

Focus on Development Policy

KfW Entwicklungsbank Position Paper

May 2007

Promotion of Energy Efficiency through German Financial Cooperation

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Editor: Frank Weiler

- **Rising demand for energy worldwide threatens bases of life and development opportunities**

Energy security and global climate protection are among the main challenges of the 21st century. Under the assumption that there will be no profound changes to the current energy supply and energy use, the reference scenario of the IEA World Energy Outlook 2006 presupposes a global rise in energy consumption of around 50% by the year 2030. Developing countries will account for over 70% of this increase, particularly China and India. For the year 2030 it is being assumed that developing countries will account for over half the world's energy needs against 40% today.

The share of fossil fuels in this scenario will still be 82% in the year 2030. Coal is being expected to increase most of all. Coal will be used primarily for electricity generation, and four fifths of the increase in coal consumption will take place in China and India. By 2030 worldwide CO₂ emissions will reach 40 gigatonnes, 55% more than today. China will overtake the USA as the world's largest CO₂ emitter before the year 2010.

The IEA expects investment in the energy supply sector over the period of 2005 to 2030 to reach USD 20 trillion, two thirds of which will have to be made in the electricity industry. More than half this sum will be invested in the developing countries.¹

In the face of limited energy reserves and resources the rising demand will further intensify demand competition with rising and continuing high prices on the international energy markets. Furthermore the worldwide production of primary energy like oil and natural gas will in future concentrate on ever fewer countries. Many of these countries and regions are extremely unstable politically and prone to crisis.

The availability of sufficient and affordable energy is of crucial importance to sustainable development, both economically and socially. The serious environmental impacts of traditional energy production and consumption will become an increasingly heavy liability for the entire world. The direct and indirect costs of climate change can be measured in the billions of euros, and recent surveys² have concluded that the negative impacts of global warming that are expected to occur in the future have so far been rather underestimated than overstated.

¹ IEA, World Energy Outlook 2006

² Stern Review Report on the Economics of Climate Change, 2006

- **Dire consequences for poor countries in particular**

As their economic structure has little diversification and their financial capacities are limited, oil importing developing countries are particularly affected by high energy prices. It is estimated that additional expenditure resulting from rising energy import prices which developing countries in the southern part of Africa are having to pay are nearly as high as the overall international commitments flowing into the region under bilateral and multilateral development cooperation. This is rendering development efforts and debt relief initiatives in favour of poor countries ineffective, posing a massive threat to the achievement of the Millennium Development Goals.

Moreover, a large number of developing countries will be especially affected by the negative impacts of climate change owing to their geographical location -- more frequent storms, periods of extreme drought and flooding, rising sea levels, the extinction of plant and animal species and the spread of disease. Developing countries hardly have the means to use available options to adjust to changing climatic conditions as they usually do not possess the necessary funds to implement them.

- **Huge potential for raising energy efficiency in developing countries**

Even in well-organised and highly developed energy supply systems only one third of the primary energy converted is currently being used for actual energy services, around two thirds go unused because of conversion, transmission and distribution losses. In many developing countries this balance is even poorer and the specific energy consumption per unit of BSP (energy intensity) is usually considerably higher than the energy required in industrialised countries. This partly results from the differences in the industrial structure but is also due to the use of obsolete technology, the lack of incentives for efficient conversion and consumption, the lack of expertise and the lack of resources for upkeep and maintenance.

According to the World Energy Council (WEC), average worldwide power generation efficiency of the existing thermal power plants³ is approximately 30%. New hard coal-fired power plants, in turn, can reach an efficiency of roughly 45% while gas-fired combined cycle power plants reach up to 60%. The efficiency of combined heat and power plants can be as much as 85% to 90%. This holds considerable potential for increasing efficiency, particularly in developing countries where power plant efficiency is often less than 30%.

In addition to making better use of primary energy, efficiency improvements also reduce SO₂, NO_x and dust emissions. An efficiency increase by one percentage point in a typical Indian 210 MW coal-fired power plant, for example, leads to a reduction of CO₂ emissions of approximately 50,000 tonnes per year.

According to the WEC, significant improvements can also be achieved in power plant availability. The WEC estimates that increasing the average availability of the world's power plants to today's standards can lead to worldwide savings of approximately USD 80 billion annually and a substantial reduction or postponement of the construction of new power plant capacities. A large portion of this potential would be realised in developing countries.⁴

³ "Energy Efficiencies – Pipe dream or reality?" World Energy Council (WEC) Statement 2006

⁴ „Performance of Generating Plant: New Realities, New Needs“, World Energy Council (WEC), 2004

Further substantial efficiency improvement potential exists in the area of transmission and distribution since technical and non-technical losses are extremely high in most developing countries, often representing more than 30%. Although technical losses in the transmission of electricity are unavoidable to a certain extent, they can be significantly reduced by measures such as reducing grid overload, improving grid configuration and design and improved upkeep and maintenance. German Financial Cooperation (FC) with developing countries, which is implemented by KfW Entwicklungsbank on behalf of the German federal government, supports grid studies and grid expansion and optimisation measures in many countries. Optimization of the tariff systems and improvements in the metering, billing and collection systems lead to a situation where the energy consumed is adequately charged to and collected from the respective customers, which generally leads to efficient utilisation. The introduction of modern electricity meters, which is being financed under a project in Kyrgyzstan, or the installation of a prepaid metering systems, such as in Bangladesh, are concrete examples from the practical work of German FC.

Vast, hitherto unutilised technical and economic energy-saving potential does not only exist in the area of generation, transmission and distribution but also in the area of electricity end-use by the ultimate consumer. Public awareness campaigns, guidelines and binding rules, labelling of appliances, exemplary conduct of the public sector in procurement, standards as well as fiscal and other financial incentives can contribute to tapping this potential.

- **Distorted energy prices and inadequate incentive systems - fundamental problems in many developing countries**

If energy efficiency is to be increased it is crucial that energy sources and services be priced appropriately, reflecting their actual costs. This is the main element for steering the consumers' rational decisions. It is only through cost-covering prices and by elimination of subsidies which distort the market that incentives can be created for responsibly managing our natural resources, energy and - indirectly - protecting the environment.

In many developing countries, however, consumers often pay much less for electricity than the cost of supply. While a system of tariffs with limited (cross-) subsidisation of low income customers may be justified on social grounds, it should nevertheless be generally assured that the average tariff adequately covers the average cost of electricity supply. Tariffs that fail to cover costs not only have serious economic consequences for the power suppliers and usually lead to poor service quality -- they also encourage excessive demand and thwart efforts to promote rational energy consumption.

Tariff systems existing in developing countries often send out fundamentally wrong signals⁵. Domestic households are often billed in the form of lump sum payments without regard for quantities consumed, or billed on the basis of degressively staggered tariff systems that charge lower kilowatt hour prices for the higher quantities consumed. Even as degressive tariffs may generally correspond with how the cost of energy supply evolves, in the usually significantly overloaded systems of developing countries the additional demand induced by such tariff systems only leads to increased losses, capacity bottlenecks and power cuts, thereby thwarting the efficient use of energy.

⁵ „Pricing Energy in Developing Countries“, World Energy Council (WEC), 2001

- **Other obstacles to using available efficiency potential**

Besides the incentive systems mentioned, many developing countries lack further important prerequisites for the implementation of energy efficiency measures by the state, the enterprises and private households. Enterprises in developing countries usually operate in a politically and economically unstable environment which prompts them to implement a strategy aimed at short-term amortisation periods and risk minimisation and often prevents the implementation of energy-saving measures whose effects only set in in the medium term.

Moreover, appropriate financing offers are usually unavailable as well. Loan amounts are often limited and maturities inappropriate to the investment measures. Enterprises willing to invest also face the problem that banks do not have enough expertise and experience to assess energy efficiency investment measures.

Energy consumers, enterprises and private households have very little knowledge of how to conserve energy. As a result, these aspects have so far played only a minor role in the public debate going on in these countries, and it also shows the unavailability of competent advisory capacities and appropriate education and information campaigns on the part of the responsible government agencies or electricity supply companies⁶.

- **The Contribution of KfW Entwicklungsbank**

The energy sector is of crucial importance for our cooperation with developing countries because problems such as limited access to energy sources, the massive use of traditional biomass as energy source and the dependence on imported energy considerably limit social and economic development. Given the particular importance of electricity supply for economic development, electricity is the priority area of German financial cooperation in the energy sector.

In order to better meet the developmental objectives of its measures, KfW developed sector-specific selection and support criteria, entitled "Operational Appraisal Criteria for Electricity Supply Projects" in the early 1990s. The minimum requirements defined by these criteria, such as economic production and allocation efficiency, commercial efficiency, financial and economic cost coverage, are the basis for the appraisal and selection of eligible projects and measures. If the major appraisal criteria are not or not adequately fulfilled, the project is either not eligible for support under the given circumstances or required to undergo adjustments designed to enhance the likelihood of success. These include measures that are crucial for reliable energy supply and environmentally sustainable energy use, such as improving tariff structures, building institutional capacities and promoting good governance. The appraisal criteria are also designed to ensure that further expansion of an energy supply system only occurs if there is an intention to make adequate use of existing potential for efficiency increases. Where subsidies are considered they should specifically target and be limited to poor groups of the population. Subsidising the one-time expenditure poor groups of the population have to make to access energy services is considered to be generally more sound and less problematic than permanently subsidising their energy consumption.

⁶ „Energy Efficiency: A Worldwide Review, Indicators Policies, Evaluation“, WEC in collaboration with ADEME, 2004

Between 2002 and 2006 KfW committed a total of EUR 1,597 million for measures in the energy sector from budget funds of the German Ministry for Economic Cooperation and Development (BMZ) and from funds of its own. More than 50% of the funds made available were utilised for measures to promote energy efficiency in the area of fossil fuel production and grids as well as in hydropower plants. The projects that were promoted covered the full range from generation to transmission, distribution and consumption.

- In the area of electricity generation funds were committed in particular for projects to (i) improve the efficiency of power plants (such as the rehabilitation of thermal power plants in China, Egypt and Kosovo) or to (ii) employ combined heat and power plants for the simultaneous generation of electrical energy and heat or air conditioning/heating (such as district heat, local heat networks in Serbia and China), as well as measures for replacing fuels (such as natural gas for diesel and coal). An example of a successful measure was the modernisation programme for 13 turbines in six coal-fired power plants in China. The installation of improved turbine blades enabled an approximately 10% reduction in specific coal consumption and a rise in electricity generation by around 3%. These measures have avoided 600,000 tonnes of CO₂ emissions annually.
- In the area of transmission and distribution a distinction can be made between measures to (i) reduce losses through network improvements, (ii) optimise transformer stations and (iii) create incentives for efficient energy use through the installation of systems for consumption-related billing (installation and rehabilitation of meters). During the last five years KfW Entwicklungsbank has financed projects designed to rehabilitate substations and switching plants in Egypt and Mozambique and to optimise transmission and distribution networks in Afghanistan, Armenia, Azerbaijan, Bangladesh, the Dominican Republic, Georgia, Kyrgyzstan, Mozambique, Pakistan, Sri Lanka and Tanzania. In Mozambique, for example, KfW has financed the rehabilitation of the two local grids in Nampula and Nacala, parts of which were 50 years old and rapidly decaying as a result of negligence and/or insufficient maintenance during the civil war, leading to losses of nearly 40%. The losses in these two local grids could be reduced to just under 20%.
- The area of heat transmission and distribution covers measures designed to (i) improve storage, (ii) reduce losses by closing leaks and (iii) creating incentive systems to reduce consumption (installation and rehabilitation of meters). Current examples include projects designed to rehabilitate district heating systems in Serbia and China. In Serbia, for example, the rehabilitation of the district heat systems in Belgrade, Nis and Novi Sad led to a significant reduction in water and heat losses in the distribution networks; fuel is being utilised more rationally and the consumption of district heat has declined significantly as a result of improved supervision and management of heat supply to the buildings in the demonstration projects. Rehabilitation measures in other cities are under preparation.
- The area of electricity end-use includes a diverse package of measures aimed at increasing energy efficiency at the point where it reaches the ultimate consumer, that is, in industrial production, in the area of services, buildings, and in private households. In recent years KfW has stepped up its promotion of such projects, which by nature consist of numerous individual measures. On the German side GTZ (Gesellschaft für Technische Zusammenarbeit) and InWent (Internationale Weiterbildung und Entwicklung GmbH) have been and are still actively involved in the framework of technical cooperation and in the promotion of personnel

and organisational development in the partner countries, respectively. KfW finances major projects to support the efficient use of energy by ultimate consumers (primarily financing facilities) for partner countries in southeast Europe and in the Caucasus.

On behalf of the BMZ KfW has since 2005 made available around EUR 500 million under the Special Facility for Renewable Energy and Energy Efficiency for low-interest loans to finance investments in energy efficiency and renewable energies in developing countries up to the year 2009. It committed EUR 170 million to finance five projects in India, Azerbaijan, Morocco, Chile and seven Andean states in 2005. More than 70% of the funds were invested in energy efficiency.

In principle, all activities carried out by KfW Entwicklungsbank in the energy sector are designed to contribute to creating suitable economic and legal conditions within a dialogue with partner countries to bring about structural effectiveness and raise the acceptance and dissemination of new and efficient technologies and processes through the promotion of exemplary projects. In this effort KfW Entwicklungsbank benefits from the synergies existing within KfW Bankengruppe because the subject "energy efficiency" is also very high on the agenda within the financing programmes in Germany and KfW's Carbon Fund. KfW Bankengruppe is therefore one of the front runners in the promotion of energy efficiency - both nationally and internationally.

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Information on the topics of energy efficiency and environment in the transport sector can be found in the publication Focus on Development Policy, "Transport, Energy and Global Climate Change", October 2006.