Workshop Proceedings Series 007/08
October 2008

FINAL VERSION

Bridging the Energy Efficiency Divide: Implementation Models and Best Practices

Energy Sector Management Assistance Program

Energy Sector Management Assistance Program (ESMAP)

Purpose

The Energy Sector Management Assistance Program is a global knowledge and technical assistance partnership administered by the World Bank and sponsored by bilateral official donors since 1983. ESMAP's mission is to assist clients from low-income, emerging, and transition economies to secure energy requirements for equitable economic growth and poverty reduction in an environmentally sustainable way.

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- Enhancing energy efficiency for energy secure economic growth, and
- Deploying renewable energy systems for a low carbon global economy.

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Bridging the Energy Efficiency Divide: Implementation Models and Best Practices

Energy Sector Management Assistance Program

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First printing October 2008

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This report documents the proceedings of the International Energy Efficiency Roundtable "Bridging the Energy Efficiency Divide: Implementation Models and Best Practices" held on July 19, 2007 in Tokyo, Japan. The event was organized by the Energy Sector Management Assistance Program (ESMAP) at the World Bank, along with the Ministry of Finance of the Government of Japan and the World Bank-Tokyo Office. The roundtable contributed toward greater appreciation of the benefits of efficient use of energy, and in learning more about effective measures, policies and programs for scaling up energy efficiency efforts across the world. The report is based on the presentations and recorded transcripts at the roundtable. The roundtable agenda and list of participants are included in appendixes A and B, respectively.

The roundtable was task-managed by Mr. Ashok Sarkar, Senior Energy Specialist and Energy Efficiency Thematic Leader at ESMAP, World Bank, Washington, DC and was organized with support from Mr. Koichi Omori, Communications Associate, World Bank Tokyo Office. Mr. Jamal Saghir, Director, Energy, Transport and Water Department at the World Bank, Mr. Ede Ijjasz, Manager, ESMAP, and Mr. Lester Dally, Acting Special Representative, World Bank Tokyo Office (now, Sr. External Affairs Counsellor in World Bank, Washington), provided strategic vision and guidance for this effort. The team is grateful for valuable support from Ms. Yoshiko Maruyama of World Bank Tokyo Office and Ms. Nyra Wallace of ESMAP.

More than 55 participants, including high-level energy efficiency decision makers from the government, private and financial sector practitioners from 15 countries, and senior officials from various bilateral and multilateral development organizations attended the event. Special thanks go to all the excellent presenters, moderators, and participants for their contributions to make the roundtable successful.

Additionally, thanks are due to Ms. Janice Tuten for compiling the draft of these proceedings and to Mr. Shyam Menon for its early review and edits. Special thanks to Ms. Marjorie K. Araya (ESMAP), Ms. Janice Tuten (Consultant), and Ms. Thaisa Ysonde Tiglao (ESMAP, now EXTOP) for coordinating the editing and production of this report.

Please address questions or comments to Mr. Ashok Sarkar (asarkar@worldbank.org).

Abbreviations and Acronyms

ACM	approved consolidated methodology
ADB	Asian Development Bank
AfDB	African Development Bank
AM	approved methodology
APEC	Asia Pacific Economic Cooperation
APP	Asia-Pacific Partnership
ATC	aggregate technical and commercial
BEE	Bureau of Energy Efficiency (India)
CDM	clean development mechanism
CEIF	clean energy investment framework
CER	certified emission reduction
CF	carbon finance
CFL	compact fluorescent light
CO_2	carbon dioxide
CONAE	National Commission on Energy Saving (Mexico)
CPA	CDM project activity
DSM	demand side management
EBRD	European Bank for Reconstruction and Development
EC	energy conservation
EE	energy efficiency
EE&C	energy efficiency and conservation
ELI	Efficient Lighting Initiative
EMCO	energy management company
EPC	energy performance contracting
ESCO	energy service company
ESMAP	Energy Sector Management Assistance Program (World Bank)
FAO	Food and Agriculture Organization (UN)
FI	financial institution
GEF	Global Environment Facility
GHG	greenhouse gas
IDB	Inter-American Development Bank
IEA	International Energy Agency
IFC	International Finance Corporation (World Bank)
IFAD	International Fund for Agricultural Development (UN)
IGCC	integrated gasification combined cycle
JAMA	Japanese Automobile Manufacturers Association
JI	joint implementation
LED	light emitting diode
LPG	liquefied petroleum gas
M&V	monitoring and verification
METI	Ministry of Economy, Trade, and Industry (Japan)
MIGA	Multilateral Investment Guarantee Agency (World Bank)
POA	program of activity
PV	photovoltaic

RE	renewable energy
REEEP	Renewable Energy and Energy Efficiency Partnership
SDA	State Designated Agency
SME	small and medium enterprises
TA	technical assistance
tce	tons of coal equivalent
toe	tons of oil equivalent
UNIDO	United Nations Industrial Development Organization
VER	verified emission reduction

1. Introduction

On July 19, 2007, the joint roundtable on Bridging the Energy Efficiency Divide: Implementation and Best Practices was held to discuss greater appreciation of the benefits of efficient use of energy and to learn more about effective measures, policies, and programs in this field; to enhance the understanding of the growing importance and role of energy efficiency in the context of climate change and energy security; to increase awareness of the market opportunities; and to demonstrate best practices in the area of policies and investments.

The roundtable was organized jointly by the World Bank's ESMAP Program, the Ministry of Finance of the Government of Japan, and the World Bank's Tokyo office.

The roundtable had the following specific objectives:

- To learn from Japan's experience with energy efficiency, such as the importance of regulatory and the institutional frameworks and sectoral approaches.
- To discover ways that global or regional experiences can be used to support growing countries to formulate effective policy framework and institutional grading.
- To explore different financing mechanisms for developing nations.

The roundtable brought together more than 55 participants including high-level energy efficiency decision makers from the government, private, and financial sectors; practitioners from 15 countries; and senior officials from various bilateral and multilateral development organizations. Their presentations and active participation contributed toward greater appreciation among all participants of the benefits of efficient use of energy, as well as in learning more about effective measures, policies, and programs in this field.

This report on the proceedings of the joint roundtable summarizes the discussions on various topics, based on the presentations made by various speakers. The chapters of this report correspond with the different sessions of the roundtable. The agenda and list of participants are included in appendixes A and B, respectively. The slides from the presentations are included in appendix C. This roundtable helped enhance the understanding among all participants of the growing importance and role of energy efficiency in the context of climate change and energy security, increased awareness of the market opportunities, and demonstrated best practices in the area of policies and investments.

2. Bridging the Energy Efficiency Divide: Opening Session

The Deputy Director General of the International Bureau of the Ministry of Finance of the Government of Japan welcomed participants from 15 countries and more than 30 organizations, followed by introductory presentations by speakers from the World Bank and the International Energy Agency.

Opening Remarks—Key Messages

Climate change was discussed at the G-8 Summit in Heiligendamm and will be the main agenda at the G-8 Tokyo Summit in 2008. As Japan's commitment to address climate change, Prime Minister Abe launched "Clean Earth 50," which proposes a common goal for the world of cutting global emission by half to the same level as the capacity of natural sinks by 2050. As a medium-term goal, Prime Minister Abe proposes three principles in designing a complete framework beyond 2012 as a post-Kyoto Protocol regime. Commitments under the Kyoto Protocol account for only 30% of global emissions; the future framework would need more effective measures with participation of all major emitters. Second, the framework must be flexible and diverse, with consideration for the circumstances in each country. Third, the framework must achieve compatibility between environmental protection and economic growth by using technology.

Energy efficiency, as is the focus of this roundtable, should play an important, critical role to tackle climate change as it provides commercially viable solutions to all stakeholders and enables countries achieve compatibility between environmental protection and economic growth.

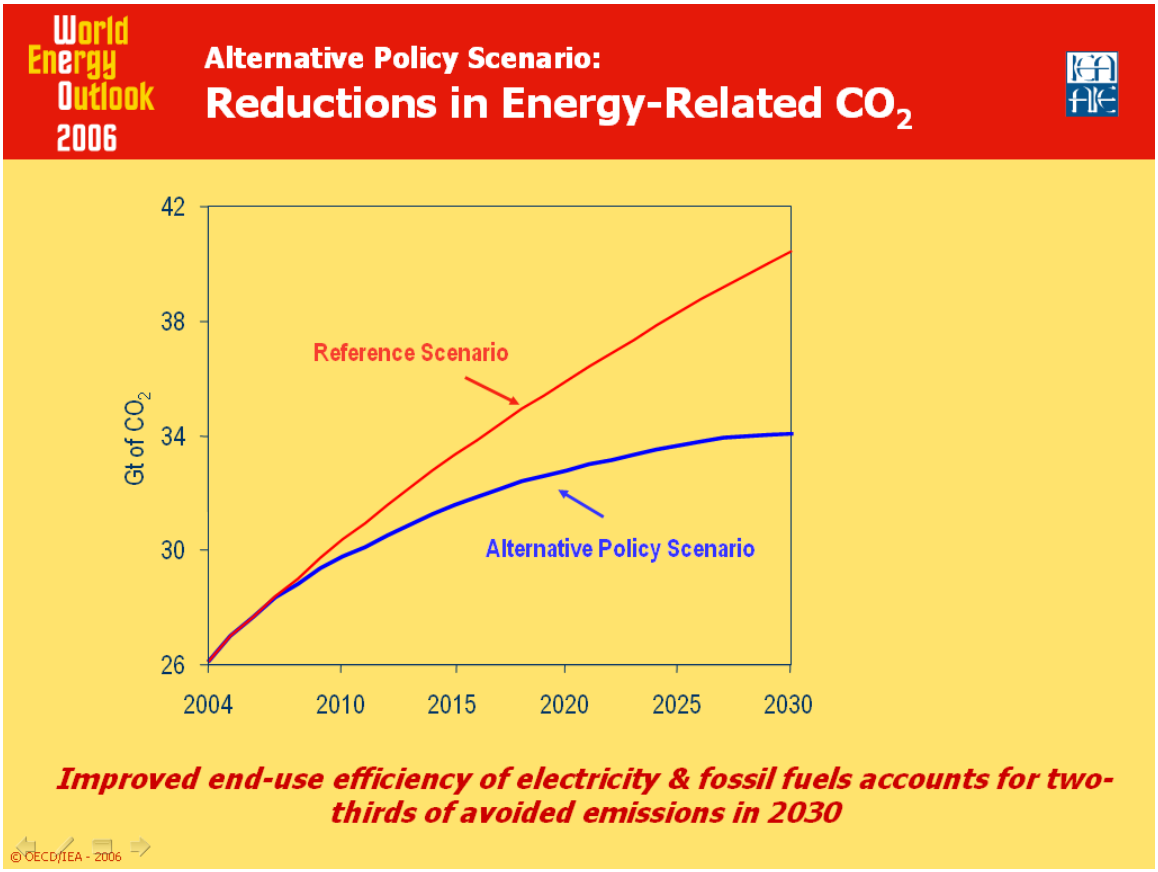
Global Energy Efficiency Scenarios and Sectoral Approaches to Climate Change Policy and Energy Efficiency

Global demand for each primary energy source—oil, coal, gas, other renewables, nuclear, and hydro—is growing rapidly, driven by population and economic growth. With current policies, it is clear that we are not on track in terms of addressing energy security or climate change concerns. Half of the projected increase in emissions comes from new power stations, mainly using coal, and mostly located in China and India.

Governments are taking action, but at the global level, we have yet to see the human imprint on emissions reductions. An alternative policy scenario—based on surveys of actions of IEA member countries and major industrializing countries as well as assumptions about polices in the rest of the world—shows that 66% of greenhouse gas (GHG) emission reduction that would occur between the reference case and the alternative policy scenario would be due to induced energy efficiency.

Induced energy efficiency could be the biggest contribution of GHG reductions in the future. That is, we can continue to provide the same energy service levels and pursue economic growth with less energy use.

So, in this context, energy efficiency can be considered as a fuel contribution, which along with power sector efficiency, and increases in renewables and nuclear power can lead to significant reduction in emissions. In the IEA alternative policy scenario, improved end-use efficiency of electricity and fossil fuels accounts for two-thirds of avoided emissions in 2030.



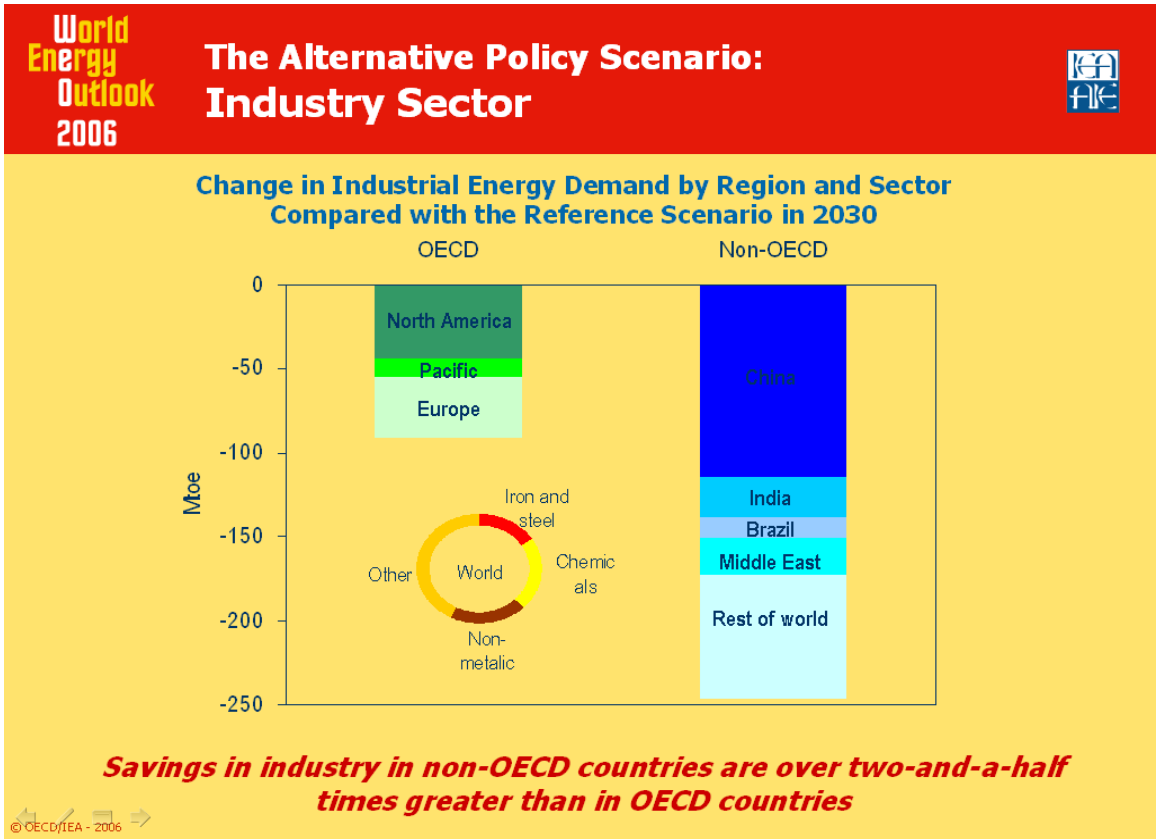
Source: Alternative Scenarios and Sectoral Approaches (SA). Richard Bradley, July 2007.

How can we change today's trends? As we know from discussions about a framework for the post-2012 period, there is no common approach to achieve emission reductions. For example, there is increased current attention on the use of emissions trading, but there is uncertainty about the future, for a framework or agreement. In a world without consensus to move forward, we need to look for new ways to achieve emission reductions. The relatively long lifetime of CO_2 in the atmosphere means that the emissions generated today will last for centuries. To alter that scheme, the IEA alternative policy scenario shows that energy efficiency is a viable option.

Are there other structures besides national or international frameworks to achieve reductions while the global community tries to reach consensus? The International Energy Agency has looked at sectoral approaches. Energy efficiency is a particularly useful way to reduce emissions in sectors and end users because that is where the market failures and market barriers exist. So it is at this level that we need to think about designing policies and structures to achieve reductions. Parties give many reasons for sectoral approaches, but they have not included every sector; in the emissions trading system, for example, airline transport and transport in general. It can be argued that certain sectors will be treated differently (perhaps for reasons of national security).

Why focus on sectors? There has been rapid growth in GHG-intensive industrial activities outside Annex 1 regions; sectoral approaches might be a vehicle for achieving emission reductions there. A focus on sectors could reveal win-win opportunities for CO_2 reductions, particularly emphasizing the role of energy efficiency.

A new IEA book, *Energy Use in the Millennium*, shows tremendous industry growth in almost all regions, but particularly in China. In most cases, except in Europe, there has been a dramatic increase in energy use, as well, so looking historically; this would be a target for improved energy efficiency. Looking to the future (2030) savings in industry in non-OECD countries are more than two-and-a-half times greater than in OECD countries. Some of the largest potential for improvement at zero or negative cost exists in developing and industrializing countries.



Source: Alternative Scenarios and Sectoral Approaches (SA). Richard Bradley, July 2007.

Sectoral approaches—a typology: This effort has tried to categorize the various approaches made for sectoral analysis. One problem is the use of the term "sectoral approach" without being clear about the meaning. There is a large variety of sectoral approaches in the market; many have energy efficiency at the core.

The sectorwide transnational qualitative approach has, by and large, come from industry, for example, the International Aluminum Institute sustainability goals (including PFC reductions) in which an agreement is made among industry partners.

The current discussion, which is targeted to developing countries, looks at specific sectors that could be included in a larger crediting arrangement. One argument might be the expansion of the Clean Development Mechanism (CDM) or a similar trading mechanism. For example, South Africa has talked about using sustainable development policies and measures (SD-PAMs) at the sector level as forms of commitment to improving energy efficiency and reducing GHG emissions.

Examples of technology-oriented sectoral agreements include one by the International Iron and Steel Institute, the "CO_2 breakthrough program," and various public-private partnerships to deliver future low-emission technologies.

The G-8 Heiligendamm Communiqué used the following language in the context of support for sectoral approaches:

> G-8 leaders: "Action of emerging economies could take several forms, such as *sustainable development policies and measures*, an improved and strengthened *clean development mechanism*, the setting up of plans for the *sectors that generate most pollution* so as to reduce their greenhouse gas emissions compared with a business as usual scenario."
>
> G-8 + 5 leaders: "We need a flexible, fair and effective global framework and concerted international action. We underline *the crucial role of economic incentives, in particular by carbon markets*, for the necessary investments in climate-friendly technologies at *large scale*."
>
> "We confirm our commitment to promote *energy efficiency* through cost-effective solutions."

Competitiveness: There have been various industry-led efforts to establish sectoral approaches, for example, the sustainability of an activity vis-à-vis greenhouse gas emissions (good corporate citizenship) and to possibly substitute lighter/smarter constraints/costs for the more heavy-handed constraints that might have come with government intervention. The Asia-Pacific Partnership and Clean Development and Climate (AP6) industry partners have shared know-how with China and India, which is, of course, another effective alternative. The European Union has discovered, as it starts to think about its approaches of commitments, that the way they allocated permits among sectors and among firms within sectors turned out to be controversial; it led in parts to the

crash in the prices of the carbon credits in the past two years. One argument that the European Commission now makes is they realize that they made allocations to the industry without understanding where industry actually was, in terms of performance, and that it could use a sectoral approach to develop information that could help make future allocations fair and more efficient.

Critical steps: We need to understand how to effectively link climate change debate to the opportunities that energy efficiency offers. Obvious benefits include lower pollution, enhanced energy security and economic performance, and lower GHG emissions as a co-benefit. It is necessary to bring the right decision makers to the table to shift the debate from a North-South antagonism to a concerted win-win action, highlighting energy, economic, and social aspects.

The issue of a new forum for international cooperation on energy efficiency is an important critical next step that should be considered. A great deal of additional detail needs to be understood at the industry level about how such an agreement would work. Additional studies need to be carried out for more concrete analyses of the implications of different approaches to sectoral agreements.

3. Energy Efficiency: Lessons from Japan

This session presented three perspectives—government, industrial, and trade association—on energy efficiency and conservation in Japan

The Roadmap to Success for Energy Efficiency Improvements in Japan

Despite the recent rapid oil price increase of 2.8 times, the consumer price index decreased more than 0.3 % in Japan. The reduction in two factors—oil dependency and energy intensity—was essential to achieve this decoupling between oil prices and the consumer price index in Japan. Furthermore, improved energy efficiency resulted in a significant reduction of the impact of oil prices and imports on the total GDP of Japan.

Japan's energy intensity is the lowest among major economies. In the industrial sector, the Energy Efficiency Law regulates large energy-consuming factories to improve energy efficiency by 1% annually, to submit annual reports and mid- to long-term EE plans, and to appoint a qualified energy manager (30,000 experts have passed a national exam for energy managers and have at least one year of experience). Insufficient performance could result in an administrative order with fines. Incentives for investments in EE facilities and equipment include tax reductions and subsidies.

Japan's residential and commercial sectors have standard regulations for energy efficiency. Buildings with more than 2,000 square meters of floor space must report on their energy performance at the time of construction or renovation. The "Top Runner" program, introduced in 1999, sets mandatory efficiency standards for 21 products, including household appliances, and identifies the most energy efficient products commercially available (see table 1). The results have been impressive; for example, energy efficiency of VCRs improved 74% and of air conditioners improved 68% in about seven years. As the standards increase for target years; fines will be imposed on manufacturers who do not comply with the higher levels. An EE labeling program also increases energy-efficiency awareness for 16 end-use products.

Table 1 Top Runner Energy Efficient Products

1. Passenger vehicles	8. Computers	15. Oil water heaters
2. Freight vehicles	9. Magnetic disc units	16. Electric toilet seats
3. Air conditioners	10. Electric refrigerators	17. Vending machines
4. TV sets	11. Electric freezers	18. Transformers
5. Video-cassette recorders	12. Space heaters	19. Electric rice cookers
6. Fluorescent lights	13. Gas cooking appliances	20. Microwaves
7. Copiers	14. Gas water heaters	21. DVD recorders

The transport sector is also regulated by the Energy Efficiency Law. Large carriers and consigners must submit annual reports and mid- to long-term EE improvement plans. Significantly poor performance is subject to administrative order and fines. Automobiles and buses have also improved through the Top Runner program: the 2010 standard set in 1999 was almost achieved in 2004; a new fuel efficiency standard will be set for 2015. Green taxation, which differentiates tax levels based on fuel economy and gas emission performance, and traffic management systems also improve the energy efficiency of the transport sector.

Technology development is key to improving energy efficiency, for example, coke dry quenching (CDQ) for iron and steel, the new suspension preheater (NSP)-type kiln for cement, as well as new technologies for refrigerators, water heaters, and lighting. However, effective energy efficiency implementation requires strong cooperation between the government and private sectors. The Ministry of Economy, Trade, and Industry (METI) is in charge of policy planning, regulations, and incentive measures in Japan. The Energy Conservation Center of Japan (ECCJ), a non-profit private organization, gathers information, provides energy audits and guidance, and promotes wider use and international cooperation. The New Industrial Technology and Energy Development Organization (NEDO), a government-owned center for the development of energy-related technologies, supports new technologies and international cooperation. The government sector cooperates closely with the Japan Business Federation and industrial associations in the private sector.

Taxes on petroleum and coal fund a special budgetary account for energy to implement policies and measures including legislation, regulation, incentives, and publicity, which have improved energy efficiency by 37% between 1993 and 2003. The New Energy Strategy targets 30% more improvement by 2030.

At the international level, Prime Minister Abe of Japan proposed “Cool Earth 50,” which includes a long-term strategy to cut global greenhouse gas emissions by half by 2050 by developing innovative technologies and building a low-carbon society. Prime Minister Abe also presented three principles for establishing an international framework beyond 2013:

- All major emitters must participate, thus moving beyond the Kyoto Protocol, leading to global reduction of emissions.
- The framework must be flexible and diverse, and consider the circumstances of each country.
- The framework must achieve compatibility between environmental protection and economic growth through energy conservation and other technologies.

Energy efficiency in developing countries: Asian countries are moving forward to improve energy efficiency for their own economic prosperity. For example, China’s five-year plan aims to improve energy efficiency by 20% by 2010; 1,008 large energy-consuming factories must formulate energy conservation plans. India has established a Bureau of Energy Efficiency, activated the Energy Efficiency Act, drafted energy

efficiency standards for the cement and paper sectors, and implemented a labeling system for refrigerators and fluorescent lamps. Indonesia's Presidential Decree (2006) aims to make energy elasticity to GDP of 1.0 or below by 2025 and is drafting a new energy regulation. Thailand's energy conservation law was enacted in 1992; subsidies, tax relief, and low-interest loans for energy conservation are available. Vietnam has a decree on energy conservation and efficiency (2003), and a national program on energy savings and effective use (2006) aiming for 3–5% reduction of energy consumption during 2006–10 and 5–8% reduction between 2011 and 2015.

International efforts: Multinational forums have agreed to set EE goals and formulate action plans including the East Asia Summit (January 2007) and APEC (May 2007). The Asia-Pacific Partnership has commenced cooperative projects in eight task areas. The IEA ministerial meeting (May 2007) promoted the development of efficiency goals and action plans at all levels of government. Japan will host the G-8 Summit (July 2008); energy and the environment will continue to be key issues, and leaders will work together with major emerging economies to reduce energy consumption in priority sectors. METI will host the G-8 Energy Ministers (June 2008).

Japanese Industry's Action toward Climate Change: A Study of Toyota

Toyota is an active member of the World Business Council for Sustainable Development, which recommends the following focus areas: energy, climate, development in developing countries, and the role of business. Toyota, as an industry, is in a unique position to carry out research beyond academia and to apply technology and engineering at the commercial level. Toyota's development policy includes four elements: technology, future vision, public institutions, and financial mechanisms.

Toyota's approach has four components: to be comprehensive (for example, by considering CO_2 emissions in the manufacturing process in addition to emissions during driving, as well as emissions based on velocity and traffic flow); to set targets based on benchmarks (for example, using a more efficient "bottom-up" approach for the "Top Runner" to improve engine efficiency and the drive train, and disseminate the hybrid system); to achieve "eco-efficiency" (the balance of *eco*nomy and *eco*logy, for example, the purchase price of a fuel cell hybrid vehicle is much more than a natural gas, D4 diesel, hybrid, or electric vehicle); and to use a parallel approach (to develop options for the market to choose, with competition resulting in the most efficient developments and to use its important partnerships with international policy organizations for climate change). Toyota has held in-depth discussions with the government, academia, and automotive engineers. Toyota—like its competitors, it does not share inside information—has submitted its technology improvement plans to the Japanese Automobile Manufacturers Association (JAMA). This benchmark approach leads to significant improvement in energy efficiency.

Institutional Aspects of Energy Efficiency and Conservation in Japan

Production was a priority in Japan during post-World War II reconstruction. Coal fed the steel production, which fed machinery and industrial exports. A coal shortage led to the regulation of heat management in 1947. By 1948, private sector engineers from the iron, cement, and power industries established the Heat Management Association, which later became the Energy Conservation Center, Japan (ECCJ). Today, the energy conservation market is "pushed" by government regulation and "pulled" by associations or the private sector.

After the 1973 oil crisis, Japan's industries succeeded in energy conservation because of government regulation, support, and subsidies and because international competition caused enterprises to use more efficient practices including quality control and small group activities; investments in energy conservation and technology innovation became necessary. The efforts of enterprises with government support and regulation have brought mutual benefits for energy conservation. ECCJ acts as the bridge between the government and private sector to promote energy conservation.

Enforcement measures include appointment of qualified energy managers in designated buildings and factories to provide technical advice and instruction for employees and to meet the energy conservation law requirements including energy consumption reports and improvement recommendations. ECCJ inspects the facilities and provides support. If the factory assessment is low, an on-site inspection is conducted after six months; if factory standards are noncompliant, then a rationalization plan is required; if those instructions are not followed, the factory is issued an order and its name is publicized. ECCJ also provides a variety of energy management seminars, correspondence classes, and training courses in addition to preparing energy managers for the national exam.

Industries have three energy conservation activities in common: energy management at no/low cost, such as cleaning, measuring, minor repairs, and tuning carried out by operators (Kaizen by Sho-shudan); technical improvement with a medium investment, such as removing obsolete equipment and introducing EE equipment, carried out by engineers and operators (Kaizen by Sho-shudan); and improvement requiring large-scale investment, such as introducing a new process or constructing a new plant—carried out at the task-force level. Since 1976, ECCJ has conducted an annual national convention for thousands of participants to discuss technology and promote excellent cases of successful energy efficiency practices.

ECCJ's activities cover the industrial, consumer, and transportation sectors through dissemination and promotion, training, examination, monitoring, and research. It performs energy conservation audits for more than 300 factories and 450 buildings a year, free of charge through METI funds, to report findings and proposals for improvement. These proposals are made public for the benefit of other facilities.

Internationally, ECCJ advises on policy proposals, trains in capacity building, provides technical assistance through factory diagnoses and energy conservation audits, and supports energy efficiency and conservation (EE&C) centers in various countries. The new Asia EE&C Collaboration Center provides “one-stop service” for inquiries and activities (see http://www.asiaeec-col.eccj.or.jp/). A typical cooperation scheme with ECCJ begins with a request from the counterpart government to the Japanese government. An agreement establishes cooperation with a Japanese organization. For example, a JICA (Japan International Cooperation Agency) project assists a developing country to promote EE&C through expert training in Japan and the provision of equipment to establish a center similar to ECCJ in that country.

4. Energy Efficiency and Technology Transfer

The speaker at the working lunch is an advisor to the Tokyo Electric Power Company.

Energy Efficiency

When we talk about energy efficiency, we usually talk about quantity, but it is important to discuss the quality of energy. The Japanese term *mottai-nai* refers to "a waste," such as keeping the room temperature too low in the summer. Likewise, the inefficient, ineffective uses of fossil fuel are *mottai-nai*. It is not, however, *mottai-nai* to convert fossil fuel to electricity. For future technologies (by 2020) the efficiency could reach more than 50% reduction. This is possible because the quality of energy in electricity is very high and the quality of heat from coal is relatively low. To not be *mottai*-nai, heat pump technology is strongly recommended after converting coal or other fossil fuels to electricity at the highest efficiency.

A thermal power plant is an example of *mottai-nai*. The initial thermal efficiency is as high as 34% but, in the example of a power plant in the Philippines, it decreases rapidly because of the lack of appropriate maintenance and operations practices. Developing countries have two *mottai-nai* situations: First, technology is not modern and initial thermal efficiency is low; second, initial thermal efficiency can decrease quickly due to lack of proper operations and maintenance. Japanese power companies, with the Asia-Pacific Partnership (APP), are helping developing countries to overcome these situations.

Technology Transfer

Six countries participate in the Asia-Pacific Partnership (Australia, China, India, Japan, Republic of Korea, and the United States).[1] The APP has four work streams:

- *Sharing best practices (technology transfer).* In the APP countries, the iron and steel sector has the most advanced approach for EE improvements and it can be replicated in the power generation sector. To share best practices, APP gathered 50 engineers from six countries in April 2007 to discuss "maintaining and improving thermal efficiency of aged coal-fired thermal power plants." Initially Chinese and Indian colleagues wanted information sharing on the latest

[1] Foreign, environment, and energy ministers from partner countries agreed to cooperate on the development and transfer of technology to reduce greenhouse gas emissions. Ministers agreed to new models of private-public task forces to address climate change, energy security, and air pollution. It is a government approach and a sector approach; it is a public-private partnership initiative.

technologies, such as IGCC, but after consultations they agreed that the first step of sharing best practices should address improving efficiency in aged plants.[2]

- *Identifying and removing barriers (especially socio-political barriers).* At least four barriers were identified. (1) The optimal dispatch order mechanism—which means that most efficient power stations have a longer opportunity to run—is not a practice in China because of socio-political reasons. (2) Work sharing in China and India—from the viewpoint of Japanese engineers—results in too many engineers in a single power plant with a job allocation that is too diversified. (3) Cooperation among sections—*kaizen* in Japan—and optimum allocation of responsibilities with daily conversation is very important to improve efficiencies in power plants in Japan, but it is unsure if the *kaizen* practice can be introduced in the different cultures in China and India. (4) Capacity building is necessary.

- *Improving investment conditions* (especially investment structures).

- *Creating new financial flows* (in combination with development assistance, carbon financing, etc.).

[2] The teams met at an aged (1968) power station and at a new one (2003) built with supercritical boiler technology. The initial thermal efficiency of the aged plant has decreased a bit (from 36%) but it can be kept high or improved. Japanese engineers shared with Chinese, Indian, and Korean engineers how they have achieved this long-term efficiency, which includes day-to-day maintenance and operation as well as knowledge and medium-size investment.

5. Energy Efficiency Challenges for the Developing World

This session presented energy efficiency experiences from China, Mexico, and India.

Experience from China: Scaling up Energy Efficiency—Strategies and Financing Options

The EE market is growing.

Over the past four years, energy demand has grown faster than the GDP, which has been more than 10%; the elasticity coefficient is more than 1.0. Four sectors drive the growing demand for energy: infrastructure construction, real estate, industrial development, and exports. The situation is urgent, for example, in the New Shanghai, where the city plans a large industry and market for iron, steel, and cement. Factories (large and small) are booming and enterprises are enlarging. The focus has been on quantity, not on quality or improving competitively, which has resulted in inefficiency. The gap is large between outdated and the most advanced technologies.

The issue of energy efficiency in China has become more serious in recent years. The central government made energy efficiency a priority in the new national strategy. In the long-term, resource conservation is now a national policy. In the mid-term, China's 11th five-year plan raised the target to reduce energy intensity by 20% by 2010. In the short-term, the target was to reduce energy intensity by 4% in 2006; however, actual reduction was 1.33%. The situation is also severe during 2007–08 with the growth of energy-intensive industries. Actions to address energy efficiency include:

- a commitment between provinces and the central government to contribute to the target goal of 20%;
- a goal to eliminate small plants through standards to get rid of outdated equipment, commitments between local governments and enterprises, increased electricity prices for specific enterprises, and pollution-control measures;
- 10 energy conservation projects (including optimizing motor systems, retrofitting boilers and furnaces, conserving energy in government agencies, and building EE) to save 240 million tons of coal equivalent (50 million tce in 2007);
- the 1,000 enterprise energy conservation action program (including signing the energy conservation commitment, ordering energy audits, composing EC plans and energy use reports, and benchmarking) to save 100 million tce by 2010 (20 million tce in 2007).

The potential EE market is large.

Central and local governments as well as enterprises have great opportunities as well as pressure on the political front. The market for advanced EE equipment, as well as

the investment demand and profit margin, are large. Between 2006 and 2010, China has an energy conservation target of 600 million tce, which translates into a total market of US$120-160 billion in those five years.

Barriers affect EE financing.

Various barriers affect EE financing, which is scattered in different industries with secondary investments. Because energy conservation technology does not belong to the enterprises, leaders care more about productivity. Enterprises, especially decision makers, also lack knowledge about reliable economical technologies and providers. Investments to promote EE are lacking because of the preference given for investment in productivity, inability to get bank mortgages, and the difficulty of showing the EE benefit on financial records.

China also promotes energy conservation through energy management companies (EMCOs) that provide services to diagnose, design, finance, purchase, implement, manage, and monitor EC for enterprises. China worked with the World Bank and GEF on the Energy Conservation Promotion Project, the first phase of which introduced three energy service companies (ESCOs) (that did 475 energy conservation projects for 405 enterprises, with 90% of the projects having a payback time of less than three years) and established the EC information center. The second phase provides loan guarantees (based on the output of the first stage) as well as technical and financial assistance. The EMCO mechanism seems very successful in China's EC market. The new EMCO Commercial Loan Guarantee Plan uses World Bank and GEF funds to demonstrate the effect of EE investments.

Experience from Mexico: Transforming the Energy Efficiency Market—Institutional Aspects and Financing

Mexico has tried to promote the message that success in one policy area depends on success in others (box1). The institutions have awareness, but need to promote consciousness in the general society about saving energy.

Box 1: Sustainable development

Sustainable development means economic prosperity and security, enhanced social welfare and social inclusion, and a healthy natural environment. These are all connected; success in one policy area is dependent on success in others.

The energy system and economy in Mexico are excessively dependent on oil and natural gas, with low energy efficiency and higher intensities in the global context. The industrial sector (mainly cement, iron and steel, cement) uses 59% of Mexico's energy, followed by the residential sector at 24%. The National Commission on Energy Savings (CONAE) is targeting those two sectors. The economy mainly depends on its petroleum industry to support the country, which leaves little investment money for improving

energy efficiency and the environment.[3] However, the Trust for Electric Energy Saving (FIDE), a public-private fund implemented in 1990, has produced good results; unfortunately it only works on EE savings mainly for end users of electricity. CONAE would like a similar trust fund to promote thermal efficiency in different applications.

Strategy. CONAE's EE strategy includes assistance, standardization, and promotion through federal and local governments, banking systems, industries, educational institutions, associations, social and private sectors, and the media. The objectives are to conserve energy resources, diversify the energy matrix, protect the environment, benefit household income, use renewable and nonrenewable energies efficiently, and increase private sector competitiveness.[4]

The National Strategy for Climate Change in Mexico set a target reduction of 106.8 megatons of CO_2 per year between 2007 and 2014; energy efficiency is estimated to reduce 27.9 Mt CO_2 per year, mainly through regulations and norms. CONAE has achieved a 2% reduction in national energy use.[5]

Mexico has issued EE standards for 18 products and systems and is working on 4 new standards. An energy working group (with Canada and the United States) tries to harmonize standards throughout the region, which is important because they trade in many such products. One problem is the sale of old appliances in Mexico that no longer comply with standards in the United States. Norms and regulations have increased thermal efficiency for water heaters, resulting in a savings of 997,335 m^3 of LPG since 1996. Mexico is the world's leading consumer of LPG for residential use, so this reduction is a big step.

CONAE has set up or improved specific national EE programs in 2007, including the following:

- *Energy efficiency in federal government buildings*, mandatory since 1999, has generated a cumulative savings of more than 1,800 million pesos in its electricity bill. Since 2002, federal agencies pay 2.5 times the cost of energy, which is a good incentive to promote energy efficiency. However, the Treasury Department does not allow contracts with ESCOs to determine mechanisms to lower energy consumption. CONAE is working to eliminate this barrier, with a target to reduce energy consumption in government buildings by 15% during the next six years. The program has not reduced consumption as much as it hoped; it focused on lighting and worker awareness. Since 2007, CONAE has implemented programs for air conditioning, fuel for the government transportation fleet, and the use of ESCOs, which could increase the reduction of the government energy consumption by 20–25%.
- *The Green Building Initiative* will promote a trademark, *Edificio Verde*, to foster competitive effective sustainable building markets. The certification guidelines,

[3] The administration wants to change that.
[4] Mexico has good experience implementing EE institutions; however, those budgets have been reduced.
[5] During the past administration (2000–06) every US$1 dollar invested in EE initiatives saved approximately US$34.

with help from Canada, will focus on materials, design, usage, regulations, and financial mechanisms. The certification will make energy consumption levels more visible to users, mainly in the residential sector. It hopes that many of the 750,000 homes built each year will be sustainable energy houses.

- *The green mortgages program*, with the National Housing Mortgage Institution, is a financing mechanism to reduce the additional costs of efficient systems; it focuses on solar water heating, thermal insulation, and lighting in low- and medium-income housing. The pilot project targets 10,000 houses equipped by 2007.
- *The solar water heaters program's* objective is to develop a framework for that technology market through regulation and certification, economic incentives, market enhancement, data, and synergies between agencies, with a target to install 1,800,000 m^2 by 2012 and to avoid 450,000 tons of carbon emissions. Mexico has great potential for solar energy and has manufactured solar water heaters for 50 years, but mainly for pools and industry, not the residential sector.
- *The PowerMex Clean Energy and Efficiency Annual Conference* has been conducted for 10 years. CONAE awards energy efficiency and renewable energy initiatives to promote technology and it participates in the international exhibition, which has 140 stands and more than 5,000 visitors each year.

Next steps. Although Mexico has a lot of experience in energy efficiency, it lacks synergy among the different sectors and government institutions. It needs a national program to for greater impact. CONAE's national program (2007–12) hopes to reduce energy intensity through better management and technological processes without adverse economic affects. It will target promising areas, develop a group of experts on indicators and data collection, establish policies and advice, promote investment by increasing awareness, involve development banks in assessing financial mechanisms for EE/RE projects, and promote EE/RE projects in governments and municipalities. The public building initiative has set up energy committees with different institutions; people in charge of maintaining buildings have been taught how to do energy audits and train others in energy conservation.

Financial barriers still need to be addressed in the Mexican EE market. Financial incentives are limited and the national policy is not clear about EE; funding is available only for isolated programs. Local financing institutions, in general, are reluctant to participate in EE projects or innovative schemes with ESCOs; although most have participated, none differentiates EE lending practices.[6] The estimated percentage of EE loans is less than 1%. The situation is critical and there is a need for the government to create awareness with banks and for policies to foster EE investments.

[6] These institutions believe projects need to cost US$50 million to justify the high transaction costs.

The current administration is working on:

- Enforcing norms and standards for sustainable energy use;
- Defining criteria to promote sustainable building in urban development, establishing a certification system, and setting a target for sustainable housing projects per year;
- Promoting sustainable energy investment through engagement and building capacity of local banks by demonstrating EE/RE projects (CONAE has projects with REEEP/UNDP and APEC);
- Encouraging local governments (the enforcers) to review laws, norms, practices, and strategies;
- Creating synergies with stakeholders to implement EE measures, which—as colleagues from Japan have stated—requires involving stakeholders from the beginning for promotion and implementation;
- Identifying possible tax incentives to make technologies affordable and accelerate demand (Mexico has some RE incentives, but EE are more cost-effective and are needed);
- Promoting the use of RE and cogeneration technologies; and
- Designing a national campaign for energy efficiency to improve social awareness and technology.

Experience from India: Promoting Energy Efficiency through the Regulatory Framework and Financing Options

Energy demand is increasing in India because of rising incomes, accelerated industrialization, urbanization, and urban growth—from 572 million tons of oil equivalent in 2003–04 to an estimated 1,500 million toe by 2027. Meeting the increased demand only through increased supply will lead to reduced energy security, adverse environmental impacts, and strain on the balance of payments as well as issues of equity and access. Therefore, energy conservation and efficiency are essential parts of a national energy strategy.

Three key transitions in energy use are occurring in India:

- *The household energy mix is moving rapidly from inefficiently used biomass to gas and electricity*. Since the early 1970s biomass energy has doubled from 100 million toe to about 200 million toe now. Fossil fuels have increased more than six times, from about 50 million tons to more than 300 million tons. As incomes increase, people are moving from the inefficient dirty biomass to commercial fuels—kerosene, LPG, then electricity—which has increased CO_2 emissions. Managing the transition to quality energy but without unnecessary CO_2 emissions is a critical issue for public policy.
- *Commercial space is increasing; commercial building energy use is increasing at a faster pace*. The growing service industry has led to an annual increase in high performance buildings of 10%; their electricity use has increased 12–13% annually. The glass and steel buildings in India require much more energy for air

conditioning than similar buildings in Europe and North America. Therefore, intervention is required.

- *Industrial energy intensity is declining, but the bandwidth of specific energy consumption within industrial sectors is wide*. Indian cement plants are among the most energy efficient in the world, in fact, two cement plants often compete for the world title. The plants are becoming more efficient; however, across sectors, plants coexist with older less-efficient technologies. The challenge to public policy is to address the inefficiencies.

Barriers to energy efficiency include the lack of information about comparative energy use, especially retail appliances; the perceived risk due to lack of confidence in new technologies (in appliances, building design, and industrial technologies); the higher cost of EE technologies; and the asymmetry of sharing costs and benefits, especially in the building sector (that is, a builder might invest in the initial expenses but the tenant will benefit from the energy efficiency, so codes that address the costs and benefits are particularly important for this sector).

The Energy Conservation Act of 2001 addresses these barriers. India's EE efforts go back a long way, however, the success stories need to be replicated on a large scale. The objectives of the Energy Conservation Act are to reduce energy consumption using efficiency and conservation measures, reduce the need to create new capacity thereby saving resources and greenhouse gas emissions, secure environmentally benign and sustainable growth, stimulate market transformation in favor of EE products and appliances, and create the Bureau of Energy Efficiency (BEE) as the nodal agency at the center and State Designated Agencies (SDA) at the state level to implement the Act.

The Act has regulatory provisions, but most provisions are facilitative. Regulatory interventions provide energy use information (such as labeling appliances and providing energy-use information by units within industrial sectors); reduce perceived risk (through bulk procurement, utility driven demand-side management, and performance guarantee contracting through ESCOs); and mandate standards (building codes and sectoral energy consumption norms).

The preparers of the Act looked at experiences around the world and replicated many provisions." The accomplishments of the Act include:

- *Launching a labeling scheme* (May 2006). Fluorescent tube lights, refrigerators, air conditioners, and distribution transformers are covered; labels for motors, transformers, fans, LPG burners, and standby power are under preparation. The labeling program worked with appliance manufacturers to develop the testing and rating systems as well as future rating targets. The emphasis was on inclusiveness while setting future standards to include in technology upgrades. The voluntary program for the initial three types of equipment has been impressive; after a leadtime for industry preparation, the program will become mandatory.
- *Launching the Energy Conservation Building Code* (June 2007). The design of ECBC-compliant buildings is encouraged; training is underway for architects,

designers, and certifiers. The Code covers commercial buildings in five climatic zones; the potential energy-consumption savings is 25–40%. The Code covers building components such as walls, roofs, and windows; indoor and outdoor lighting; heating, ventilation, and air-conditioning; solar water heating and pumping; and electrical systems.

- *Creating a market for ESCOs*. Government buildings are being upgraded; a risk-guarantee fund is being considered to promote lending.[7] India's public building projects have had few ESCO bidders; it is considering the IFC and World Bank's experience with partial risk guarantee schemes so that banks would be more comfortable lending to ESCOs.
- *Launching demand-side management (DSM) interventions* (CDM-based CFL scheme and Ag. DSM).

The Act specifies high energy-using units as designated customers who need to appoint a certified energy manager, conform to EE consumption norms, and submit an annual energy consumption report. Every three years the designated consumers are audited; web-based e-filing of energy reports will be mandated soon. The current 9 designated consumer sectors will increase to 15 over the next two years.

The Bureau of Energy Efficiency, with the central government, implements parts of the program at the federal level; SDAs implement the program at the state level. Capacity building and financial assistance are needed for SDAs to regulate, facilitate, and enforce the Act and to ensure balanced implementation throughout India's states.[8]

Energy auditors and managers need professional certification and accreditation to promote energy efficiency and conservation in energy-intensive industries. The BEE has increased the number of annual national certification exams.

The states are promoting DSM measures. A new program in two states seeks to change normal light bulbs to CFLs in the domestic sector. CFL-penetration in India's commercial sector is nearly 100%, but due to its high cost it is extremely low in the domestic sector. The program would provide consumers with CFLs at the price of the incandescent lamps; the difference would be made up through the CDM because of lower energy consumption and lower carbon emissions. When expanded to all 36 states, the program would save about 24 million tons of carbon dioxide and 10,000 megawatts annually.

The energy supply has increased about 2% while the GDP has increased 8–9% annually over the last decade. An effective decoupling is occurring. Taking out biomass and using only fossil fuels, energy use is increasing at 3% a year. The energy intensity is also declining and is at about 0.19 tons of oil equivalent for each dollar of GDP.

Finally, the transport sector should be addressed. It is difficult in India because many different ministries look after that sector. India could introduce a labeling program

[7] China's experience with ESCOs has been successful, but India is not doing well in this area.

[8] One person from each SDA visited Japan in 2007 to look at policies and programs. Each agency is developing a five-year action plan.

for vehicles, which would increase energy efficiency of individual vehicles. However, as fuel efficiency increases, people tend to drive more, which could cause a rebound effect. Also, India must ensure a reliable, affordable, and comfortable public transportation system, which is handled by a different ministry and local municipalities. The Bureau is working with the Ministry of Urban Development to link support for urban upgrades with bus rapid transit systems.

Tentative lessons. New financing is not required because these investments will be made anyway. Finances should be redirected; energy efficiency should be mainstreamed. Redirecting finances requires risk reduction through capacity building (for project preparation, data collection, monitoring and verification, and project appraisal); codes, standards, and agreements (for appliances, buildings, and manufacturing sectors); risk guarantees for financial institutions to lend to ESCOs and small and medium enterprises; demonstrations and training on EE technologies; and collaborative research and development to adapt technologies. The key issue is to reduce the risk, which is why public policy is important.

6. Financing Mechanisms for Energy Efficiency

This panel discussion featured six speakers from financial institutions, government, and the private sector about financing options offering different financial perspectives on the energy efficiency sector.

Leveraging the International Finance Corporation's Comparative Advantage to Mobilize Private Sector Investment in Clean Energy

The energy efficiency opportunity is lying in wait for cost-effective investments, with compelling social, environmental, and economic benefits. Institutions try to enable the market through policies, interventions, and core competency. People are slow to respond to energy efficiency opportunities because of market failures as well as irrational behavior by institutions and individuals, which leads to lack of investments.

The comparative advantages, in the context of EE lending, vary by institutions (IFC, IBRD, MIGA, ADB, private equity, and commercial banks), which must be clear about their strengths and play those roles accordingly (such as influencing markets or mobilizing capital). Institutions also need to be clear about what they want to affect (determining the problem and best instrument to address it, if the need fits its role and capacity). Institutions often tend to use a ready-made solution and need to make sure that the proposed structure is responsive to the problem. Markets vary, so do the needs and solutions.

The market has high liquidity and money is not lacking. However, institutions need to look at what they bring to the table in terms of resources and expertise. For example, the IFC has the ability to mobilize large investments, a network of investee companies and global and substantial local players, convening power, commitment to innovate, expertise in structuring/credit/risk mitigation, a mission to support sustainable economic development, as well as market focus and private sector orientation. However, the IFC does not do small investments well. Table 2 addresses some of the financing problems and how IFC addresses these barriers. From its perspective, therefore, energy efficiency is a collection of small investments. Two approaches have evolved over at IFC: mobilizing commercial investments in EE through financial markets and mobilizing market development for new technology.

- *Mobilizing commercial investments in EE through financial markets*.

At IFC, 45% of its business is through financial institutions (FIs). It is essential to get well suited FIs and to have them realize that they can make money by investing in EE projects. For example, FIs need risk sharing until they understand the transactions better or to learn to put a new product, such as EE, together.

Table 2 Barriers and Responses to Market Needs

Barrier	IFC Response
Small deal size	Work through IFC's highly developed financial markets business
Lack lending experience by FIs	Support with credit enhancements or other financial products
Limited FI knowledge of EE sector	Support with TA for financial product development and marketing; aggregate the market
Unsophisticated vendors and developers	Support with TA to prepare and standardize transactions

Technical assistance to structure transactions is key for companies that know engineering and technology, but are not sophisticated financially. The IFC's business model has evolved as IFC brings advisory services to commercial banks. The business of banks is to lend; they do not look at the world through the window of energy efficiency, but rather as lending for housing, small and medium enterprises (SMEs)/corporations, ESCOs, and municipals, etc. For example, in Russia, where there was a need for long-term financing, IFC brought credit lines. In markets with high liquidity, IFC brings risk-sharing tools. In all cases, it brings technical assistance with the financing solution.

In Russia, 48% of the production assets are more than 20 years old. The companies are not competitive because their assets are old. The bank looks at this as an industrial sector opportunity, but if they can brand a lending product to modernize the companies then EE makes the deal work, which has become the focus of IFC work with banks in Russia. Another example is Ceska Sporitelna, the largest competitive commercial bank in the Czech Republic. Competing markets were fighting over the same 100 blue chip borrowers in that market, so Ceska Sporitelna worked with IFC to target the SME market, specifically the EE/RE market segment. They developed the FINESA (Financial Energy Saving Applications) product. After the Czech Republic became members of the EU, regulatory measures were put in place and demand suddenly increased, resulting in US$20 million in EE/RE loans in 36 months. The current project pipeline is US$58 million.

Over the years, IFC's experience in EE lending has evolved. It started doing this business exclusively using GEF money in 1998; in 2000 it wanted to put US$12 million of its own money in, but it learned that looking at these individual transactions did not work because IFC does not do small loans. It restructured, let the banks doing market credit assessments with IFC agreeing to underwriting criteria. For example, IFC is working with 10 banks in Central Europe. The portfolio has all sorts of specialized products, but no bank considers it as lending exclusively for EE. For example, with assistance for risk sharing and structuring, lending for housing has become a viable business; previously there was no commercial lending in that sector.

IFC has also learned to do more leveraging of public money. For example, in Hungary, a project that was 100% GEF funded evolved to a consortium with OTP Bank working with ESCOs to renovate public buildings, schools, and municipal buildings throughout the country using the leverage of GEF money and risk sharing provided by IFC. The project impacts include lowered energy costs and municipal fiscal balances; reduced dependence on imported gas; a new GE factory (supplier) providing FDI and jobs; and improved health, safety, and learning conditions for children.

The opportunities are much greater for emission reductions in China. Specialized funding is needed on a larger scale to cover soft/transaction costs, project assessments, technical assistance, and credit enhancement to enable innovation in the market. As seen in the housing example in Hungary, innovation can have initial losses; therefore, it is necessary to intelligently leverage donor funds and institutional partnerships.

- *Mobilizing market development for new technology*. Beyond mobilizing commercial investment, IFC has learned about fostering market accelerations for new technology. Many technologies—for example, compact fluorescent lights (CFLs)—have not penetrated the market. IFC can use its assets, the ability to convene the private sector, and knowledge to intervene in markets to help promote such technologies. The program design must be flexible in a dynamic market, and an exit strategy is critical for sustained impact. It is a critical instrument to accelerate market development and institutional change. Risk appetite is often irrational and driven by culture and convention.

For example, the Efficient Lighting Initiative (ELI) had interesting results. The US$15 million project was funded by GEF and implemented by IFC. The goal was to accelerate the development of local markets for EE lighting—which industry could not do for itself— in Argentina, the Czech Republic, Hungary, Latvia, Peru, the Philippines, and South Africa. ELI sought long-term and sustained impact on markets through increasing consumer knowledge and demand, improving access to capital, and increasing sales volume and product availability. The result was enhanced competition, producing downward pressure on prices. As a result of efforts under ELI, consumers have the power of information through labels on about 200 different products. Labels allow consumers to differentiate quality and forces producers to compete. In South Africa, the penetration of CFLs increased from 1.5 million units a year to about 6 million over the life of the ELI project.

However, 1.6 billion people around the world still live in the dark and use fuel-based lighting. They pay 15% of the global lighting bill and receive only 0.2% of the lighting services, up to one-third of the income in some of these households. The inefficient product limits small-scale productive activities, indoor pollution leads to serious health problems, safety issues are epidemic, and access to education is limited. This market is significant—US$38 billion a year (US$17 billion in Africa). Fuel-based lighting is a commercial, functioning market with an established value chain, collection systems, and spare parts/repair services. Although clean, efficient, and affordable modern

lighting solutions are becoming available, they have not reached this off-grid market. These solutions are based largely on light emitting diodes (LEDs).

At the same time, a successful analogy is the sales of mobile telephones in Kenya, which soared to 6,000,000 customers since the technology was introduced in 1997. Mobile phones require access to electricity to be recharged. Off-grid customers use car batteries to charge mobile phones. Important lessons are emerging: the poor, even the poorest of the poor, can be a profitable market; the product or service needs to be priced to meet income constraint; success requires new business models, often created locally; and the different needs of the poor can be met by large-scale commercial solutions, promoting a higher quality of life and overall development. The key is to tap into the entrepreneurial genius of the market.

IFC supports market entry by responding to industry requests and suggestions. It intervenes to reduce transaction costs of market entry through assessing markets, testing and certifying products, identifying distribution channels, and assessing the regulatory environment, thereby reducing regulatory, market, and financial risks for market entry. A new joint World Bank–IFC initiative, Lighting Africa, anticipates rapid scale-up of access to clean, reliable, and affordable lighting and basic energy services for 250 million across Africa by 2030, based on lessons learned and drawing upon the technical solutions, such as LEDs.

- *Mainstreaming EC into IFC's core business*. IFC's core business— investment in infrastructure, global financial markets, general manufacturing, agribusiness, municipal funds, and oil, gas and mining—has embedded an estimated US$1.7 billion in EE and RE in investment projects. These investments were not a result of a structured system to identify and develop these opportunities; instead, IFC learned that with integrating these opportunities, it has the ability to have huge impact toward sustainable development.

IFC can maximize the impact by influencing clients, carefully assessing the quality of the investments and packaging product offerings. For example, when a client asks the World Bank to build them a road, the dialogue includes transportation alternatives; when a steel industry asks IFC for a loan, the best technology projections are made available. Offerings are packaged in a manner so that every investment officer in the corporation knows how to mainstream RE/EE. Specialized funding is required to cover soft and transaction costs, credit enhancement and other financial products beyond the institutional comfort zone, and donor support to enable market transformation. With increased sophistication, the measurement goes beyond investments, to savings. At the institutional level, the following requirements are in place: established measurement and tracking protocols that capture embedded sustainable energy use impacts, departmental scorecard aligned with institutional goals, performance measures carried through to the management level, honest assessment of institutional capacity, and risk appetite commensurate with the problem.

IFC believes that moving large amounts of money might be easiest, but it is not always the answer to solving the EE problem. Picking winners can distort the market; big initiatives are rarely nimble enough to stay ahead of the market; and lack of capital is rarely the problem. It is necessary to match the intervention to market need, to institutional comparative advantage, and to institutional incentives.

Lessons from the Private Sector: Mitsubishi UFJ Securities in Japan

The most important lesson learned in the last seven years of experience of Mitsubishi is the increased confidence that barriers to financing energy efficiency can be overcome. Factors that once posed major obstacles are now considered "manageable problems"; and these problems are becoming less severe. About seven years ago, when the Clean Energy Finance Committee was established at Mitsubishi UFJ Securities in Japan (MUS), before the Kyoto Protocol, people were concerned about the absence of a framework to provide incentives for EE efforts. Now the Clean Development Mechanism (CDM)/Joint Implementation (JI) has become an established concept. Higher oil prices and growing concerns about energy efficiency are also helping. Higher oil prices have the same effect on promoting energy efficiency as would something such as carbon taxes.

With the CDM in place since 2001, people were increasingly concerned about the lack of methodologies until recently. The secretariat prepared methodologies, resulting in 12 approved consolidated methodologies (ACMs) and 54 approved methodologies (AMs).[9]

Underlying financing is a concern in the area of CDM. Many EE projects are not implemented because bank lending is not available. Some greenhouse gas mitigation projects can be financed on carbon finance alone, but that is not the case for energy efficiency, which needs conventional upfront financing. Based on experience, 90% of the revenue must come from traditional means, such as bank loan or equity to be repaid by the savings from reduced energy bills. Educating the banks about carbon credits has had little effect until recently. Banks have a growing willingness to fund EE projects, particularly when they qualify for JI/CDM, including multilaterals, developed country government banks, host country development banks, multinational commercial banks, and host country commercial banks. The interest of host country commercial banks—in China, Malaysia, and to a lesser extent, Indonesia—are particularly encouraging. However, in most countries it is still difficult for host country commercial banks, for example, in Cambodia.

Lack of a post-2012 regime poses substantial difficulty to large-scale energy efficiency projects with a medium to long playback period (such as building a supercritical coal-fired power station, which has a payback period of 20–30 years). A robust mechanism is needed for carbon credits well beyond 2012.

[9] As of July 2007, Mitsubishi UFJ Securities was responsible for 6 of the 54 AMs, second only to the World Bank (which has 9) and followed by Quality Tons (5), MGM International (5), and EcoSecurities (4).

Alternatively, a private institution can work with verified emission reduction credits for post-2012, as some pioneering funds and some European and American utility companies are interested in verified emission reductions (VERs). Japanese utility companies and government have been slow to respond to post-2012 with the rationale that using shareholders' or taxpayers' money for that period, when there is still a lot of uncertainty, is not justified.

Funding for early-stage feasibility studies for small projects is increasingly hard to come by as public sector programs become more results-oriented. There is a need to explore the possibility of entrepreneurial (venture capital) financing to respond to these funding needs.

Project structuring and management is possibly the most significant obstacle going forward, particularly with respect to programmatic project activities for energy efficiency. Public funding for project structuring and management, combined with carbon financing for project profitability enhancement is the approach to be adopted. In the past when GEF money was used, carbon finance was usually off limits. However, the synergies of the two are evolving; and GEF and carbon finance should be available for different purposes, for example, GEF money for project management and capacity building, and carbon finance for profitability enhancement.

Sustainable Energy Initiative of the European Bank for Reconstruction and Development

Energy efficiency is a key issue for the EBRD region of operations to increase the security of supply, improve competitiveness, save scarce capital resources, and improve the environment. In the region where EBRD operates, the issue is not the lack of access to power; rather it is the waste of energy and very high energy intensities. Energy exporting countries, such as Kazakhstan and Russia, are becoming more interested in energy efficiency because when the price of oil or gas increases, the "opportunity cost" of waste increases.

EBRD had a specific response to the G-8 Gleneagles Summit by increasing awareness of countries of operations predominantly driven by rising energy prices and energy security concerns. The new EBRD energy operations policy places EE and RE as its key cornerstone. It has a target of US$1.5 billion in EBRD financing between 2006 and 2008 for RE and EE.

EBRD's EE business builds on comparative advantages: private sector focus, environmental mandate, country/sector knowledge, business relationships, project finance skills, investment capacity, donor funding mobilization and management, specific EE knowledge, and organizational strengthening. EBRD decided to mainstream EE business in its core business several years ago. It is a business of moving, for example, with people in the power sector and people in industry, and verifying what every project can do in terms of energy efficiency. The EBRD approach includes a specialist team working across the sectors and linking the corporate planning function to fully mainstream EE and climate change activity across EBRD. The specialist team includes engineers, EE

specialists, and carbon finance staff at headquarters and in the field, with full leverage across sector and country teams.

EBRD's approach to expanding EE operations is based on two factors: the problems in the country and how they can solve them. EBRD focused on six areas for energy efficiency: large industries in energy intensive sectors; small energy users such as SMEs and residential users; cleaner power energy supply including fuel switch and generation, transmission, and distribution efficiency improvement; renewable energy including hydro, wind, and biofuels; municipal infrastructure including district heating, public transport, solid waste (methane), and water; and carbon finance. In 2006, EBRD financed 51 projects under its Sustainable Energy Initiative.

EBRD uses three distinctive operational approaches:

Approach 1: Defining EE components in all relevant operations. Dedicated teams screen all EBRD projects to identify those with EE potential, with ratings to the projects. Free energy audits are provided, funded by donors. An "add-on" is structured to direct debt or equity financing, enhancing company cash flow. Energy management training modules are used where appropriate. A benchmarking initiative is also underway. The projects are voluntary and 80% of EBRD's financing is private, so EBRD makes the point to industry that it can have a big impact by mainstreaming EE. EBRD's successful examples include a pulp and paper company in Bulgaria, a steel mill in Ukraine, and a power project in Azerbaijan.

Approach 2: Financing small EE/RE projects through local banks with dedicated credit lines. EBRD loan finance (could be guarantee) is channeled to small- or medium-sized projects through local banks. Beneficiaries can be corporations, households, or project developers. A grant component addresses market barriers to investments such as lack of capacity, information, or motivation. The grant–commercial finance ratio is 1 to 5. Examples include projects in Bulgaria, Romania, Slovakia, and Ukraine. EBRD expects to have 12 countries with these projects by mid-2008.

Approach 3: Combining project finance and carbon finance. Emission trading is underdeveloped in EBRD countries. However, the trading of carbon emission credits is an efficient tool to price carbon and achieve greenhouse gas emission reductions at the lowest cost, as marginal abatement costs differ across locations. The sale of carbon credits creates an additional hard currency revenue stream for project sponsors, improving the bankability and attractiveness of carbon reduction projects (higher IRR, additional security).

Financing Energy Efficiency: The Global Environment Facility Strategy and Program Models

GEF was established in 1991 to provide incremental cost funding to projects with global environmental benefits in developing countries and economies in transition. GEF operates the financial mechanism for the UN Framework Convention for Climate

Change, the UN Convention to Combat Desertification, the Convention on Biological Diversity, and the Stockholm Convention on Persistent Organic Pollutants. Since its creation, GEF has allocated more than US$6 billion (until the end of the third replenishment in August 2006) and leveraged more than US$20 billion. GEF's six focal areas are biodiversity, climate change, international waters, ozone depletion, land degradation, and persistent organic pollutants. Within the climate change focal area, GEF has allocated US$2 billion and leveraged US$10 billion; the allocation specifically for EE is close to US$700 million.

GEF has 10 agencies; the World Bank, UNDP, and UNEP are the key implementing agencies and have been there since the inception. Since 1999, 7 other agencies joined GEF as executing agencies; they include 4 regional development banks—ADB, AfDB, EBRD, and IDB—and 3 specialized UN agencies—FAO, IFAD, and UNIDO. The GEF Trust Fund is replenished every four years; the current period, 2006–10, received the largest replenishment of US$3.13 billion.

The EE share of the climate change funding has increased since its pilot stage and, to date, has been funding projects through four operational programs: removing barriers to EE and EC (OP5), promoting RE by removing barriers and reducing operational costs (OP6), reducing long-term costs of low greenhouse gas-emitting technologies (OP7), and promoting environmentally sustainable transport (OP11).

The GEF strategy was recently revised as part of the negotiation for the fourth replenishment. The climate change focal area now has six strategic programs: two are related to energy efficiency (buildings and industry), two are related to renewable energy (off-grid electricity from renewables and sustainable energy production from biomass), transport (sustainable urban transport), and land use/land use change and forestry (a totally new strategic program for GEF).

The GEF EE strategy has been revised. For example, the objective in OP5 is to remove barriers to large-scale application, implementation, and dissemination of EE technologies. GEF-4 will focus on the building and industry sectors for greater impact in terms of reducing greenhouse gas emissions targeted to large rapidly urbanizing and industrial economies and supported by TA with limited investments.

Under the new Resource Allocation Framework of GEF, resources are allocated to countries based on their potential and capacity to develop global environmental benefits. Table 3 ranks the top 10 countries (as well as several other countries) with resources allocated for climate change. Most or the resources will go to countries that are big emitters with a carbon-intensive economies.

Table 3 Indicative Resources for Climate Change in GEF-4

Country	Allocation (US$ million)	Country	Allocation (US$ million)	Country	Allocation (US$ million)
1. China	150	6. S. Africa	24	...	...
2. India	75	7. Ukraine	19	11. Thailand	15
3. Russia	73	8. Turkey	18	15. Pakistan	13
4. Brazil	38	9. Iran	17	17. Malaysia	11
5. Mexico	28	10. Indonesia	16		

GEF's climate change/EE strategy has evolved from barrier removal to market transformation. GEF intervention is also moving upstream away from simply technology demonstrations; from a broad range of technologies and market applications to more strategic interventions; from "first-come, first-served" project-based funding to being programmatic and country-driven; and from abstract cross-country replication to more concrete in-country dissemination.

GEF energy efficiency program models.

Policy and regulatory reform. This model targets policy and regulatory measures at the national level and has been used by the World Bank and UNDP. Project examples include heat reform and building EE, end-use EE, and thermal power efficiency, all in China.

Standards and labeling. This model focuses on EE appliances and has been used by UNDP. Project examples include market transformation for EE refrigerators and air conditioners (India), six products in five to seven countries (Asia Regional), and a program for refrigerators and air conditioners under development in South Africa.

Technology demonstration and dissemination. This model is sector/technology specific and has been used by UNDP. Project examples include energy conservation in township and village enterprises (four sectors in China), EE improvement in the steel re-rolling mill sector (India), energy conservation in SMEs (five sectors in Vietnam), and EE brick kilns (Bangladesh).[10]

Utility demand-side management (DSM). This model draws upon the World Bank engagement in the power sector. Project examples include a high efficiency lighting pilot (Mexico), energy efficiency (Brazil), promotion of electricity EE (Thailand), DSM and EE (Vietnam), and DSM demonstration (Jamaica).

ESCO development. This model features creation of ESCOs and development of ESCO industry and utility-based ESCOs. The World Bank and UNDP use this model.

[10] In fact, the Bangladeshis want to use the same technology as the Chinese TVE project and have frequently visited the demonstration plant there.

Project examples include energy conservation I and II (China), EE (Brazil and India), and DSM and EE (Vietnam).

Partial risk guarantees. This model features underwriting partial credit guarantees to ESCOs, end-users, etc.; local FIs or the IFC act as guarantor. The World Bank and IFC use this model. Project examples include China, Hungary, the Philippines, and Russia.

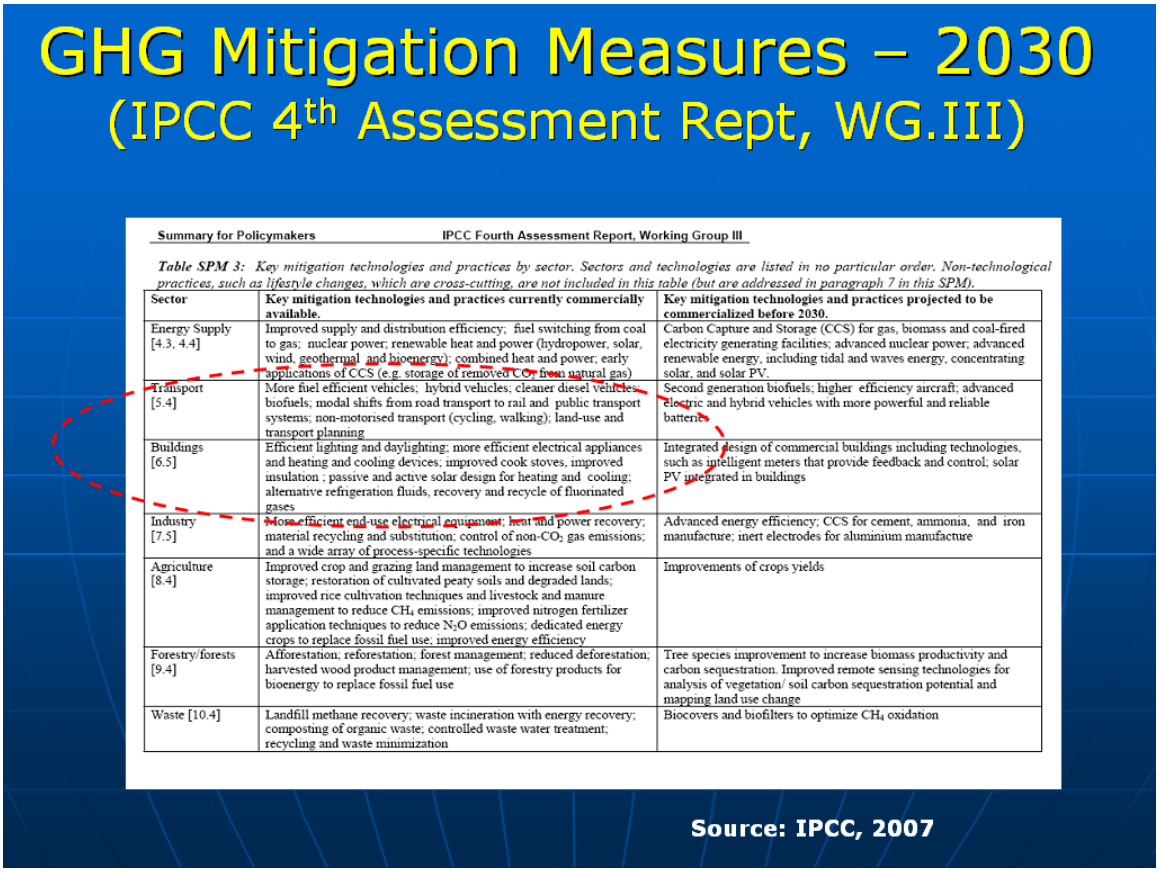
Special purpose funds. This model has revolving funds, for example chiller replacement project (World Bank, Thailand), EE project (World Bank, Bulgaria), and reconstruction of public lighting systems (UNDP, Slovakia); equity funds, for example, a regional project in Eastern Europe and CIS (UNEP-EBRD, eight countries); and partial performance guarantee mechanism for ESCOs to borrow from commercial banks, for example, EE buildings (UNDP-IADB, Brazil).

These program models are not mutually exclusive; they are complementary. Some projects use several models. The models have evolved over time. These models are country-specific, product-specific, and, more importantly, agency-specific, reflecting GEF agency comparative advantages, mandate, expertise, and country strategy and commitment. There is an urgent need to understand program models and implementation needs so that better projects can be designed in the future.

Catalyzing Energy Efficiency Market Transformation through Carbon Finance

Improved end use (demand side) energy efficiency is one of the most important contributors to reduced emissions. However, to realize the real EE potential, small-scale measures need to be captured through carbon finance, private sector capital, or other investments. Large EE potential lies in smaller projects, in buildings, in standards and labeling, in the transportation sector (see table 4).

Table 4 GHG Mitigation Measures and Sectoral Policies



Source:*Catalyzing Energy Efficiency Market Transformation through Carbon Finance.* Ashok Sarkar, July 2007.

Table 5 shows a snapshot of the trade for the 2012 certified emission reductions (CERs). The number of projects for energy efficiency is 14%, but the total volume of energy efficiency CERs is only 9%, which means the carbon market has actually been captured by non-CO_2 gases, the methane, and the hydrofluorocarbons. In the process, the small EE projects have been left behind, which is an unfortunate part of the carbon market. When the Kyoto Protocol was established, there was emphasis on promoting RE/EE, but that is not how the carbon market has evolved until now.

Table 5 Certified Emission Reductions by Project Type and Sector (July 2007)

Project	2012 CERS	
	By type	By sector
Energy efficiency	9%	14%
Renewables	24%	60%
CH_4 reduction, cement, and coal mine/bed	23%	20%
HFCs, PFCs, and N_20 reduction	37%	3%
Fuel switch	7%	3%
Afforestation and reforestation	0%	0%

Source: CD4CDM website.

The World Bank, in collaboration with other stakeholders, has started analyzing this problem. The total volume of CERs traded so far in the carbon market is mostly on the supply side. Energy efficiency in households has a mere 4 projects out of a total of 2,000 projects. Within energy efficiency, the 14% share is mostly for large EE projects (148, or 7%, own generation projects and 96, or 5%, industry projects). Yet, most of the potential lies in the smaller programs, which need to be bundled together, such as light bulbs or motors. These are programmatic options, not project-based options. Unfortunately the clean development mechanism (CDM) has been focused on project options.

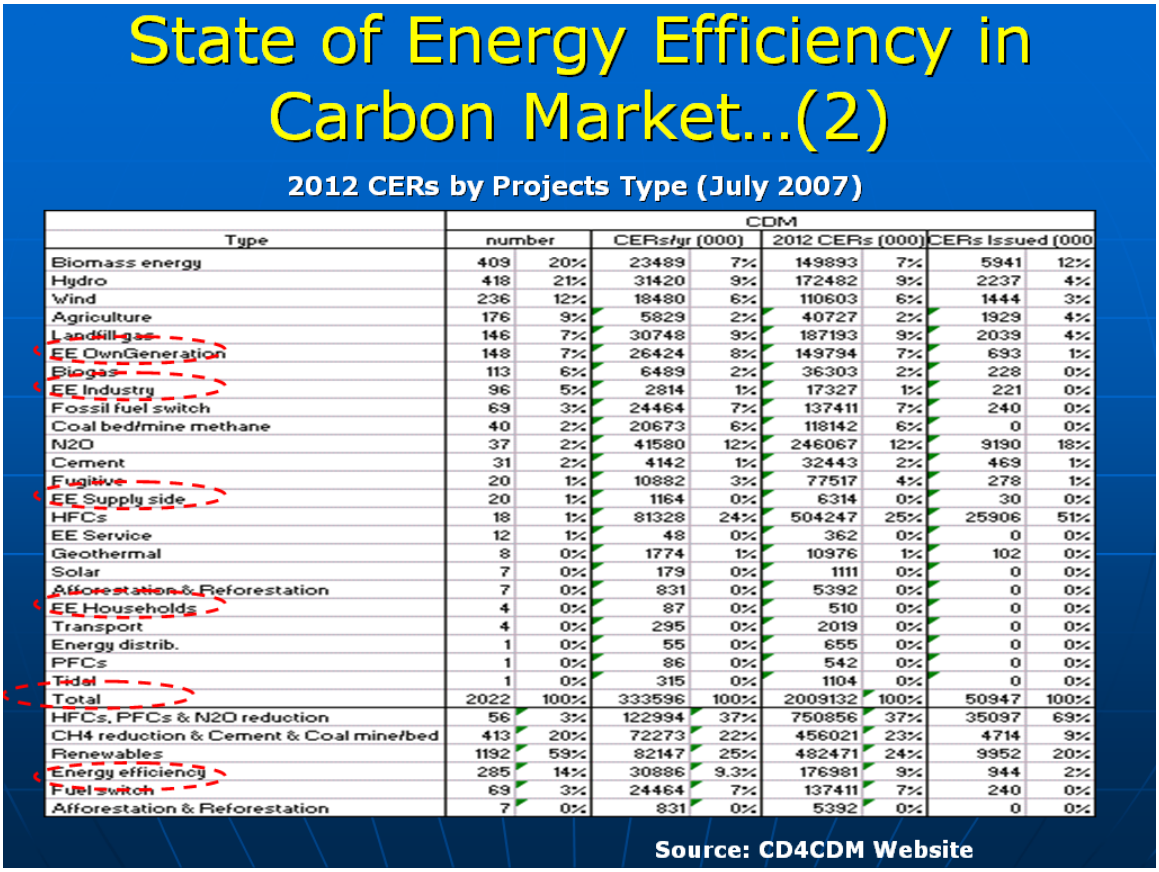
Barriers and strategies for EE implementation

Barriers to address at the level of the public authorities include non-economic pricing of energy, inappropriate tariff structures, and poor collection rates; market incentives for energy suppliers to supply more rather than less; lack of EE information campaigns, standards, codes, or labeling systems; and inadequate regulatory or legal frameworks to support energy service companies.

Barriers to address at the level of end users (final beneficiaries) include lack of awareness of the financial or qualitative benefits from energy saving measures, together with implementation skills; capital constraints and corporate culture leading to more investment in new production capacities rather than EE; and greater weight given to addressing the upfront costs compared to recurring energy costs, especially if these costs are a small proportion of production costs.

Barriers to address at the level of provision of finance and expertise include lack of awareness among investors and financiers of potential financial returns: local banking sectors tend not to prioritize EE finance due to inexperience, high transaction costs associated with smaller projects, and the perceived risks associated with assessing and securitizing revenues generated through energy savings; and limited access to robust systems and skills for measurement, monitoring and verification of energy savings.

Table 6 State of Energy Efficiency in the Carbon Market



Type	CDM number		CERs/yr (000)		2012 CERs (000)		CERs Issued (000	
Biomass energy	409	20%	23489	7%	149893	7%	5941	12%
Hydro	418	21%	31420	9%	172482	9%	2237	4%
Wind	236	12%	18480	6%	110603	6%	1444	3%
Agriculture	176	9%	5829	2%	40727	2%	1929	4%
Landfill gas	146	7%	30748	9%	187193	9%	2039	4%
EE OwnGeneration	148	7%	26424	8%	149794	7%	693	1%
Biogas	113	6%	6489	2%	36303	2%	228	0%
EE Industry	96	5%	2814	1%	17327	1%	221	0%
Fossil fuel switch	69	3%	24464	7%	137411	7%	240	0%
Coal bed/mine methane	40	2%	20673	6%	118142	6%	0	0%
N2O	37	2%	41580	12%	246067	12%	9190	18%
Cement	31	2%	4142	1%	32443	2%	469	1%
Fugitive	20	1%	10882	3%	77517	4%	278	1%
EE Supply side	20	1%	1164	0%	6314	0%	30	0%
HFCs	18	1%	81328	24%	504247	25%	25906	51%
EE Service	12	1%	48	0%	362	0%	0	0%
Geothermal	8	0%	1774	1%	10976	1%	102	0%
Solar	7	0%	179	0%	1111	0%	0	0%
Afforestation & Reforestation	7	0%	831	0%	5392	0%	0	0%
EE Households	4	0%	87	0%	510	0%	0	0%
Transport	4	0%	295	0%	2019	0%	0	0%
Energy distrib.	1	0%	55	0%	655	0%	0	0%
PFCs	1	0%	86	0%	542	0%	0	0%
Tidal	1	0%	315	0%	1104	0%	0	0%
Total	2022	100%	333596	100%	2009132	100%	50947	100%
HFCs, PFCs & N2O reduction	56	3%	122994	37%	750856	37%	35097	69%
CH4 reduction & Cement & Coal mine/bed	413	20%	72273	22%	456021	23%	4714	9%
Renewables	1192	59%	82147	25%	482471	24%	9952	20%
Energy efficiency	285	14%	30886	9.3%	176981	9%	944	2%
Fuel switch	69	3%	24464	7%	137411	7%	240	0%
Afforestation & Reforestation	7	0%	831	0%	5392	0%	0	0%

Source:*Catalyzing Energy Efficiency Market Transformation through Carbon Finance.* Ashok Sarkar, July 2007.

The large potential for demand side EE projects is in terms of small, dispersed measures (buildings, residential sector, SMEs). These measures are not consistent with the project-based concept of traditional CDM. "Traditional" CDM modalities have limited scope in EE market reach and do not reach the small-scale EE market. However, more recently the concept of a "programmatic" CDM has evolved, which could become a catalyst for capturing the potential (building codes, appliance standards, labeling, efficient lighting programs, and so on). Small-scale EE projects could be bundled through a simpler regulatory mechanism. In a project-based mechanism, bundling small-scale projects is complex; it is also transaction-oriented and takes more time and money to develop. In a programmatic CDM mode, the process would be easier for the project developers. The rules, however, are still being defined.

For example, if India were to have a program with 400 million efficient light bulbs, under the current CDM modality, the performance of each and every light bulb would need to be measured, which is impractical. However, in a programmatic CDM approach, once the rules were clearer, it is expected that a much smaller sample could be used for verification of savings.

Table 7 illustrates the mismatch of the CDM approach that exists in relation to the procedures and modalities of EE programs. As a result, the share of EE has been very small.

Table 7 Differences between EE Programs and CDM Approach

Real EE Programs versus CDM Approach	
Effective EE programs	CDM process is long
Assume that real barriers exist	Barriers to be demonstrated for each project
Address capital cost barrier, even though cost-effective	Tendency to equate profitability with "non-additionality" thus against CDM rules
Aim to transform markets, not prohibitive incentives for one-time technology change	Lack of guidance/accepted approaches to attribute energy savings to programs; if you do a few the rest will not "qualify" for CDM
Often target systems and therefore involve multiple technologies	Traditional CDM is single-technology "project" based; even programs of activities (under pCDM) are limited to single methodology, single technology

Source: Adapted from A. Arquit Niederberger at the UNFCCC CDM Joint Coordination Workshop, 2007.

Programmatic CDM approach would allow for the increased use of small-scale CDM methodologies (such as, AMS II.C, AMS II.D, AMS II.E), which the CDM market has not used as effectively as it should have so far. Project developers tend to look at the big projects. On the other hand, the small-scale CDM approaches are already approved that can be applied to energy efficiency projects.

The EE best practice programmatic activities proposed must have a higher degree of "traceability"; that is, the emission reductions must be linked with the CDM program activity. For example, if you can trace the action that has leveraged the energy saving under the new rules of programmatic CDM, you can develop it as a CDM activity. This is an opportunity for the future of scaling up EE in the carbon market.

There are excellent synergies in the area of monitoring and verification approaches in both robust CDM programs and EE best practices; combining them can lower transaction time and costs to capture more EE shares in the CDM market.

The Program of Activities (PoA) approach in CDM is emerging. In PoA, the CPA is the most important design feature and it should be defined carefully. The PoA itself does not actually achieve reductions; the emission reductions are attained at the level of the program activity (CPA).

Illustrative initiatives

The Lighting Africa Program is the rapid scale-up of access to clean, reliable, and affordable modern lighting and basic energy services for 250 million people in Sub-Saharan Africa by 2030. In the context of this initiative, if 10 million PV lanterns (and

LED-based lights) replace kerosene lamps, more than 2 million tons of CO_2 emissions will be reduced every year for the 10-year life of LED lamps. The additional future revenue stream of carbon incentives could be used appropriately in the financial analysis to buy down the higher costs of the off-grid LED systems/lanterns that the consumers will ultimately have to pay. Of course the methodology to bring in the CDM benefits is still being explored.

Ghana air conditioner labeling program is an EE-CDM activity that was not approved by the CDM Executive Board. The Government of Ghana passed a minimum EE standard for room air conditioners; the policy is not to be effective until the implementation infrastructure is created. The CDM program facilitates the implementation of a program for efficiency testing, consumer labeling, and quality assurance for air conditioners countrywide. Currently more than 100,000 air conditioners are sold per year in Ghana (nearly all are imported); the market is growing quickly and the program ensures that more efficient air conditioners will be bought. The estimated ERs are more than 3 million tCO_2e over 7 years. More efficient air conditioners do not cost (significantly) more than BAU ACs; energy savings for consumers are more than US$60 million annually. About US$2 million would be financed out of CDM revenues.

Global Carbon Finance–Energy Efficiency Network. The World Bank has proposed this partnership to increase synergies between carbon finance and energy efficiency communities and their actions. The draft concept note on the two-year program has been discussed with partners: key agencies in the international, national, government, private and NGO domain that are working in the area of energy efficiency and carbon finance to catalyze the acceleration of EE. It has support from IEA, REEEP, UNDP, and UNFCCC.

Clean Energy Wiki. This World Bank-driven effort brings along all the work of multiple agencies in the area of EE. A beta version of the "Energy Efficiency" portal on Wikipedia is available at www.cleanenergywiki.org, with public domain information for anyone to access. The World Bank will manage the open forum, which will bring together bilateral and multilateral partners and country participants.

Session Summary

Although liquidity and availability of financing for EE are not a problem, innovative solutions are required to make financing available for demand-side EE projects and programs. The public and private sectors have made efforts to develop solutions for the EE sector. EE projects have special characteristics, including the smaller scale, the difficulty of project design and measurement, and the failure to be identified as traditional "project financing" activities. The coming-together of the EE community is an important step to improve communications, share experiences, and overcome barriers.

7. The Energy Efficiency Roadmap and the Way Forward

This final discussion asked representatives from different countries, financial institutions, and agencies to comment on the knowledge and advice they would take back to their governments, organizations, and the private sector. This section summarizes the key points indicated by these representatives. Some of the facts presented here are anecdotal and have not been verified.

- *Ministry of Power, India.* The key barriers that need to be addressed are subsidies and access to electricity; data monitoring; and adaptation to climate change. Theft is a point of major concern in India. Power loss—euphemistically called aggregate technical and commercial (ATC) loss, which is basically theft—is about 38%. Now, anything that comes free will be used inefficiently, so that problem needs to be addressed before scaling up EE. The Accelerated Power Development and Reform Program in India have a target of a 15% reduction in ATC losses by 2012.

Government procurement is another area that needs focus in India and is also relevant for economies in transition. Preaching about energy efficiency should begin at home: the government is the largest procurer in India and should therefore switch over to lifecycle cost-based procurement to increase the share of EE stock.

Finally, the role of the private sector is important. The private sector has come forward in the EE area with a far more proactive and positive approach. Over the last four years, the EE development and progress has happened mainly because of the private sector's involvement.

- *Energy Management Company Association, China.* It is important to promote energy efficiency at the government level (at the central and local levels) and in the market. In China, the central government has formulated a lot of policies to support EE. It is important, particularly for the World Bank, to support the market focus on the new EE mechanism.

Creating more financing mechanisms for EE projects in all sectors (industrial, building, transportation, including personal behavior) is also important.

It is important to introduce energy performance contracting (EPC) approaches, to develop ESCOs in China so that there are new mechanisms to create, and to promote collaboration among EE market stakeholders. M&V should also be supported and developed for scaling up implementation of energy conservation technology, equipment, and savings.

- *National Economic and Social Development Board, Thailand.* Thailand prepared the legal and institutional frameworks, but enforcement and implementation is not always smooth because of the political situation. This issue is critical. In addition, coordination between energy sector stakeholders and the transport sector has been weak.

The transport sector analysis (such as the rapid transit and rail network) was not integrated with the energy sector. However, the National Economic and Social Development Board initiated the National Logistic Development Plan, because transport consumes more than 37% of energy in Thailand. The share of road traffic is more than 80%, so a "mode-shift" policy has been launched to shift from road to rail and waterway transportation.

- *Department of Energy and Minerals, Indonesia.* Indonesia's potential for energy savings is huge. A new energy law (2007) shifts the paradigm from the supply side to the demand side, so EE/RE will be a primary focus of future efforts.

Until now, however, there has been no regulation to put pressure on energy users to promote EE. Regulation or energy laws that focus on EE could lead to EE progress in Indonesia, but the problem will be enforcement. This problem is not only related to economics, but also to culture. After solving that problem, EE regulation measures will work well. The EE market is huge and financing is available. The key issue is the implementation of projects and programs that will help capture the EE potential into investments.

- *ENERCON, Pakistan.* Pakistan is facing energy deficiencies and is likely to continue to have severe shortages. The government has devised an energy policy and is taking a number of measures, upstream for production and downstream for conservation to address the impending blackouts and brownouts.

For economic growth, one needs energy efficiency and energy does not have to be subsidized. In Pakistan, energy conservation in industry boiler systems has demonstrated the success of energy efficiency.

The problem of off-grid systems also needs to be resolved. LED lamps could be placed in areas that still use kerosene; LED lamps in streetlights could reduce government costs. Energy efficiency labeling is another area of intervention.

- *National Business Initiative on Energy Efficiency, South Africa.* The demand for raw materials is growing unabated in South Africa. There is pressure on industry, particularly the mining sector. Electricity supply resources are restricted. There is a real drive on the industrial/commercial sector to get the EE performance in South Africa in order.

First, energy pricing is a driver for promoting EE. Second, measurement information is difficult to get even though many companies have it. Third, the drive for technologically competent people in South Africa is a big limitation. But South Africa has the focus to drive the economy forward. South Africa could take some good lessons from EE labeling experiences around the world.

- *International Finance Corporation.* Even though it is not a question of availability of money, the money is not going to the right places when it comes to EE. No matter how much IFC scales up, it will still be a small player in the EE market and the focus has to be on catalyzing funding through capital markets and from the private sector; there are ways to do this. The hope is to replicate in a sense, the experience of microfinance, where maybe 10 years ago nobody wanted to fund microfinance in the commercial sector and it was considered risky, not profitable.

IFC will focus on developing innovative capital market-based instruments whereby, together with donors and other IFIs, IFC will take segments of the markets and let the private sector fund the less risky portions. IFC will focus on putting it together and pooling the funding, with capacity building and technical assistance for the right investments.

- *Confederation of Indian Industry, India.* In the last five years, the private sector has taken the lead on many of the initiatives in India. The CII has put up a green business center (GBC) at Hyderabad and had the first platinum-rated building outside the United States. Thirty such buildings are now coming up, seven of which are platinum-rated—voluntarily by industry without governmental pressure.

Pricing of energy is an important driver for scaling up energy efficiency investments; free and subsidized energy rates do not promote efficiency in the residential sector, for example, while the industrial and commercial sectors pay very high rates.

At the same time, global competitiveness has made industry more efficient. For example, the cement industry in India will double its inventory in the next seven to eight years. India is also acquiring private-sector companies abroad, which will increase access to global technology and position it as global manufacturers. The cement industry in India is among the best in the world in terms of energy intensities.

Building the capacity of professionals is also needed to take up financing and to scale up ESCO operations in India. The private sector still prefers to have an energy audit done and to do the financing; therefore, the role of ESCOs is limited in the industry sector.

- *Asian Development Bank.* The ADB president presented the challenge of increasing loans for clean energy programs to US$1 billion a year in 2005. At the time, ADB did not have the right capacity and expertise, and client governments

were not interested in EE. But today, governments are very interested and ADB is ramping up.

The vision is two-fold. First, ADB has to stick with what it is good at: policy dialogue, because that is the core business, and financing. ADB works with partners who are good at knowledge building. Second is capacity. ADB has the money for capacity, but not a lot, so it has to carefully choose standards and codes that work and to partner with organizations that want to do them. So ADB's vision for the region is to move ahead and stick to what it is good at. ADB has also volunteered to be in charge of the transport sector in the Clean Energy Investment Framework.

- *Ministry of Foreign Affairs, Japan.* Three elements for future focus from a foreign policy perspective are: 1) China and India; 2) Russia; and 3) international efforts on energy efficiency.

A joint effort to develop technology with China and India for reducing GHG emissions is very important. A recent negotiation proposed international collaboration to achieve zero emission of carbon dioxide from coal by combining coal gasification technology and carbon capture and sequestration technologies. If this project becomes successful and is initiated by the five countries (perhaps with participation by many more countries) and if it would be commercially applied to China and India, then energy intensities of these large-consuming countries would be dramatically improved.

An international agreement to collectively improve EE is worth considering, if (in this speaker's personal view) three conditions are satisfied: stipulation of how to quantify effects of EE improvement on CO_2 reduction; broad participation of major energy consuming and producing countries (such as emerging economies like China and India) with differentiated responsibilities; and stipulation for national goals and action plans to improve energy efficiency.

Appendix A. Agenda

Wednesday, July 18, 2007

18:30–20:30 Reception – Hosted by the World Bank
Venue: Tokyo Kaikan Pavillon,
1st Floor, Fukoku Seimei Building, 2-2-2 Uchisaiwai-cho, Chiyoda-ku, Tokyo 100-0011

Thursday, July 19, 2007

8:30–9:00 Registration

9:00–10:15 **Session 1: Opening Session**

9:00–9:20 ***Opening Remarks*** **by Tatsuo Yamasaki**,
Deputy Director General, International Bureau, Ministry of Finance of Japan

9:20–9:40 ***World Bank's Experience and Action Plan for Energy Efficiency*** **by Jamal Saghir**,
Director for Energy, Transport and Water, The World Bank

9:40–10:00 ***Global Energy Efficiency Scenarios and Sectoral Approaches*** **by Richard Bradley**,
Head, Energy Efficiency Division, International Energy Agency

10:00–10:15 Discussion

10:15–10:45 Coffee Break

10:45–12:00 **Session II: Energy Efficiency: Lessons from Japan**
Moderator: Robert Dixon,
Head, Energy Technology Policy Division, International Energy Agency.

Presentations:

10:45–11:05 ***The Roadmap to Success: Lessons from Japan*** **by Jun Arima**,
Director of International Energy Negotiation, Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry of Japan

11:05–11:25 ***Energy Efficiency Technologies and Opportunities*** **by Masayuki Sasanouchi,**
Project General Manager, Environmental Affairs Department CSR & Environmental Affairs Division Toyota Motor Corporation and Chairman, Working Group on Global Environment Strategy Nippon Keidanren (Japan Business Federation)

11:25–11:45 ***Methodology for Energy Conservation in Japan*** **by Shoichiro Ozeki,**
Director General, The Energy Conservation Center, Japan

11:45–12:00 Discussion

12:00–1:15 **Working Lunch (hosted by the World Bank)**
Guest Speaker: Yoshiharu Tachibana,
Advisor to the Board on Sustainability, Tokyo Electric Power Company

1:15–2:30 **Session III: Energy Efficiency Challenges for the Developing World**
Moderator: Barry Bredenkamp,
Acting General Operations Manager, National Energy Efficiency Agency, Johannesburg, South Africa

Presentations:

1:15–1:35 ***Scaling up Energy Efficiency: Case Studies from China: Strategies and Financing Options*** **by Bai Quan,**
Deputy Director, EEC, Energy Research Institute, NDRC, Beijing, China

1:35–1:55	***Energy Efficiency Market Transformation: Institutional Aspects and Financing*** **by Maria Elena Sierra Galindo,** Executive Secretary, Comisión Nacional para el Ahorro de Energía -CONAE, Mexico
1:55–2:15	***Promoting Energy Efficiency through the Regulatory Framework and Financing Options: Experience from India*** **by Ajay Mathur**, Director General, Bureau of Energy Efficiency, New Delhi, India
2:15-2:30	Discussion
2:30–3:00	Coffee Break
3:00–5:00	**Session IV: Financing Mechanisms for Energy Efficiency** **Moderator: Dr. Marianne Osterkorn,** International Director, Renewable Energy and Energy Efficiency Partnership (REEEP)
	Presentations:
3:00–3:20	***Leveraging IFC's Comparative Advantage to Mobilize Private Sector Investment in Clean Energy*** **by Russell Sturm,** Sustainable Energy Team Leader, International Finance Corporation
3:20–3:30	***Energy Efficiency Financing Perspectives*** **by Rintaro Tamaki,** Director General of International Bureau, Ministry of Finance, Japan
3:30–3:50	***Lessons from the Private Sector*** **by Junji Hatano,** Chairman, Clean Energy Finance Committee, Mitsubishi UFJ Securities, Japan
3:50–4:10	***Sustainable Energy Facility: EBRD Energy Efficiency Activity*** **by Josué Tanaka,** Corporate Director, Energy Efficiency and Climate Change, European Bank for Reconstruction and Development
4:10–4:30	***Financing Energy Efficiency: The GEF Experience*** **by Zhihong Zhang,** Senior Climate Change Specialist and Program Manager, Global Environmental Facility
4:30–4:50	***Catalyzing Energy Efficiency Market Transformation through Carbon Finance*** **by Ashok Sarkar,** Senior Energy Specialist and Energy Efficiency Thematic Leader, ESMAP, The World Bank
4:50–5:15	Discussion
5:15–6:25	**Session V: Panel Discussion** **Co-Chairs: Toshinori Doi**, Director of Development Institutions, Ministry of Finance of Japan; **Jamal Saghir**, Director for Energy, Transport and Water, The World Bank. **Topic: The Energy Efficiency Roadmap and the Way Forward** *Panel Discussants:* **Gireesh Pradhan**, Ministry of Power, India; **Shen Longhai**, EMCA, China; **Poomjai Attanun**, National Economic and Social Development Board, Thailand; **Titovianto Widyantoro**, Department of Energy and Minerals, Indonesia; **Syed Ghulam Akber Bukhari**, ENERCON, Pakistan; **Ian Langride,** NBI, South Africa; **Marge Karner**, IFC; **V. Raghuraman**, CII, India; **Samuel Tumiwa**, ADB; Manabu **Miyagawa**, Ministry of Foreign Affairs, Japan
6:25–6:30	**Closing Remarks and Adjourn**

Appendix B. Participants

- **China**

  Mr. Shen Longhai
  Director, **China Energy Management Company (EMCA) Association**

  Ms Jing Ma
  Assistant General Manager, Corporate Department 1, **Huaxia Bank**

  Dr. Bai Quan
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Mr. Koichi Omori
Communications Officer, Tokyo Office, **The World Bank**

Dr. Marianne Osterkorn
International Director, **Renewable Energy and Energy Efficiency Partnership (REEEP)**

Appendix C. Workshop Presentations

***Session I**. Bridging the Energy efficiency Divide: Opening Session*

Opening Remarks, ***Tatsuo Yamasaki***
World Bank's Experience and Action Plan for Energy Efficiency, ***Jamal Saghir***
Global Energy Efficiency Scenarios and Sectoral Approaches, ***Richard Bradley***

***Session II.** Energy Efficiency: Lessons from Japan*

Moderator: ***Robert Dixon***
The Roadmap to Success: Lessons from Japan, ***Jun Arima***
Energy Efficiency Technologies and Opportunities, ***Masayuki Sasanouchi***
Methodology for Energy Conservation in Japan, ***Shoichiro Ozeki***

Working Lunch. Beyond Energy Efficiency and Beyond Technology Transfer, ***Yoshiharu Tachibana.***

***Session III.** Energy Efficiency Challenges for the Developing World*

Moderator: ***Barry Bredenkamp***
Scaling up Energy Efficiency: Case Studies from China: Strategies and Financing Options, ***Bai Quan***
Energy Efficiency Market Transformation: Institutional Aspects and Financing, ***Maria Elena Sierra Galindo***
Promoting Energy Efficiency through the Regulatory Framework and Financing Options: Experience from India, ***Ajay Mathur***

***Session IV.** Financing Mechanisms for Energy Efficiency*

Moderator: ***Dr. Marianne Osterkorn***
Leveraging IFC's Comparative Advantage to Mobilize Private Sector Investment in Clean Energy, ***Russell Sturm***
Lessons from the Private Sector, ***Junji Hatano***
Sustainable Energy Facility: EBRD Energy Efficiency Activity, ***Josué Tanaka***
Financing Energy Efficiency: The GEF Experience, ***Zhihong Zhang***
Catalyzing Energy Efficiency Market Transformation through Carbon Finance, ***Ashok Sarkar***

World Bank's Experience and Action Plan for Energy Efficiency

Jamal Saghir
Director
Energy, Transport and Water
The World Bank

Tokyo
July 19, 2007

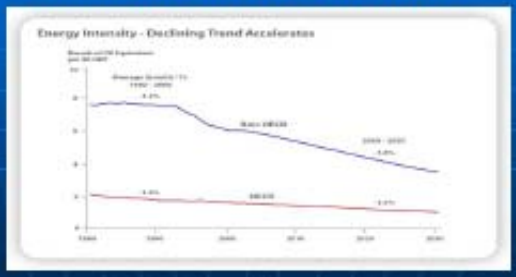
Outline

- Energy efficiency in the context of global climate change mitigation
- World Bank's activities and illustrative examples of initiatives
- What we are planning to do for bridging the energy efficiency gap.

Energy efficiency in the context of global climate change mitigation

Energy Efficiency Trends

Energy Intensities have been declining...but gaps remain high



Source: Exxon-Mobil (2005), "The Outlook for Energy: A View to 2030"

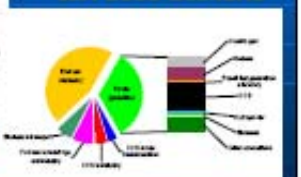
GHG Emission Reduction Scenarios

Energy Efficiency is the Lowest Hanging Option...

IPCC 2030 Scenario

Source: IPCC 4th Assessment Report-WG.III, 2007

IEA 2050 Scenario



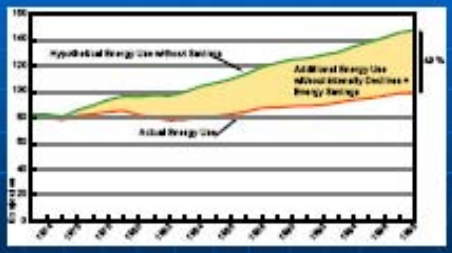
Improved and use (share of cost) energy efficiency most important contributor to reduced emissions

Source: IEA Energy Technology Perspectives 2008

Barriers to EE Development

- **Barriers to address at the level of the public authorities:**
  - Non-economic pricing of energy, inappropriate tariff structures, poor collection rates;
  - Market incentives for energy suppliers to supply more rather than less;
  - Lack of EE information campaigns, standards, codes, norms or labelling systems;
  - Inadequate regulatory or legal frameworks to support energy service companies.
- **Barriers to address at the level of end-users (final beneficiaries):**
  - Lack of awareness of the financial or qualitative benefits arising from energy saving measures, together with the skills to implement them;
  - Capital constraints and corporate culture leading to more investment in new production capacities rather than energy efficiency;
  - Greater weight given to addressing upfront (first) costs compared to recurring energy costs; , especially if these costs are a small proportion of production costs.
- **Barriers to address at the level of provision of finance and expertise:**
  - Lack of awareness and experience among investors and financiers of potential financial returns; local banking sectors tend not to prioritise energy efficiency finance, due to inexperience and lack of competition in the area, high transaction costs associated with smaller projects, and risks associated with assessing and securitising revenues generated through energy savings;
  - Limited access to robust systems and skills for measurement, monitoring and verification of energy savings

Gains from Energy Efficiency – OECD Countries (1973-1998)

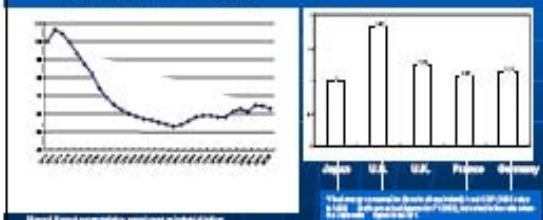


Gains from Energy Efficiency – The Japanese Success Story

-The energy intensity per GDP has improved by 37% over the last 30 years.

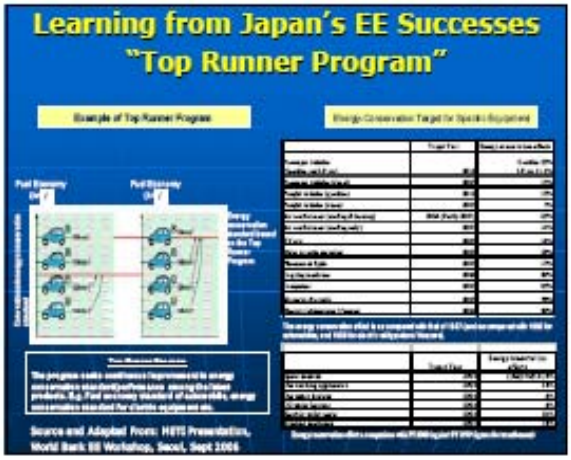
Japan – Industry Energy Efficiency

Energy consumption in the industrial sector has been generally steady since oil crisis. Energy intensity for the manufacturing industry fell sharply through the 1980s.



Source and Adapted From: METI Presentation, World Bank EE Workshop, Seoul, Sept 2006

Learning from Japan's EE Successes "Top Runner Program"



Source and Adapted From: METI Presentation, World Bank EE Workshop, Seoul, Sept 2006

World Bank's Activities –and Illustrative Examples of Some Initiatives

The Bank's Rationale for Energy Efficiency Investments: Convergence of Interests

WBG Commitment to RE/EE

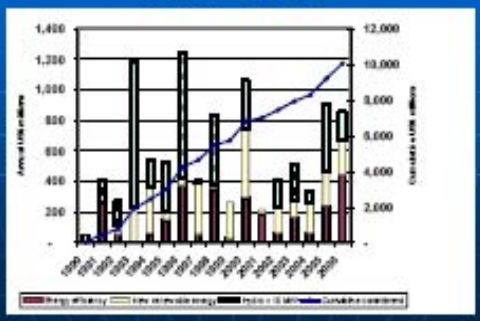
Bonn Commitments (2004):

- Support Renewable Energy (RE) & Energy Efficiency (EE) scale-up
- Committed to an average 20%/year growth over the next 5 years for new RE & EE investments.

Clean Energy Investment Framework (2005):

- Raise the profile of climate change globally and to expand the participation of key countries in long term climate management.

WBG Renewable Energy and Energy Efficiency Commitments, 1990 - 2006

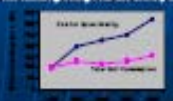


Energy Efficiency Challenge

Strategies for Fostering EE Investments…

China – Development of Pro-Poor National Heat Pricing and Billing Policy (FY06-07)

- Resulted in the design and adoption of a new National Heat Pricing Method by the Ministry of Construction in China
- Tianjin Municipality became the first large city to adopt new heating tariffs for a pilot area of 2 million sq. m.
- Will contribute to China's 11th FYP targets of 20% reduction in energy intensity by 2010



Source: ESMAP Report (Draft) "China: Development of Pro-poor National Heat Pricing and Billing Policy"

Relevant Global EE Initiatives (with IEA and IADB)

- Energy Efficiency (Sectoral/ End-Use) Indicators Project (jointly with International Energy Agency, IADB)
  - Focused on Brazil, China, India, Mexico and South Africa
  - Developing an EE Indicators Methodology
  - Report on EE indicators, comparative analysis of EE indicators across countries, sectors, end-uses.

Building Up on WBG's Energy Efficient Lighting Program Successes

- WBG engagement in EE Lighting started with GEF support in 1995-96 with **Poland Efficient Lighting Project** (PELP) and **Mexico High Efficiency Lighting Project** (ILLUMEX)
- Continued with **Efficient Lighting Initiative** program of IFC in 2002-2005 (Argentina, Czech Republic, Hungary, Latvia, Peru, Philippines, South Africa) – Led to standardization of specifications and product quality certification of **Compact Fluorescent Lamps (CFLs)**
- Bank supported CFL projects in other countries – Vietnam, Sri Lanka
- In 2006, several EE lighting projects have been designed:
  - **Uganda** – 600,000 CFLs bulk procurement (under ERT Project)
  - **Rwanda** – 400,000 CFLs procurement (under UER project)
  - **Ethiopia** – 200,000 CFLs component under Accelerated Electricity Access (Rural) Expansion project (approved FY06)
  - **East Timor** – 27,000 CFLs to pre-paid meter customers under Power Sector Priority Investments Project
  - **Kenya, Ghana** – IFC's "Lighting the Bottom of the Pyramid Project" to promote LED based lighting to replace fuel oil-based lighting
  - **Nigeria** – Proposed >500,000 CFLs (this year)
- The new **"Lighting Africa"** project started this year aims to replace inefficient, expensive and polluting fuel-based lighting for 250 million people in Sub-Saharan Africa with efficient, affordable and clean LED-based off grid lighting solutions. – Collaboration between the Bank and IFC, GEF.

World Bank's EE Scale Up Action Plan- What are we planning to do to bridge the EE gap?

World Bank Clean Energy Investment Framework (CEIF)

- 3 Pillars:
  - Increase Energy Access in Sub-Saharan Africa
  - Transition to Low Carbon Economy
  - Adaptation to Climate Change



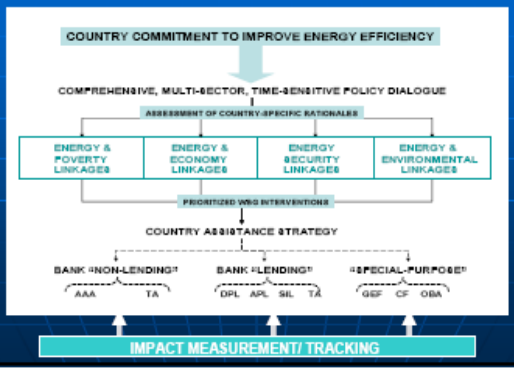
Accelerating the Transition to a Low Carbon Economy

- Our strategy is:
  - to support, on demand from client countries, the development and financing of country low carbon energy strategies that promote diversification of energy sources to encompass a wider menu of lower carbon alternatives;
  - **To promote efficient use of energy (emphasis on both supply and demand side energy efficiency improvements)**
  - while assuring an energy platform that supports growth and poverty alleviation
- Broad array of instruments: IBRD, IDA, IFC, MIGA
- Plus sources that buy-down incremental costs, including the GEF and carbon finance:
  - GEF is the largest source of grant financing for EE and RE, with cumulative commitments through WB of $1.5 billion since 1992.
- Close cooperation with RDBs and the IFIs
- IFC promoting greater investment in sustainable energy through a range of mechanisms and initiatives

Strategic Action Plan Energy Efficiency for SD (EEfSD) (consultation stage)

- **Track 1**- Integrating Energy Efficiency within Economic and Sector Work
- **Track 2** – Mainstreaming Energy Efficiency in Investment Operations
- **Track 3** – Improving Internal Operational, Learning and Analytic Capacity
- **Track 4** – Monitoring, Evaluation, and Outreach
- Three **different levels**:
  - **Policy and Regulatory** level;
  - **Sector and Sub-sector** level; and
  - **End-use Equipment and Appliances** level
- Strengthening of EE resources in the Bank

Scaling Up EE Investments- Mainstreaming Across Sectors



For more information…


http://www.worldbank.org/energy

THANK YOU

Climate change policy and energy efficiency

Alternative Scenarios and Sectoral approaches (SA)

Richard A. Bradley, PhD
Head, Energy efficiency and environment division
International Energy Agency

July 2007

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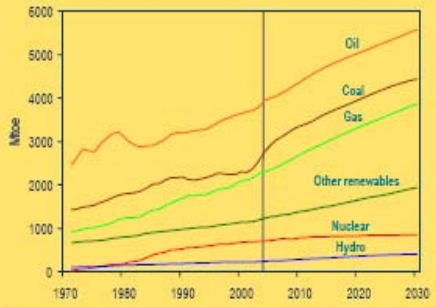
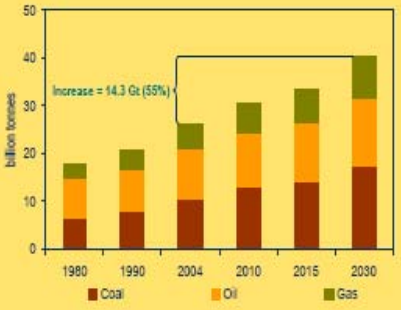
The Reference Scenario: World Primary Energy Demand



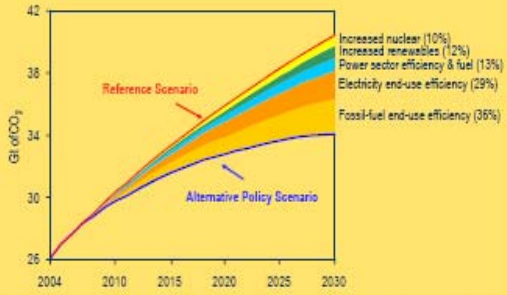
Global demand for each primary energy source grows, driven by population & economic growth.

Reference Scenario: Implications for CO_2 Emissions



Half of the projected increase in emissions comes from new power stations, mainly using coal & mainly located in China & India

Alternative Policy Scenario: Reductions in Energy-Related CO_2



Improved end-use efficiency of electricity & fossil fuels accounts for two-thirds of avoided emissions in 2030

The multi-billion-tons-of-CO_2 question:

How to make energy efficiency work for climate change mitigation?

→ Emphasis on sector-specific activities

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Sectoral approaches: why?

- UNFCCC Parties are searching for means to broaden greenhouse gas reduction activities
  - Some (most) countries will not take country-wide targets yet
  - Rapid growth in GHG-intensive industrial activities outside Annex I regions
  - A focus on sectors could reveal **win-win** opportunities for CO_2 reductions – emphasize the role of **energy efficiency**
  - → **Sector-based commitments**, for some countries, as part of a post-2012 climate regime?
- Need to address **competitiveness** concerns for trade-exposed energy-intensive industries
  - Climate policy costs hamper competition of some industries in some countries only
  - Competitiveness concerns are a constraint on governments' willingness to set more ambitious goals

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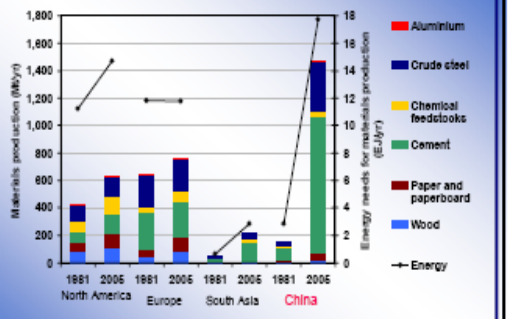
Industry growth: introducing China



Source: IEA, 2007 (forthcoming), *Energy use in the new millennium.*

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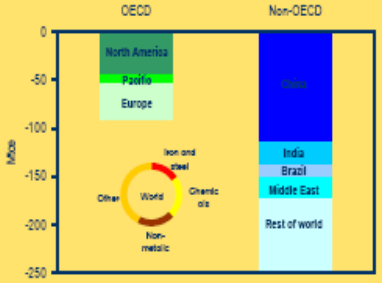
The Alternative Policy Scenario: Industry Sector

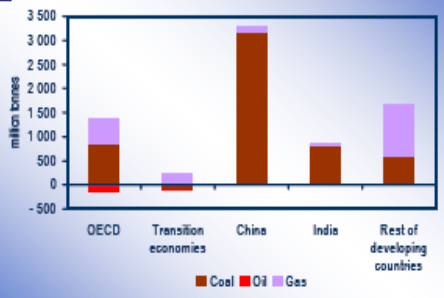
World Energy Outlook 2006

Change in Industrial Energy Demand by Region and Sector Compared with the Reference Scenario in 2030



Savings in industry in non-OECD countries are over two-and-a-half times greater than in OECD countries

CO_2 emissions growth in electricity in IEA's Reference Scenario (2004-2030)



Two priorities: 1. Encourage higher-efficiency coal-based generation
2. Improve end-use efficiency in electricity use

Source: IEA, 2006, World Energy Outlook

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Sectoral approaches: a typology

- *Sector-wide transnational quantitative approach*
  - E.g. International Aluminium Institute sustainability goals (incl. PFC reductions) – governments not involved so far
- *Targeted to developing countries*
  - Country-level, sectoral objective ("no lose sectoral target", CCAP) – with greenhouse gas crediting
  - Sustainable Development Policies and Measures (SD-PAMs) – no crediting? What other forms of incentives?
- *Technology-oriented*
  - Various public-private partnerships to deliver future low emission technologies
    - International Iron and Steel Institute "CO_2 breakthrough program"
- All (or a mix) of the above?

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G8 Heiligendamm Communiqué(s)

G8 leaders

"Action of emerging economies could takes several forms, such as sustainable development policies and measures, an improved and strengthened clean development mechanism, the setting up of plans for the sectors that generate most pollution so as to reduce their greenhouse gas emissions compared with a business as usual scenario."

G8 + 5 leaders

"[…] we need a flexible, fair and effective global framework and concerted international action. We underline the crucial role of economic incentives, in particular by carbon markets, for the necessary investments in climate friendly technologies at large scale.

[…] We confirm our commitment to promote energy efficiency, through cost-effective solutions […]"

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SA and competitiveness

- Industry-led efforts. Possible aims:
  - Establish the sustainability of an activity vis-à-vis GHG emissions (good corporate citizenship)
  - Possibly substitute lighter/smarter constraints/costs to existing policies
- Asia-Pacific Partnership on Clean Development and Climate (AP6)
  - Prompt industry to share know-how with China and India
- Allocation under the EU ETS based on industry-wide benchmark
  - Seeks to homogenize impacts across installations within Europe
- Sector-wide GHG crediting in developing countries
  - Encourages GHG reductions in developing countries …
  - … but subsidizes them to do so, while Northern competitors face a carbon cost

  → Encourages relocation? → Adjust stringency of the credit baseline

  Note: Industry stakeholders generally in favour of facilitating CDM projects in their respective activity. Contradicts Cness argument?

  → Sector-wide commitments for more "domestic" sectors?

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"Sectoral Approaches" Different views and interpretations

- UNFCCC: a stepping stone for developing country commitments (no-lose sectoral, SD-PAMs)
- EU industry: a substitute, or complement, to the EU CO_2 emissions trading system
  - Hard to go back on the EU ETS – but sectoral insights are helpful (a benchmark-based allocation post 2012?)
- Other OECD industry (AP6): a vehicle to enhance efficiency in China, India, etc.
- A method to build GHG commitments for Kyoto Parties, based on sectoral potentials - indicators?
  - Critical question: at what cost?

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Sectoral approaches: caveats

- Technical complexity of a sector-specific discussion in UNFCCC context
  - Feasibility of an outcome going beyond "*pledge and review*" by industry? An industry-focused negotiation *à la WTO*?
- Creating sectoral "niches" in global climate policy regime could lead to economic inefficiency
  - Emissions trading and related mechanisms provide means to reflect the prevalent CO_2 cost
  - US and Australia: domestic moves towards emissions trading

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Critical steps

- How to link climate change debate to energy efficiency?
  - Obvious benefits: Lower pollution, enhanced energy security and economic performance, and lower CO_2 as co-benefit
  - Need to bring the right decision-makers to the table
    - Shift the debate from a North-South antagonism to a concerted, win-win action, highlighting energy, economic and social aspects
- A new forum for international cooperation on energy efficiency?
  - Asia Pacific Partnership on Clean Development and Climate
  - G8+5 Dialogue
  - EU International Agreement on Energy Efficiency (2007 G8)

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The Roadmap to Success

Japan's Experience

Jun ARIMA

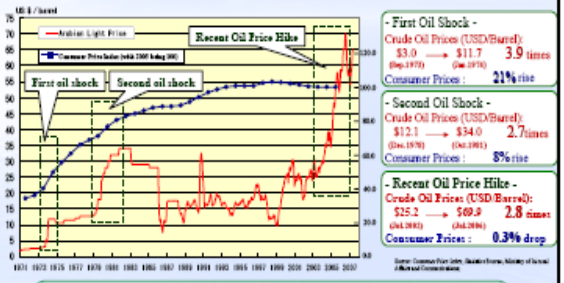
19th July 2007

Director, International Energy Negotiation

Agency for Natural Resources and Energy, METI

How does Energy Efficiency work? – Energy Security - 1

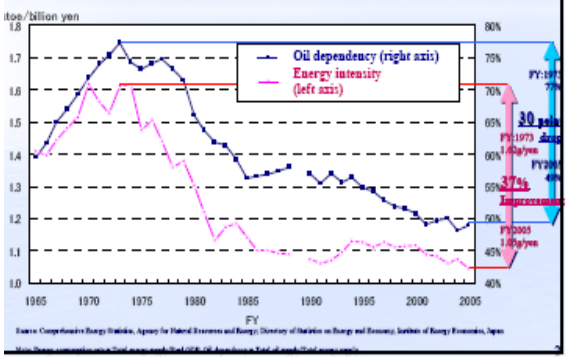
Changes in international crude oil prices and consumer price index



Why is the consumer index so stable despite the recent oil price increase?

How does Energy Efficiency work? – Energy Security - 2

Changes in Oil Dependency and Energy Intensity in Japan



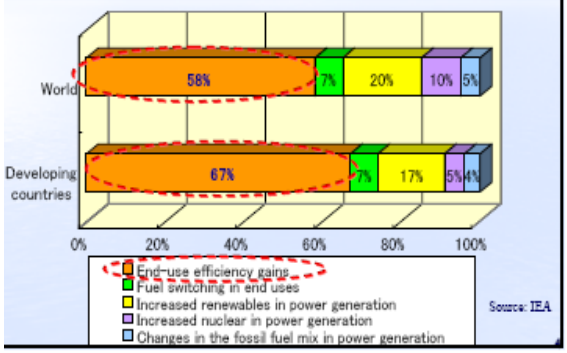
How does Energy Efficiency work? – Energy Security - 3

Increase in the value of crude oil imports/GDP	Increase in the value of crude oil imports/GDP
1974: 2.8%	2005: 0.7%

Main Factors Contributing to Impact Reductions	Percentage Contribution
①A decline in energy intensity (energy conservation)	Approx. 40 percent
②Reductions in oil dependency	Approx. 20 percent
③Advance of the appreciation of the yen	Approx. 40 percent

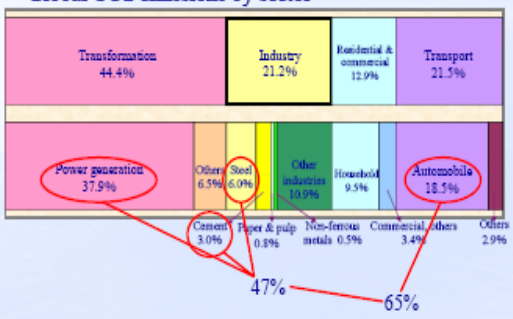
How does Energy Efficiency work? - Global Warming 1 -

- **Potential of CO2 reduction in 2030 from 2004**



How does Energy Efficiency work? - Global Warming 2 - Sector Analysis

- **Global CO2 emissions by sector**



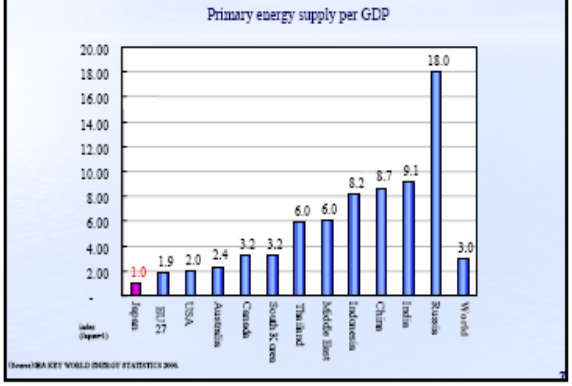
*Data from IEA Energy Balances & IEA CO2 emissions from fuel combustion

Energy Efficiency Improvement

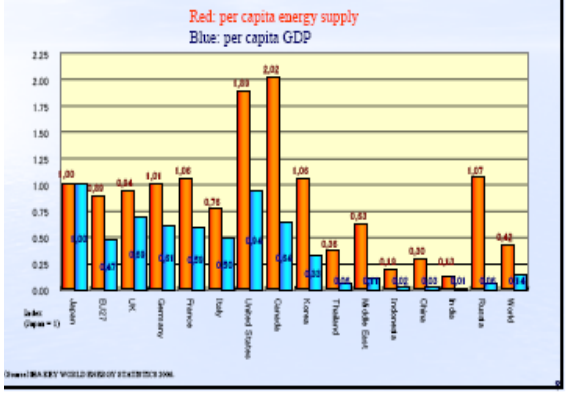
Energy Efficiency Improvement is ;

- A most efficient way to
  - enhance energy security
  - deal with global warming
- The easiest way to implement
  - using existing and proven technologies
  - everybody can do it
- Consistent with economic growth
  - improving productivity
  - enhancing industrial competitiveness

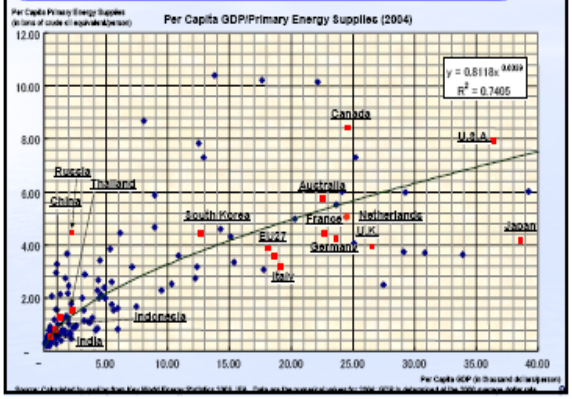
International Comparison of Energy Efficiency



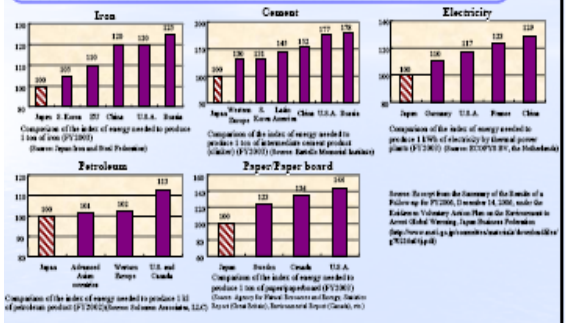
International Comparison of per capita energy supply



International Comparison of Per Capita GDP/Energy Supplies



Energy Efficiency by Sectors



IEA is now in the process of developing energy efficiency indicators by sectors and will report them in 2008.

Industrial Sector

- Number of factories with large energy consumption is limited → Regulatory measures work effectively
- Regulation (Energy Efficiency Law)
  - Designate factories with annual energy consumption of more than 1500kl (oil equivalent) [about 13,000 factories]
  - Request the factories to;
    - improve energy efficiency by 1% annually
    - submit annual reports and mid-to-long term energy efficiency improvement plans
    - appoint energy experts (energy managers) in the factories
  - If the improvement is significantly insufficient administrative order will be issued → fine will be imposed
- Incentive measures for investment in energy efficiency facilities and equipment
  - Tax reduction and subsidies

Industrial Sector
- Energy Managers -

- Human resources are the key to improve energy efficiency
  - Energy management is a daily activity finding energy inefficiency, providing options, introducing appropriate facilities or equipment, measuring the effect, etc.
  - Energy management requires expertise
    Ex. burner- appropriate mixing ratio of fuel and air

- Designated factories are required to appoint energy managers in the factories(1-5 people, according to the amount of energy usage)
  ---there are more than 30,000 energy managers in Japan
- To become a qualified energy manager, passing of a national examination and one year's practical experience are necessary

Residential/Commercial Sector
- Regulation of standard on housing energy efficiency -

Regulation of standard on housing energy efficiency
(Energy Efficiency Law)

- The standard for housing energy efficiency has been decided and strengthened
- To implement the regulation effectively
  - request buildings with a floor space of more than 2,000㎡ to report on energy performance of buildings/residences at the time of construction or renovation
  --if the improvement is significantly insufficient, an administrative instruction shall be given and the status shall be publicized

Residential/Commercial Sector
- Top Runner Program -

-To find the most energy efficient product commercially available in the market (= "top runner")
-To set the energy efficiency standards at the target year higher than the performance of the "top runner" in the same product category
-Target year differs by product categories, but usually 4 to 6 years later from the year when the standard is set
-Manufacturers are requested to comply with standards
→ If fail to do so, fine (s) will be imposed
-This program was introduced in 1999 and now covers 21 products

1. Passenger vehicles	12. Space heaters
2. Freight vehicles	13. Gas cooking appliances
3. Air conditioners	14. Gas water heaters
4. TV sets	15. Oil water heaters
5. Video-cassette recorders	16. Electric toilet seats
6. Fluorescent lights	17. Vending machines
7. Copiers	18. Transformers
8. Computers	19. Electric rice cookers
9. Magnetic disc units	20. Microwaves
10. Electric refrigerators	21. DVD recorders
11. Electric freezers	

Residential/Commercial Sector
- Top Runner Program 2 -

- The result of the Top Runner program

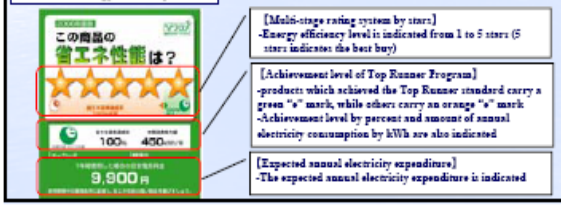
Equipment	Improvement of energy consumption efficiency (Results)
TV sets	25.7% (FY 1997→ FY 2003)
Video-cassette recorders	73.6% (FY 1997→ FY 2003)
Air conditioners *	67.8% (FY 1997→ FY 2004)
Electric refrigerators	55.2% (FY 1998→ FY 2004)
Electric freezers	29.6% (FY 1998→ FY 2004)
Gasoline passenger vehicles *	22.8% (FY 1995→ FY 2005)

* Note that the effects of reducing energy consumption are indicated as inverse numbers because COP or fuel economy (km/L) is used as an energy consumption efficiency index.

Residential/Commercial Sector
- Labeling -

- The energy efficiency labeling system is;
  - To inform consumers of the energy efficiency level of home appliances
  - To promote energy efficient products
- The labeling covers 16 products including air conditioners, refrigerators, freezers, TV sets, gas cooking appliances and computers.
- New uniform energy efficiency labeling was introduced from 2006 (3 products – air conditioners, refrigerators, TV set)

Uniform Energy-efficiency Label



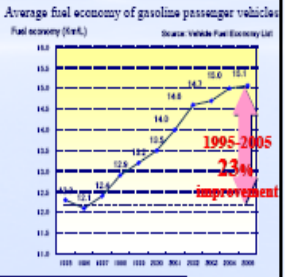
Transportation Sector
- Regulation of carriers and consigners -

Regulation on carriers and consigners (Energy Efficiency Law)

- Designate carriers with ownership of 200 trucks or more and consigners with annual cargo of 30 million ton-kilometers or more
- Request the carriers and consigners to submit annual reports and mid-to-long term energy efficiency improvement plans
- If the improvement is significantly insufficient administrative order will be issued:
  → fine (s) will be imposed

Transportation Sector
- Top Runner Program for Vehicles -

- The Top Runner Program for vehicles regulating fuel economy standards was introduced in 1999 with the target year 2010.
- The fuel standard in 2010 was almost achieved in 2004.
- New fuel efficiency standard (under consideration)
  - Target year: 2015 (base year 2004)
  - Coverage: automobiles, trucks, buses both gasoline and diesel
  - Efficiency target



Type	Efficiency target [2004 → 2015]	
Automobiles	13.6km/l → 16.8km/l	23.5% improvement
Small-size Buses	8.3km/l → 8.9km/l	7.2% improvement
Small-size Trucks	13.6km/l → 16.8km/l	12.6% improvement

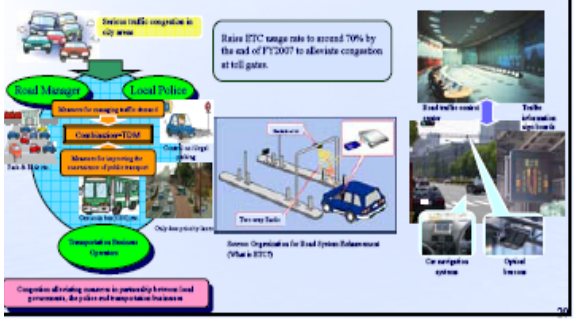
Transportation Sector
- Green Taxation for Vehicles -

- Taxation levels for vehicles differs in accordance with fuel economy performance and gas emission performance
  - Tax reductions for well-performing vehicles
  - Additional taxes for poorly performing vehicles

- Motor vehicle taxation for standard-size vehicles
  - Vehicles with 20% higher fuel efficiency than 2010 and with a 75% reduction from the 2005 exhaust gas — 50% reduction
  - Vehicles with 10 to 20% higher fuel efficiency than 2010 and with a 75% reduction from the 2005 exhaust gas — 25% reduction
  - Diesel vehicles used over 11years — 50% reduction
  - Electric and natural gas vehicles — 10% additional
  - Gasoline vehicles used over 13 years — 10% additional

Transportation Sector
- Traffic Management Measures -

Promotion of TDM (Transportation demand management) | ETC Promotion Measures | Development of Traffic Safety Infrastructures



Technological Development 1

- Technological development is key to medium and long term energy efficiency improvement

Coke Dry Quenching (CDQ): (Iron and Steel)

CDQ is equipment to cool down heated coke from a coke oven by using inert gas, and recovers waste heat efficiently. CDQ equipment has been installed at almost all coke ovens in the Japanese steel industry, contributing to energy saving.

Precalciner-type SP kiln (NSP*): (Cement)

* NSP=New Suspension Preheater-type kiln

- Raw materials are fed into the rotary kiln after passing through a suspension preheater that uses waste hent of the rotary kiln to improve thermal efficiency.
- The NSP type of kiln consumes about 70% of energy compared with the vertical kilns used in the past.

Technological Development 2

Example of Energy Conservation Technology

◎Thermal Insulation Technology applied for New-Type Refrigerator (Vacuum Thermal Insulation Material)

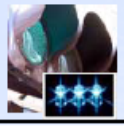
- The performance of insulation is 10 times better than the usual thermal insulation materials. (e.g., glass wool)

◎High-Efficiency Water Heater

- Approximately 30% energy conservation can be achieved compared to traditional combustion-type water heaters by using the principle of heat pumps used in an air-conditioners.

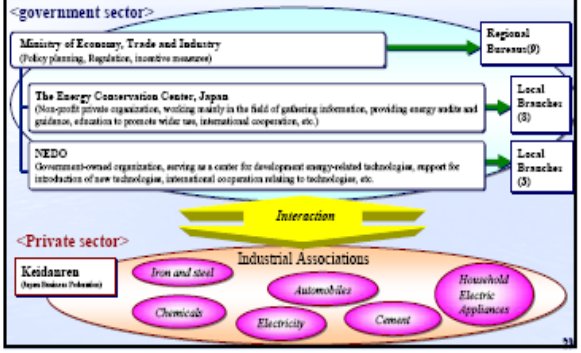
◎Lighting by White Light-Emitting Diode

- Lighting using semiconductors to be light-emitted by electric current, the same principle as for lasers.
- Energy consumption decreases by 20% and 80%, and life spans increase by 3 times and 30 times, respectively, compared with a fluorescent light and an incandescent bulb.



Nationwide Institutional System for Energy Efficiency Promotion

- Cooperation between government and private sector
- Establishment of efficient regional system



Special Budgetary Account for Energy

Petroleum and Coal Tax
- Imposed on importers of petroleum and coal etc.
- Oil: 2,040 yen/KL LPG: 1,080 yen/t LNG: 1,080 yen/t coal: 700 yen/t

533 billion yen

Petroleum and coal tax and surplus, etc.

(FY 2006 budget)

Energy Demand and Supply Account : 569 billion yen
(a part of the Special Budgetary Account)

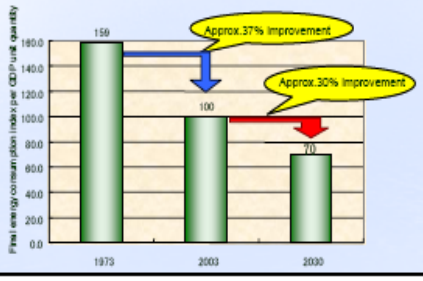
-Expenditures for structural improvement measures of energy supply and demand: Total = 263 billion yen

- Measures for energy efficiency and conservation: **110** billion yen
- Measures for new energy and renewable energy: **88** billion yen
- …etc

- Expenditures for fuel measures: 306 billion yen

Japan's new Target for Energy Efficiency

- Japan decided to aim to improve energy efficiency by at least 30% by 2030 ("New National Energy Strategy," May 2006)



Prime Minister Abe's Proposal on Global Warming "Cool Earth 50"

1. Long-term Strategy

- Cutting global Greenhouse gases emissions by half from the current level by 2050.
- Presenting a long-term vision for developing innovative technologies and building a low carbon society.

2. Three principles for establishing an international framework beyond 2013 (Abe's Three Principles)

- All major emitters must participate, thus moving beyond the Kyoto Protocol, leading to global reduction of emissions.
- The framework must be flexible and diverse, taking into consideration the circumstances of each country.
- The framework must achieve compatibility between environmental protection and economic growth by utilizing energy conservation and other technologies.

Efforts by some countries towards Energy Efficiency improvement [1]

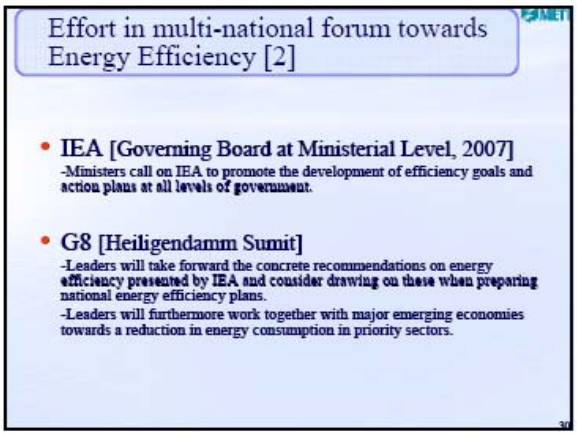
- **China**
  - -20% improvement of energy efficiency in 5 years (2006-2010)
  - -1008 factories with high energy consumption have been designated and obligated to formulate energy conservation plan and reporting
  - -Amendment of Energy Efficiency Law
- **India**
  - -Establishment of Bureau of Energy Efficiency within MOP
  - -Energy Efficiency Act of 2001 (penalty clause activated in 2006)
  - -Setting draft energy intensity standard (cement, paper/pulp)
  - -Implementing Energy Efficiency Labeling System (refrigerators, fluorescent lamps)

Efforts by some countries towards Energy Efficiency improvement [2]

- **Vietnam**
  - -Decree of Government on Energy Conservation and Energy Efficiency (2003)
  - -National Program on Energy Saving and Effective Use (2006)
  - (3-5% reduction of energy consumption during 2006-10 and 5-8% reduction during 2011-15)
- **Thailand**
  - -Energy Conservation law was enacted in 1992.
  - -Subsidy, tax relief and low interest loan for energy conservation activities is available.
- **Indonesia**
  - -Presidential Regulation No.5 in 2006
  - (Make energy elasticity to GDP 1.0 or below by 2025.)
  - -Preparing the draft of Energy Law.

Effort in multi-national forum towards Energy Efficiency [1]

- **East Asia Summit** [Cebu Declaration]
  - -Leaders agreed to set individual goals and formulate action plans voluntarily for improving energy efficiency, and take concrete action toward improving efficiency and conservation.
- **APEC** [The 8th meeting of Energy Ministers]
  - -Ministers encourage APEC economies to individually set goals and formulate action plans for improving energy efficiency on an overall basis and/or sector basis.
  - -Ministers direct the EWG to develop a voluntary Energy Peer Review Mechanism, with an initial focus on progress toward attaining energy efficiency goals.
- **APP**
  - -Total share of energy consumption of the 6 member countries (Australia, China, India, Japan, Korea, USA) in the world is 48%.
  - -Concrete cooperative projects have already commenced in 8 task forces [i) Cleaner Use of Fossil Energy, ii) Renewable Energy and Distributed Generation, iii) Power Generation and Transmission, iv) Steel, v) Aluminium, vi) Cement, vii) Coal Mining, viii) Buildings and Appliances].


Effort in multi-national forum towards Energy Efficiency [2]
IEA [Governing Board at Ministerial Level, 2007]
-Ministers call on IEA to promote the development of efficiency goals and action plans at all levels of government.
G8 [Heiligendamm Sumit]
-Leaders will take forward the concrete recommendations on energy efficiency presented by IEA and consider drawing on these when preparing national energy efficiency plans.
-Leaders will furthermore work together with major emerging economies towards a reduction in energy consumption in priority sectors.

Toyota Perspective on Policies toward Climate Change

Masayuki Sasanouchi
Toyota Motor Corporation

July 19th, 2007

What's Business Role ?

World Business Council for Sustainable Development

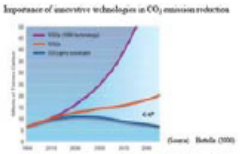
4 Focus Areas of WBSD
- Energy and Climate
- Development
- Business Role
  "What we can do."
  "What we should do."
  "What we can't do."

July 19th, 2007

For what ?

July 19th, 2007

Effectiveness(substantial outcome)

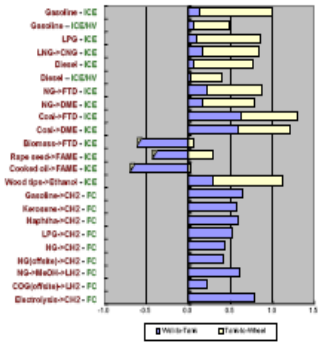


- Comprehensive Approach (e.g. LCA)
- Target setting based on benchmarking
- Eco-Efficiency

And "Parallel Approach"

July 19th, 2007

Well to Wheel CO2 Emission

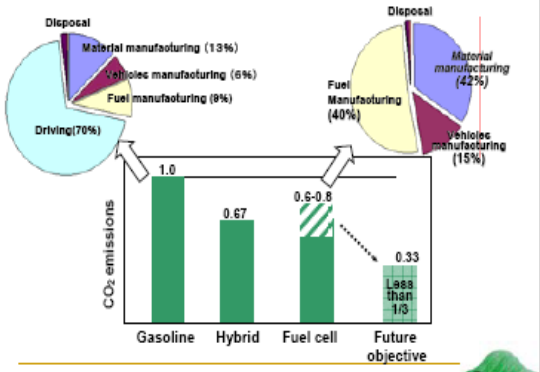


Toyota and Mizuho Calculation

Relative CO2 emission (Gasoline ICE = 1)

July 19th, 2007

Total CO_2 Emissions In an Automobile's Lifecycle



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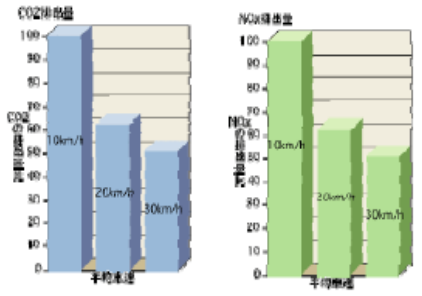
Impact of Traffic Flow



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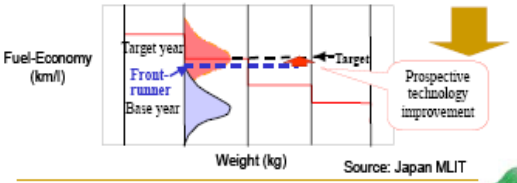
Example:Japan Fuel efficiency standard(Front Runner Approach)

Importance of Benchmarking

Bottom Up >>Top Down

-Improvement of engine efficiency
e.g. Direct-injection engine, Reduction of friction loss, etc.
-Improvement of driving-train
e.g. Multiple AT (5AT, 6AT)
-Dissemination of hybrid system



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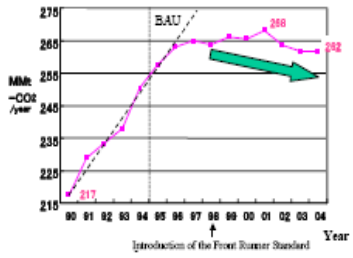
Status of Front Runner Approach

Example:Japan Fuel efficiency standard



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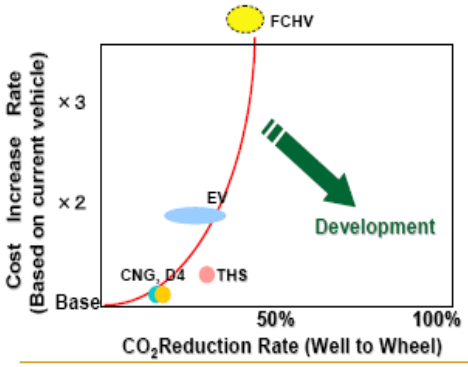
"Eco-Efficiency"



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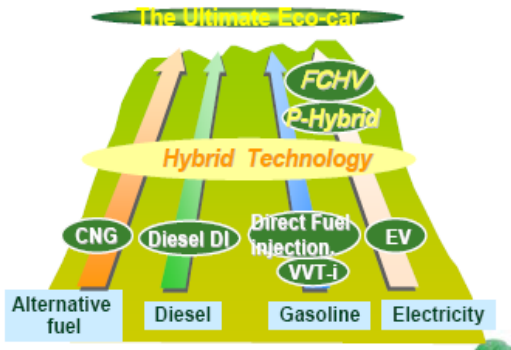
"Parallel Approach" (Multiplicity)



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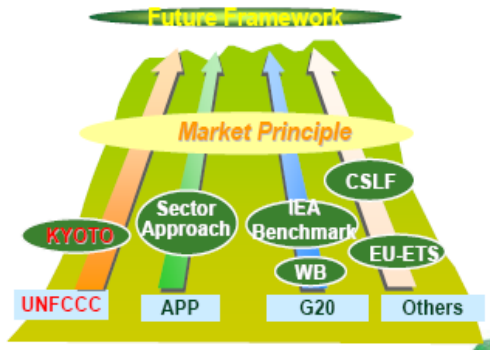
"Parallel Approach"(Multiplicity)



July 19th, 2007

Methodology for Energy Conservation in Japan

"Bridging the Energy Efficiency Divide : Implementation Models and Best Practices"

2007-7-19

Asia Energy Efficiency & Conservation Collaboration Center (AEEC)

CONTENTS

1. Methodology for Energy Conservation in Japan

Reconstruction after the World War II

○Priority Production Policy:

Coal ⇒Steel ⇒Machinery ⇒Export Ind.

Shortage of coal supply

⇒Regulation for Heat Management in 1947

○Private sector such as Iron, Cement, Power

⇒established Heat Management Association

(Original Organization for ECCJ in 1948)

○Energy Conservation is pushed by Regulation and pulled by Association.(Inseparable Wheel)

Why did the manufacturing industry of Japan succeed in the energy conservation after the Oil Crisis?

1. International cost competitiveness enforced enterprises to do efforts such as *ZD,QC activity, Kaizen by small group activities, TQC and TQM*
   Energy conservation investment and technological innovation.
2. Regulation measures by Government (Energy Conservation Law)
3. Support and subsidy system by Government (tax, subsidy, soft lone)

Mutual effect, synergy effect

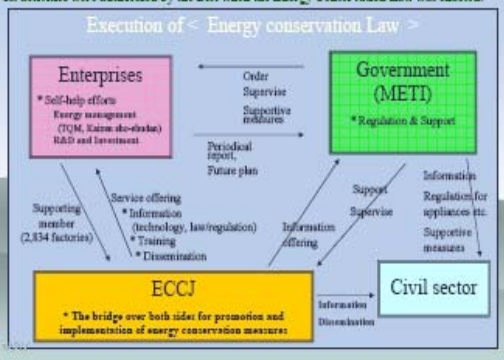
< Energy conservation is to minimize *energy loss* and to maximize *energy efficiency* at energy utilizing site. >

< Energy Conservation Philosophy >

- Energy Conservation should be achieved at "on-site".
- Energy Conservation is to be practical and steady activities.

Role of ECCJ

ECCJ is the core organization responsible for promotion of energy conservation.
Its activities were authorized by the Diet when the Energy Conservation Law was enacted.

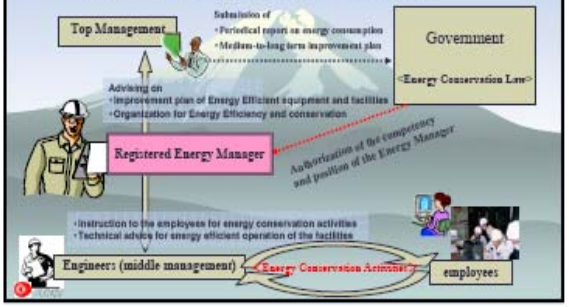


2. Enforcing measure : Energy Manager System

Energy Manager is "Key Person" for achieving the EE&C activity in a factory and building.

Role of Energy Managers under the Law>

* To maintain energy-using facilities in sound conditions following the Guidance (Judgment Standards) by the Law.
* To recommend energy efficiency improvement of the facilities.



2.Enforcing measure : Obligation by the law for EE&C

Notice :Criteria for Factory

■Energy Conservation Measure

EE&C Management Standard : Daly Control

Long & Mid Term Planning : Facility Control

■Results

Periodical Report : ・Yearly progress report and energy intensity
・Facility planning report

■Checking Method

Overall Inspection for designated Factory

On sight Inspection

●Supporting measure and subsidies

PDCA

Overall inspection scheme

Implemented since 2001

Object: Type 1 Designated Energy Management Factories

Factory site surveys — ・Survey of the status of compliance with the standard portion within the factory assessment standards (600 – 800 factories for each business category every year)

If the assessment score is lower than 60

On-the-spot inspection — ・About six months after the site survey at the factory

Where the performance is noticeably noncompliant with the factory standards.

Instructions to draw up a rationalization plan

If the instructions are not followed

Publication of the name and issuance of an order

ECCJ

Training Courses for energy management

1. Symposium , Top management seminar
   - ◆Symposium for energy managers ・・・ Specified for Type 1
   - ◆Symposium for energy management officer ・・・Specified for Type 2
   - ◆Energy-related lecture meetings (at each branch), etc.

   } Communication of the latest information on and trends of laws and management technologies

2. Technical training
   - ◆Practical training courses for energy conservation (5 courses)
     ・・・ Training of beginners in energy management to the backbone engineers (500 people/50 times/year)
   - ◆Technical training courses for energy conservation
     ・・・ Personnel in charge of practical energy management / lectures, practices, and field trips
   - ◆Training in energy management technologies
     ・・・ Energy managers / training in the latest management technologies
3. Correspondence training
   - ◆Correspondence course for energy managers
4. Preparatory training for national exam.
   - ◆Long-term preparatory training course for national exam
   - ◆Short-term preparatory training course for national exam

   } preparing for national exam of Energy managers / acquisition of technical knowledge

ECCJ

3. Common Energy Conservation Activities across the Industry

Step of Improvement

"Step 1": Energy management <no/low cost level>
— cleaning, measuring, recording, operation tuning etc. minor repair, and minor remodeling
Activities of this step can be carried out by operators' own idea
< suitable for operator : Kaizen by Sho-shudan >

"Step 2" : Technical improvement, medium-scale investment
— Replacement of obsolete equipment with high efficiency equipment and introduction of energy-saving equipment
<*Engineer/operator's level*, Kaizen by Sho-shudan>

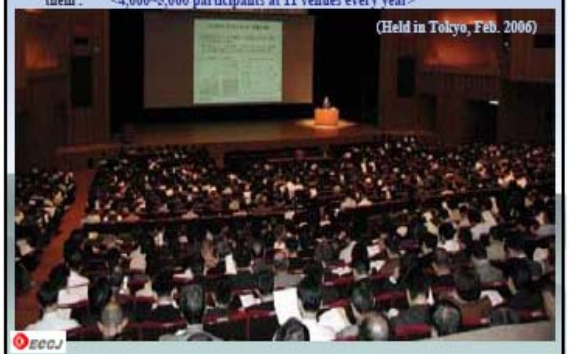
"Step 3" : Improvement requiring a large-scale investment
— Introduction of a new process and construction of a new plant <Depreciation cost and period must be concerned>
< *Project, Task-force level*, >

ECCJ

The National Convention of Excellent Successful Cases

ECCJ organizes and implements every year from 1976

Mass meetings for announcement of excellent cases to disseminate and promote them . <4,000~5,000 participants at 11 venues every year>



ECCJ

Voluntary Environmental Action Plan of KEIDANREN

(Japan Federation of Economic Organizations)

* Participants : 35 industrial associations (Coverage Ratio : 82% of CO_2 emissions in industrial sector as of Nov. 2005)
* Implementation of Energy Conservation Measures aiming at the Target by each Industry

Overall Target in FY2010:

To reduce CO_2 emission from Industrial and Energy-Converting Sector below the amount in 1990 :

- Steel Industry:
  - 10% Energy Consumption below 1990 by 2010
- Chemical Industry :
  - 10% Energy Intensity below 1990 by 2010
- Paper and Pulp Industry :
  - 10% Energy Intensity below 1990 by 2010

Source: KEIDANREN (Japan Federation Economic Organizations)

4. Main Activities of ECCJ

Industrial sector

① Dissemination (conference for successful cases of E-C activities, excellent energy conserving equipment, etc.)
② Technological development and spillover
③ Energy conservation audits services for factories
④ Education & training on energy conservation
⑤ State examination for energy managers (assigned by the Gov.)

Consumer & Transportation sector

① Energy conservation audits services for buildings
② Ranking catalogue for energy efficient appliances (dissemination of Top Runner Program)
③ Promotion of Energy labeling system
④ International Energy Star Program implementation
⑤ Energy efficiency product retailer assessment system
⑥ Dissemination of Energy conservation indicator "E-Co Navigator"
⑦ Energy efficiency education at elementary and middle schools
⑧ ESCO research and development

Cross sector

① Energy conservation campaign & exhibition (ENEX)
② Commendation (grand energy conservation prize)
③ Information & data base, Publicity and publishing
④ Survey and monitoring
⑤ International cooperation & Communications

Public Programs on Energy Conservation Auditing Performed by ECCJ

Program	Applicable factory	Overview	Funded by
Energy Conservation Auditing for Factories (Free-of-charge)	Medium sized factories	On-site discussion, Document review, On-site Inspections — 1 day → Report of findings and Proposals on Improvement 300 factories/year	METI
Energy Conservation Auditing for Buildings (Free-of-charge)	Buildings	On-site discussion, Document review, On-site Inspections — 1day → Report of findings and Proposals on Improvement 454 buildings/year	METI

We have made public the proposed measures & expected effects for other factories' reference.

5. International cooperation

<Policy Proposal>
*Investigation of energy and energy conservation policy.
*Potential survey and feasibility study on energy conservation and reduction of GHG emission .

<Capacity-Building>
*Training course at home and abroad.
*Dispatching experts to overseas for seminars.

<Technical Cooperation>
*Factory diagnosis and improving advise based on measurements (plant survey, energy conservation audit)
*Cooperation and support for establishment and operation of EE&C Centers or such organizations.

<Asia EE&C Collaboration Center> ---- *New !!*
*One-stop answering service for inquiries related to EE&C
*Information Service concerning EE&C activities

Cooperation Scheme through ECCJ

JICA: Japan International Cooperation Agency
AOTS: The Association for Overseas Technical Scholarship
ECCJ: The Energy Conservation Center, Japan
JODC: Japan Overseas Development Corporation
JETRO: Japan External Trade Organization
NEDO: New Energy and Industrial Technology Development Organization

Your Governments
Request
ODA (grant aid) Scheme
METI Scheme
Human Development
JICA
AOTS
JODC
ECCJ
JETRO
NEDO
Technical/Hard-ware Development
Energy Conservation Spread
ECCJ
Government (Japan)
Other Organizations
International Cooperation

JICA Scheme

JICA-project type International Cooperation
Establishment of Energy Conservation Center

ECCJ
Master Plan
Dispatch of experts
Training in Japan
Provision of equipment

CHINA : ECTC (1992.7~99.1)
ARGENTINA : CIPURE (1995.7~00.6)
BULGARIA : EEC (1995.11~00.10)
TURKEY : NECC (2000.8~05.7)
THAILAND : PEMTC (2002.4~05.4)
IRAN : NTCEM (2003.4~07.3)
POLAND : ECTC (2004.7~08.6)

ECC : The Energy Conservation Center
ECTC : Dalian China Energy Conservation Training Center
CIPURE : The National Use of Energy Center
NECC : The National Energy Conservation Center
PEMTC : Practical Energy Management Training Center
NTCEM : The National Training Center for Energy Management

In progress

Asia Energy Efficiency and Conservation Collaboration Center

Asia Energy Efficiency and Conservation Collaboration Center (A EEC) contributes to promoting the efficiency use of energy in Asian counties through international cooperation on information service and One-stop window service for a variety of inquiries related to energy efficiency and conservation.

Contact Us :

http://www.asiaeec-col.eccj.or.jp/

6. Summary

1. Thorough Energy Management is the first important step toward EE&C in the industrial sector.
   Philosophy: EE&C can be realized only by the daily continuous practices on site.
2. " Kaizen by Shoshudan Approach (Small Group Activities)" is a practical and effective way toward best practices for Energy Management.
3. Japanese firms follow the tradition to cooperate mutually for their common benefits, while having stiff competition each other. EE&C is the example for such common benefits to be pursued by the whole industries.
4. Support and subsidy system by government is important to promote energy conservation.
5. Industrial associations and public services corporations like ECCJ have been acted as catalysts for overall EE&C promotion.

ECCJ

July 19, 2007
Joint Roundtable
@World Bank Tokyo Office

Beyond Energy Efficiency and Beyond Technology Transfer

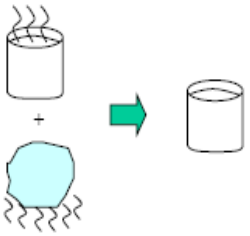
Yoshiharu Tachibana
TEPCO

1. Beyond Energy Efficiency

- Quantity = Energy Efficiency
- Quality = Exergy* Efficiency
  (Energy Effectiveness)

* $E = H - H_0 - T_0 (S - S_0)$

Energy Efficiency is 100%, but something is lost.



- Hot Water plus Ice equals Room-temperature Water.

2. Beyond Technology Transfer

- Sosio-politcal Barriers

Menu

- Appetizer
  : *Mottai-nai*
- Main
  : Asia Pacific Partnership (APP)
  on Clean Development and Climate
- Desert
  : Socio-political Barriers

Anglicized Japanese

- Sake
- Sashimi
- Sushi
- Tempura
- Tofu
- Yakitori
- Karaoke
- Aikido
- Bushido
- Judo
- Karate
- Sumo
- Yokozuna
- Sudoku

Source: Concise Oxford ENGLISH Dictionary except for Sudoku

Mottai-nai
勿体ない

1. It is *Mottai-nai* (a waste) to keep the temperature of this room at such a low level in summer.
   (Quantitative argument)
2. Your wife is *Mottai-nai* (too good) for you.
   (Qualitative argument)

7

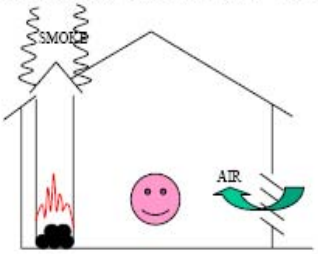
Fossil Fuel is *Mottai-nai*

COAL
0.1%

- To burn to heat you up outdoor.

8

Fossil Fuel is *Mottai-nai*

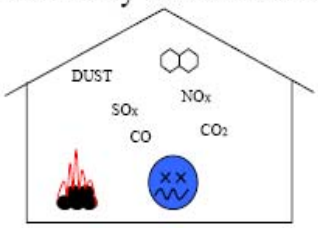


5%

- To burn to heat you up indoor.

9

Fossil Fuel may not be too *Mottai-nai*

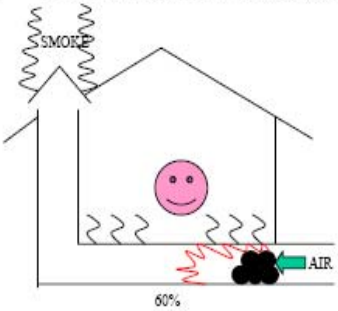


100%

- To burn to heat you up indoor in the most "energy efficient" way, but, at your own risk.

10

Fossil Fuel is still *Mottai-nai*

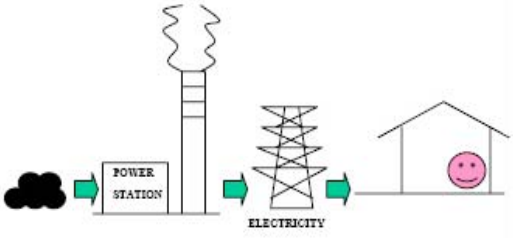


60%

- To burn to heat you up indoor in the most practically "energy efficient" way.

11

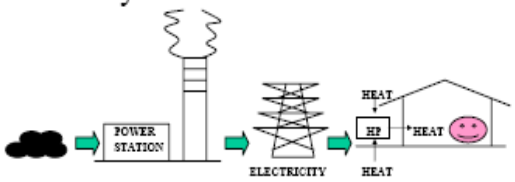
Fossil Fuel is NOT *Mottai-nai*



- To convert to electricity at the first place.

12

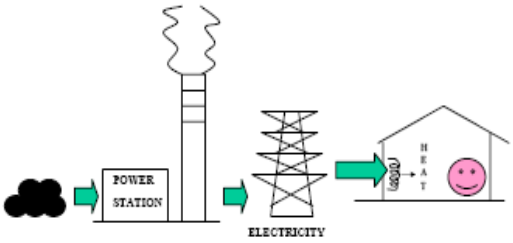
Why it is NOT *Mottai-nai*?



35% (SUB-CRITICAL)	90%	300%	94. 5%
45% (USC, FBC, IGCC)	90%	400%	162%
50%- (USC, IGCC, IGFC) 2020	90%	500%	225%~

13

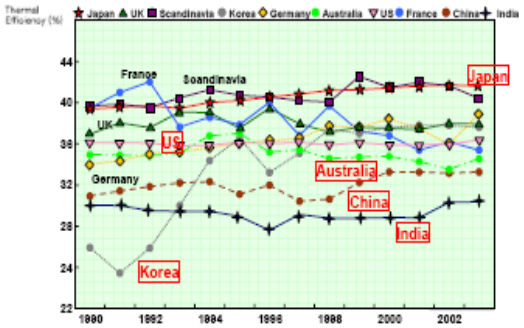
Electricity is *Mottai-nai*



- Just to convert to low-temperature heat.

14

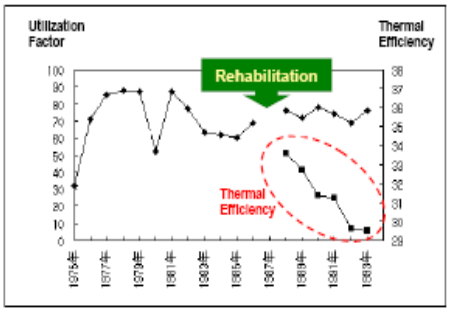
Coal is *Mottai-nai* to convert to electricity at low efficiency



Sources: Updated Comparison of Power Efficiency on Grid Level, 2000(Ecofys)

15

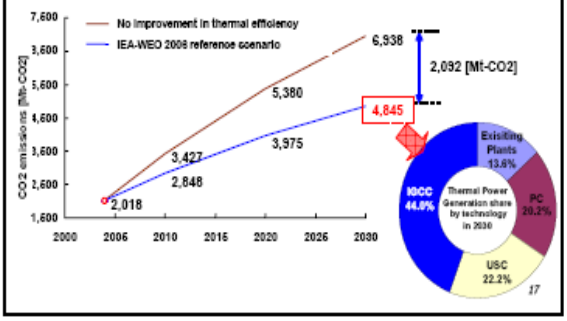
It is *Mottai-nai* to degrade thermal efficiency



Malaya power station, Philippine Source: JICA, 2004

16

Potential of thermal efficiency improvements in China



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Asia Pacific Partnership (APP) can make it happen by

- Sharing of best practices
- Identifying and removing barriers
- Improving investment conditions
- Creating new financial flows (in combination with development assistance, carbon financing, and/or carbon pricing for example)

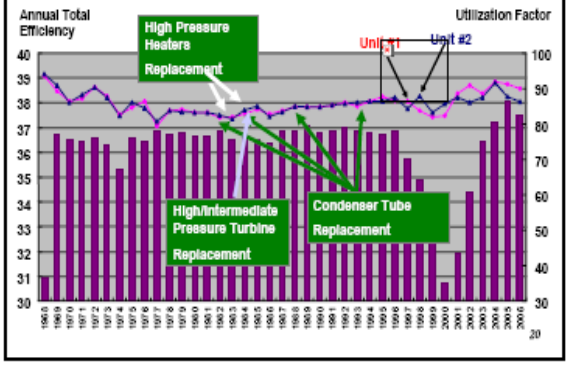
18

A thousand-mile journey began with a single step of sharing best practices

- Theme: Maintaining & improving thermal efficiency of aged coal-fired thermal power plants
- Date: April 16 -19, 2007
- Venue: Takasago Thermal Power Station of J-Power (1968-), and Hitachinaka Thermal Power Station of TEPCO (2003-).
- Participants: 50 plant engineers from the six APP countries
- Organizer: Power Generation and Transmission Task Force of APP.

19

Actual Practices at Takasago P/S



20

Socio-political Barriers (Beyond Technology Transfer)

- Optimal dispatch order mechanism
- Work sharing issue
- Mutual co-operations among sections
- Capacity building

21

Thank you for your attention!

22

References

23

Clean Coal Technologies

Clean Coal Technology		Installed capacity	Thermal Efficiency
Conventional Coal-fired	Sub-critical	86%	33 - 39%
Advanced Efficiency (Pulverized Coal)	Supercritical (SC)	11%	42 - 45%
	Ultra-Supercritical (USC)	2%	44 - 45% (50-55% in 2020)
	Fluidized Bed Combustion (FBC)	2%	- 45%
Coal Gasification	Integrated Gasification Combined Cycle (IGCC)*	>0.1%	42% (50% in 2020)

* "Capital costs of IGCC plants today are about 20% higher that for PCC plants." (Energy Technology Perspective 2006, IEA.)

Note: Supercritical plants are defined as those operating with steam temperature above 540°C. Ultra-supercritical plants are units operating with temperature above 680°C

Source: IEA Energy Technology Perspectives 2006
Powering a Sustainable Future, 2006, WBCSD

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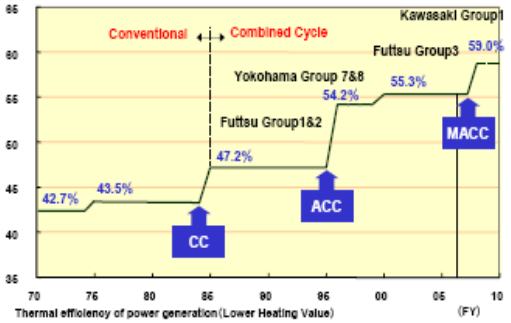
Improvement of Thermal Efficiency in TEPCO

Gas-fired Thermal Power Plant



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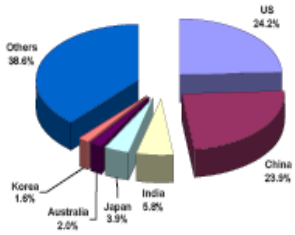
Significance of Electricity Sector in APP countries

- Electricity sector contributes approx. 40% of global CO2 emissions.
- CO2 emissions from electricity sector in APP countries account for approx 60% of total CO2 emission in electricity sector.



- Electricity sector in APP countries is responsible for approx. 22% of global total CO2 emissions.

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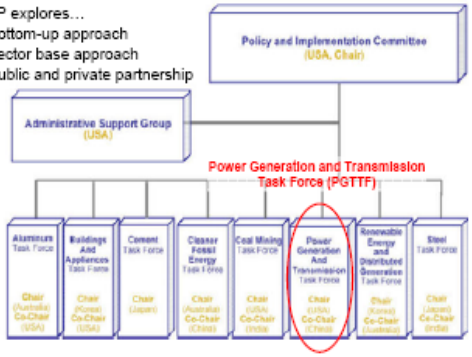
Asia-Pacific Partnership on Clean Development and Climate

APP explores…
- bottom-up approach
- sector base approach
- public and private partnership



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Individual Projects under the PGTTF in APP

- Best Practices for Power Generation Activity Plan
- Best Practices for Transmission and Distribution Activity Plan
- Best Practices for Demand Side Management Activity Plan
- Energy Regulatory & Market Development Forum
- Trade Exhibitions/Conferences and Trade Missions
- Hydroelectric Generation Best Practices
- Combustion Optimization in Coal Based Power Plants
- Implementation of Artificial Intelligent Soot Blowing System for Improving the Steam Generator Efficiency by Increasing the Effectiveness of Soot Blowers.
- SOx Reduction Technologies in Flue Gas
- Risk Evaluation and Prioritization (REAP) for Maintenance and Renovation & Modernization (R&M) of Power Plants
- Life Extension & Remaining Life Assessment of Power Plants
- Site Visit of Energy Conservation and Environment Protection Technology—Application of Plasma Ignition Technology in Power Generation

Site Visit
Peer review
Workshop
Capacity Building

28

Peer Review Activity Participants (1)

Australia(2)	Department of the Environment and Water Resources International Power
China(8)	China Electricity Council (CEC) Beijing Guodian Kehuan Clean Combustion Technology & Engineering Ltd. China Datang Corporation China Power Investment Corporation Guodian Technology & Environment Group Co., Ltd. Huaneng Power International Inc. Yantai Longyuan Electric Technology Co., Ltd.
India(8)	National Thermal Power Corporation Ltd. (NTPC). CESC Ltd. Confederation of Indian Industry (CII)
United States(6)	Edison Electric Institute (EEI) Alliant Energy Ameren American Electric Power (AEP) Southern Company

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Peer Review Activity Participants (2)

Korea(13)	Ministry of Commerce, Industry & Energy Korea Electric Power Corporation Korea East-West Power Co., Ltd. Korea Midland Power Co., Ltd. Korea South-East Power Co., Ltd. Korea Southern Power Co., Ltd. Korea Western Power Co., Ltd. Korea Electric Power Research Institute (KEPRI)
Japan	Ministry of Economy, Trade and Industry Hokkaido Electric Power Co., Inc. Tokyo Electric Power Company Chubu Electric Power Co., Inc. The Kansai Electric Power Co., Inc. The Chugoku Electric Power Co., Inc Kyusyu Electric Power Co., Inc. Electric Power Development Co., Ltd. The Federation of Electric Power Companies Thermal and Nuclear Power Engineering Society International Center for Environmental Technology Transfer

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Energy Efficiency in China: Strategies and Financing Options

Bai Quan Ph.D.

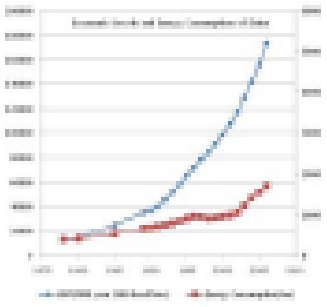
Energy Research Institute
National Development and Reform Commission
P.R. China

Content

- Macro Situation of EE in China
- Energy Efficiency Market Potential in China
- Financing Case in EE financing in China

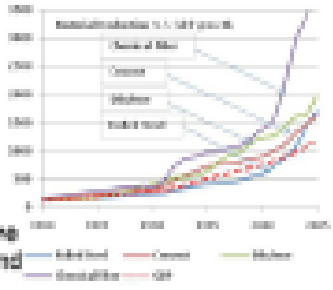
Macro Situation of EE in China

- Fast GDP Growth
  - >10% 4 years
  - 10.7%↑11.1%
- Energy Demand Grow Faster
- Elasticity >1.0

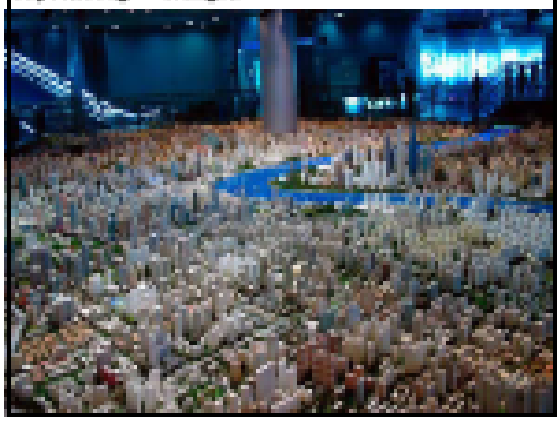


Macro Situation of EE in China

- Driven by
  - Infrastructure
  - Real Estate
  - Industrial Dev.
  - Exportation
- Energy-intensive Material Demand Increased



City Planning — Shanghai

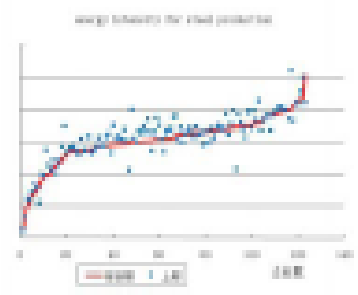


Macro Situation of EE in China

- Large market potential absorbed large sum of investment
  - Booming: both small plants v.s. large plants
  - Enterprise: favors on scale, not quality & competition capability
  - ↓ low efficiency & outdated tech v.s. world most advanced technology
  - A large EE Gap exist, large EE potentials exists

Gap between good and bad

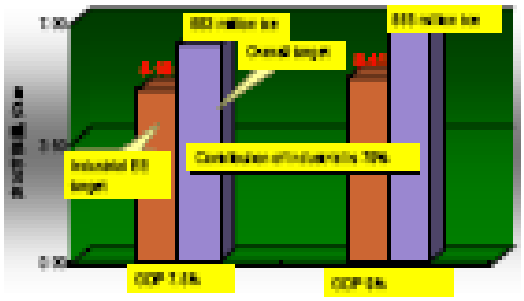
- Energy consumption per ton of steel



Macro Situation of EE in China

- Central Government of China
  - Long term
    - New 'National Policy': Resource Conservation
    - 'Building a Resource Conserving Society, and Environmental Friendly Society'
  - Mid term
    - 11th five-year plan: reduce GDP Energy-Intensity 20%
  - Short term
    - Year 2006, target 4%, 1.33%
    - First half of Year 2007: severe, due to fast growth of Energy-Intensive Industry

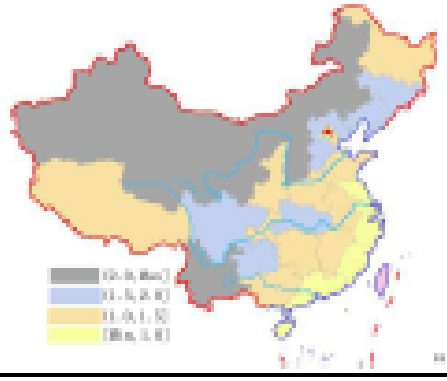
11th five year energy conservation target



Macro Situation of EE in China

- Current Actions
  - Decompose 20% target to provinces: sign commitment
  - Eliminate small plants with price measure and pollution control measure
  - Ten Energy Conservation projects
    - Motor system
    - Boiler and furnace
    - Building EE
  - 1,000 Enterprise Energy Conservation Action
  - …

Energy Intensity by Province in China



Decompose 20% target to provinces

Macro Situation of EE in China

- Eliminate small plants with price measure and pollution control measure

Industry	Standard	Unit	Value added	Year 2005
Power Gen	[illegible]	kW	[illegible]	[illegible]
Iron prod.	[illegible]	kt iron	[illegible]	[illegible]
Steel prod.	[illegible]	kt iron	[illegible]	[illegible]
Alloy Iron	[illegible]	kt iron	[illegible]	
Coke	[illegible]	kt iron	[illegible]	[illegible]
Cement	[illegible]	kt iron	[illegible]	[illegible]
Glass	[illegible]	kt iron	[illegible]	[illegible]

Measures to eliminate small plant

- Eliminate according to laws and standards
- Sign commitments with local government and enterprises .
- Use economic measures, such as raise electricity price for specific enterprises

Ten EC Projects

- Target
  - To form EC capability of 240 million toe
  - To form EC capability of 50 million toe in year 2007
- Ten EC Projects
  - Coal-based Boiler (Furnace) project
  - Cogeneration Project
  - Waste Heat & Waste Pressure Recovery Project
  - Oil Saving and Substitution Project
  - Motor System Energy Conservation Project
  - Energy System Optimization Project
  - Green Light Project
  - Building EC project
  - EC of Government Agencies
  - Capacity Building of EC Technical Assistant System

1000 Enterprise EC Action

- EC target:
- Save 100 Million toe by 2010,
- Year 2007: 20 million toe's EC capability
- Measures
  - Sign EC release commitment
  - Energy Auditing
  - Compose EC plans
  - Compose 1000 enterprises energy utilization situation report
  - ..... Blacklist.....
  - .....

Energy Conservation Market in China

- Opportunities:
  - New Guidance – Central government
  - High political stress – local government
  - Large necessity – enterprises (esp. 1,000 list)
  - Implementation team and capability – rebuilding
  - Matured Technology

Energy Conservation Market in China

- Large market for advanced EE equipment
- Large investment demand and profit margin
- Market potential
  - 2006-2010:
    - Energy conservation target: 630 million toe
    - Investment per unit toe: 1500~2000 RMB, half of it on...
    - Total: USD 120~150 billion
- For EE in China: Winter is over, spring is coming !

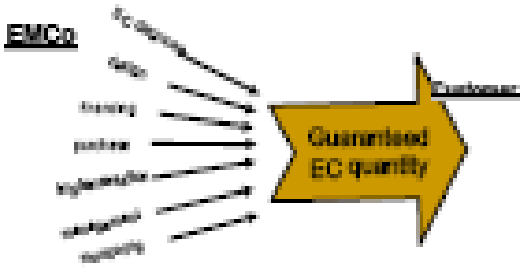
Financing Case in EE

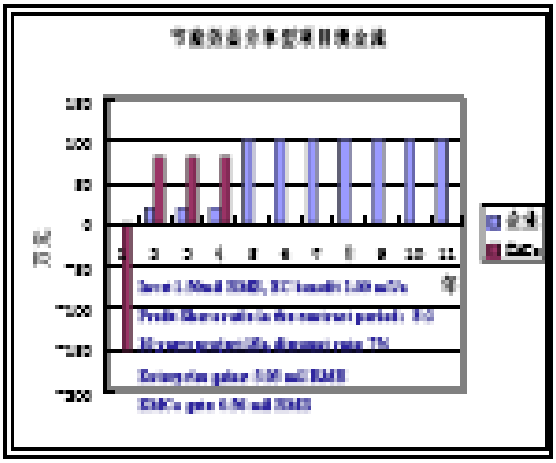
- Barrier of EE
  - Scattered distributed in different industries and secondary investment
  - Do not belong to enterprise's major business, leaders do not care about EC
  - Lack of professional information for enterprise decision makers: available tech? reliable tech? economic solution?
  - Leaders do not what companies/ institutions could provide high quality EC service

Financing Case in EE

- Barrier of EE
  - Lack of investment to conduct EE
    - Prefer to invest into production capability
    - Could not form bank mortgage
    - It is hard to split EC benefit from financial record

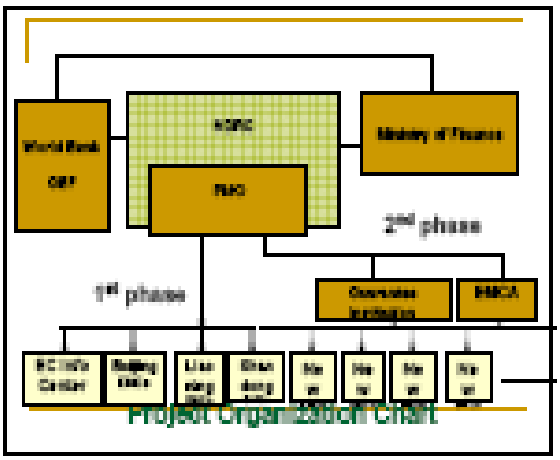
key point of EMC
EMCo's erial service



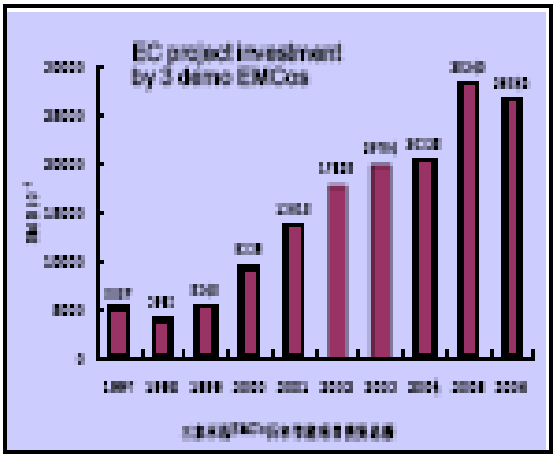


Financing Case in EE

- NDRC-WB-GEF Energy Conservation Promotion Project
- 1st Phase: introducing ESCo mechanism
  - 3 ESCos
  - Energy conservation information dissemination center
- 2nd Phase: Provide Loan Guarantee
  - Base on the output of 1st stage
  - Provide technical assistant and financing assistant



Project Organization Chart



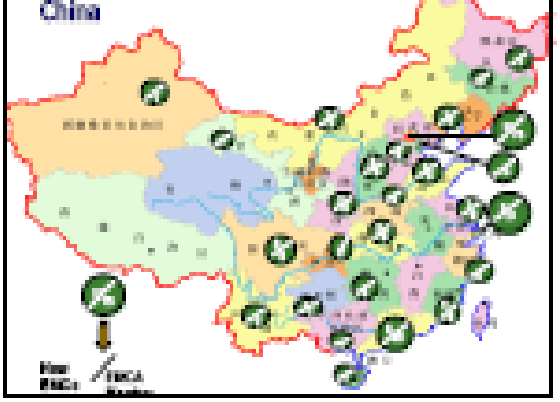
Development of 3 demo EMCos

- [illegible]
- [illegible]
- [illegible]
- It is proved that EMCo is warmly welcomed in China, and has become a successful and profitable option in EE financing

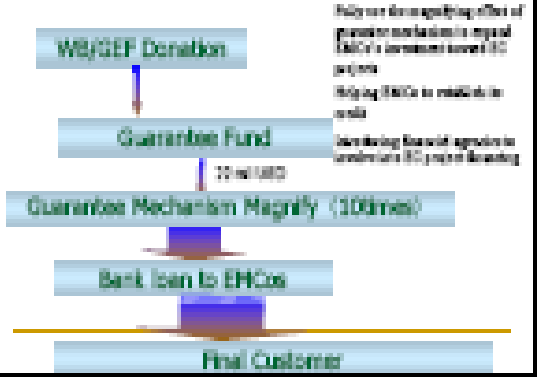
Achievement of 1st stage

- Up to Jun 30, 2006, 3 EMCos did 475 energy conservation projects for 405 enterprises, the accumulated investment reached 1.331 billion RMB.
- Characteristic: short pay back time(most 1~2 years, 90% <3 years), good economic and environmental benefit
- average investment of forming per ton of coal equivalent EC capability: about 1150 RMB/(toe.a), i.e. USD $ 211/(toe.a)

203+EMCA Members(47 new EMCo) Across China



EMCo Commercial Loan Guarantee Plan



Thank you!

SENER

SECRETARÍA DE ENERGÍA

CONAE

ENERGY EFFICIENCY MEXICAN EXPERIENCE:
INSTITUTIONAL ASPECTS AND FINANCING

María Elena Sierra

Deputy Director General

Tokyo, Japan

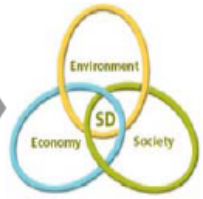
July 2007

National Commission for Energy Conservation

SENER

A GLOBAL AIM ...

"Sustainable Development means economic prosperity and security, enhanced social welfare and social inclusion, and a healthy natural environment. These are all connected; success in one policy area is dependent on success in others..."



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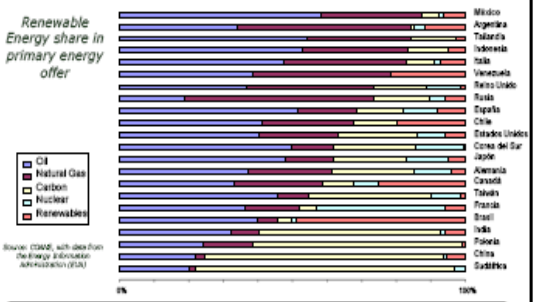
WORLD OVERVIEW: ENERGY CONSUMPTION

Renewable Energy share in primary energy offer



The energy system in Mexico is excesively dependant in oil and gas

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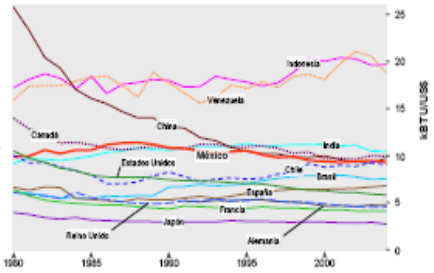
CHALLENGES: LOW ENERGY EFFICIENCY

Energy Intensity in hydrocarbons usage

Hydrocarbons consumption per USD.



Mexican economy is particularly dependant on oil and natural gas with a low energy intensity in the global context.

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ENERGY USAGE

Energy Usage by Sector

88% of the clients are from the residential sector.

Industry accounts for 59% of the usage,mainly chemicals, iron and steel, and cement.

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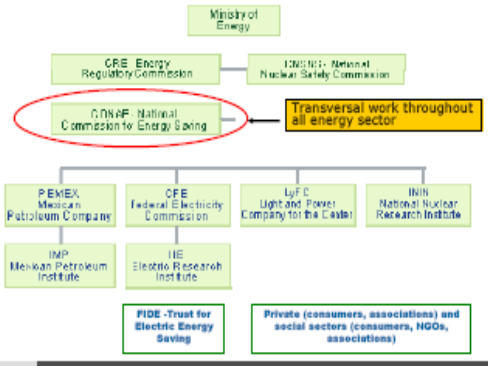
MEXICO'S ENERGY SECTOR INSTITUTIONAL STRUCTURE



CONAEs ENERGY EFFICIENCY STRATEGY

Assistance
Standardization
Promotion

- Conserving energy resources
- Diversifying energy matrix
- Protecting the environment
- Benefiting household income
- Efficient use of renewable and non-renewable energies
- Increasing private sector competitiveness

+ Working Groups

NATIONAL STRATEGY FOR CLIMATE CHANGE

Power Generation and Energy Use
Mitigation Opportunities for Greenhouse Gas Emissions
Target: 106.8 $MtCO_2$/year, 2007-2014

Conae's direct participation

Conae's indirect participation

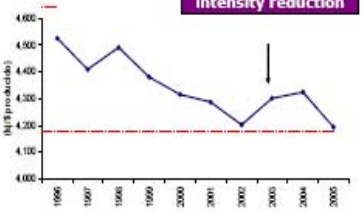
Activity	Estimated Reduction MtCO2/year
Energy Efficiency	27.8
Pemex	14.7
Power Generation & Distribution	27.7
Industry Sector	26.0
Renewable Energy Sources	8.0
Transportation	3.6
Total	108.8

Conae's Commitment **26%**

CONAE. IMPACTS

Average energy intensity reduction

Potential Savings :~20% national energy usage



We have achieved 2% reduction of the national energy usage.
During the past administration, for every USD dollar invested in energy efficient initiatives aproximetly 34 USD were saved.

ENERGY EFFICIENCY STANDARDS

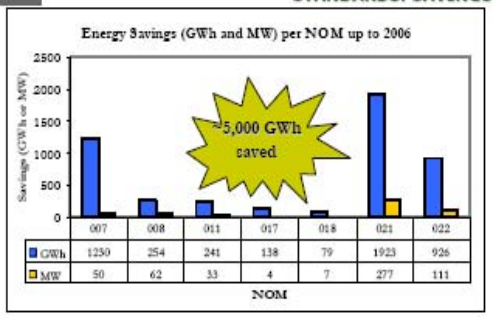
Energy efficiency standards have been issued for 18 different products and systems, including:

- Electro domestic equipment
- Air conditioner
- Lightning
- Domestic Water Heaters
- Water pumping

During this year, Conae is working in the elaboration of 4 new standards, namely:

- Shadow glass coefficient
- Machinery for tortilla elaboration
- Insulation for residential buildings (thermal insulation)
- Ductless air conditioner (mini-split)

ENERGY EFFICIENCY STANDARDS: SAVINGS



NOM-003. Thermal Efficiency for water heaters, has saved since 1996, aprox. 997,335 m3 of LPG

NATIONAL ENERGY EFFICIENCY PROGRAMS 2007

1. ENERGY EFFICIENCY IN FEDERAL GOVERNMENT BUILDINGS
2. GREEN BUILDING INITIATIVE
3. GREEN MORTGAGES PROGRAM
4. SOLAR WATER HEATERS PROGRAM
5. POWERMEX Clean Energy & Efficiency 2007

ENERGY EFFICIENCY IN FEDERAL GOVERNMENT BUILDINGS

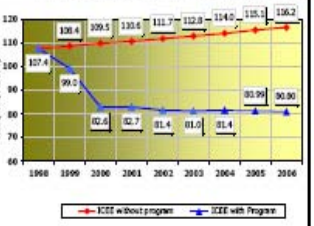
Mandatory Program since 1999

- 1,425 office's buildings, 4.97 Millions square meters
- Cumulative savings for more than 1,800 million pesos in the electricity bill (XXXUSD)

Program's Impacts

Year	Savings Million of $ pesos	GWh	MW	Buildings
1999	17	24	4	374
2000	73	104	18	869
2001	73	104	18	867
2002	306	175	31	874
2003	312	178	32	1475
2004	338	193	35	1447
2005	354	202	37	1455
2006	371	212	39	1425
TOTAL	1,844	1,192	215	1425

Electric energy consumption index (ICEE)



Federal Agencies pay, since 2002, 2.5 times the cost of energy.

GREEN BUILDING INITIATIVE

Project Strategy

To create and promote a Green Building Trademark, **"Edificio Verde"**, with the purpose of fostering and incrementing competitive and effective sustainable building markets.

It will function as a system of building certification that will make energy consumption levels much more visible to owners, tenants and users.

Expected Impact

To provide decision makers and end users information regarding the most appropriate sustainable systems available and renewable energy technologies (RETS) for buildings.

- **Capacity building;**
- **Fostering market development;**
- **Fostering market sustainability;**

GREEN BUILDING INITIATIVE

The Green Building Certification Guidelines will include:

- Insulation and construction materials
- Energy efficiency design
- Bioclimatic criteria
- Analysis of positive externalities
- Financial mechanisms
- Regulations and construction codes
- Water use and savings in terms of appliances
- Fittings, site and design interventions, such as rain water harvesting, and RETS

GREEN MORTGAGES PROGRAM

Objective

Financing mechanisms to reduce the additional costs of efficient systems (Green mortgage) on pilot projects supported by INFONAVIT CREDITS to promote the use of renewable energy technologies (RETs) and energy efficiency measures for low/medium income housing in the following:

- Domestic solar water heating
- Thermal insulation
- Energy efficiency for residential lighting

Program:

10,000 houses equipped by the end of 2007 (Tecamac, Edo. de México)

Conae will collaborate, with the technical support of the National Solar Energy Association (ANES), in the equipment certification and the suppliers and installation companies validation processes.

SOLAR WATER HEATERS PROGRAM

Actual Situation:

- More than 50 years of National manufacturing
- 640,000 m2 installed in México [1]

Program Objective: To develop an appropriate framework for the solar water heaters technologies market

Target: 1 800 000 m² installed by the end of this administration (2012)

Target in Carbon emissions avoided: 450,000 tons.

Lines of action:

- Regulation and certification
- Economic incentives for end users and manufacturers
- Market enhancement
- Development and assessment indicators, statistics and data
- Program synergies between agencies

POWERMEX Clean Energy & Efficiency 2007

"XIII Energy Efficiency, Cogeneration and Renewable Energy Seminar" 16-18 October, 2007; WTC, Mexico City

- International Exhibition and Conference for Mexico's Power Generation, Transmission and Distribution, Co-Generation and Natural Gas Industries
- With more than 140 stands and an audience of over 5,000 visitors, seeking energy products and services
- This year, the Seminar's main topic is: "*Sustainable Buildings* "; with 40 technical conferences, divided in several topics, such as:
  - Sustainable building design;
  - Renewable energy technologies;
  - Electric and thermal energy efficient technologies and
  - Financing mechanisms.

NEXT STEPS: ENERGY EFFICIENCY AND RENEWABLE ENERGY NATIONAL PROGRAM 2007-2012

Energy Efficiency

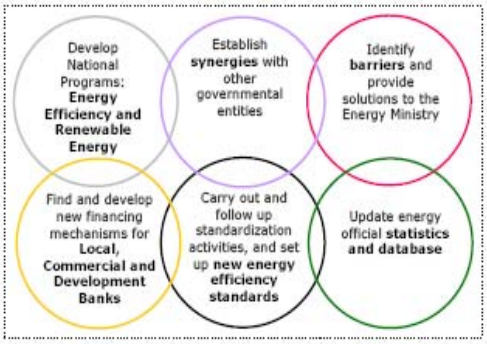
- Achieve energy intensity reductions through better management practices and/or technological processes with no adverse effects in the economic activity.
- Target promising areas for energy efficiency potentials in critical sectors,
- Develop new indicators and statistics for industrial and residential energy efficiency
- Establish policies and advice on best practices on key areas for efficiency gains.
- Promote sustainable energy investment by increasing the awareness and engagement, and building capacity of local banks by demonstrating the business opportunities for EE/RE projects in Mexico.
- Involve development banks in assessing financial mechanisms for EE/RE industry projects.
- Promote financing of EE/RE projects in State governments and Municipalities.

BARRIERS STILL NEEDED TO BE TACKLED

Financial

- Limited fiscal incentives or unknown to market actors
- Lack of EE and RE clear National Policy, isolated programs.
- In general Local Financing Institutions, LFIs, are mostly reluctant to participate in Energy Efficiency Projects, EEPs, or in innovative financing schemes with ESCOs.
- While most LFIs have participated in financing EEPs, none of them has differentiated EE lending from their current practices
- LFIs in Mexico believe projects need to cost at least US$50 million in order to justify high transaction costs associated with their complex financing structure
- In all Mexican LFIs, the estimated percentage of EEPs is less than 1% of their total loans.
- Local commercial banks do not have sufficient knowledge about EEPs and therefore allocate a greater risk in their assessment of the related loans

INSTITUTIONAL AREAS TO BE STRENGTHEN. CONAE



CONCLUSIONS

The present administration is working on:

- Enforcing norms and standards to incorporate the criteria for sustainable energy usage;
- Defining criteria to promote sustainable building in urban development programs and establishing a certification system; setting a target for sustainable housing projects per year, according to the expected annual increase of 750,000 new units.
- Promoting sustainable energy investment by increasing the awareness and engagement, and building capacity of local banks by demonstrating the business opportunities for EE/RE projects in Mexico.
- Encouraging local Governments to consider reviews on laws, norms, practices, strategies, etc.
- Creating synergies with stakeholders, to promote a framework that allows the implementation of energy efficiency measures;
- Identifying possible tax incentives for energy-efficient technologies, in order to make these affordable and accelerate the growth of market demand
- Promote the use of RE and Cogeneration technologies
- Designing an Energy Efficiency National Campaign

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CONAE

THANK YOU

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National Commission for Energy Conservation

MECHANISMS AND OBJECTIVES FOR EE/RE PROJECTS

Objective	Mechanism	Outcome	Examples
Guarantee the quality and operational function of systems	Certification and standardization	Norms, procedures and training	Building codes, norms and standards applied to systems and equipment
Reduce the costs of buying and installation	Subsidies and fiscal incentives	Direct or partially focus	Tax exemption (sales equipment, tax fee, property). Cash or in kind transfers to particular groups (low-income groups)
Provide investment in EE/ER projects	Access financing	Warranties, promotion bank	Loan warranties, loan through governmental entities
Foster awareness	Campaigns	Media	Seminars, workshops, among others

Promoting Energy Efficiency through Regulatory Framework and Financing Options- Experience from India

Ajay Mathur
Director General
Bureau of Energy Efficiency, Government of India

Government of Japan & World Bank Joint Roundtable
Bridging the Energy Divide: Implementation Models and Best Practices
Tokyo, 19th July 2007

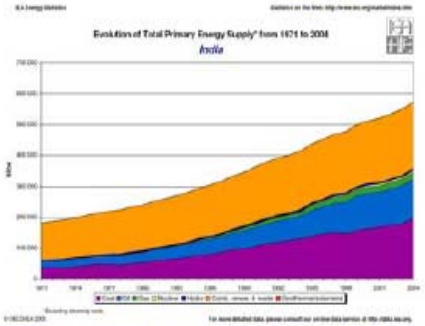
Energy Use in India

- Energy demand is increasing due to rising incomes, accelerated industrialization, urbanization and population growth
  - 2003-04 : 572 Mtoe
  - 2016-17 : 842-916 Mtoe
  - 2026-27 : 1406-1561 Mtoe
- Meeting the increasing demand only through increases in supply will lead to:
  - Reduced energy security due to volatility in availability and prices of imported fuels
  - Adverse environmental impacts
  - Strain on balance of payments
- Energy conservation and energy-efficiency are an essential part of national energy strategy

Energy use transitions hold key to future trajectory

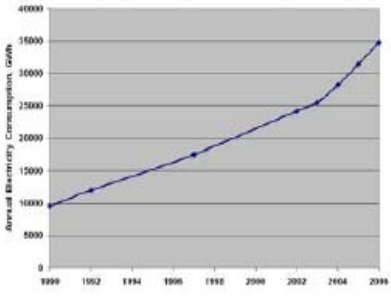
- Household energy mix is rapidly moving from inefficiently-utilized biomass to gas and electricity
- Commercial space is increasing; and energy use is commercial space is increasing at a faster pace
- Industrial energy intensity is declining, but there is a wide bandwidth of specific energy consumption within industrial sectors

Fuel Mix is changing

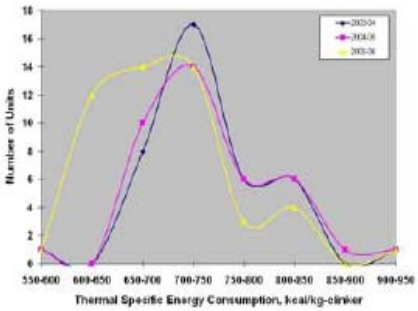


- Energy use has grown at 2.2% per year; marked by a transition from inefficiently-used biomass fuels to cleaner fossil fuels

Electricity Use in the Commercial Sector is increasing



Energy Intensity in Cement Sector



Barriers to Energy Efficiency

- Lack of information about comparative energy use – especially of appliances bought by retail consumers
- Perceived risk due to lack of confidence in performance of new technologies – in appliances, building design, industrial technologies
- Higher cost of energy-efficient technologies
- Asymmetry in sharing of costs and benefits – especially in the buildings sector

Energy Conservation Act, 2001 Objects and Reasons

- Reduction of energy consumption using efficiency and conservation measures.
- Reduce the need to create new capacity thereby saving resources and green house gas emissions.
- Secure environmentally benign and sustainable growth
- Stimulate market transformation in favour of energy efficient products and appliances.
- Created Bureau of Energy Efficiency (BEE) as the nodal agency at the center and State Designated Agencies (SDAs) at the state level to implement the Act.

Key regulatory interventions

- Provide energy use information
  - Labeling of appliances
  - Energy use information by units within industrial sectors
- Reduce perceived risk
  - Bulk procurement
  - Utility-driven Demand side management
  - Performance guarantee contracting, through ESCOs
- Mandate standards
  - Building Codes
  - Sectoral energy consumption norms in industry

Enabling Regulatory and Financing Framework

- Labeling Scheme launched
  - Fluorescent tubelights, refrigerators air conditioners and distribution transformers are currently covered
  - Labels for motors, transformers, fans, LPG burners, standby power under preparation
- Energy Conservation Building Code prepared and launched
  - Design of ECBC-compliant buildings being encouraged
  - Training of architects, designers and certifiers underway
- Market for ESCOs being created
  - Government buildings being upgraded through ESCOs
  - Risk-guarantee fund being considered to promote lending to ESCOs
- DSM interventions being launched
  - CDM based CFL scheme
  - Ag DSM

Standards & Labeling Programme

- Programme launched by Minister of Power in May, 2006 under the legal and regulatory environment of Energy Conservation Act. Initially launched as a voluntary programme.
- Refrigerators, Tube Lights, Air conditioners and Distribution Transformers covered till now. Others to be added in a phased manner.
- Programme to be made mandatory after giving lead time to industry for preparation.
- Targets energy consumption reduction potential 18 billion kWh/ year by 2012
- Impressive results in the voluntary programme for 3 equipments so far.
- Prepare Indian industry for international markets that have made/ are making such standards mandatory eg. US or EU

Energy Conservation Building Code (ECBC)

- Covers commercial buildings in 5 climatic zones of the country.
- Potential of 25%-40% savings of energy consumption
- Like other such codes, it includes building components like.
  - Building Envelope (Walls, Roofs, Windows)
  - Lighting (Indoor and Outdoor)
  - Heating Ventilation and Air Conditioning (HVAC) System
  - Solar Water Heating and Pumping
  - Electrical Systems (Power Factor, Transformers)

ECBC launched by Minister of Power on 27.6.2007

Energy Efficiency in Existing Buildings

- 8 Government buildings (including President House, PMO, Shram Shakti Bhawan) have been audited. Implementation of energy conservation measures in 4 buildings completed and remaining are on their way.
- Impressive Energy savings achieved in Rashtrapati Bhawan

Month	Estimated savings, kWh	Acutal Savings achieved, kWh
August, 2006	93080	124466
September,2006	97549	142597
October, 2006	97549	169179
November, 2006	105642	222567

- 17 additional Central Government buildings undertaken for second phase through ESCO mode.
- Energy Audit study in 15 Government buildings completed

Designated Consumers (DCs)

- EC Act mandates Government to designate consumers who consume electricity beyond a benchmarked limit.
- The DCs are required to
  - appoint Energy Manager
  - adhere to energy efficient consumption norms stipulated
  - submit annual energy consumption information
- 9 sectors notified as DCs in March, 2007
- Web based e-filing of energy consumption returns to be mandated soon- **first of its kind initiative**

SDA Strengthening Programme

- Statutory bodies set up by states under section 15 (d) to implement energy conservation measures
- 30 SDAs already established till now
- Inadequate capacity and resources to effectively implement the Act.
- Capacity building to play the roles of regulator, facilitator and enforcing body under the Act.
- Financial assistance to provide necessary resources required for effective functioning
- Ensure balanced implementation of the Act in all states of the country.
- Facilitate development of deliver 5 year Energy Conservation Action Plan

Professional Certification and Accreditation

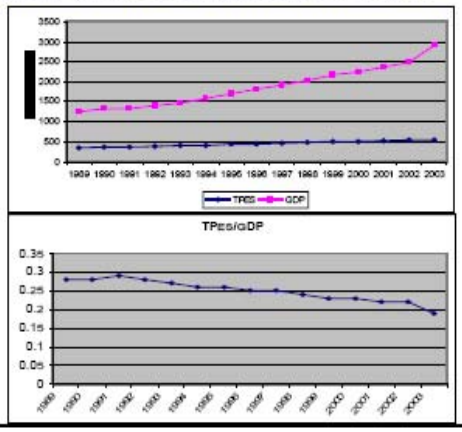
- To promote efficient use of energy and its con-servation in the energy intensive industries
- Bureau has conducted 4 National certification examinations for energy managers & energy auditors
- 713 Certified Energy Managers and 2023 Certified Energy Auditors are in place
- Over 2500 candidates appeared in the examination held in April 2007.

Demand Side Management (DSM)

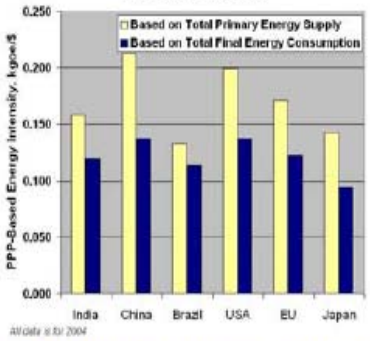
- Promotion of DSM measures in states
- CDM based lighting DSM projects
  - 400 million GSL points to be replaced by CFLs
  - Sales, at a reduced price, or donation of CFLs to households within a distinct geographical area
  - The households purchase or receive CFLs upon return of currently used and functioning light bulbs
  - The returned light bulbs must be destroyed
  - Energy reduction monitored and verified- CERs so generated used to recover cost of initial investments
  - 24 million CERs every year; 10,000 MW reduction in load

To be launched in two states shortly

INCREASING ENERGY EFFICIENCY



Energy Intensities of Six Large Economies



- Japan has best energy intensity; other economies have relatively comparable levels

Future Initiatives

- Transport sector
  - Considering introduction of labeling of 2-wheelers and 4-wheelers; however concern about limited impact because of rebound effect
  - Working on programs to promote affordable, reliable and comfortable public transport so as to increase its modal share
  - Working with Ministry of Urban Development to link support for urban upgradation to requirement to establish Bus Rapid Transit (BRT) systems

Tentative Lessons

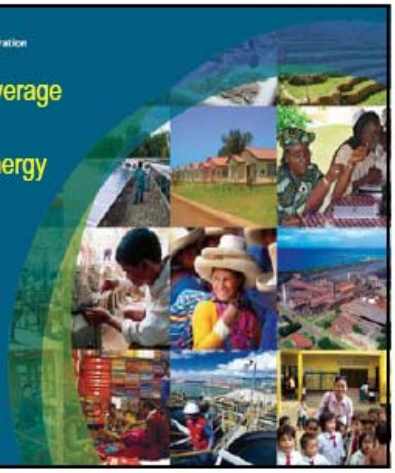
- By far and large, "fresh" financing is not required; key seems to be to "redirect" finance, or "mainstream" energy efficiency
- Redirecting requires risk reduction through:
  - Capacity building – for project preparation; data collection, monitoring & verification; and project appraisal by FIs
  - Codes, Standards & Agreements – for appliances, buildings, transport, and manufacturing sectors
  - Risk guarantees for FIs – for lending to ESCOs, SMEs
  - Demonstration of, and training on EE technologies
  - Collaborative R&D – to adapt technologies
- Climate change financing – CDM – accelerates energy efficiency interventions
- Economic growth – and competition – promotes energy efficiency, and energy efficiency accelerates economic growth

THANK YOU

IFC International Finance Corporation

How do we leverage real impact on sustainable energy investment?

A Rational Approach to Mobilizing Investment and Accelerating Market Transformation



Russell Sturm

Sustainable Energy Team Leader

Energy Efficiency:

An opportunity lying in wait

- Cost-effective investments with compelling social, environmental, and economic benefits
- Barriers relate to nature of the underlying investments … and human nature

IFC International Finance Corporation

What does each key institution do best?

Institutional comparative advantages vary

– IFC	– ADB
– IBRD	– Private equity
– MIGA	– Commercial banks

- Big or small investments?
- Project management?
- Project development?
- Advisory?
- Supporting public or private sector?

Influencing markets vs. mobilizing capital

IFC International Finance Corporation

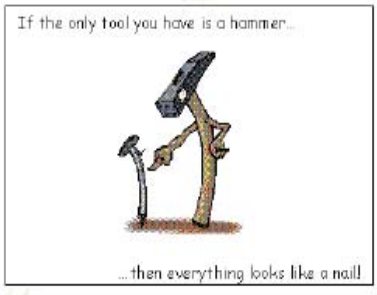
What are we actually trying to affect?

- What is the problem at hand and what instrument best addresses it?
- Does the need fit our role… and our capacity?
- Why do we always return to **funds** solutions?
  - Specialized funds CAN enable big impact if well-conceived!
  - Based on understanding of the problem at hand?
  - Motivated by need to announce a big bang?
  - Presupposes that we first get our house in order

IFC International Finance Corporation

Markets vary … and so do the needs and solutions

- Market diagnostics are critical before intervening



IFC International Finance Corporation

Cultivating the money tree

- With liquidity high in most markets – the problem isn't a lack of capital availability

IFC International Finance Corporation

What does IFC bring to the table?

Leveraging IFC's Comparative Advantage

- Able to mobilize big chunks of money
- Network of investee companies
  - 45% of business done through financial intermediaries
  - Big global players
  - Substantial local players seeking to gain global stature
- Convening power/ private sector market focus
- Commitment and drive to innovate and the expertise to do so – structuring/credit/risk mitigation/technical
- A mission to support sustainable economic development
- Market focus and private sector orientation

And… realistically speaking

- Inability to efficiently invest directly in "small" transactions

Leveraging IFC to Transform Markets

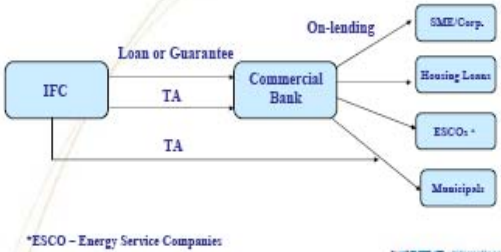
Two Opportunities – Two Approaches

1. Mobilizing commercial investment in EE through financial markets
2. Mobilizing market development for new technology
3. And a sleeping giant… IFC's core business

1. Mobilizing EE Investment: Matching IFC's Strengths to Market Needs

Barrier	IFC Response
Small deal size	⇨ Work through IFC's highly developed financial markets business
Lack of lending experience by FIs	⇨ Support with credit enhancement/other financial products
Limited FI knowledge of EE sector	⇨ Support with TA for financial product development/marketing; aggregate the market
Unsophisticated vendors and developers	⇨ Support with TA to prepare and standardize transactions

Wholesaling through FIs: How do we work?



*ESCO – Energy Service Companies

End user inefficiency

From

To

Russia... 48% of production assets installed over 20 years ago

Building business for Partner Banks

The Ceska Sporitelna Story

- Competition squeezing margins for leading bank
- Developed FINancing Energy Saving Applications (FINESA) product
- US$ 20 million in RE/EE loans in 36 months

Current project pipeline US$ 58 million.

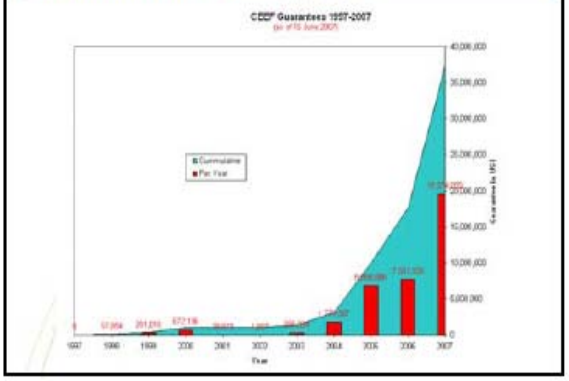
- Market Forces In Play

IFC International Finance Corporation

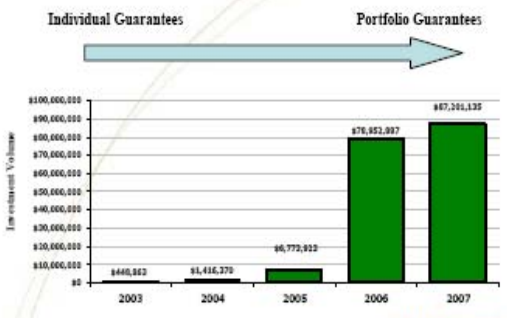
Sustained, Concrete Impact = Moving markets

IFC International Finance Corporation

The Central Europe Pilot: Program Achievements



CEEF/Hungary EE Housing Portfolio



IFC International Finance Corporation

Scaling up – better leverage of funds

Project Impacts

- Lower Energy cost – municipal fiscal balances
- Reduced gas import dependence
- New GE factory (supplier) providing FDI and jobs

AND

Improved Health, Safety & Learning Conditions for Children!!

>100 x 1 leverage of donor funds

IFC International Finance Corporation

One in a Million:
A CHUEE Project Example

Haizi Coking Plant Coking Gas Recovery for Power Generation:

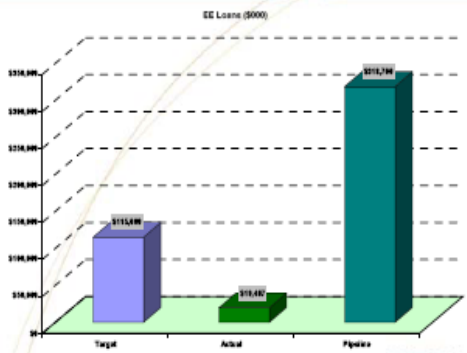
$2 million loan to Shengdong Machinery Company Limited

20 units of gas-fired power generators

Emission reduction of more than 30,000 tons of CO2 per year

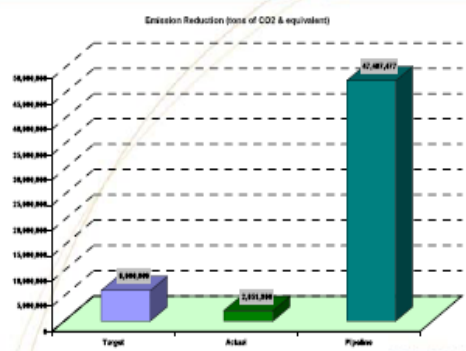
IFC International Finance Corporation

Loan amount up to date



IFC International Finance Corporation

Emission reduction up to date



IFC International Finance Corporation

Scaling up…
what would it take?

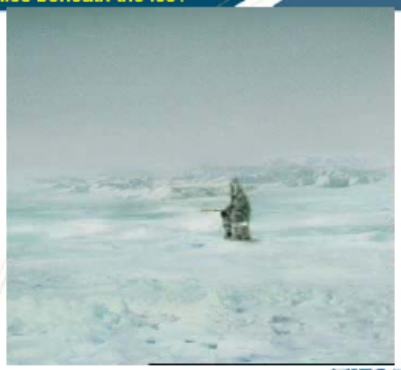
- *Some* dedicated specialized funding
  - (highly leveraged).
- Specialized funding to cover:
  - Soft costs/transaction costs
  - Engineering assessments/audits, project definition, project identification, marketing ideas to clients
  - Credit enhancement and other financial products beyond institutional comfort zone
  - eg, Mezzanine financing for RE projects

Intelligently leveraging donor funds

And institutional partnerships

IFC International Finance Corporation

BEYOND IFI INVESTMENT: The Market Forces
What lies beneath the ice?



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2. Fostering Market Acceleration

Grants, subsidies, picking winners… A dangerous game

- Grants can be easily misused
  - Can impede market development if not treated with care
  - Must use flexibility in program design to dance with a dynamic market
  - Exit strategy critical for sustained impact
- Critical instrument to accelerate market development and institutional change
  - Risk appetite is often irrational and driven by convention and culture
  - Money still gets people's attention

ELI A model to build on

- $15 million project funded by the Global Environment Facility (GEF), implemented by the International Finance Corporation (IFC)
- ELI's goal: accelerate the development of local markets for energy-efficient lighting.
- ELI countries: Argentina, the Czech Republic, Hungary, Latvia, Peru, Philippines, South Africa

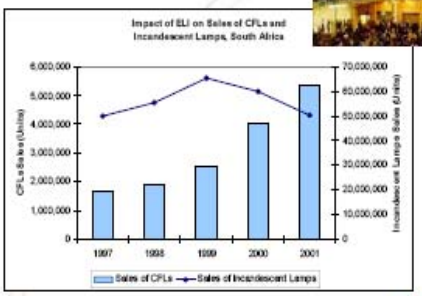
The IFC/GEF Efficient Lighting Initiative: Successful Market Acceleration Model

- ELI sought long-term and sustained impact on markets through:
  - Increasing consumer knowledge and demand,
  - Improved accessibility of capital,
  - Increasing sales volume, and product availability

Enhancing Competition / Producing downward pressure on prices.

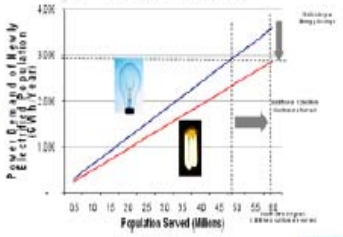
Giving Consumers the Power of Information

Driving REAL Market Transformation in South Africa

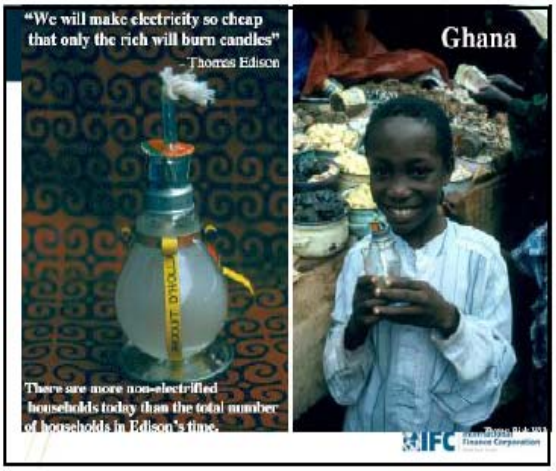


Responding to opportunity: Leveraging new policies and initiatives in S. Africa

Improving People's Lives in South Africa: CFLs enable increased access to modern energy services

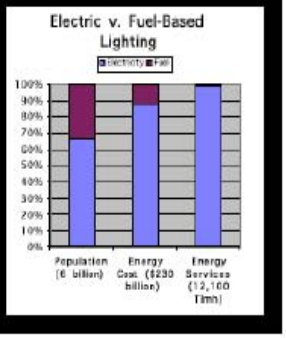


IFC International Finance Corporation



Lighting Equity

Although one in three people obtain light with kerosene and other fuels, representing about 15% of global lighting costs, they receive only 0.2% of the resulting lighting energy services.



A closer look into lighting
End-users hurt by inefficient product

- Fuel-based lighting often most expensive energy item in household – up to 50% of energy expenses, as much as 33% of household income

- Limits small-scale productive activities
- Indoor pollution leads to serious health problems
- Safety/fire issues epidemic
- Limits educational access

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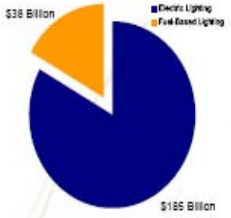
A closer look into lighting:
Fuel-based lighting is ALREADY a very large market

Global Annual Spending on Lighting



- Fuel-based lighting accounts for 17% of global lighting market – a US$ 38 billion/year demand ($17 billion in Africa)
- It is a commercial, functioning market
  - established value-chain
  - collection systems
  - spare parts, repairs services, etc

IFC International Finance Corporation

New Rays of Light Emerge

1. Technology
   - Performance, cost
   - Packaged as single light systems
2. Lessons of experience in the market
   - Business models for the bottom of the pyramid
     - Package products at price point to match market
   - Solar home system business models demonstrated, but limited impact
   - IFC's experience in market development
3. Substantial international political focus
   - Energy access
   - Climate change

IFC ASKED…

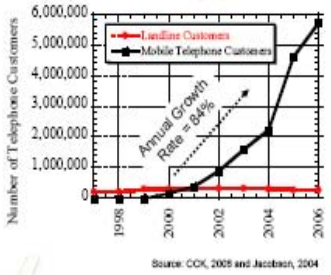
Is There an Opportunity for a Large-Scale Commercial Solution To Increase Access to Modern Energy Services?

- Are those 1.6 billion lacking access to modern energy services a market?
- If so, can global and local private companies be engaged to develop this market commercially?
- Does a market, commercial solution that increases access to modern energy services serve our development objectives?

The Moment At Hand:

Leveraging Technology to Transform a Market … and People's Lives

A Highly Successful Analogy: Mobile Telephone Sales In Kenya



Mobile telephone use in Kenya has skyrocketed to nearly 6,000,000 customers since introduction of the technology in 1997…

Mobile Telephone Charging by Off-Grid Customers – LED synergy

How do off-grid users keep their phones charged?

…and important lessons are emerging

- Poor, even poorest of the poor, can be a "profitable market"
- Need to "price" service or product to meet income constraint
- Success requires "brand new" business models, often created locally – organic solutions
- Different needs of the poor can be met by large scale, commercial solutions – promoting higher quality of life and overall development

The key is to stay out of the way of the entrepreneurial genius of the market.

How Does IFC Support Market Entry?

Responding to Industry Request and Suggestions, the Project will:

- Reduce Transaction Costs of Market Entry
  - Market Assessment
  - Testing and Certifying Products
  - Identifying Distribution Channels
  - Assessing Regulatory Environment
- Reduce Risk of Market Entry
  - Regulatory Risks
  - Market Risks
  - Financial Risks

The Response

Lighting Africa – Joint World Bank/IFC Initiative

Goal: Rapid scale-up of access to clean, reliable and affordable lighting & basic energy services for 250 million people across Africa by 2030

3. The Sleeping Giant

Clean Energy Investment… Embedded in IFC's business

IFC Investments In Clean Energy (US$ million)	FY 06		FY 05	
	EE/RE $ Component	IFC Prorated Share Investmt	EE/RE $ Component	IFC Prorated Share Investmt
Infrastructure	535	125	508	122
Global Financial Markets	408	166	0	0
General Manufacturing	664	59	276	86
Agribusiness	28	4	36	10
Municipal Fund	102	37	0	0
Oil, Gas and Chemicals	25	2	12	4
TOTAL	1,762	393	832	221

Next Step…

Systematically leverage our position in the market

The Unsung Hero: Leveraging IFI's core business

The "big ticket" lies in our core business

- How many opportunities missed?
- How much opportunity to influence policy and investment approaches of clients?
- Transport, agribusiness, general manufacturing, oil gas and mining, and infrastructure!!

Unleashing the sleeping giant

THESIS: The biggest bang is right in our midst

Leveraging IFIs' core investment business to influence the quality and direction of IFC/IBRD "mainstream" investment

- Client influence
  - Government / enabling environment
- Careful assessment of quality of investment
  - Many ways to skin a cat (transport example)
- Packaged product offerings
  - For IFC: changing the dynamic and moving from financing as a commodity

So… what would it take?

Specialized funding to cover:

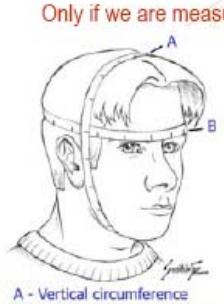
1. Soft costs/transaction costs
   - Engineering assessments/audits, project definition, project identification, marketing ideas to clients, build institutional capacity
2. Credit enhancement and other financial products beyond institutional comfort zone
   - eg, Mezzanine financing for RE projects
   - Based on Shadow price of Carbon?
3. Donor support to enable market transformation

At the institutional level…

- Establishment of measurement and tracking protocols which capture embedded sustainable energy and energy use impacts (transport example)
- Departmental scorecard alignment with institutional goals
- Performance measures carrying through to the management level
- Honest assessment of institutional capacity – capacity building at technical level
- Risk appetite commensurate with the problem

So…Is a 20% annual increase in World Bank Group EE/RE investment the right goal?

Only if we are measuring the right thing…



A - Vertical circumference
B - Horizontal circumference

Moving Big Chunks of Money …The Easiest Way Possible Not Always the Answer

- Picking winners can distort the market
- Big initiatives are rarely nimble enough to stay ahead of the market
- Lack of capital in the market is rarely the problem

Need to Match:

- Intervention to market need
- Intervention to institutional comparative advantage
- Institutional incentives and goals to the objective

The world is walking on thin ice Collaboration is Essential

The Government of Japan and the World Bank Join Roundtable
"Bridging the Energy Efficiency Divide:
Implementation Models and Best Practices"

Financing Mechanisms for Energy Efficiency

---- A Private Sector Perspective

July 19, 2007

Clean Energy Finance Committee

Mitsubishi UFJ Securities

I Lessons Learned

II Remaining Issues and Possible Action Plans

I Lessons Learned

- Barriers to financing energy efficiency can be overcome.
- A number of factors that once posed major obstacles are now manageable problems.

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1. Incentives

Absence of a framework to provide incentives for energy efficiency efforts

⇩

CDM/JI as an established concept

(Higher oil prices and growing concerns about energy security also helped.)

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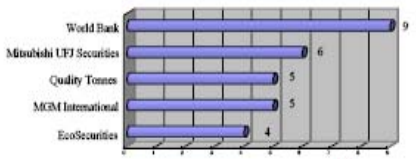
2. Operationalizing Carbon Finance

No methodologies

⇩

12 approved consolidated methodologies (ACMs)

54 approved methodologies (AMs)



No methodologies for energy efficiency

⇩

Recent ACMs and AMs increasingly related to energy efficiency

Project type breakdown of AMs MUS prepared

Renewable energy	2
Waste management	2
Energy efficiency	2

- Energy efficiency improvement through an ESCO (AM0044)
- Energy efficiency improvement through an oil/water emulation technology (AM0054)

3. Underlying Financing

Many energy efficiency projects not implemented due to unavailability of bank lending

⇩

Growing willingness of banks to fund energy efficiency projects particularly when they qualify for JI/CDM

- Multilaterals
- Developed country government banks
- Host country development banks
- Multinational commercial banks
- Host country commercial banks

4. More Growth Expected

Technology breakdown

In the next 12 months, do you expect supply from the following to:

%	Increase dramatically	Increase slightly	Stay roughly the same	Decrease slightly	Decrease dramatically
HFC	0.0	25.0	12.5	0.0	62.5
N_2O	25.0	25.0	37.5	12.5	0.0
Coal-mine methane	37.5	50.0	12.5	0.0	0.0
Hydro	12.5	62.5	12.5	12.5	0.0
Wind	11.1	33.3	33.3	11.1	11.1
Biomass	25.0	62.5	12.5	0.0	0.0
Animal waste	0.0	33.3	33.3	33.3	0.0
Landfill gas	0.0	44.4	44.4	11.1	0.0
Energy efficiency	25.0	75.0	0.0	0.0	0.0
LULUCF	16.7	83.3	0.0	0.0	0.0
Other	25.0	75.0	0.0	0.0	0.0

Source: Carbon Finance, June 2007

II Remaining Issues and Possible Action Plans

1. Lack of Post-2012 Regime

<Comment>

Poses substantial difficulty to large-scale energy efficiency projects with a medium to long payback period

<Action Plan>

Not much a private institution can do except to work with VER investors for post-2012 credits, notably

- Pioneering funds
- Some European and American utility companies

2. Funding for Early-stage Feasibility Studies

<Comment>

Increasingly hard to come by as public sector programmes become more results-oriented

<Action Plan>

Explore the possibility of entrepreneurial (venture capital) financing to respond to this type of funding needs

3. Project Structuring and Management

<Comment>

Possibly the most significant obstacle going forward, particularly with respect to programmatic project activities for energy efficiency

<Action Plan>

a) Top-level know-how
+ local knowledge / local language skills

MUS host country full-time staff for Asia

China, India, Indonesia, Korea, Malaysia (recruiting), Philippines, Thailand

b) Public funding for project structuring and management, combined with carbon financing for project profitability enhancement

SUSTAINABLE ENERGY INITIATIVE

EBRD ENERGY EFFICIENCY ACTIVITY

PREPARED FOR "BRIDGING THE ENERGY EFFICIENCY DIVIDE: IMPLEMENTATION MODELS AND BEST PRACTICES" ROUNDTABLE
TOKYO, 19 JULY 2007

JOSUÉ TANAKA
CORPORATE DIRECTOR
ENERGY EFFICIENCY AND CLIMATE CHANGE

ENERGY EFFICIENCY: A KEY ISSUE FOR THE EBRD REGION OF OPERATIONS

- INCREASE SECURITY OF SUPPLY
  - REDUCE IMPORTS OF INCREASINGLY EXPENSIVE FOSSIL FUELS
- IMPROVE COMPETITIVENESS
  - SAVING ENERGY REDUCES COST, IMPROVES CASH FLOWS
  - ENERGY INTENSITY OF UKRAINE (PPP-ADJUSTED) IS OVER 3.3 TIMES THE EU-15 AVERAGE
- SAVE SCARCE CAPITAL RESOURCES
  - SAVING ENERGY IS CHEAPER THAN BUILDING A NEW POWER PLANT
- IMPROVE THE ENVIRONMENT
  - GLOBAL: REDUCE GREENHOUSE GAS EMISSIONS; CARBON INTENSITY
  - LOCAL: AIR POLLUTION

EBRD ENERGY EFFICIENCY BUSINESS: CONTEXT AND OVERVIEW

- EBRD SPECIFIC RESPONSE TO G8 GLENEAGLES SUMMIT
- INCREASING AWARENESS OF COUNTRIES OF OPERATIONS PREDOMINANTLY DRIVEN BY RISING ENERGY PRICES AND ENERGY SECURITY CONCERNS
- NEW EBRD ENERGY OPERATIONS POLICY PLACING ENERGY EFFICIENCY AND RENEWABLE ENERGY AS CORNERSTONE
- TARGET OF 1.5 BILLION IN EBRD FINANCING OVER PERIOD 2006-2008, AN INCREASE OF CA 50% OVER PREVIOUS LEVELS
- PRIORITY FOCUS MATCHED TO EBRD'S COMPARATIVE ADVANTAGES

EBRD ENERGY EFFICIENCY BUSINESS: BUILDING ON COMPARATIVE ADVANTAGE

- PRIVATE SECTOR FOCUS
- ENVIRONMENTAL MANDATE
- COUNTRY / SECTOR KNOWLEDGE
- RANGE OF BUSINESS RELATIONSHIPS
- PROJECT FINANCE SKILLS
- INVESTMENT CAPACITY
- DONOR FUNDING MOBILISATION AND MANAGEMENT
- SPECIFIC ENERGY EFFICIENCY KNOWLEDGE
- ORGANISATIONAL STRENGTHENING

EBRD ENERGY EFFICIENCY BUSINESS: ORGANISATION

- A SPECIALIST TEAM WORKING ACROSS THE BANKING MATRIX
- BUILDING OVER 10 YEARS OF ENERGY EFFICIENCY WORK
- LINK TO CORPORATE PLANNING FUNCTION TO FULLY MAINSTREAM ENERGY EFFICIENCY AND CLIMATE CHANGE ACTIVITY ACROSS ORGANISATION
- SPECIALIST TEAM INCLUDES ENGINEERS, ENERGY EFFICIENCY SPECIALISTS AND CARBON FINANCE STAFF AT HQ AND IN THE FIELD
- FULL LEVERAGE ACROSS SECTOR AND COUNTRY TEAMS

EBRD ENERGY EFFICIENCY BUSINESS: SECTOR FOCUS

- LARGE INDUSTRIES IN ENERGY INTENSIVE SECTORS
- SMALL ENERGY USERS SUCH AS SME'S AND RESIDENTIAL USERS
- CLEANER POWER ENERGY SUPPLY INCLUDING FUEL SWITCH AND GENERATION, TRANSMISSION AND DISTRIBUTION EFFICIENCY IMPROVEMENT
- RENEWABLE ENERGY INCLUDING HYDRO, WIND AND BIOFUELS
- MUNICIPAL INFRASTRUCTURE INCLUDING DISTRICT HEATING, PUBLIC TRANSPORT, SOLID WASTE (METHANE), AND WATER
- CARBON FINANCE

EBRD ENERGY EFFICIENCY BUSINESS: 2006 RESULTS

SEI SECTOR	NUMBER OF PROJECTS	EBRD SEI FINANCING (€ MILLION)
INDUSTRIAL EE	16	188.2
EE CREDIT LINES	8	81.1
CLEANER ENERGY PRODUCTION	5	310.3
RENEWABLE ENERGY	6	80.8
MUNICIPAL INFRA EE	16	88.0
TOTAL	51	748.4

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EBRD ENERGY EFFICIENCY BUSINESS: OPERATIONAL APPROACHES

THREE DISTINCTIVE OPERATIONAL APPROACHES:

- APPROACH 1: DEFINING ENERGY EFFICIENCY COMPONENTS IN ALL RELEVANT OPERATIONS
- APPROACH 2: FINANCING SMALL EE/RE PROJECTS VIA LOCAL BANKS WITH DEDICATED CREDIT LINES
- APPROACH 3: COMBINING PROJECT FINANCE AND CARBON FINANCE

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APPROACH 1: DEFINING ENERGY EFFICIENCY COMPONENTS

- DEDICATED TEAM SCREENS ALL EBRD PROJECTS ENTERING PIPELINE TO IDENTIFY THOSE WITH EE POTENTIAL WITH RATINGS GIVEN TO PROJECTS (*E0, E1, E2*).
- PROVISION OF FREE ENERGY AUDITS FUNDED BY DONORS (TC), MOSTLY FOR E2 RATED PROJECTS.
- STRUCTURE "ADD-ON" TO DIRECT DEBT OR EQUITY FINANCING ENHANCING COMPANY CASH FLOW.
- ENERGY MANAGEMENT TRAINING MODULES WHERE APPROPRIATE.
- BENCHMARKING INITIATIVE UNDERWAY, IN PARTICULAR FOR E1 RATED PROJECTS.

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ENERGY EFFICIENCY PAYS! ENERGY AUDIT RESULTS FOR PULP AND PAPER COMPANY, BULGARIA 2006

Measure Description	Annual Savings (€)	Investment Cost (€)	IRR (%)	Payback (Years)
Reconstruction of WWTP, replacement of cyclone evaporator with a new vapor concentrator for black liquor	1,717,545	6,615,000	25%	3.9
Implementation of dry debarking unit	129,710	190,000	68%	1.5
Upgrading of washing unit and replacement of condensers with plate heat exchangers in evaporating systems for black liquor	482,160	1,440,750	33%	2.4
Installation of frequency control drives on electric motors	23,624	41,420	57%	1.8
Installation of back pressure steam turbine to utilize steam generated by WWTP	1,220,610	3,500,000	35%	2.9
Flue gases heat recovery system for WWTP	54,760	40,000	137%	0.7
Replacement of the old refrigeration units with new absorption units and optimization of water cooling system	170,111	980,000	17%	5.7
Replacement of old piston air compressors with new units and optimization of compressed air supply system	13,374	114,000	11%	7.2
Shift of production from pulp blanks to pulp sheets	821,454	2,300,000	35%	2.8
CONSOLIDATED	4,772,846	15,965,170	31%	3.2

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EE IN INDUSTRY: *MITTAL KRYVIY RIH (UKRAINE 2006)*

- USD 200 MILLION LOAN FOR UPGRADE/OPTIMISATION OF INTEGRATED STEEL MILL
- USD 66 MILLION TO BE USED FOR MODERNISATION OF EQUIPMENT AND PROCESSES :
  - MODERNISATION OF THE AIR SEPARATION UNIT
  - IMPROVEMENT OF THE ENERGY MANAGEMENT SYSTEM (EMS)
  - REHABILITATION ELECTRICITY DISTRIBUTION SYSTEM
  - INSTALLATION OF ENERGY EFFICIENT BURNERS
  - MODERNISATION OF CHP PLANTS INCLUDING REHABILITATION OF 25MW STEAM TURBINE

- BENEFITS: WILL REDUCE ENERGY CONSUMPTION BY 10% AT CURRENT OUTPUT; EQUIVALENT TO 0.4% OF ELECTRICITY CONSUMPTION AND 0.3% OF GAS CONSUMPTION OF UKRAINE. ENERGY COSTS REDUCTION > USD 30 MILLION P.A; PRODUCTIVITY IMPROVEMENTS
- IRR RANGE: (20% - 150%). AVG. PAYBACK ~ 2 YEARS
- ENVIRONMENTAL BENEFITS: CO_2 EMISSION REDUCTION >800 KTONCO$_2$/YEAR = ANNUAL EMISSIONS OF 100,000 HOUSEHOLDS IN UK = CITY OF 230,000 PEOPLE; REDUCED WATER AND HEAT LOSSES

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EE IN POWER: *AZDRES (AZERBAIJAN 2006)*

- US$115M SOVEREIGN GUARANTEED LOAN TO FUND THE REHABILITATION OF AZERSALUNYB, LARGEST THERMAL POWER PLANT WITH 2,400 MW NAMEPLATE CAPACITY.
- PROJECT WILL RESTORE PLANT EFFICIENCY, AVAILABILITY AND CAPACITY WITH AN EXTENSIVE REFURBISHMENT OF 7 OUT OF 8 UNITS ON SITE TOGETHER WITH THE REPAIR AND MODERNISATION OF THE FLUE GAS CHIMNEY AND COOLING WATER TUNNEL.
- PLANT BASED IN MINGECHAUR PROVIDES OVER 40% OF AZERI GENERATION CAPACITY BUT OPERATES SIGNIFICANTLY BELOW TECHNICAL CAPACITY DUE TO GROWING INEFFICIENCIES
- THE PROJECT COULD SAVE OVER 8M TONNES OF CO2 PER ANNUM AND IS SEEKING QUALIFICATION UNDER THE CLEAN DEVELOPMENT MECHANISM
- IN CONJUNCTION WITH THE LOAN EBRD HAS SOURCED TECHNICAL ASSISTANCE TO SUPPORT REGULATORY REFORM IN THE POWER SECTOR

EBRD WILL PLAY AN ACTIVE ROLE IN THE IMPLEMENTATION OF THE PROJECT ENSURING QUALITY AND TRANSPARENCY

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APPROACH 2: ENERGY EFFICIENCY CREDIT LINES

- EBRD LOAN FINANCE (COULD BE GUARANTEE) CHANNELLED TO SMALL OR MEDIUM-SIZED PROJECTS VIA LOCAL BANKS
- BENEFICIARIES CAN BE:
  - CORPORATES
  - HOUSEHOLDS
  - RENEWABLE ENERGY DEVELOPERS
- GRANT COMPONENT FROM DONOR(S) TO ADDRESS MARKET BARRIERS TO INVESTMENTS
  - LACK OF CAPACITY, INFORMATION, MOTIVATION
  - RATIO OF ABOUT €1 OF GRANT TO €5 OF COMMERCIAL FINANCE

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EXAMPLE: BULGARIA SEFF (I)

- **CORPORATE FACILITY** (SEE WWW.BEERECL.COM):
  - €100 MILLION CREDIT LINE FRAMEWORK WITH 7 BULGARIAN BANKS
  - FOR ON-LENDING TO PRIVATE SECTOR FOR **INDUSTRIAL ENERGY EFFICIENCY AND SMALL RENEWABLE ENERGY PROJECTS**
  - 66 SUB-LOANS APPROVED BY PARTICIPATING BANKS FOR €39.6 MILLION AND TOTAL SUB-PROJECTS OF €55.7 MILLION. ESTIMATED SAVINGS OF 344,000 TONNES C02 PER YEAR AND 110 MWE (EQUIVALENT TO ENERGY NEED OF AROUND 100,000 HOUSEHOLDS)

www.ebrd.com

EXAMPLE: BULGARIA SEFF (II)

- **RESIDENTIAL FACILITY** (SEE WWW.REECL.ORG)
  - €50 MILLION EBRD CREDIT LINE FRAMEWORK WITH 6 BULGARIAN BANKS
  - FOR ON-LENDING TO INDIVIDUALS FOR EE INVESTMENTS IN RESIDENTIAL SECTOR: I) INSULATION II) BIOMASS EFFICIENT HEATERS/BOILERS, III) SOLAR WATER HEATERS, IV) EFFICIENT GAS BOILERS
  - 5,935 SUB-LOANS FOR A TOTAL INVESTMENT OF €8.2 MILLION. ESTIMATED SAVINGS OF OVER 58,000 TONNES OF C02 PER YEAR EQUIVALENT TO 5.5 MWE OF NEW CAPACITY
- ADVANTAGES OF MODEL: RELIES ON LOCAL PRIVATE BANKS; STRONG INCENTIVES FOR BOTH BANKS AND END-BORROWERS; BUILT-IN PROJECT PREPARATION FACILITY

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APPROACH 3: COMBINING PROJECT FINANCE AND CARBON FINANCE

- THE TRADING OF EMISSION RIGHTS OR PERMITS (CARBON CREDITS) IS AN EFFICIENT TOOL TO PRICE CARBON AND ACHIEVE GREENHOUSE GAS EMISSION REDUCTIONS AT THE LOWEST COST AS MARGINAL ABATEMENT COSTS DIFFER ACROSS LOCATIONS
- THE SALE OF CARBON CREDITS CREATES AN ADDITIONAL HARD CURRENCY REVENUE STREAM FOR PROJECT SPONSORS, IMPROVING THE BANKABILITY AND ATTRACTIVENESS OF CARBON REDUCTION PROJECTS (HIGHER IRR, ADDITIONAL SECURITY)
- EMISSION TRADING IS UNDER-DEVELOPED IN EBRD'S COOS
  - CA. 2% OF PROJECT-BASED TRADES VS 13% OF GLOBAL EMISSIONS

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ISTIL CARBON TRANSACTION: UKRAINE

- ENERGY EFFICIENCY INVESTMENT PROGRAM AT MINI STEEL MILL IN DONETSK:
  - NEW OXYGEN PLANT;
  - STEAM GENERATING UNIT;
  - SOAKING PITS CONTROL SYSTEM; AND
  - NEW TRANSFORMER FOR ELECTRIC ARC FURNACE;
- €17 MILLION INVESTMENT, FINANCED BY EBRD AS PART OF A USD 85 MILLION LOAN;
- REDUCTION OF CARBON EMISSIONS BY 70,000 TONS PER YEAR;
- PRODUCE €3.2 MILLION WORTH CARBON CREDITS, PURCHASED BY THE EBRD FOR THE NETHERLANDS;
- FIRST PROJECT IN IN THE STEEL SECTOR IN CIS TO LINK THE FINANCING WITH CARBON CREDITS.

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Financing Energy Efficiency: The GEF Strategy and Program Models

Zhihong Zhang
Global Environment Facility

Bridging the Energy Divide: Implementation Models and Best Practices
The Government of Japan and the World Bank Joint Roundtable
Tokyo, July 19, 2007

Global Environment Facility

- Established in 1991 to provide "incremental cost" funding to projects with "global environmental benefits"
- Operates financial mechanism for UNFCCC, CBD, UNCCD, and Stockholm Convention
- Allocated $6 billion until 2006 and leveraged $20 billion
  - Climate change: $2 billion and $10 billion respectively

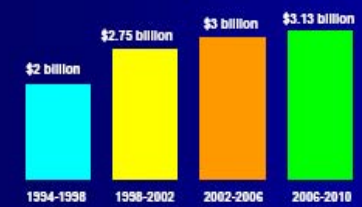
GEF's Six Focal Areas

- Biodiversity
- Climate change
- International waters
- Ozone depletion
- Land degradation
- Persistent organic pollutants

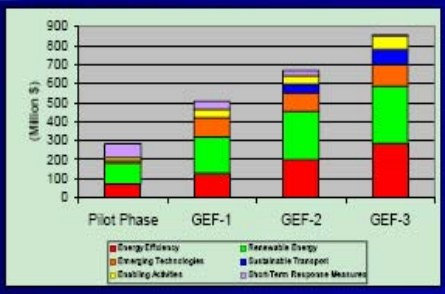
GEF's Ten Agencies

- United Nations Development Program
- United Nations Environment Program
- World Bank
- African Development Bank
- Asian Development Bank
- European Bank for Reconstruction & Development
- Inter-American Development Bank
- International Fund for Agricultural Development
- United Nations Food and Agriculture Organization
- United Nations Industrial Development Organization

GEF Replenishments



GEF Funding to Climate Change



Climate Change Operational Programs (1995 to 2006)

- Removal of barriers to EE and EC (OP5)
- Promoting RE by removing barriers and reducing implementation costs (OP6)
- Reducing the long-term costs of low GHG emitting energy technologies (OP7)
- Promoting environmentally sustainable transport (OP11)

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Strategic Programs for CC Mitigation During GEF-4

- Energy efficiency
  - Buildings
  - Industry
- Renewable energy
  - On-grid electricity from renewables
  - Sustainable energy production from biomass
- Transport
  - Sustainable urban transport
- Land use and land-use change and forestry

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GEF Strategy to Energy Efficiency

- OP5 Objective
  - Removing barriers to large-scale application, implementation, and dissemination of energy-efficient technologies
- GEF-4 Strategy
  - Focusing on buildings and industry for impact
  - Targeting large, rapidly urbanizing and industrializing economies
  - Supporting TA with limited investments

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Indicative Resources for Climate Change in GEF-4

1. China: $150 million
2. India: $75 million
3. Russia: $73 million
4. Brazil: $38 million
5. Mexico: $28 million
6. S. Africa: $24 million
7. Ukraine: $19 million
8. Turkey: $18 million
9. Iran: $17 million
10. Indonesia: $16 million

11. Thailand: $15 million
15. Pakistan: $13 million
17. Malaysia: $11 million

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Evolution of Climate Change (Energy Efficiency) Strategy

- From barrier removal to market transformation
- GEF intervention moving upstream away from simply technology demonstrations
- From a broad range of technologies and market applications to more strategic interventions
- From "first-come, first-served," project-based funding to being programmatic and country-driven
- From abstract cross-country replication to more concrete in-country dissemination

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Energy Efficiency Program Models

1. Policy and regulatory reform
2. Standards and labeling
3. Technology demonstration & dissemination
4. Utility demand-side management
5. ESCO development
6. Partial risk guarantees
7. Special-purpose funds

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Policy and Regulatory Reform

- GEF agency: WB and UNDP
- Feature: Targeting policy and regulatory measures at the national level
- Project examples
  - China: Heat Reform and Building Energy Efficiency (WB)
  - China: End-use Energy Efficiency (UNDP)
  - China: Thermal Power Efficiency (WB)

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Standards and Labeling

- GEF agency: UNDP
- Feature: focusing on energy-efficient appliances and products
- Project examples
  - India: Market Transformation for Energy Efficient Refrigerators and Air Conditioners
  - Asia Regional: 6 products in 5-7 countries
  - South Africa: under development

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Technology Demonstration and Dissemination

- GEF agency: UNDP
- Feature: sector/technology-specific
- Project examples
  - China: Energy Conversion in Township and Village Enterprises (4 sectors)
  - India: Energy Efficiency Improvement in Steel Re-rolling Mill Sector
  - Vietnam: Energy Conservation in SMEs (5 sectors)
  - Bangladesh: Energy Efficient Brick Kilns

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Utility Demand-Side Management

- GEF agency: WB
- Feature: Based on Bank engagement in the power sector
- Project examples
  - Mexico: High Efficiency Lighting Pilot
  - Brazil: Energy Efficiency
  - Thailand: Promotion of Electricity Energy Efficiency
  - Vietnam: DSM and Energy Efficiency
  - Jamaica: DSM Demonstration

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ESCO Development

- GEF agencies: WB and UNDP
- Feature: Creation of ESCOs, development of ESCO industry, and development of utility-based ESCOs
- Project examples
  - China: Energy Conservation I & II
  - Brazil: Energy Efficiency
  - India: Energy Efficiency
  - Vietnam: DSM and Energy Efficiency

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Partial Credit Guarantees

- GEF agency: IFC and WB
- Feature: Underwriting partial credit guarantees to ESCOs, end-users, etc.; local FIs or IFC acting as guarantor
- Project examples
  - Hungary
  - Russia
  - China
  - Philippines

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Special Purpose Funds

- Revolving funds
  - Thailand: Chiller Replacement Project (WB)
  - Bulgaria: Energy Efficiency Project (WB)
  - Slovakia: Reconstruction of Public Lighting Systems (UNDP)
- Equity funds
  - Regional project in Eastern Europe and CIS: 8 countries (UNEP-EBRD)
- Partial performance guarantee mechanism (for ESCOs to borrow from commercial banks)
  - Brazil: Energy Efficient Buildings (UNDP-IADB)

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Observations on Program Models

- Not mutually exclusive
- Evolving over time
- Project/country-specific
- Agency-specific
  - reflecting GEF agency comparative advantages, mandate, expertise, and country strategy and commitment

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Conclusion

- GEF energy efficiency program
  - Most robust
  - Most cost-effective
  - Has demonstrated most impact
  - More emphasis during GEF-4
- Barrier removal and upstream intervention
- Program models → best practices

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Catalyzing Energy Efficiency Market Transformation through Carbon Finance

Ashok Sarkar
ESMAP, Energy, Transport & Water Dept
The World Bank

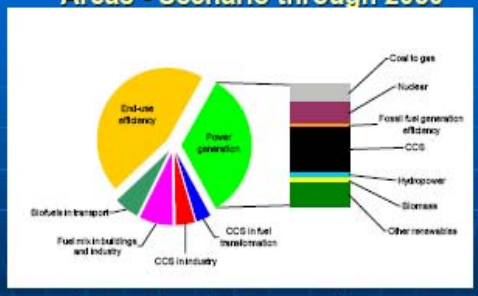
Tokyo
July 19, 2007

Outline

- Significance of Energy efficiency in the context of global climate change mitigation;
- The State of Energy Efficiency in the Carbon Market;
- Barriers and Strategies for Potential Synergies between Energy Efficiency and CDM;
- Illustrative initiatives.

Significance of Energy efficiency in the context of global climate change mitigation

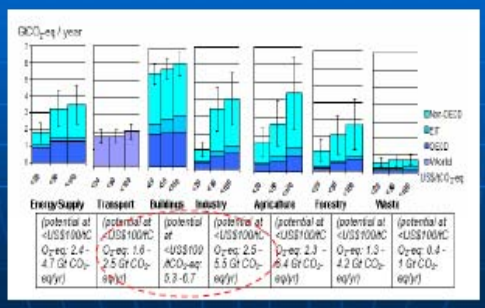
GHG Emission Reduction by Technology Areas - Scenario through 2050



Improved end use (demand side) energy efficiency most important contributor to reduced emissions

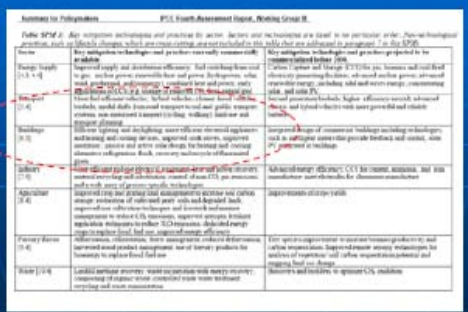
Source: IEA Energy Technology Perspectives 2006

GHG Mitigation Measures – 2030
(IPCC 4th Assessment Rept, WG.III)



Source: IPCC, 2007

GHG Mitigation Measures – 2030
(IPCC 4th Assessment Rept, WG.III)



Source: IPCC, 2007

Sectoral Policies & Measures – 2030 (IPCC 4th Assessment Rept, WG.III)

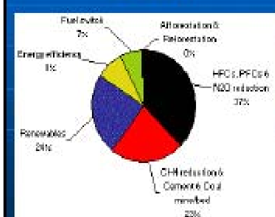
Transport [5.5]	Mandatory fuel economy, biofuel blending and CO_2 standards for road transport	Partial coverage of vehicle fleet may limit effectiveness
	Taxes on vehicle purchase, registration, use and motor fuels, road and parking pricing	Effectiveness may drop with higher incomes
	Influence mobility needs through land use regulations, and infrastructure planning	Particularly appropriate for countries that are building up their transportation systems
	Investment in attractive public transport facilities and non-motorised forms of transport	
Buildings [6.8]	Appliance standards and labelling	Periodic revision of standards needed
	Building codes and certification	Attractive for new buildings. Enforcement can be difficult
	Demand-side management programmes	Need for regulations so that utilities may profit
	Public sector leadership programmes, including procurement	Government purchasing can expand demand for energy-efficient products
	Incentives for energy service companies (ESCOs)	Success factor: Access to third party financing
Waste management [10.5]	Financial incentives for improved waste and wastewater management	May stimulate technology diffusion
	Renewable energy incentives or obligations	Local availability of low cost fuel
	Waste management regulations	Most effectively applied at national level with enforcement strategies

Source: IPCC, 2007

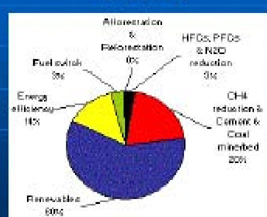
The State of Energy Efficiency in the Carbon Market

State of Energy Efficiency in Carbon Market…(1)

2012 CERs by Projects Type (July 2007)



Number (%) of Projects by Sector (July 2007)



Source: CD4CDM Website

State of Energy Efficiency in Carbon Market…(2)

2012 CERs by Projects Type (July 2007)

Type	CDM							
	number		CERs/yr (000)		2012 CERs (000)		CERs issued (000)	
Biomass energy	409	20%	22499	7%	149892	7%	5941	12%
Hydro	410	20%	31420	9%	172492	9%	2237	4%
Wind	236	12%	18480	6%	110603	6%	1444	3%
Agriculture	178	9%	8828	3%	49727	3%	1829	4%
Landfill gas	149	7%	20749	9%	197192	9%	2039	4%
EE Own Generation	140	7%	20424	6%	140794	7%	630	1%
Biogas	113	6%	6488	2%	36363	2%	328	0%
EE Industry	98	5%	2891	1%	17327	1%	221	0%
Fossil fuel switch	69	3%	24464	7%	107411	7%	240	0%
Coal bed/mine methane	40	2%	20573	6%	118542	6%	0	0%
N2O	37	2%	41980	12%	246067	12%	8180	16%
Cement	21	2%	4942	1%	32443	2%	469	1%
Fugitive	20	1%	10062	3%	77517	4%	276	1%
EE Supply side	20	1%	1164	0%	6314	0%	38	0%
HFCs	18	1%	81228	24%	504247	25%	23908	50%
EE Service	12	1%	49	0%	392	0%	0	0%
Geothermal	8	0%	1774	1%	10575	1%	102	0%
Solar	7	0%	178	0%	1111	0%	0	0%
Afforestation & Reforestation	7	0%	921	0%	5292	0%	0	0%
EE Households	4	0%	67	0%	510	0%	0	0%
Transport	4	0%	285	0%	2019	0%	0	0%
Energy distrib.	1	0%	55	0%	455	0%	0	0%
PFCs	1	0%	96	0%	542	0%	0	0%
Tidal	1	0%	315	0%	1104	0%	0	0%
Total	2023	100%	339586	100%	2069733	100%	50587	100%
HFCs, PFCs & N2O reduction	56	3%	123294	37%	750856	37%	32087	63%
CH4 reduction & Cement & Coal mine/bed	412	20%	72270	22%	450021	23%	4714	9%
Renewables	1182	58%	82147	25%	482471	24%	9952	20%
Energy efficiency	288	14%	30588	9.3%	178881	9%	944	2%
Fossil switch	69	3%	24464	7%	107411	7%	240	0%
Afforestation & Reforestation	7	0%	921	0%	5292	0%	0	0%

Source: CD4CDM Website

Barriers and Strategies for Potential Synergies between Energy Efficiency and CDM

Barriers to EE Development

- **Barriers to address at the level of the public authorities:**
  - Non-economic pricing of energy, inappropriate tariff structures, poor collection rates;
  - Market incentives for energy suppliers to supply more rather than less;
  - Lack of EE information campaigns, standards, codes, norms or labelling systems;
  - Inadequate regulatory or legal frameworks to support energy service companies.
- **Barriers to address at the level of end-users (final beneficiaries):**
  - Lack of awareness of the financial or qualitative benefits arising from energy saving measures, together with the skills to implement them;
  - Capital constraints and corporate culture leading to more investment in new production capacities rather than energy efficiency;
  - Greater weight given to addressing upfront (first) costs compared to recurring energy costs; , especially if these costs are a small proportion of production costs.
- **Barriers to address at the level of provision of finance and expertise:**
  - Lack of awareness and experience among investors and financiers of potential financial returns: local banking sectors tend not to prioritise energy efficiency finance, due to inexperience and lack of competition in the area, high transaction costs associated with smaller projects, and risks associated with assessing and securitising revenues generated through energy savings;
  - Limited access to robust systems and skills for measurement, monitoring and verification of energy savings

Weak Linkages between CDM and EE

- Large potential for demand side EE projects are in terms of small, dispersed measures (buildings, residential sector, SMEs.....)
- These measures are not consistent with "project based" concept of traditional CDM
- "Traditional" CDM modalities have limited scope in EE market reach
- "Programmatic CDM" could be a catalyst for capturing the potential (building codes, appliance standards, labeling, efficient lighting programs, etc.)

Differences between Energy Efficiency Programs and the CDM Approach

CDM APPROACH ≠ REAL EE PROGRAMS	
Effective EE programs	CDM process- long
Assume that real barriers exist	Barriers to be demonstrated for each project
Address capital cost barrier, even though cost effective	Tendency to equate profitability with "non-additionality" thus against CDM rules
Aim to transform markets, not prohibitive incentives for 1-time technology change	Lack of guidance/accepted approaches to attribute energy savings to programs- if you do a few – rest will not "qualify" for CDM
Often target systems and therefore involve multiple technologies	Traditional CDM is single technology "project" based; Even Programs of Activities (under the pCDM) limited to single methodology, single technology

Adapted from: A. Arquit Niederberger @ UNFCCC CDM JtCoordination Workshop 2007.

Operational Synergies between CDM and EE

- **Increased use of three CDM small-scale methodologies, which** allow for a "programmatic" approach (AMS II.C, AMS II.D., AMS II.E)
- **The EE best practice programmatic activities proposed must have higher degree of "traceability";** that is, the emission reductions must result directly from the CDM program activity.
- Excellent synergies in the area of **Monitoring and Verification** approaches in both robust CDM programs and EE best practices --→ lowered transaction costs.
- **Newly emerging Programme of Activities in CDM: The CPA is the most important design feature of a PoA and should be carefully defined** - the program (PoA) does not actually achieve the reductions. The emission reductions are attained at the level of the program activity (CPA).

Illustrative Initiatives

Catalyzing Carbon Finance though Lighting Africa Program

Rapid scale-up of access to clean, reliable and affordable modern lighting & basic energy services for 250 million people across Africa by 2030

(replacement of kerosene based lighting with LED systems)

If 10 million PV lanterns (& LED) replace kerosene lamps, over 2 million tons of CO2 emissions reduction will take place every year for the 10-year life of LED lamps.

The additional future revenue stream of carbon incentives could be used appropriately in the financial analysis to buy down the costs of the off-grid LED systems/lanterns, that the consumers will have to ultimately pay.

Lighting Africa - Approaches and Options

- Size of Projects (Project boundary, defined primarily by the number of fossil-fuel-based lamps in the baseline to be displaced by the PV-based LED systems
  - Large scale CDM (programmatic CDM) and
  - Small Scale CDM projects
- Methodologies (parallel tracks)
  - Using existing approved methodologies (simplified procedure)
  - Developing new programmatic CDM methodologies
- Transactions (parallel tracks)
  - Formal markets ←→ CERs
  - Voluntary markets ←→ VERs

Ghana Air-Conditioner Labeling Program – NM0158(C) ->PoA?

- Government of Ghana passed a minimum energy efficiency standard for room air conditioners, policy by law not effective until implementation infrastructure created.
- CDM program is the implementation of an efficiency testing, consumer labeling and quality-assurance program for air conditioners in Ghana (countrywide).
- Currently more than 100.000 ACs p.a. are sold in Ghana (close to 100% imported), fast growing market: program ensures that more efficient ACs will be bought.
- Estimated ERs: more than 3 Mio t CO2e over 7 years.
- More efficient ACs do not cost (significantly) more than BAU ACs, energy savings for consumers: more than 60 Mio USD p.a.; costs: about 2 Mio USD (financed out of CDM revenues (additionality, CDM as provider of missing link).

Source: WB Carbon Finance, 2007

Partnership to Increase Synergies between Carbon Finance and Energy Efficiency

- The Bank has worked with partners to develop a proposed "**Global Carbon Finance – Energy Efficiency Network**"- draft concept note on the 2-year work program under discussion with partners.
- Key agencies in the international, national, government, private and NGO domain, that are working in the area of energy efficiency and carbon finance in order to catalyze the acceleration of energy efficiency.
- In principle endorsement/support from IEA, REEEP, UNDP, UNFCCC…
- Formal announcement/launch of the Network at the December 2007 COP/MOP in Bali.

For more information…

http://www.worldbank.org/energy

CLEAN ENERGY WIKI (Wikipedia)– "ENERGY EFFICIENCY" PORTAL

http://www.cleanenergywiki.org/index.php/Energy_efficiency_portal

Appendix D. Workshop Proceedings Series

Region/Country	Activity/Report Title	Date	Number
	SUB-SAHARAN AFRICA (AFR)		
Regional	Impact of Determinants of Success of PP in Power in SSA. Conference on Private Participation in Infrastructure in SSA. June 6-7, 2005. Cape Town, South Africa.	03/06	003/06
Senegal	Facility for the Follow-up of Africa Energy-Poverty Workshops	10/06	006/06
	EAST ASIA AND PACIFIC (EAP)		
China	Symposium on Hydropower and Sustainable Development (CD Only)	12/05	001/05
	EUROPE AND CENTRAL ASIA (ECA)		
Poland	Women in Mining: Chance for a Better Life Workshop (CD Only)	05/06	004/06
	GLOBAL		
	The Energy Efficiency Investment Forum: Scaling Up Financing in the Developing World	10/06	005/06
	Bridging the Energy Efficiency Divide: Implementation Models and Best Practices	10/08	007/08

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