing and new lending portfolios to increase the volume of investments made on RE and EE technologies consistent with the MDBs' core mission of poverty reduction;
- Work with interested borrower countries with significant energy requirements to identify less greenhouse gas-intensive growth options that meet their priorities and ensure that such options are integrated into CASS; and
- Develop local commercial capacity to advance and finance cost-effective projects that promote energy efficiency and low-carbon energy sources.

The ESSD and Infrastructure Network Vice Presidencies are leading the work to develop the Clean Energy Investment Framework. To this end, the WBG has established five working groups on enhancing country dialogue, technology assessment, financial instruments, adaptation, and communications.



## **Annex 1: Institutional Support for Renewable Energy and Energy Efficiency**

This section describes the various WBG institutions and units and the role that each plays in contributing to RE and EE. It also provides detailed definitions of RE and EE. Last, it discusses the methodology used to compute the data in this report.

### **The World Bank Group**

In this report, the World Bank Group (WBG) refers to four closely associated World Bank institutions, which directly support RE and EE activities.<sup>19</sup> The four institutions are the IBRD, IDA, IFC, and MIGA. There are six operational regions under IBRD/IDA. The report disaggregates the commitments made by these regions and institutions. In addition, the WBG is an implementing agency for the GEF. This report provides information on WBG-administered GEF projects. The WBG's Carbon Finance Business is reported separately because it is a unique business line that purchases emissions reductions and does not directly invest in a project.

#### **IBRD**

The International Bank for Reconstruction and Development (IBRD) aims to reduce poverty in middle-income and creditworthy poorer countries by promoting sustainable development through loans and guarantees, and in the non-lending area analytical and advisory services. <http://www.worldbank.org/ibrd>

#### **IDA**

Contributions to the International Development Association (IDA) enable the World Bank to provide approximately US\$6–9 billion a year in highly concessional financing to the world's 81 poorest countries (home to 2.5 billion people). IDA's interest-free credits and grants are vital because these countries have little or no capacity to borrow on market terms. <http://www.worldbank.org/ida>

#### **IFC**

The International Finance Corporation's (IFC's) mandate is to further economic development through the private sector. Working with business partners, it invests in private enterprises in developing countries and provides long-term loans, guarantees, and risk management and advisory services to its clients. <http://www.ifc.org>

#### **GEF**

The Global Environment Facility (GEF), which is the World Bank's largest partner in the area of RE and EE investments, is the financing mechanism for a range of international environmental agreements, and it provides financing for projects that have global environmental benefits. <http://www.worldbank.org/gef>

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19. There is also a fifth institution that is a part of the WBG: the International Centre for Settlement of Investment Disputes (ICSID). Because this institution does not directly support any RE or EE activities, for this annual report, "WBG" precludes ICSID.

## **MIGA**

The Multilateral Investment Guarantee Agency (MIGA) provides political risk insurance against noncommercial risks to eligible foreign investors and commercial banks for qualified investments in developing member countries. <http://www.miga.org>

## **Carbon Finance**

Both the IBRD and IFC have Carbon Finance units that leverage public and private investment for projects that generate greenhouse gas ERs. This helps to grow the market by extending carbon finance to both developing and transition economies. The funds are provided by private companies and governments seeking to purchase ERs to learn how to originate transactions in this complex emerging market.

Carbon Finance business is a relatively new business for the WBG. It can be divided into separate business lines: the IBRD Carbon Finance (<http://www.carbonfinance.org>) and the IFC Carbon Finance (<http://www.ifc.org/carbonfinance>).

## **ESMAP**

The Energy Sector Management Assistance Programme (ESMAP) is a global technical assistance program and knowledge partnership sponsored by a group of donors, including Canada, Denmark, Finland, Germany, the Netherlands, Norway, Sweden, the United Kingdom, the United Nations Foundation, the United Nations Development Programme (UNDP), and the World Bank. ESMAP is managed by the World Bank. <http://www.worldbank.org/esmap>

## **ASTAE**

In 1992, the World Bank and donor partners established the Asia Sustainable and Alternative Energy Program (ASTAE) to support the transition to environmentally sustainable energy use in developing countries in Asia. ASTAE supports both upstream Economic and Sector Work, much like ESMAP, but also provides assistance in RE and EE project identification, preparation, and supervision. <http://www.worldbank.org/astae/>

## **Definitions**

Following are the definitions used for the purpose of the reporting on the WBG's activities.

### **New Renewable Energy**

Projects that had at least one of the following were considered projects with a new RE component: geothermal energy; hydrogen and fuel cells; micro-, mini-, and small hydroelectric plants (less than 10 MW); PV; solar thermal energy; sustainable biomass fuel wood use; fuels produced from urban wastes; and wind.

### **Energy Efficiency**

Energy efficiency comprises end-use thermal and electric efficiency activities (e.g. buildings, appliances, etc.), power sector rehabilitation, loss reduction in transmission and distribution as well as improvements in the efficiency of district heating systems.

## Hydropower

This includes hydropower projects where the installed capacity at a single facility exceeds 10 MW. Pumped storage, run-of-river hydropower, and hydropower projects with dams are included here as long as the capacity exceeds 10 MW.

The WBG supports projects that may be cross-sectoral in nature. For example, RE and EE components may be embedded within an agricultural, health, or power project. In the case of such blended projects, sometimes it is not easy to specify precisely what the size of each sectoral component is. In this report, as far as possible, great care has been taken to show only the commitment amount associated with new renewables, EE or hydropower (>10 MW). For example, in a particular project, the total commitment made by IBRD/IDA may be US\$100 million. This project may have three different sectoral components: agro-industry, 50 percent; health, 30 percent; and new renewables, 20 percent. In such case, in this report only US\$20 million has been included as the project's contribution to RE.

## Different Reporting Styles

The various World Bank institutions have differing styles of reporting their data because of their different kinds of business. For example, MIGA provides guarantees to projects against various kinds of risks, whereas IBRD and IDA provide project finance and guarantees. Emissions reductions purchases by carbon finance are a revenue stream. IFC provides both equity and loan financing, as well as guarantees. For the purposes of this report and to arrive at an estimate of the WBG's total commitments toward RE and EE, we have added commitments made by each WBG institution. The following distinctions should be kept in mind when reading this report.

### IBRD/IDA

For IBRD/IDA–assisted projects, *commitment amounts* toward RE and/or EE for each project have been used to estimate the cumulative total for the WBG.

### IFC

IFC annual reports show both the gross investment amount (which includes the amount of B loans syndicated by IFC from commercial banks for which IFC is the lender of record) and the IFC net investment amount side by side to illustrate the difference. For the purposes of arriving at a cumulative total for the WBG, this report uses the *original IFC gross commitment*.

The commitment amounts mentioned in this report are an underestimate of IFC's actual investment commitments to all RE and EE activities because some types of such investments are not reported separately in the IFC's current information systems or are difficult to identify as discrete components in larger IFC project investments or corporate loans. There is also no easy way to analyze the amount of indirect financing of RE and EE projects that occurs via IFC's multibillion-dollar portfolio of capital market operations (that is, commercial bank and lease company financings, private equity funds, and so forth), except for those that specifically target RE or EE objectives.

**GEF**

For the approved GEF projects, this report uses the *commitment amounts* for each project. The total investment leveraged by GEF is difficult to gauge accurately. Typically it is two to five times the size of the GEF investment.

**MIGA**

MIGA normally reports the maximum liability of its guarantee and the FDI that the guarantee leveraged. For the purposes of arriving at a cumulative total for the WBG, this report added together the MIGA *maximum liability*.

**Carbon Finance**

For purposes of this annual report, in order to compare carbon asset purchases and regular project financing, this report considered *ERPAs signed* to be the appropriate measure and added those amounts to arrive at the total commitment, that is, the Carbon Finance business' equivalent of Board approval for World Bank loans.

## Annex 2: Annual Renewable Energy and Energy Efficiency Statistics<sup>20</sup>

(All amounts in millions of U.S. dollars)

**Annual Table 1: WBG Renewable Energy and Energy Efficiency Commitments**

Type of commitment	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Grand total
New renewables	53	2	56	227	300	59	47	336	15	239	444	26	169	105	192	212	<b>2,482</b>
Energy efficiency		265	54	10	59	148	380	56	356	26	295	193	67	168	67	87	<b>2,228</b>
Hydropower (> 10 MW)		150	161	938	186	317	819	15	461		320		181	237	81	449	<b>4,313</b>
<b>Grand total</b>	<b>53</b>	<b>417</b>	<b>271</b>	<b>1,174</b>	<b>545</b>	<b>524</b>	<b>1,245</b>	<b>407</b>	<b>832</b>	<b>264</b>	<b>1,059</b>	<b>219</b>	<b>416</b>	<b>510</b>	<b>339</b>	<b>748</b>	<b>9,023</b>

**Annual Table 2: WBG Renewable Energy and Energy Efficiency Commitments by Institution or Unit**

Institution or unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Grand total
GEF-IBRD/IDA			3	36	56	35	10	78	28	56	111	14	37	70	83	100	717
GEF-IFC							37	33		30	5		19		14	8	145
IBRD Carbon Finance												2	8	10	48	23	91
IBRD/IDA	53	392	196	1,113	303	452	1,108	146	534	137	691	197	340	290	194	445	6,590
IFC		25	72	26	186	7	36	135	206	15	1	6	13	135		61	921
IFC Carbon Finance																21	21
MIGA						30	35	15	65	26	252			5		91	519
Special Financing							20										20
<b>Total commitment</b>	<b>53</b>	<b>417</b>	<b>271</b>	<b>1,174</b>	<b>545</b>	<b>524</b>	<b>1,245</b>	<b>407</b>	<b>832</b>	<b>264</b>	<b>1,059</b>	<b>219</b>	<b>416</b>	<b>510</b>	<b>339</b>	<b>748</b>	<b>9,023</b>

<sup>20</sup> The report provides the amount of the WBG commitments for renewable energy and energy efficiency projects. The total amount of disbursements from project inception to completion for all Bank investment projects is usually around 20% lower than the committed amount due to unforeseen changes during project implementation. This also applies to the RE and EE projects included in this report.

**Annual Table 3: WBG New Renewables Commitments by Institution or Unit**

<b>Institution or unit</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>Grand total</b>
GEF-IBRD/IDA			3	26	30	10	7	39	6	56	66	9	36	16	62	47	413
GEF-IFC							30	30		14					14	1	89
IBRD Carbon Finance												2	4	10	19	4	39
IBRD/IDA	53	2	20	201	270	19	8	132	10	128	127	9	128	64	97	139	1,404
IFC			33					135		15		6	1	15		12	216
IFC Carbon Finance																10	10
MIGA						30	2			26	252						311
<b>Total commitment</b>	<b>53</b>	<b>2</b>	<b>56</b>	<b>227</b>	<b>300</b>	<b>59</b>	<b>47</b>	<b>336</b>	<b>15</b>	<b>239</b>	<b>444</b>	<b>26</b>	<b>169</b>	<b>105</b>	<b>192</b>	<b>212</b>	<b>2,482</b>

**Annual Table 4: WBG Energy Efficiency Commitments by Institution or Unit**

<b>Institution or unit</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>Grand total</b>
GEF-IBRD/IDA				10	26	25	3	39	22	1	45	5	1	54	22	53	304
GEF-IFC							7	3		16	5		19			7	55
IBRD Carbon Finance															13	4	18
IBRD/IDA		265	54		33	123	350	14	328	9	244	188	35	34	32	23	1,733
IFC									6		1		12	75			93
IFC Carbon Finance																	
MIGA														5			5
Special Financing							20										20
<b>Total commitment</b>		<b>265</b>	<b>54</b>	<b>10</b>	<b>59</b>	<b>148</b>	<b>380</b>	<b>56</b>	<b>356</b>	<b>26</b>	<b>295</b>	<b>193</b>	<b>67</b>	<b>168</b>	<b>67</b>	<b>87</b>	<b>2,228</b>

**Annual Table 5: WBG Hydropower (>10 MW) Commitments by Institution or Unit**

<b>Institution or unit</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>Grand total</b>
IBRD Carbon Finance													4		15	15	34
IBRD/IDA		125	122	912		310	750		196		320		177	192	66	283	3,453
IFC		25	39	26	186	7	36		200					45		49	612
IFC Carbon Finance																11	11
MIGA							33	15	65							91	203
<b>Total commitment</b>		<b>150</b>	<b>161</b>	<b>938</b>	<b>186</b>	<b>317</b>	<b>819</b>	<b>15</b>	<b>461</b>	<b>—</b>	<b>320</b>	<b>—</b>	<b>181</b>	<b>237</b>	<b>81</b>	<b>449</b>	<b>4,313</b>

**Annual Table 6: WBG Renewable Energy and Energy Efficiency Commitments by Region**

<b>Region</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>Grand total</b>
Africa		127	73	203		3	12	30	201	7	124		78	32	46	101	<b>1,036</b>
East Asia and Pacific	51		121	410	310	367	400	145	123	139	513	8	124	177	47	314	<b>3,247</b>
Europe and Central Asia		290			33	140	381	14	238	15	68	186	75	139	147	227	<b>1,954</b>
Latin America and Caribbean	2		75	340	199	10	2	41	186	79	219	6	30	78	30	31	<b>1,329</b>
Middle East and North Africa					2	4									40	9	<b>55</b>
Global							32	148		25		12	1		13		<b>231</b>
South Asia			2	222			419	29	85		135	7	108	85	15	65	<b>1,171</b>
<b>Grand total</b>	<b>53</b>	<b>417</b>	<b>271</b>	<b>1,174</b>	<b>545</b>	<b>524</b>	<b>1,245</b>	<b>407</b>	<b>832</b>	<b>264</b>	<b>1,059</b>	<b>219</b>	<b>416</b>	<b>510</b>	<b>339</b>	<b>748</b>	<b>9,023</b>

**Annual Table 7: WBG New Renewables Commitments by Region**

<b>Region</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>Grand total</b>
Africa		2	18	3		3	8	30	5	6	124		16	32	46	46	338
East Asia and Pacific	51				300	49		112	2	139		3	18		37	129	840
Europe and Central Asia							7		9	6	6	2		0	56	6	92
Latin America and Caribbean	2		37	2		3	2	20		78	204	6	26	35		15	430
Middle East and North Africa						4									40	1	45
Global							30	145		10		12	1		13		212
South Asia			2	222				29			110	2	108	38		16	525
<b>Grand total</b>	<b>53</b>	<b>2</b>	<b>56</b>	<b>227</b>	<b>300</b>	<b>59</b>	<b>47</b>	<b>336</b>	<b>15</b>	<b>239</b>	<b>444</b>	<b>26</b>	<b>169</b>	<b>105</b>	<b>192</b>	<b>212</b>	<b>2,482</b>

**Annual Table 8: WBG Energy Efficiency Commitments by Region**

<b>Region</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>Grand total</b>
Africa							4		1	1						4	9
East Asia and Pacific			54	10	10	8		33	121		193	5	1	32	11	23	498
Europe and Central Asia		265			33	140	374	14	229	9	62	183	65	131	41	51	1,598
Latin America and Caribbean					14			6		1	15		0	6	15		57
Middle East and North Africa					2											9	11
Global							2	3		15							19
South Asia									6		25	5	1				37
<b>Grand total</b>		<b>265</b>	<b>54</b>	<b>10</b>	<b>59</b>	<b>148</b>	<b>380</b>	<b>56</b>	<b>356</b>	<b>26</b>	<b>295</b>	<b>193</b>	<b>67</b>	<b>168</b>	<b>67</b>	<b>87</b>	<b>2,228</b>

**Annual Table 9: WBG Hydropower (>10 MW) Commitments by Region**

<b>Region</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>Grand total</b>
Africa		125	55	200					196				62			51	689
East Asia and Pacific			67	400		310	400				320		105	145		163	1,910
Europe and Central Asia		25											10	8	51	170	264
Latin America and Caribbean			39	338	186	7		15	186				4	37	15	16	842
South Asia							419		79					47	15	49	609
<b>Grand total</b>		<b>150</b>	<b>161</b>	<b>938</b>	<b>186</b>	<b>317</b>	<b>819</b>	<b>15</b>	<b>461</b>	<b>—</b>	<b>320</b>	<b>—</b>	<b>181</b>	<b>237</b>	<b>81</b>	<b>449</b>	<b>4,313</b>



### Annex 3: List of FY05 Renewable Energy and Energy Efficiency Projects

(All amounts in millions of U.S. dollars)

No.	Country	Project Name	Energy Type	Financing Source	RE or EE Component Financing
<b>Africa Region</b>					
1	Benin	Energy Service Delivery APL <sup>i</sup>	Biomass	IBRD/IDA	5.70
2	Burkina Faso	BF Power Sector Development <sup>ii</sup>	EE (DSM)	IBRD/IDA	3.38
3	Kenya	Energy Sector Recovery <sup>iii</sup>	Geothermal	IBRD/IDA	31.50
4	Rwanda	Urgent Electricity Rehabilitation SIL <sup>iv, v</sup>	Hydro<10MW EE	IBRD/IDA IBRD/IDA	4.70 0.90
5	Senegal	Rural Electric Service <sup>vi</sup>	Biomass	IBRD/IDA	4.10
6	Sierra Leone	Bumbuna Support SIL	Hydro>10MW	IBRD/IDA	12.50
7	Sierra Leone	Bumbuna Hydro Completion	Hydro>10MW	IBRD/IDA	38.00
8	Sierra Leone	Power & Water SIL	Hydro>10MW	IBRD/IDA	0.57
<b>East Asia &amp; Pacific Region</b>					
9	China	Renewable Energy Scale-Up Program	Wind, biomass	GEF (WB) IBRD/IDA	40.22 87.00
10	China	Heat Reform & Building EE	EE	GEF (WB)	18.00
11	China	PCF Xiaogushan Hydropower	Hydro>10MW	IBRD Carbon Finance	10.00
12	Lao PDR	Nam Theun Social & Environment	Hydro>10MW (mitigation)	IBRD/IDA	20.00
13	Lao PDR	Nam Theun 2 Power	Hydro>10MW	IBRD/IDA	42.00
14	Lao/Thailand <sup>vii</sup>	Nam Theun 2	Hydro>10MW	MIGA	90.60
15	Philippines	PCF-Northwind Bangui Bay	Wind	IBRD Carbon Finance	1.40
16	Vietnam	Rural Energy II <sup>viii</sup>	EE	GEF (WB)	5.25
<b>Europe &amp; Central Asia Region</b>					
17	Bulgaria	PCF-District Heating	EE - district heating	IBRD Carbon Finance	4.34
18	Bulgaria	Energy Efficiency	EE	GEF (WB)	10.00
19	Croatia	Renewable Energy Resources	RE	GEF (WB)	5.50
20	Moldova	Renewable Energy from Agric. Waste	Biomass	GEF (WB)	0.68
21	Poland	Energy Efficiency	EE	GEF (WB)	11.00
22	Romania	Programmatic Adjustment Loan <sup>ix</sup>	EE	IBRD/IDA	10.00
23	Romania	Energy Community of South East Europe	Hydro>10MW rehabilitation	IBRD/IDA	84.30
24	Russian Federation	Kazan Municipal Development <sup>x</sup>	EE	IBRD/IDA	8.75
25	Russian Federation	Russian Sustainable Energy Finance Program	EE	GEF-IFC	7.00
26	Ukraine	Hydropower Rehabilitation	Hydro>10MW rehabilitation	IBRD/IDA	85.86
<b>Latin America &amp; Caribbean Region</b>					
27	Brazil	Brascan Energetica	Hydro>10MW	IFC Carbon Finance	11.00
28	Chile	Hornitos Hydropower	Hydro>10MW	IBRD Carbon Finance	1.58

No.	Country	Project Name	Energy Type	Financing Source	RE or EE Component Financing
29	Dominican Republic	Basic Energy	Wind	IFC	12.00
30	Ecuador	Umbrella of Hydro Projects	Hydro>10MW	IBRD Carbon Finance	1.81
31	Honduras	La Esperanza Hydroelectric Development	Hydro>10MW	IBRD Carbon Finance	0.84
32	Mexico	Waste Management and Carbon Offset	Hydro<10MW	IBRD Carbon Finance	0.60
33	Peru	Poechos Hydropower	Hydro>10MW	IBRD Carbon Finance	0.60
34	Peru	Santa Rosa Hydro	Hydro<10MW	IBRD Carbon Finance	1.50
35	Peru	Peru Bio fuel	Biofuel	GEF (IFC)	1.00
<b>Middle East &amp; North Africa Region</b>					
36	Tunisia	Energy Efficiency Program / Industrial Sector	EE	GEF (WB)	8.50
37	Yemen	Rural Electrification & Renewable Energy Development <sup>xi</sup>	RE	GEF (WB)	0.55
<b>South Asia Region</b>					
38	Afghanistan	Emergency National Solidarity - Supplemental <sup>xii</sup>	RE	IBRD/IDA	5.60
39	India	Allain Duhangan Hydropower	Hydro>10MW	IFC	49.00
40	India	BCML Bagasse Cogeneration Plants	Biomass	IFC Carbon Finance	10.00

Because the WBG supports many cross-sectoral projects, RE and EE components are sometimes buried within larger projects. For example, RE and EE components could be embedded within an agricultural, health, or power project and may not be not coded as an RE or EE component. These endnotes help identify those smaller RE and EE components.

i This project contains a biomass component of US\$5.7 million.

ii This project dedicates US\$3.38 million to support demand-side management and energy efficiency initiatives.

iii The figure of US\$31.5 million includes the Bank's 50% commitment for the construction of a geothermal plant, including the studies and engineering for the plant.

iv This project includes US\$4.7 million for the rehabilitation and construction of small and micro-hydro units, and for feasibility studies for future hydro projects.

v This project includes US\$0.9 million for the efficient utilization of biomass resources.

vi This project includes US\$4.1 million for two sub-components: Sustainable Wood\_fuels Supply Management and Demand Management and Inter-fuel Substitution Options.

vii Thailand as power purchaser was a signatory to the guarantee agreement

viii This GEF grant of US\$5.25 million is to be used for capacity building for energy efficiency activities.

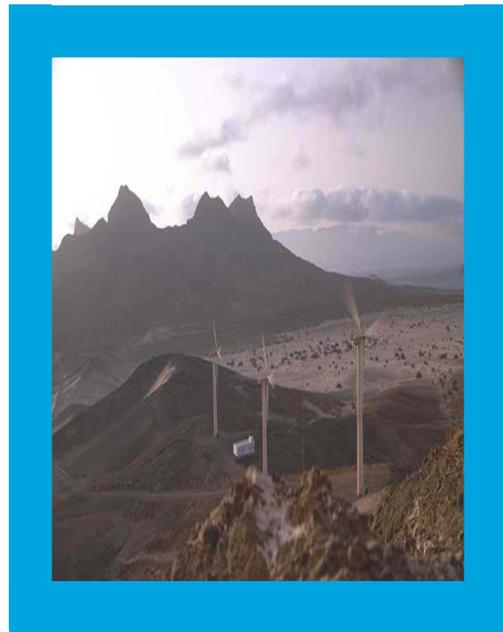
ix This project includes US\$10 million for district heating restructuring and is one of 3 energy sector policy objectives.

x This project dedicates US\$8.75 million to district heating activities.

xi The renewable energy component of this project is 55% of a US\$1 million GEF grant.

xii This project dedicates 20% (US\$5.6 million) of the US\$28 million IDA grant to renewable energy.





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