

# Expanding Energy Efficiency Interventions

It is possible to improve energy efficiency in many ways. The production, distribution, and use of energy all offer opportunities. Buildings can be insulated better, industries can upgrade equipment, and inefficient power plants can be rehabilitated or replaced with more efficient ones. These opportunities can be captured in every sector of the economy, but despite cost savings, this does not happen readily because of a variety of barriers. It can be that the companies are not informed about the possibilities, that they lack the money and cannot obtain financing, that the laws in place are not favorable, that the projects are too small, or that the technology is not available or proven in a particular location. The solutions need to be as diverse as the problems, and they need to include modifying laws, improving technologies, setting the right prices, and opening markets. The World Bank Group has projects in each of these areas with the goal of transforming energy markets and bringing other sources of investment to capture energy efficiency opportunities.

## Opportunities and Benefits of Energy Efficiency

Every country and every sector of the economy have the potential for energy savings (see Table 3). The production of energy can be more efficient by improving power plants and transmission systems.

The use of energy in buildings, industries, and transports can be reduced by 33 percent by 2050 according to the International Energy Agency.<sup>7</sup>

The lighting sector in developing countries has enormous potential for energy savings and improved quality. The demand for electric lighting is increasing twice as fast in developing countries (3.6 percent) as in industrial countries (1.8 percent). Developing countries are using more and more electricity, including for lighting. Whereas lighting is on the order of 5–15 percent of energy use for households in industrial countries, in the developing world it is typically much greater. Remarkably, poor households without access to electricity can pay as much for kerosene used in lanterns as their wealthier counterparts pay for

<sup>7</sup> IEA, “Energy Technology Perspectives,” Paris, 2006.



**Table 3: Energy Efficiency Opportunities in Important Consuming Sectors**

<i>Sector</i>	<i>Energy efficiency improvement opportunities</i>
Buildings	Integrated building design, better insulation, advanced windows, energy-efficient lighting, space conditioning, water heating, and refrigeration technologies.
Industry	Industrial processes, cogeneration, waste heat recovery, preheating, and efficient drives (motor, pump, compressors).
Cities and municipalities	District heating systems, combined heat and power, efficient street lighting, efficient water supply, pumping, and sewage removal systems.
Agriculture	Efficient irrigation pumping and efficient water use, such as drip irrigation.
Power supply	New thermal power plants: Combined cycle, supercritical boilers, integrated gasification combined cycle (IGCC), and other advanced combustion technologies.  Existing generation facilities: Refurbishment and repowering (including hydropower), improved operation and maintenance practices, and better resource utilization (higher plant load factors and availability).  Reduced transmission and distribution losses: High-voltage lines, better-insulated conductors, capacitors, efficient and low-loss transformers, and improved metering systems and instrumentation.
Transport	Efficient gasoline and diesel engines, urban mass transport systems, modal shifts to inter- and intracity rail and water transport, improved fleet usage, and compressed natural gas (CNG) vehicles.
Households	Lighting, appliance efficiency, and improved cook stoves.

much higher-quality electric lighting. The quality and efficiency of lighting technologies adopted in the next twenty years will have significant implications for the environment and development.

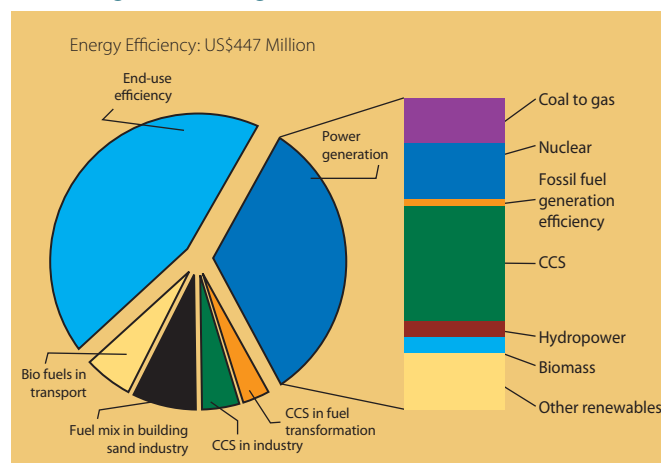
Energy efficiency reduces the demand for funds in developing countries by deferring the need for new power plants and fuel whose cost is rising. It also reduces costs of operation and maintenance, and can improve productivity. Companies increase their financial performance and countries become more competitive thanks to an efficient private sector. Less energy use also provides public benefits by reducing pollution and improving work conditions from better light and indoor air quality. When it comes to climate change, energy efficiency is the largest, least expensive, and fastest way to reduce its effects over the next decades (see Figure 3).

### Barriers to Energy Efficiency Investments

Although the economics of energy efficiency measures are compelling and often underlie

the financial decisions that drive larger project designs, a focus on energy efficiency is rarely the primary rationale of an investment decision. More often, an industrial operator seeks to modernize or expand its operations, or a commercial building operator seeks more reliable space conditioning equipment or more attractive and

**Figure 3: Reductions in Greenhouse Gas Emissions by Consuming Sector through 2050**



Source: IEA, "Energy Technology Perspectives," Paris, 2006.

functional lighting, and the associated energy efficiency cost savings provides the financial return necessary for the project to go ahead.

While projects with strong energy efficiency components are appealing financially, cost-saving measures are rarely recognized as creditworthy by banks, and even less frequently viewed as a target business for lending. Since debt financing is usually critical for energy efficiency investment, this lack of recognition is a serious constraint. Financial institutions traditionally have not organized products and marketing efforts to capture energy efficiency opportunities—a major missing force for investment. The lack of a systematic business focus on the energy efficiency market opportunity has transcended global financial markets—from the larger international financial institutions to local commercial banks and leasing companies.

### **World Bank Group Energy Efficiency Investments**

Since 1990, the World Bank Group has invested nearly \$3.1 billion in energy efficiency in about 120 projects in 40 countries. There are projects in all regions with a significant concentration in Europe, Central Asia, East Asia and Pacific. A few sectors have received a larger share of the investments, in particular industries, district heating, and electric power. In the past much of the energy efficiency investment was for improving district heating systems. This fiscal year saw the beginning of several projects to provide modern and efficient lighting technologies for grid-connected and off-grid consumers.



### **Private Sector Finance for Energy Efficiency**

Convincing private banks to invest in energy efficiency is a key feature of the World Bank Group approach as it allows leveraging its own resources. The World Bank offers technical assistance and financial intermediary loans for this purpose. For example,

- The World Bank brought together domestic banks in Brazil, China, and India to share experiences, create partnerships, and explore opportunities for energy efficiency investment.<sup>8</sup> This project highlighted the importance of a dialogue between banks and technology suppliers. One such exchange led to new lending programs for energy efficiency in several Indian banks. Major Chinese banks created a concept for an energy

<sup>8</sup> The project is funded by the Energy Sector Management Assistance Programme (ESMAP) and the United Nations Foundation (UNF) and is implemented with the United Nations Environment Programme (UNEP). A World Bank book expected for the end of 2007 will synthesize the practical knowledge from the project, together with additional knowledge from efforts in different countries on this topic.



helped offer advice on setting up energy efficiency service companies, training, and outreach.

The IFC's strategy to mobilize energy efficiency investments makes the most of its position as a lender for private sector projects in developing countries. First, it targets opportunities emerging from its own investment business, and second, it explores the corporation's network of more than 400 commercial financial institution clients (see Box 5).

### Energy Efficiency Action Plan

After years of effort to catalyze substantial energy efficiency investment in client countries, the WBG began evaluating its own business in order to understand best how to more systematically and strategically support client countries in energy efficiency. The World Bank launched an Energy Efficiency Action Plan for Sustainable Development (EEfSD) in 2007 to guide actions in client countries on multiple fronts. The

Action Plan comprises four tracks:

efficiency financing project (see Case Study Three). In Brazil, banks developed a loan guarantee for energy service companies.

- In the Second Renewable Energy Project with the India Renewable Energy Development Agency (IREDA), energy efficiency investments were supported through an IDA credit of US\$17 million that leveraged an additional US\$58 million from IREDA's own resources, loans from other commercial sources, and developer's equity and saved an equivalent of 86 MW of generation capacity at an investment cost of under US\$900/kW. Five million dollars in cofinancing from GEF

1. Integrating energy efficiency within economic and sector work.
2. Mainstreaming energy efficiency in investment operations by systematically integrating energy efficiency operations within the core energy practice by replicating the "business-as-usual" and proven energy sector project designs and instruments.
3. Improving the internal operational, learning, and analytic capacity to provide broad-based analytical and operational support, including developing new finance instruments or adapting existing ones.

### **Box 5: IFC Financial Intermediation in Energy Efficiency**

The size of investments in energy efficiency is often smaller than the amount the IFC and World Bank find most efficient, despite the potential for high returns and development impact. These projects, however, are a perfect fit for many financial institutions in developing countries, such as commercial banks and leasing companies.

In 1997 the IFC began to work with some of the 400 financial institutions among its clients. Although energy efficiency is not a specific business for most of them, they all have loans for sustainable energy projects in their portfolio. The IFC works with the institutions to align energy efficiency investments with their business strategy. This may include, for example, lending to small and medium enterprises (SMEs), marketing new products to existing clients, or using a bank's position as a holder of accounts for municipal governments. The IFC then works with their management to develop financial products, train the bank staff to market the new product, and develop credit procedures for what might be a new class of borrowers in their pipeline. This includes how to assess risk and value in investments for energy efficiency.

The IFC will choose to use financial tools or advisory services depending on the needs of each client. This includes enabling long-term financing in local currency or sharing the risk with the financial institution while it builds experience. In each case, IFC support is a short-term boost to build capacity and enthusiasm for a growing investment business.

Results to date are impressive. The IFC has supported more than 20 financial institutions, leading to an estimated more than US\$120 million in energy efficiency lending and a much larger pipeline of expected future investment.

4. Monitoring, evaluation, and outreach in relation to developmental outcomes and results.

In 2004, IFC started to identify clean energy components within its own investments as part

of a process to determine whether such efforts could be expanded. This new tracking system will be extended to the World Bank to identify new energy efficiency investment opportunities (Box 6).

### **Box 6: Identification of New Energy Efficiency Opportunities through the IFC's Investment Tracking System**

Starting in fiscal 2005, by developing and refining an investment tracking system that identifies the energy efficiency and renewable energy components embedded in its core investment business, the IFC has developed a full understanding of where energy efficiency opportunities emerge across the industry sectors in its portfolio. The exercise has identified a broad range of energy efficiency investments across the power generation and distribution business, municipal water system investments, and throughout the general manufacturing, chemicals, agribusiness, and mining businesses. In the process, the IFC identified close to US\$2 billion in energy efficiency and renewable energy investment resident in 25 projects in its portfolio of fiscal 2007 new investment commitments. These investments are typically a small part of a much larger loan, and most often take place without any deliberate promotion or incentives from IFC, but driven by the production efficiency gains inherent to energy efficiency applications. Based on this profile, the IFC has identified a portfolio of energy efficiency investment opportunities it is seeking to replicate and expand by systematically identifying similar opportunities in the market and working with project sponsors as part of the IFC's appraisal process. The IFC seeks to leverage its financial appraisal and review procedures to promote greater energy efficiency investment and offering more value to its clients and greater overall development impact.

### CASE THREE

## PROMOTING ENERGY EFFICIENCY INVESTMENTS THROUGH FINANCIAL INTERMEDIATION IN CHINA

The National Development and Reform Commission of China launched the “1000 Large Industrial Enterprises Energy Conservation Action Plan” in April 2006, targeting the top 1,008 largest industrial energy consumers. Together, these account for approximately 30 percent of China’s total primary energy consumption. The conservation opportunity in these industries is often referred to as a “goldmine” of energy savings by Chinese energy

conservation experts because of the potential for significant savings.

The estimated energy conservation investments needed to achieve the 20 percent energy efficiency target of the National Development and Reform Commission surpass US\$50 billion—most of them in the industrial sectors. The World Bank-GEF funded First and Second China Energy Conserva-



tion Projects in the 1990s successfully introduced an energy performance contracting mechanism through energy management companies to support small commercially viable energy conservation projects. The proposed China Energy Efficiency Financing (CHEEF) project, prepared by the World Bank in fiscal 2007, is an important follow-up. The CHEEF project complements and reinforces several ongoing World Bank/IFC energy efficiency projects through a focus on the medium-size and large industrial energy conservation investment market. The proposed CHEEF project will provide (a) a Bank loan of US\$200 million to support energy conservation investments in target industries through the selected participating financial institutions; and (b) a GEF technical assistance grant of US\$13.5 million to strengthen the government capability to enforce related laws, regulations, and standards; and (c) assist the private financial institutions to

develop and sustain energy conservation lending business lines.

This integrated IBRD/GEF funded project is designed to help remove the principal barriers impeding investments in medium-size and large industrial energy conservation projects. The GEF grant-financed technical assistance activities will address the knowledge, institutional, and capacity gaps of the banking sector, mitigate the risk concerns of enterprises, and strengthen the governmental supervision of industrial energy conservation. The efforts of the energy conservation financial intermediary lending program are expected to demonstrate the financial viability of medium-size and large industrial energy conservation investments, and provide direct support to the government's energy conservation priorities during the 11th Five-Year Plan period.

