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CODE2011-0021

March 16, 2011

For meeting of
Committee: Monday, April 11, 2011

COMMITTEE ON DEVELOPMENT EFFECTIVENESS

FROM: The Secretary, Committee on Development Effectiveness

Energizing Sustainable Development: Energy Sector Strategy of the World Bank Group

Attached is the document entitled *Energizing Sustainable Development: Energy Sector Strategy of the World Bank Group*, which will be discussed at a meeting of the Committee on Development Effectiveness scheduled for **April 11, 2011**.

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Energizing Sustainable Development: Energy Sector Strategy of the World Bank Group

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Abbreviations

AFR	Africa Region of the World Bank (Sub-Saharan Africa)
CEIF	Investment Framework for Clean Energy and Development
CIC	Climate Innovation Center
CIF	Clean Investment Funds
CODE	Committee on Development Effectiveness
CO ₂	carbon dioxide
CTF	Clean Technology Fund
EAP	East Asia and Pacific Region of the World Bank
ECA	Europe and Central Asia Region of the World Bank
EI	extractive industry
EIA	Energy Information Administration (of the U.S. Department of Energy)
EITI	Extractive Industries Transparency Initiative
ESMAP	Energy Sector Management Assistance Program
<i>FFT</i>	<i>Fuel for Thought</i>
FY	fiscal year
GDP	gross domestic product
GEF	Global Environment Facility
GHG	greenhouse gas
GPOBA	Global Partnership for Output-Based Aid
IBRD	International Bank for Reconstruction and Development
GW	gigawatts
IDA	International Development Association
IEA	International Energy Agency
IEG	Independent Evaluation Group
IFC	International Finance Corporation
LCR	Latin America and the Caribbean Region of the World Bank
LPG	liquefied petroleum gas
MDG	Millennium Development Goal
MIGA	Multilateral Investment Guarantee Agency
MNA	Middle East and North Africa Region of the World Bank
MW	megawatts
OP	Operational Policy (of IDA and IBRD)
ppm	parts per million
PREM	Poverty Reduction and Economic Management network of the World Bank
QAG	Quality Assurance Group
R&D	research and development
RPTES	Regional Program for Traditional Energy Sector
SAR	South Asia Region of the World Bank
SDV	Social Development sector of the World Bank
SFDCC	<i>Development and Climate Change: A Strategic Framework for the World Bank Group</i>

SMEs	small- and medium-sized enterprises
SREP	Scaling Up Renewable Energy Program for Low Income Countries
SWAp	sector-wide approach
WBG	World Bank Group
WDI	World Development Indicators

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All dollar amounts are U.S. dollars

Executive Summary

This new energy sector strategy is the result of an extensive review of past experience and widespread consultation with stakeholders, and embodies the five strategic priorities of the World Bank Group's Post-Crisis Directions: targeting the poor and vulnerable, creating opportunities for growth, promoting global collective action, strengthening governance, and managing risks and preparing for crises. The strategy outlines how the World Bank Group (WBG) can make a significant contribution to the global goals of reducing energy poverty and achieving sustainable development. The strategy is guided by two overarching objectives: (1) increasing modern energy access and reliability with a special emphasis on the poor, and (2) facilitating the shift to environmentally sustainable energy sector development.

The strategy recognizes the multiple needs inherent in working to deliver energy as a basic building block of modern economies. Those without access to reliable modern energy services are overwhelmingly poor and vulnerable; increasing access enhances human and economic development and contributes to efforts to achieve the Millennium Development Goals. The availability of reliable modern energy services is also essential for economic growth. At the same time, the global energy sector needs to evolve rapidly to respond to the challenge of climate change. Strengthening the sector's governance and financial performance is essential to creating an enabling environment in which to achieve the two objectives.

Making significant progress on the access and sustainability objectives demands a clear departure from existing policies and approaches. The challenge is formidable. At current rates of investment and growth in demand, the number of people without electricity—some 1.4 billion today—will decline only slightly by 2030, while the number of people relying on traditional use of solid fuels—an estimated 3 billion—may even increase. Both groups are disproportionately concentrated in Sub-Saharan Africa and South Asia, while about 1 billion of those using solid fuels also reside in East Asia. Extending access for these families and communities will free them from the debilitating health burdens exacted by indoor air pollution, ensure basic lighting and other essential services, and enhance opportunities for education and healthcare. Modern and reliable energy services will also greatly expand entrepreneurial and business opportunities, with large benefits for individuals' income generation and for the economy as a whole.

This strategy aims to secure the energy sector's long-term sustainability. For this, the sector must be economically and financially viable, socially inclusive, and environmentally sustainable both locally and globally. Meeting the need of developing countries for more and cleaner energy will require a transformation of energy systems to integrate energy efficiency, conventional energy, and expanding use of renewable energy sources for added flexibility and resilience to guard against supply shocks and price volatility. In so doing, the WBG recognizes the different roles that countries can play—in achieving universal access, providing reliable modern energy for economic development, and shifting to an environmentally responsible global emissions trajectory—and will assist them in tailoring different approaches to individual circumstances.

A critical aspect of this transformation is the role of developed countries. They can lead the transformation of the global energy sector by providing stronger incentives in their domestic markets to launch, sustain, and encourage research and development and the movement of innovations to the market. Further, they can bring down the costs of cleaner energy options with use and help developing countries by significantly increasing concessionary financing to the developing world as affirmed at the meeting of the parties to the Climate Convention in Cancún in December 2010.

Meeting the two objectives: increasing energy access and reliability, and facilitating the shift to an environmentally sustainable energy sector

This strategy sets ambitious goals for expanding access. It recognizes the critical importance of reliable access to modern energy services at the lowest price that is financially viable and sustainable for energy suppliers. The projections, based on estimates of lending patterns and client demand, view the WBG's new commitments in the energy sector between fiscal year (FY) 2012 and 2015 as extending electricity access to a total of 25–30 million people once these projects are completed; commitments between FY2012 and FY2020 will extend access to a total of 65–80 million. As part of that goal, the World Bank will contribute to the construction of 8–12 gigawatts of additional generation capacity in Sub-Saharan Africa; this is in addition to 8 gigawatts that are being constructed as part of the ongoing portfolio.

In parallel, the WBG will launch an expanded program in household energy. Supporting household energy programs, including programs for high-performance stoves and sustainable production of biomass-based energy, will help alleviate the impacts of energy poverty and the quality of energy services on women, children, and socioeconomic groups that often pay the highest costs—in terms of time, labor, health damage, and, all too often, cash—for the worst-quality energy services. The WBG will promote household energy initiatives such as increasing the availability of high-quality, affordable, solar-based energy services and work to expand the types of distributed and environmentally sustainable energy supply options designed to provide energy services for economically productive uses. The household energy program will pay particular attention to efficiency of energy use by the poor.

The strategy aims to significantly and steadily increase lending for clean energy projects. These projects increase access and bring sustainable energy to the market, and specifically include those for energy efficiency, renewable energy, electricity transmission and distribution, and policy lending. The goal is to increase the share of clean energy projects from an average of 67 percent in FY2008–10 to 75 percent by FY2015. As the WBG gains experience in the analysis of greenhouse gas (GHG) emissions for a variety of projects in the energy sector, classification of clean energy projects will be refined based on each project's estimated impact on lifetime GHG emissions relative to alternatives.

The WBG will begin conducting GHG emissions analysis for all new power generation projects in FY2012 and within two years for other energy investment projects once methodologies have been developed. This will help generate and transfer knowledge on carbon footprinting to client countries, identify opportunities for energy diversification, and access low-carbon financing.

The WBG will give high priority to work with countries to increase energy efficiency, which can make more energy available, reduce costs, increase access, improve reliability, and lower emissions of local pollutants, GHG emissions, or both. Tremendous scope exists for improving energy efficiency in virtually all countries. The WBG will assist countries, and partnerships among countries, in designing incentives and removing barriers to increase the efficiency of energy systems and reduce wasteful energy consumption.

Distributed energy systems offer important avenues to address energy poverty, affordability, and environmental sustainability. For many who are not currently served by the grid, distributed solutions based on renewable energy coupled with greatly expanded energy efficiency technologies and management practices is often the least-cost, most-rapid means of providing high-quality and cost-effective energy services with low environmental impact.

Hydropower can help meet the dual challenge of increasing access and reliability and supplying low-carbon electricity. For many countries, hydropower is now the largest source of affordable renewable energy, and helps reduce risks associated with water- and climate-related disasters and shocks to the

economy. There is tremendous potential for developing hydropower. Nearly four-fifths of potential hydropower resources in the developing world are yet to be developed, including more than 90 percent in Sub-Saharan Africa and about 70 percent in South Asia. Regional hydropower projects can service and expand markets and facilitate the formation of interconnected systems and power pools, bringing down costs for all. The WBG has learned many lessons from past experience and has also benefited from debates and discussions around the report of the World Commission on Dams, its follow-up Dams and Development Project hosted by the United Nations Environment Programme, and the International Hydropower Association's Sustainability Assessment Protocol. The WBG is committed to scaling up efforts to utilize the maximum strategic value of hydropower resources in an environmentally and socially sustainable manner, including mechanisms to evaluate and share benefits from such multipurpose projects where appropriate.

Promotion of new clean energy technologies, innovative policy tools, and transparent market designs will steadily increase in importance in the WBG portfolio. The WBG will be a partner in innovation. Future WBG activities will directly finance projects for specific sustainable energy technologies and facilitate new technology development through policy support, capacity building, the launch of clean energy market mechanisms, and knowledge generation and sharing. An important aspect is South-South knowledge and technology cooperation and transfer. The WBG will adapt its approach to new technology promotion in accordance with the levels of funding available from the international community and from innovative new market strategies in client nations.

The WBG will scale up climate finance and explore options for new financing models and instruments. It will help strengthen the capacity of developing countries to benefit from carbon markets, and will combine the use of existing carbon financing instruments and the design of new instruments that are seen to offer unprecedented opportunities to developing countries to accelerate the transition to a low-emissions economy. In addition to climate finance, the WBG will explore financing models and instruments for low-emissions energy systems.

To create an enabling environment to achieve the strategy's two objectives, the WBG will help improve the sector's financial and operational performance and strengthen governance across the supply chain. Without financial sustainability and efficient operation, energy shortages will continue, driving up costs to consumers. Strengthening governance—including addressing transparency, accountability, and public participation—is vital to ensuring that the sector function efficiently and that energy contribute to equitable economic, social, and environmental development. Subsidy reform is important for sound financial performance in this regard.

The WBG will help governments foster private sector participation and investment. Some developing countries with near-universal access—such as those in Europe and Central Asia—face the prospect of serious energy shortages in the next few years, underscoring the importance of taking action now to attract investment and secure future energy supplies. Competitive and transparent energy markets, along with an environment that encourages private sector entrepreneurship and financing, are crucial to achieving global objectives for access and sustainable development. A transparent, predictable regulatory framework that provides assurances to investors of a level playing field and equitable treatment over a long-term planning horizon is needed to promote competitive markets and facilitate private sector investment, risk-taking, and financing. The WBG is committed to a continuing partnership role to help governments design and implement tailored approaches, including regulatory frameworks and capacity building, and to provide financing selectively for private sector energy projects.

Local engagement and empowerment

The WBG will actively look for opportunities to encourage local community involvement as part of sustainable solutions. Experience with rural electrification efforts suggests that local community participation brings many benefits, in terms of improving design, mobilizing contributions in cash or in kind, and increasing local ownership and operational sustainability. Early community involvement can also help identify those particularly in need of assistance and ensure that community voice and participation is embedded in the design. Developing local capacity to operate and maintain installations and equipment can substantially ensure continuing use and spur local economic development. Helping to grow local energy markets that support entrepreneurship is another way of empowering local communities.

The WBG will work to empower women in the energy sector through partnerships focused on means to bring benefits to women as users of energy, as well as enabling women to become providers of energy services or make productive use of energy for income generation.

Coal and natural gas

The WBG will focus its resources on helping clients identify alternatives to coal power. No new coal-based power generation projects will be financed in IDA-blend or IBRD countries. In those countries, the WBG will focus support more on renewable energy, energy efficiency, and projects that lower GHG emissions, for which concessional financing is needed more than on conventional energy. In IDA countries, the WBG will consider supporting new coal power generation projects in strict compliance with WBG guidelines: when the project can significantly increase electricity access, reliability, or both; coal power generation is the least-cost option after incorporating externalities; and no concessional financing is available for more expensive, lower-emissions alternatives.

In order to improve local and global environmental sustainability, the WBG will support brownfield coal power projects aimed at increasing the efficiency of existing thermal power plants. Such projects will be undertaken only after considering the impact on GHG emissions over the extended life of the plant in question.

The WBG will support natural gas where its lower emissions potential can be realized. Life-cycle GHG emissions analysis is a vital tool in making this determination. Also important is examination of other environmental effects, such as those on water. Switching from coal to natural gas can offer significant mitigation potential, and projects will be prioritized where natural gas can serve as a complement to intermittent renewable energy sources such as wind and solar power. Where appropriate, the WBG can address barriers to commercializing natural gas by engaging on the policy and regulatory front, financing projects, and providing guarantees.

In closing

Given the rapid pace of change, the impact of unforeseen circumstances, and the need to reconcile many differing points of view, any 10-year sectoral strategy must necessarily incorporate uncertainty over outcomes. If this strategy, built on engagement and partnership, is executed as envisaged, it will provide a pathway to greatly expand energy services and access for the poor while ensuring a sustainable energy sector that safeguards the environmental commons of the poor and the developing world.

Setting

1 This new energy sector strategy focuses on how the World Bank Group (WBG) can make a significant contribution to the global goals of reducing energy poverty and achieving sustainable development. It addresses the challenges outlined in “New World, New World Bank Group: (I) Post-Crisis Directions”—redoubling efforts to meet the Millennium Development Goals (MDGs), fostering multipolar growth through innovation and other means, responding to complex global interactions such as climate change, promoting environmentally and socially sustainable development, and managing risks and anticipating potential shocks and new crises. A major barrier to reaching the MDGs is lack of access to reliable modern energy services. An estimated 1.4 billion people live without electricity, and many in developing countries are faced with recurrent power outages. Electricity is cited more frequently than any other obstacle to doing business by firms in Sub-Saharan Africa (AFR) and South Asia (SAR), underscoring how the poor performance of the power sector has serious consequences for the economy as a whole. Also, about 3 billion people continue to rely on traditional solid fuels; the World Health Organization estimates that nearly 2 million people die every year, and many more fall ill, from indoor air pollution caused by solid fuel use (Enterprise Surveys Database 2011; IEA 2010a; UNDP and WHO 2009).

2 Extending energy access over the next two decades and providing adequate, reliable energy for equitable economic development and poverty reduction call for a clear departure from existing policies and approaches. At current rates of investment, the number of people without access to electricity will decline only slightly—from 1.4 billion in 2009 to 1.2 billion by 2030—while the number of people using solid fuels could actually increase (IEA 2010a). The MDG targets would require an additional 2 billion people gaining access to modern fuels by 2015 (UNDP and WHO 2009), a goal most unlikely to be attained without significant and immediate increases in support for this sector. To achieve universal access to electricity, financing for both grid extension and off-grid and mini-grid solutions will need to be scaled up, and renewable technologies, coupled with energy efficiency, deployed. Energy infrastructure now operating beyond its design life also will need to be rehabilitated or replaced. And to shift households away from traditional solid fuels will require not only improving supply conditions and raising awareness, but also making alternative fuels more affordable—largely by raising household income.

3 Extending access and improving supply reliability will have global consequences. Almost all of the additional global demand for energy in the coming decades will occur in developing countries. Gross domestic product (GDP)—the main driver of energy demand—will grow faster in developing than developed countries, as will the rate of urbanization, which makes modern energy services more readily available. The International Energy Agency (IEA) estimates that, if current policies continue unchanged, demand for primary energy will increase by about 80 percent between 2008 and 2035 in developing countries. Electricity consumption will grow by 160 percent. At a rate of nearly 130 percent, energy demand in transport will grow faster than in industry, which in turn will overtake buildings (IEA 2010a). Developing countries need more energy to overcome poverty and achieve strong growth, and the world needs cleaner energy. The global energy sector will thus need to curb carbon dioxide (CO₂) emissions from fuel combustion, which, absent new energy and climate policies, are forecast to double globally by 2050 (IEA 2010b). At the heart of the debate is how to use all energy sources more efficiently, expand supplies, and increase access for the world’s poor and for economic growth in ways that will ensure a sustainable future for all.

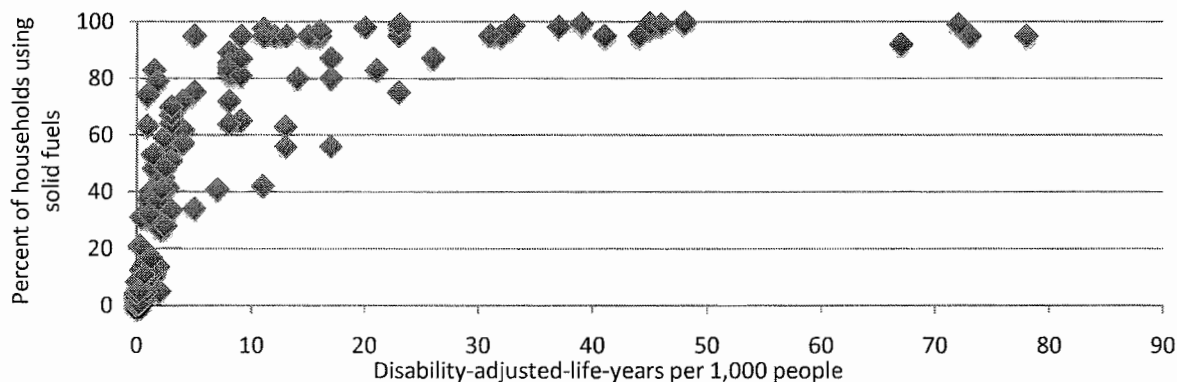
4 **The new strategy seeks to make the WBG a leading player in global efforts to reduce energy poverty and move countries along a low-emissions path.** To meet these challenges, energy systems would need to be transformed to integrate energy efficiency, conventional energy, and expanding use of renewable sources for added flexibility and resilience to supply shocks and price volatility. The strategy aims to ensure the energy sector's long-term sustainability, that it be economically and financially viable, socially inclusive, and environmentally sustainable at the local and global levels. The WBG recognizes that countries can play different roles in this regard—in achieving universal access, providing reliable modern energy services for economic development, and shifting to an environmentally responsible global emissions trajectory—and will customize its approach to individual country circumstances. Following is an overview of relevant aspects of the global energy sector that will inform where and how the WBG can most usefully engage in the coming decade; this discussion includes some of the issues raised during the global consultations on the approach paper for the strategy (Annex 1).

Energy poverty

Providing access to modern energy services

5 Such access would transform the lives of hundreds of millions of adults and children who spend hours gathering firewood and other forms of biomass, whose use poses substantial health costs (Figure 1). Freed from the necessity to collect biomass, children could attend school and study, and parents could look after their children and, where opportunities exist, undertake productive activities including income generation. Extending access to electricity would enable more effective delivery of educational and health services, enhance the possibilities of home-based production, and provide connectivity to modern sources of information. When reliable modern energy services are available, businesses are able to start up and expand. Access to clean and reliable energy will thus contribute significantly to the achievement of several MDGs, including goal 1 (eradicating extreme poverty and hunger), goal 2 (achieving universal primary education), goal 3 (promoting gender equality and empowering women), goals 4–6 (reducing child mortality, improving maternal health, combating diseases), and goal 7 (ensuring environmental sustainability).

Figure 1: Health Impact of Household Use of Solid Fuels



Sources: UNDP and WHO 2009.

6 **Enhancing access to electricity will entail considerable effort around the world.** Large proportions of the 1.4 billion people who live without electricity are concentrated in AFR and SAR. According to one estimate, 585 million people lack access to electricity in AFR, and 612 million in SAR (IEA 2010a). The total power generation capacity of the 48 countries in AFR, with a combined population of 840 million, is 78 gigawatts (GW); in comparison, Spain's capacity is 88 GW for a population of 46

million. Moreover, as much as a quarter of AFR's generation capacity is currently not in operating condition. Consequently, only 31 percent of AFR's population has access to electricity, and an even smaller percentage has access to *reliable* electricity.

7 Addressing the access gap for household fuels is even more challenging. An estimated 2.7 billion people rely on biomass for cooking and another 400 million on coal for heating. AFR, East Asia and Pacific (EAP), and SAR face the largest access gaps: about 650 million each in AFR and EAP, and more than a billion in SAR are estimated to use biomass for cooking and heating. The number of people using solid fuels could actually increase in the coming two decades, rising appreciably in AFR (UNDP and WHO 2009; IEA 2010a). Universal access to improved cooking and heating solutions requires an array of fuels and approaches based on local circumstances. Among gaseous fuels are liquefied petroleum gas (LPG), biogas (where there are farm animals and conditions are suitable), and natural gas, which is increasingly available in urban and peri-urban areas. While the initial connection cost of LPG, the most widely available gaseous fuel, is much lower than that for biogas or natural gas, the startup cost is still a barrier for many households and the fuel itself is more expensive. Kerosene has a lower start-up cost, but it is still expensive for the poor, and, except in high-pressure appliances, can be polluting. Options for solid fuels include charcoal and coal, which are purchased; and wood, dung, straws, and crop residues, which many households collect rather than purchase. Widespread use of solid fuels is likely to persist for a long time, making high-performance stoves for solid fuels an essential element of household fuel programs. Fewer than 30 percent of those relying on solid fuels use stoves that perform better than traditional stoves—through a combination of reducing fuel consumption, increasing combustion efficiency, and redirecting emissions using a chimney—and most of these better-performing stoves are in Asia (UNDP and WHO 2009). Those using advanced-combustion stoves,¹ which can dramatically reduce pollutant emissions, are much smaller in number. Long-term, stable programs and policies to address household energy are all too often weak or absent.

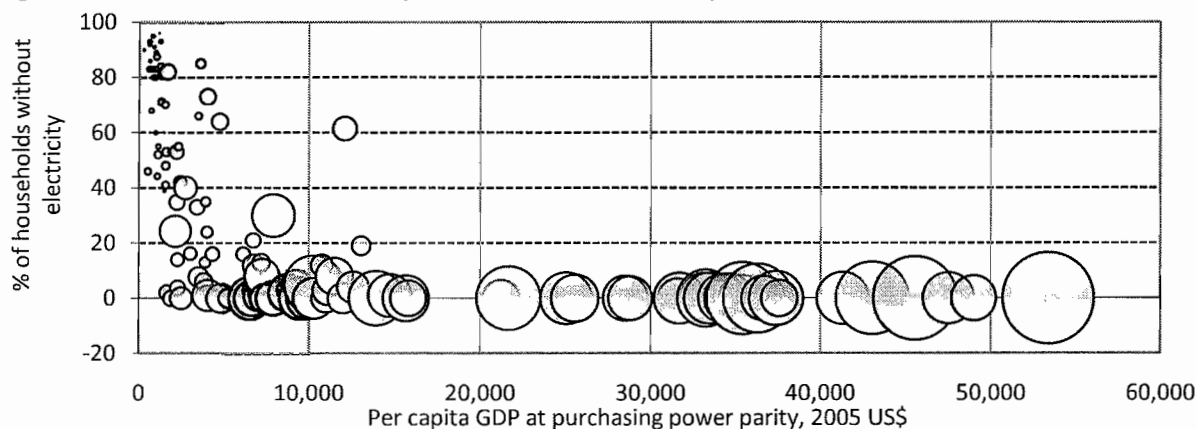
8 Achieving universal access to electricity by 2030 would require an additional annual average investment of \$36 billion (IEA 2010a). Growing power outages—and threats of power outages in the coming years—for those already connected in many countries have added another dimension to the efforts to increase access to *reliable* electricity. Supplying electricity to both poor households and better-off consumers—such as industrial, commercial, and middle- and upper-income residential customers—is important, because the latter are the main sources of revenue for the financial sustainability of electricity service. Such revenue would allow for further expansion of modern energy services to the poor segments of society. Where access is low, it is difficult for a small number of electrified consumers to provide the revenue base needed to make electricity available to many poor consumers (World Bank 2010a).

9 Increasing access of households to modern energy services will have little effect on global greenhouse gas emissions. The IEA estimates that achieving universal access to modern energy services by 2030 would increase global CO₂ emissions by less than 1 percent (IEA 2010a). Another study estimates that shifting 2 billion people previously using biomass to LPG would add less than 2 percent to global greenhouse gas (GHG) emissions (Smith 2002). Such emissions can be easily offset by energy efficiency and a reliance on cleaner sources of energy in the economy. What will materially affect global GHG emissions is energy used in the productive sectors of the economy. As shown in Figure 2, in which the size of each bubble is proportional to CO₂ emissions per capita, low access to electricity is generally

¹ Improved-fuel-use stoves increase fuel efficiency, mainly by increasing heat transfer efficiency. This achieves fuel savings, but combustion efficiency could decline, *increasing* pollutant emissions. Advanced-combustion stoves dramatically reduce emissions of harmful pollutants in the first place. Stoves for which high combustion efficiency is combined with high heat transfer efficiency can cut indoor air pollution and reduce fuel consumption markedly.

associated with low per capita emissions and is disproportionately concentrated in countries with per capita GDP of less than \$5,000, valued at purchasing power parity. Given these impacts and trends, the first priority is to accelerate the provision of affordable and reliable modern energy services in countries with low access.

Figure 2: Lack of Access to Electricity and CO₂ Emissions Per Capita



Sources: WDI database, various national statistics and household surveys, and IEA and U.S. EIA CO₂ emissions databases.

Note: Data point sizes are proportional to energy-related CO₂ emissions per capita. The graph includes data from high-income countries.

10 **Rapid urbanization across the developing world will affect efforts to increase energy access.**

The urban population in developing countries is projected to grow by 1.65 billion between 2010 and 2035 and to exceed the rural population by 1.1 billion. Globally, the rural population will see a slight decline, although with large regional differences (UN 2009). Extending access to electricity in urban and peri-urban areas strongly favors grid electricity. For cooking, the preferred options are natural gas, LPG, or electricity. One challenge is to meet increasing demand in rapidly growing low-income and informal urban settlement areas: 1 billion people are estimated to live in slums and shanty towns in developing countries, and the share of urban poverty is increasing in all regions except Europe and Central Asia (ECA). Concentrated biomass consumption, particularly of charcoal—which requires large quantities of wood to manufacture and the demand for which is likely to grow with urbanization—can lead to deforestation and rising prices, emphasizing the importance of sustainable production of woodfuels (firewood and charcoal) (Annex 2).

11 **Various approaches are needed to expand rural access.** Given low existing levels of access in rural areas, electricity services need to be extended to nearly six times as many people in rural rather than urban areas (IEA 2010a). Although the urban population will grow much more rapidly, there will still be a net increase of 50 million rural residents by 2030 in developing countries—including 140 million more in AFR and 80 million in SAR (UN 2009).² High costs of electricity in rural areas and limited capacity of households to pay for service deter investment in rural electrification. A system of tariffs and targeted subsidies that ensures sustainable cost recovery while minimizing price distortions can help but is lacking in many countries. Even in rural areas, grid, mini-grid, and off-grid options are all needed (Annex 1). Individual systems, such as solar home systems, are increasingly adopted. Generally unsuitable for large-scale productive purposes, solar home systems serve as a useful transition toward integration into

² The net increase is much smaller than the combined increase in AFR and SAR because the rural population declines in other parts of the world.

a mini-grid or a grid system. The private sector can play an important role, provided sustainable financial incentives are put in place. For other energy needs, hundreds of millions of rural households will continue to use solid fuels. For them, switching to more-efficient and less-polluting stoves can be a significant step forward.

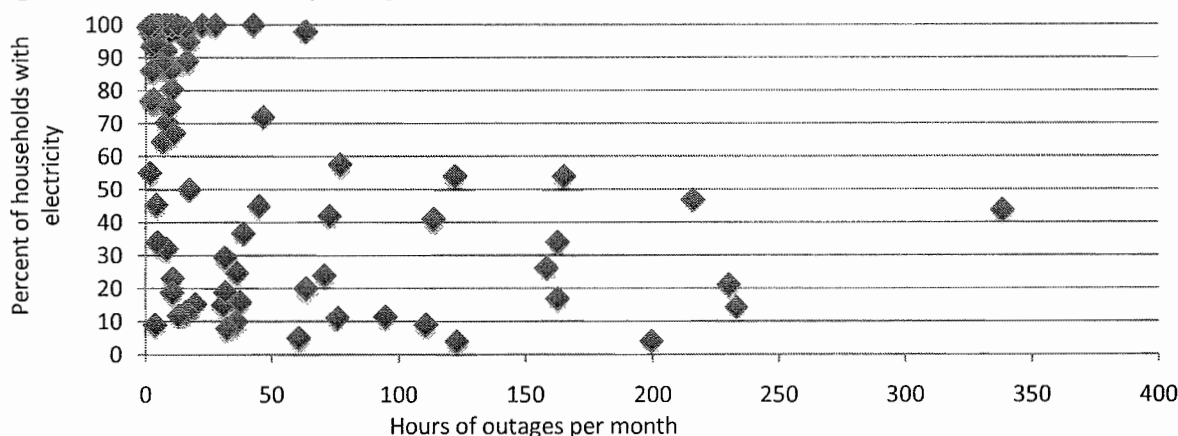
12 Making modern forms of energy affordable and increasing the cash income of those without access are two critical elements in narrowing the access gap. Affordability of energy services can be tackled through the choice of fuel and technology, incentives for supply- and demand-side efficiency improvement, and pricing policies for end-users including targeted subsidies. Breakthroughs in technology as well as falling costs—due to scale of deployment and technical advances—will also contribute to making access more affordable. Income can be increased through general economic growth as well as income-generation activities enabled through actions in the energy sector. The latter include productive uses of newly supplied modern energy and fostering development of local entrepreneurs and small- and medium-sized enterprises (SMEs) to produce or market energy.

Improving the reliability of energy services

13 Reliable energy services are critical for improving energy access and supporting economic development. Firms in AFR report losing 6 percent of their sales as a result of frequent power outages and firms in the informal sector unable to afford backup generation facilities cite losses of 16 percent (Foster and Briceño-Garmendia 2010), while firms in SAR report losing an average of 11 percent of their sales due to power outages. Although these statistics highlight the degree of severity in AFR and SAR, 7–11 percent of firms surveyed in the other four regions also cite electricity as an obstacle to doing business. And while much lower than 69 hours in AFR, the 25 hours of power outages a month in ECA and the 20 hours in Latin America and the Caribbean (LCR) reported in the same survey constitute almost an hour a day of outage (Enterprise Surveys Database 2011). Unreliable delivery of modern fuels, such as LPG, forces households to continue to use traditional solid fuels. Ironically, the subsidies intended to help the poor purchase kerosene or LPG often result in fuel shortages by creating strong incentives to divert subsidized fuels to black markets; this results in high prices for the poor.

14 Countries with low access to electricity often suffer from frequent supply disruptions, but there are also countries with near-universal access where outages are frequent and of long duration (Figure 3). Low access generally implies inadequate capacity to supply electricity. Where access is high, outages may occur because of aging capacities, increasing demand, or both. These observations underscore the importance of securing access to *reliable* modern energy services.

Figure 3: Hours of Electricity Outages per Month in Developing Countries



Sources: Various household surveys, Enterprise Surveys database.

Energy and the environment

15 Addressing climate change requires “a paradigm shift towards building a low-carbon society that offers substantial opportunities and ensures continued high growth and sustainable development.” This conclusion from the December 2010 international climate conference in Cancún acknowledges that all countries should cooperate in peaking GHG emissions as soon as possible. The parties also recognized that the time frame for peaking will be longer in developing countries, and that social and economic development and poverty eradication are the first and overriding priorities (UNFCCC 2010). In 2008, high-income countries—home to 17 percent of the world’s population—contributed to 43 percent of global CO₂ emissions from fuel combustion (IEA 2010c). Developing countries will bear an estimated 75–80 percent of the cost of damages caused by changing climate; low-income countries will suffer the most (World Bank 2010b). Some countries with more than 80 percent of their population lacking access to electricity are virtually invisible in Figure 2, while all countries with per capita GDP exceeding \$20,000 have high CO₂ emissions per person. The parties in Cancún reaffirmed that developed countries—which have largely contributed to the current stock of global-warming gases and which continue to emit them at much higher levels on a per capita basis than developing countries—must take the lead and reduce their GHG emissions significantly. Energy-saving policies and energy with low life-cycle GHG emissions are indispensable for meeting future energy needs in a sustainable manner. These measures generally also help mitigate the local environmental problems associated with energy production and use.

16 The establishment of the Green Climate Fund signals a commitment to scaling up predictable funding to help developing countries cope with adverse effects of climate change and embark on a low-emissions development path. Equity considerations call for significant financial and technology transfers to developing countries in the international effort to curb GHG emissions. The IEA estimates that additional annual investment in the energy sector in developing countries alone to limit long-term CO₂-equivalent concentrations to 450 parts per million (ppm) would rise from less than \$100 billion in 2020 to more than \$600 billion by 2035 (IEA 2010a). The establishment of the Green Climate Fund strengthens the international commitment made in Copenhagen to work toward a goal of jointly mobilizing \$100 billion a year by 2020.

17 Improving energy efficiency can lower energy demand, enhance reliability, potentially make energy more affordable to the poor, and reduce the vulnerability of the energy sector to external shocks and supply constraints. Considerable scope exists for energy efficiency improvement in every country. In the IEA’s 450 ppm scenario above, efficiency improvement provides 67 percent of the energy-related CO₂ reduction needed in 2020 and 47 percent in 2035 (IEA 2010a). Reducing technical and nontechnical losses can free up a sizable amount of electricity and natural gas, while efficient appliances, equipment, and vehicles can reduce demand by a large margin. There are well-documented barriers to improving energy efficiency, including transaction costs which are often not accounted for in economic analysis. Because lowering the cost of energy use through higher efficiency often creates new demand, energy efficiency improvement needs to be coupled with demand management to realize full benefits. These barriers and concerns notwithstanding, tremendous progress has been made in increasing both supply-side and end-use energy efficiency, and efficiency improvement will arguably continue to be the most widely applicable and cost-effective means of increasing the effective supply of energy and combating climate change.

18 Renewable energy will increasingly contribute to slowing the growth of GHG emissions. The number of governments that have set policy targets or introduced incentives for renewable energy has

doubled since 2005 and now exceeds 100; half of these are in developing countries. The potential for renewable energy varies markedly from country to country. The most common incentive policy, existing in 50 countries as of early 2010, is to set feed-in tariffs for electricity. Investment in renewable energy comprised more than half the total global investment in new power generation capacity in both 2008 and 2009. Of these sources, hydropower developed on a large scale has, on average, the least cost per unit of electricity generated, followed by geothermal and on-shore wind power. Solar power is currently the most expensive option, although its costs have been falling rapidly. Excluding hydropower, wind power dominates total power generation capacity for renewable energy. During the second half of the last decade, the number of solar hot water heating systems more than doubled, and an estimated 70 million homes—mostly in China—have such systems today. More than 30 million households use biogas, led by 25 million in China and 4 million in India (REN21 2010).

19 Hydropower, together with other types of energy, can meet the world's rapidly growing demand for electricity. Additionally, multipurpose development and management of water resources can strengthen water and food security, and reduce the risks associated with water and climate-related disasters and shocks to the economy. Multipurpose projects featuring storage reservoirs can yield several benefits:

- They increase the use of other forms of renewable energy such as wind and solar power. Hydropower has the unique advantage of allowing energy to be stored (in the reservoir) when not needed by using surplus energy to pump water to a higher elevation. The stored energy can then be rapidly deployed at a later time to generate electricity to meet peaking demand and compensate for drops in alternative supplies (such as reduced solar energy or wind power). Pumped storage helps balance the network, lower the overall operation cost of power production, and level the fluctuating output of intermittent power sources.
- They provide significant benefits for adaptation to climate change, allowing communities to cope with increasing hydrological variability by protecting them from droughts and mitigating the consequences of floods.
- They supply water for domestic uses and for agricultural irrigation.

Multilateral institutions, including the WBG, have focused on a balanced approach to hydropower generation: run-of-the-river (with minimal water storage), storage (with an appropriate reservoir), and mini- and micro-hydropower, particularly for rural electrification. Over the past few decades, the WBG and its clients have learned important lessons about how to minimize adverse upstream and downstream social and environmental impacts, use new technologies to strengthen flood and drought management, and involve communities throughout the design and implementation phases of hydropower development to ensure that evolving challenges and impacts are properly addressed.

20 Future technology advances offer significant potential for transforming the global energy sector. The WBG's partner countries—both donors and borrowers, and particularly in large middle-income countries—are engaged in innovation. Many of these efforts are led by the private sector, supported by an enabling environment created by governments. The costs of wind power and solar systems are expected to continue to fall with technical advances and scale of deployment. An affordable means of storing energy to complement solar and wind power would be a major breakthrough for grid, mini-grid, and off-grid applications. Leveraging information technology, smart grids—which are beginning to be deployed in certain markets—can enhance efficiency and enable better integration of intermittent renewable energy. Advances in the biofuels industry may lead to significant yield increases and widen the range of feedstocks that can be used. Technical improvements in advanced-combustion stoves may enable large cost reductions in the manufacture of stoves that have low pollutant emissions. Mechanisms to make adoption of such technologies economically viable will require global support. Moving to fuel taxation that captures local and global externalities in developed countries could go a

long way in promoting the development of clean energy technologies and lowering the associated costs. Equally important is local ownership of clean energy technologies—under all circumstances with the capacity to operate and maintain and, in some cases, to develop and manufacture.

Related developments

21 Financing development remains difficult, especially for low-income countries. Faced with massive infrastructure and social needs, many developing countries are seriously constrained in their ability to finance their development programs (PPIAF 2010). The private sector has not been a steady source of investment for electricity in developing countries; the variation in funding over time and across countries underscores the need to address all the various dimensions of the investment climate, including the regulatory framework. Private sector investment increased rapidly until 1997, flowing mainly to LCR and EAP; but then declined sharply. There was a major recovery in 2007, followed by a 40 percent increase in 2009 over the previous year—the largest increase since the mid-1990s. Investment has grown selectively, however, and has flowed primarily to a handful of large economies. In 2008, the top four countries accounted for two-thirds of investment, and megaprojects costing \$1 billion or more made up most of the investment growth. In contrast, investment fell sharply in AFR, where the estimated spending needs are \$41 billion a year (equivalent to 6.4 percent of the region's GDP) but where actual expenditure has been only \$12 billion. The IEA estimates that, in developing countries, the power sector alone will require an average investment of nearly \$400 billion (in 2009 U.S. dollars) every year to 2035 (IEA 2010a). The global financial crisis is likely to have long-lasting consequences, throwing an additional 50 million people into extreme poverty in 2015—including 20 million in AFR (World Bank 2010c)—and decreasing the collective ability of those lacking access to pay for modern energy services. The financial crisis has also reduced external financing for aid and private capital inflows into the energy sector in many developing countries; this has affected both new infrastructure development and the equally important maintenance of existing assets.

22 Recent volatility in energy prices has highlighted the importance of diversifying the energy portfolio, rapidly implementing measures to improve energy efficiency, and being better prepared for large energy price swings and spikes. World oil prices averaged \$29 per barrel in 1999–2001 (in 2008 U.S. dollars), rose above \$130 in mid-2008, fell sharply, and have more recently fluctuated around \$75–\$100. Rising prices up to 2008 gave an impetus to consider shifting to coal-fired power generation in many countries. Large fuel price changes affect relative costs of technologies, and large price volatility is one of the greatest barriers to developing alternative energy and shifting households to modern commercial energy.

23 High and volatile fuel prices, energy shortages, and a continuing inability to finance essential energy projects emphasize the urgency of tackling subsidies for conventional energy. Replacing universal price subsidies with targeted subsidies increases incentives for energy conservation and energy efficiency improvement, reduces subsidy bills for governments, and attracts more investment to the sector by enhancing the prospect of cost recovery. Because universal price subsidies for liquid fuels often result in supply shortages, phasing out such subsidies can eliminate incentives for black markets while minimizing adverse effects on the vulnerable. Reducing subsidies for fossil fuels goes some way toward creating a level playing field for renewable energy and decreases GHG emissions. One study estimates that consumer subsidies for petroleum products were \$57 billion globally in 2003, \$519 billion in 2008, and \$136 billion in 2009, rebounding to \$240 billion in 2010 (Coady and others 2010).³ For these

³ The methodology used for these estimates is the price-gap approach, which has several shortcomings (World Bank 2010g).

reasons, G20 leaders in September 2009 called on governments to phase out inefficient fossil fuel subsidies that lead to wasteful consumption while providing targeted support to the poorest.

24 The external environment has changed considerably in the last decade, with profound implications for the energy sector. The rate of progress in achieving universal access to modern energy services has not been sufficient to reach the 2030 goal, let alone the level needed to meet the MDGs by 2015. The reform measures enacted in the 1990s in the power sector were envisaged to promote private sector financing. Instead, private sector funds flowed selectively and not necessarily to the countries and regions most in need. Climate change is increasingly recognized as an integral part of the development agenda, interlinking energy and various other sectors and calling for greater selectivity in investment and technology choice. Large funding gaps remain for both accelerating the efforts to achieve universal access and covering the additional costs of green development. Against this backdrop, this strategy must be flexible to meet the challenges posed by future energy price shocks and financial crises, as well as to respond quickly to new opportunities presented by a marked increase in the availability of climate financing to help developing countries embark on a low-emissions trajectory

Taking Stock

25 The current WBG energy sector strategy comprises a 1999 environmental strategy for the energy sector, *Fuel for Thought* (FFT), and an informal 2001 strategy entitled “The World Bank Group’s energy program: poverty alleviation, sustainability, and selectivity” (Annex 3). *FFT* set six strategic objectives: three on environmental sustainability of energy production and use, one on reducing indoor air pollution and pressures on land and forestry, another on reducing urban air pollution from fuel combustion, and one on capacity building for environmental management. The 2001 energy sector strategy defined four lines of business: direct poverty alleviation, macro and fiscal stabilization, governance and private sector development, and environmental sustainability. The Investment Framework for Clean Energy and Development (CEIF), formulated in 2006, laid out a roadmap for increasing access and mitigating GHG emissions. More recently, the energy sector has been guided by “Sustainable Infrastructure Action Plan” and “Development and Climate Change: A Strategic Framework for the World Bank Group” (SFDCC), both covering operations through the fiscal year (FY) ending in June 2011.

26 The previous sector strategies established the importance of setting a few key outcome indicators that are not burdensome to monitor and that have a meaningful link to WBG activities and programs. *FFT* set numerous indicators at different levels for the energy and environment sectors. While a detailed breakdown of challenges helps clarify what tasks need to be tackled, having a large number of indicators could make it difficult to prioritize activities. The 2001 strategy indicators were all global in nature, making the contribution of the WBG projects difficult to assess. More detailed stocktaking is available in Annexes 5 and 6 of World Bank (2009a).

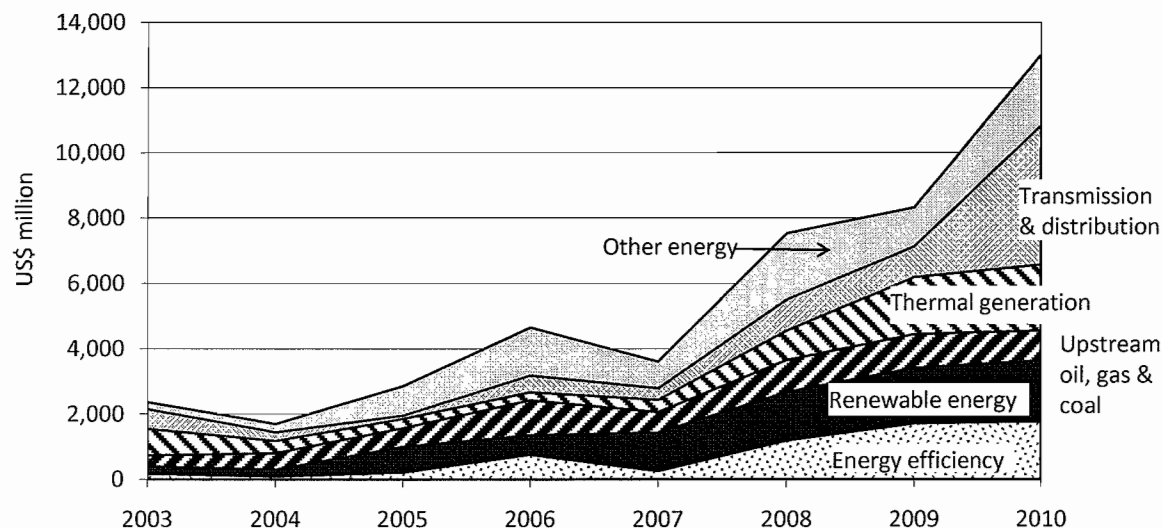
27 There is widespread recognition of the need to develop approaches in the power sector to reform and to extending access that are tailored to individual countries’ circumstances. A 2003 IEG review of the WBG’s experience with private participation in the power sector in the 1990s found that good outcomes could be obtained where there was client ownership and a sustained political commitment to private sector development. Unsatisfactory outcomes were associated with projects with multiple objectives and where the World Bank had underestimated the complexity and time required for lasting reforms. In contrast, IFC and MIGA responded to market demand for new power generation, focused on the single objective of private sector participation, and achieved good project-level outcomes overall. A 2006 review of lessons from reforming power markets in developing countries

stressed the need to adapt reform to starting conditions and discussed how these conditions could influence the design of reform programs (Besant-Jones 2006). Similarly, successful policies for extending access in specific circumstances are not necessarily universal remedies (World Bank 2010a). Experience points to the highly contextual nature of appropriate institutional and business models for electrification and improved cooking and heating solutions, necessitating varying solutions over time even within a given country.

28 Past experiences show that much commitment and effort are needed to mainstream household energy issues. The World Bank had an active program on household energy through the Energy Sector Management Assistance Program (ESMAP) in the 1980s, largely in response to what was believed at the time to be impending worldwide woodfuel scarcities that would require massive reforestation to meet ever-increasing demands. The World Bank, together with external partners, established the Regional Program for Traditional Energy Sector (RPTES) in 1993 to assist countries in AFR to review, formulate, and implement policies, programs, and projects for fuels for households and SMEs. The level of interest in household fuels declined over the years, and RPTES was discontinued in 2003. AFR has recently prepared a biomass energy strategy, focusing in particular on biomass-based energy sources for household cooking and modern cookstoves, and on mainstreaming gender in this context.

29 WBG lending for energy is rebounding strongly after a decade of decline. Lending declined to an average of about \$2.4 billion a year in FY2000–04 from \$3.7 billion in the preceding five years. Lending began to increase after WBG management, at the request of the Board of Executive Directors, launched an Infrastructure Action Plan in 2003 to revitalize the WBG’s engagement. In response to the deepening global financial and economic crisis, the WBG in April 2009 launched the Infrastructure Recovery and Assets Platform and the Infrastructure Crisis Facility; these are focused on green infrastructure. Total commitments reached \$13 billion in FY2010, as shown in Figure 4.

Figure 4: WBG Lending for Energy by Project Category (New Approvals)



Source: WBG

Note: “Other energy” is for projects where energy policy support is provided, such as energy sector development policy operations; and other interventions where the form of energy cannot be clearly distinguished or there are multiple energy subsectors supported within a single project.

30 The WBG has further strengthened its efforts to extend access and address climate change. At the 2002 World Summit on Sustainable Development in Johannesburg, the WBG launched the Global

Gas Flaring Reduction public-private partnership to reduce flaring and venting of associated natural gas through policy change, stakeholder facilitation, and project implementation. Two years later, at the Bonn International Conference on Renewable Energies, the WBG made a commitment to scale up energy efficiency and renewable energy by 20 percent a year for five years (ending in FY2009) over the average commitments made in FY2002–04. At the 2005 G-8 Summit, the World Bank was asked to facilitate the creation of an investment framework on clean energy and development; and to contribute to fostering a global dialogue around access, mitigation, and adaptation. The WBG formulated CEIF in 2006 to accelerate private and public sector investments in energy access, mitigation, and adaptation. The level of lending for energy efficiency and renewable energy reached \$3.4 billion in FY2009, and the Bonn commitment was exceeded sixfold. The share of the WBG's energy lending devoted to low-carbon projects increased from 27 percent in FY2003–05 to 41 percent in FY2008–10.

31 The WBG has been supporting new clean energy technologies in a variety of ways. The World Bank has provided policy and regulatory support not only for new technologies but also to reduce and phase out subsidies for conventional energy sources and build upstream capacity for science, technology, and innovation. Helping countries access climate finance—which accounted for 14 percent of total WBG financing in renewable energy in FY2003–10—has strengthened support for new clean energy technologies. The WBG has helped developing countries access concessionary financing instruments, such as the Global Environment Facility (GEF), various carbon funds, and the Climate Investment Funds (CIF). Two funds under the CIF target the energy sector: the \$4.4 billion Clean Technology Fund (CTF), which finances demonstration, deployment, and transfer of low-emissions technologies that meet country development objectives and have a significant potential for long-term GHG emissions savings; and the \$300 million Scaling up Renewable Energy Program for Low-Income Countries (SREP), which aims to help increase energy access using renewable energy. In the future, countries may choose to blend financing from the Green Climate Fund with WBG resources to further scale up these efforts. The WBG has not historically supported research and development (R&D) for technology in the energy sector, but IFC has very selectively explored technologies in late stages of development that show promise for adoption in developing countries using its own resources, sometimes covering some risks with donor resources.

32 The WBG has been increasing lending, analytical work, knowledge sharing, and policy dialogue in hydropower. The WBG has focused on integrated water resource management activities that take into account different users of water and multiple objectives in managing and regulating water; this emphasis is consistent with the 2003 Water Resources Sector Strategy. The climate mitigation and adaptation benefits of hydropower and its enormous untapped potential have led the WBG to efforts to utilize the maximum strategic value of hydropower resources in an environmentally and socially sustainable manner, incorporating lessons learned in the last several decades including designing mechanisms to evaluate and share benefits from multipurpose projects in an equitable way (Annex 2). Only 23 percent of the potential hydropower resources in the developing world have been developed to date, including less than 10 percent in AFR and about 30 percent in SAR; in comparison, more than 75 percent has been tapped in high-income countries. In areas with low access to electricity, developing hydropower potential can help meet the dual challenge of increasing access and supplying low-carbon electricity to the economy. Moreover, hydropower complements such intermittent energy sources as wind and solar power. Regional hydropower projects can service and expand markets and facilitate the formation of interconnected systems and power pools, bringing down costs for all.

33 The WBG established six criteria for investments in coal-based power projects in SFDCC and detailed monitoring indicators in an operational guidance note. The March 2010 guidance note calls for an external panel that would review the quality of compliance with the six criteria in every proposed project at an early stage of preparation. The first criterion requires supporting evidence for significantly

increasing access, reliability, or both; the sixth criterion requires GHG analysis and computation of switching prices for carbon between the proposed project and lower-carbon alternatives (World Bank 2010d). The six criteria are described in Table 5 in Annex 3.

34 In extractive industries, the WBG has increasingly targeted governance. WBG management has focused on the needs of poor people and the rights of those affected by extractive industry (EI) investments, governance and transparency, and mitigating environmental and social risks (Annex 3) in the wake of its response to the 2004 Extractive Industries Review. In the policy arena, the World Bank has been actively engaged since 2003 in the Extractive Industries Transparency Initiative (EITI)—a process that brings together governments, EI companies, and civil society to improve governance in resource-rich countries through the publication, verification, and reconciliation of payments made by companies and revenues received by governments. More recently, the World Bank has addressed issues across the EI value chain in collaborative efforts with PREM and the energy sector.

35 Overall energy project performance is improving over time, but with some exceptions and large regional variation. The share of World Bank energy projects rated as satisfactory by the IEG rose from an average of 66 percent for those closing in FY2000–02 to 78 percent in FY2003–05; it then fell to 69 percent in FY2007–09, due primarily to a sharp drop to 59 percent in FY2008. Weak institutional capacity is a common cause of poor performance—and this is exacerbated when a project has components in several subsectors. IDA countries disproportionately account for unsatisfactory projects. An IEG evaluation found a sharp rise in the percentage of relevant energy and mining projects with gender integration from less than 20 percent in FY2003 to more than 70 percent in FY2008. ESMAP’s 2008–13 business plan includes a technical assistance program for gender and energy development strategies. About 70 percent of the Country Assistance Strategies and Country Partnership Strategies issued in FY2006–09 discussed the link between poverty and the inadequate supply of energy, half addressed energy issues and energy policy, and 40 percent set energy policy targets (World Bank 2009a, Annex 8).

36 Eight energy projects have been investigated by the Inspection Panel since FY2001. The cases cover a range of IBRD/IDA financing and guarantee instruments. Reviews found that the World Bank during supervision had not taken adequate steps to ensure compliance with certain safeguard policies—the most frequently cited of which involved environmental assessment, involuntary resettlement, physical cultural resources, and indigenous peoples. Management has consequently aimed to strengthen consultation with communities affected by proposed energy investments; carry out a more comprehensive examination of investment and site alternatives at the project concept stage to better understand the environmental and social costs and benefits of different alternatives; and pay greater attention to supervision of implementation to ensure better compliance with the World Bank’s main environmental and social safeguard policies, particularly in countries with weak institutional capacity (World Bank 2009a, Annex 9).

Objectives and Approach

37 Widely diverging views on the challenges, priorities, and trade-offs in the energy sector, and on the appropriate role, policy stance, and interventions by the WBG were expressed during global consultations. In preparing the strategy, inputs were sought from a wide array of stakeholders beginning in January 2010, based on the concept note discussed by CODE on July 8, 2009. Annex 1 summarizes the key comments received and how the WBG considered them in developing this strategy.

38 The WBG energy sector strategy focuses on the objectives of assisting developing countries in (1) improving access to, and the reliability of, modern energy services; and (2) facilitating the shift to

an environmentally sustainable energy development path. These objectives are within the WBG's overarching mission to reduce poverty and respond to the challenges facing the global energy sector. Modern energy services include electricity, heating services, gaseous fuels, and clean-burning liquid fuels. Because high-performance stoves can bring multiple benefits to those continuing to rely on solid fuels, they are also considered under the first objective. In setting these two objectives, the strategy considers how the WBG can contribute to the transformation of the energy sector for green development in individual countries tailored to their varied circumstances.

39 The pursuit of both access and reliability will guide WBG engagement in the energy sector. With one-quarter of the developing world population with no electricity connection, extending access to electricity remains the highest priority. However, energy poverty needs to be tackled within a broader framework. First, billions of people rarely, or do not at all, use modern energy services; and achieving universal access is likely to take even longer for improved cooking and heating solutions than for electricity. Second, even those who do have access to modern energy services all too frequently face supply shortages, with power outages being most common, but shortages of natural gas, other fuels, and heating services also encountered. Addressing persistent shortages not only enhances household welfare but has significant and positive impacts on economic growth. Eliminating energy outages involves addressing various bottlenecks ranging from inadequate fuel storage, physical supply deficiencies, and universal price subsidies, to unscheduled shut-downs of supply infrastructure. More investment is needed for modernizing, expanding, and maintaining physical infrastructure, with prices below cost-recovery levels being one of the main causes of the financial difficulties to be addressed. Third, among countries with near universal access and adequate energy supplies today, some face the prospect of energy shortages in the future, underscoring the importance of taking action now to secure future supplies. A recent flagship study on the energy sector in ECA forecasts that the countries in the region could face an energy crunch in the next five to six years, calling for government measures to promote energy efficiency improvement aggressively while creating an environment to attract investment in the sector (World Bank 2010e).

40 Environmental sustainability has both local and global dimensions. The WBG's energy sector will reinforce its cooperation with the environment sector to strengthen environmental regulations, monitoring, and enforcement, with a focus on the energy supply chain. To protect the local environment from damage from energy use, such as from vehicular emissions, other sectors will take the lead and the energy sector will provide support—for example, through assistance to tighten fuel specifications (Annex 4). Efforts to reduce the growth of energy-related GHG emissions for global environmental sustainability will take economic and equity dimensions into account. Countries with the requisite capacity—in particular developed countries—can lead the way by investing in R&D and providing stronger incentives to encourage deployment of renewable energy or advanced energy efficiency technologies in their markets. Both steps would help lower the costs of these technologies, which in turn will greatly aid the uptake of renewable energy in developing countries, which cannot be expected to carry the burden of R&D or large-scale deployment of expensive new technologies on scarce development finance. However, a significant expansion of available climate finance could make a major contribution to such efforts in developing countries. To that end, the WBG will help its clients identify and obtain additional international financing to cover cost differences, nonfinancial risks, and institutional and technical capacity requirements. The need for such financing has been clearly demonstrated, as existing instruments either cater to large economies (such as the CTF) or are available only in limited amounts (as with the SREP). The parties in Cancún collectively affirmed their commitment to provide much more financing for energy sources and technologies with low life-cycle GHG emissions.

41 The WBG will consider the GHG emissions impacts of individual projects. While rules of thumb—renewable energy being generally low in emissions and the carbon intensity of natural gas

being the lowest among the three fossil fuels—are useful, emerging science points to the danger of categorizing all forms of renewable energy or all types of natural gas as having low GHG emissions relative to alternatives.⁴ The WBG will not automatically assume that these rules of thumb are valid but will estimate the life-cycle emissions in each individual case and compare them to alternatives.

42 Choice of fuel and technology intensity, particularly in the power sector, will depend on several factors. Where lower-emissions energy solutions are more expensive than the lowest-cost option, concessionary financing may be needed to provide the subsidy that makes them affordable to poor consumers. Where electricity is supplied primarily to a low-income area with serious power shortages, affordability is likely to remain the top priority. Other considerations include the ability to offer sharply targeted subsidies and the financial viability of selecting a higher-cost option with a lower emissions-intensity.

43 An essential aspect of the WBG's engagement is strengthening the social sustainability of energy policy reform and investment operations. Where policy reforms are pursued, poverty and social impact analysis accompanies the World Bank's engagement. Mitigating measures for adverse effects, particularly on the poor and vulnerable, can be incorporated either at the sector level or in the context of broader social protection programs. For energy investments, adequate social analysis and assessment is undertaken to design mitigation of social impacts and risks, focusing on access to and disclosure of information, proper consultations with and participation of various stakeholders, and strengthening the capacity of a range of actors to effectively participate in debate and discussion on policies and investments. The World Bank's social development strategy aims to empower people and make societies more inclusive, cohesive, accountable, and resilient. Whenever possible, energy investments should promote equity through community involvement, voice, and inclusion. Energy investments should be seen as providing opportunities to have far-reaching positive social impacts, especially on disadvantaged populations.

44 The WBG will work toward (1) sound operational and financial performance of the energy sector and (2) a robust governance framework. By so doing, it will create the enabling conditions to achieve the strategy's two objectives.

45 Efficient, financially sound sectoral performance is a prerequisite for affordable and reliable energy. The ability to recover costs—by addressing underpricing forced by price control; more efficient payment collection; and reducing and eliminating over time theft across supply and use, short selling, fuel adulteration, and mislabeling—can lead to financial health and restore the viability of affected suppliers. Improving management of power and natural gas utilities will often result in more efficient operation, including reduction of losses. Operational efficiency will in turn restore utilities' ability to finance new investments and make a positive contribution to the economy under all circumstances, particularly in countries with serious energy shortages. Improving the finances of a utility by reducing commercial losses and increasing potential energy supplies by reducing technical losses are effective complements to seeking new investment.

⁴ The effects arising from indirect land-use change caused by use of biomass energy can be important. Although hydropower is generally climate-friendly, it has been known for some time that GHG emissions from reservoirs, particularly in the tropics, can be significant (see Annex 2). Lifecycle GHG emissions of natural gas depend on the composition of the gas (such as its CO₂ content) upon extraction, its mode of transport (liquefaction for shipping and regasification are energy-intensive and increase GHG emissions), whether the gas is conventional or unconventional (some forms of unconventional gas may result in much higher lifecycle GHG emissions), and, where gas is used for power generation, the efficiency of the power plant.

46 **Strengthening governance by addressing transparency, accountability, and public participation helps ensure the energy sector's efficient functioning and its contribution to equitable economic development.** A system of checks and balances would need to be set up for financial and other forms of accountability. The WBG has been actively engaged in strengthening governance in extractive industries (paragraph 34), an approach considered essential to ensure that revenues from oil and gas production contribute to poverty reduction and equitable growth. Governance matters at every level. Governments are accountable for legislative governance and some aspects of financial governance, such as cost-reflective tariffs and rationalization of subsidies. Politicians and civil servants must not find it easy to use energy enterprises, particularly those that are state owned, for political ends or personal gain. Transparency in decision making (such as awarding contracts) and participation by a range of stakeholders in some decision making and regulatory processes through inclusive consultation can help improve governance in these areas and reduce inappropriate political interference. State-owned enterprises may need to take steps to move to commercially oriented corporate governance. All enterprises should consider whether they are meeting—and, if not, how to meet—the financial, corporate, and operating governance standards appropriate for their market, including their procurement and commercial practices. Strong market governance is needed to attract and retain investors and operators; this includes creating an environment where investors face reasonable commercial risks without fear of expropriation, corruption, breach of contract, sudden and/or frequent changes in the regulatory framework adversely affecting investors, or nonpayment by many consumers. Conducting more and better information campaigns and creating opportunities for feedback from consumers are means of being transparent and inclusive. Consultations involving likely beneficiaries as well as service providers for rural electrification or a new stove program would help ensure more effective design of these programs and identify vulnerable groups in need of targeting.

47 **The strategy reflects all five of the WBG's post-crisis strategic priorities.**

- (1) **Target the poor and vulnerable.** The poor and vulnerable are disproportionately represented among those without access to reliable modern energy services, and lack of access contributes to trapping them in poverty.
- (2) **Create opportunities for growth.** Post-crisis directions underline the importance of helping countries build infrastructure for sustained growth and cite the World Bank Infrastructure Recovery and Assets Platform and IFC's Infrastructure Crisis Facility as two examples of the WBG's efforts in this area. Availability of reliable modern energy services in a market with appropriate governance will contribute to expanding opportunities for private sector growth.
- (3) **Promote global collective action.** The second objective addresses one of the most complex global interactions—climate change.
- (4) **Strengthen governance.** Governance is the second area of focus in this strategy for creating an enabling environment to achieve the two objectives.
- (5) **Manage risks and prepare for crises.** This strategy contains elements that will help countries cope better with future energy price shocks on the world market and supply disruptions.

Areas of Engagement

48 **The strategy's aim is to support the global transformation of the energy sector through lending and knowledge sharing, using the comparative advantages of the WBG.** The WBG's direct contribution to the financial investments required will be small; its total financing in the coming years will be only a very small fraction of a required annual investment in developing countries possibly far in excess of \$400 billion. Nonetheless, the WBG financing can make a direct measurable difference in low-income countries and anywhere else it seeks to maximize its catalytic impact (for example, through demonstration effects). Over the long run, the WBG can make a substantial contribution to the

transformation of the access and mitigation agendas. Its greatest strength might lie in policy, technical, and strategic advice, as well as knowledge generation and sharing—often linked to lending—as suggested by feedback received during the global consultations (Annex 1). The WBG can intensify efforts to help client countries create an enabling environment, provide suitable policy direction, develop long-term energy sector development plans, and contribute to implementing certain aspects of such plans.

49 To achieve its two objectives—increasing modern energy access and reliability and facilitating the shift to environmentally sustainable energy sector development—this strategy considers two broad categories of countries:

1. **Countries or areas within countries with low rates of access to reliable modern energy services**
2. **Countries or areas within countries with high rates of access**

This clustering approach is not intended to signal rigid categorization. Energy resource endowments, the size of the economy, progress in achieving satisfactory performance and strengthening governance of the energy sector, and a country's socioeconomic profile will also shape the WBG's operations. Small countries, landlocked countries, and island economies have unique needs. And there can be significant regional differences within large economies. This categorization should be seen in this context.

Countries or areas within countries with low rates of access to reliable modern energy services

50 **The WBG will give priority to securing access to reliable energy in the countries with low access.** Countries falling under the first category tend to be concentrated in AFR and SAR, but areas within countries with low access exist even in regions with relatively high overall access rates. Equally important, the categorization is based on access to *reliable* energy, and countries with poor access in this sense are much more numerous than those with low nominal access rates. Of the 107 developing countries that reported fully on power outages in the Enterprise Surveys, 4 out of 10 experienced at least 20 hours of outages a month and 6 out of 10 at least 10 hours, suggesting that reliable power is not widely available. Reliability also takes into account such considerations as how long it takes to get electricity connections. On a broader scale, securing reliable future energy supplies is also very important. For countries that have high nominal rates of access but where supplies are unreliable, the focus will be on increasing reliability.

51 **Obtaining reliable energy at the lowest price is critical for the poor.** Making prices charged to end-users as low as financially viable and sustainable, and exploiting energy efficiency to supply more energy and minimize total consumption for the same level of benefits delivered, are both crucial. Universal subsidies are all too often fiscally unsustainable and regressive, and reforms are needed to ensure that targeted subsidies can be designed and implemented in a cost-effective and sustainable way. The WBG recognizes that prioritizing electrification investments among competing regions and projects depends on how the country wishes to balance economic efficiency and equity. Countries engaged in the last stage of electrification often give priority to the poorest regions. Conversely, in the early stages, governments are inclined to value the cost-effectiveness of the investment and prioritize access in urban and peri-urban areas. For the many households that are likely to continue to rely on traditional solid fuels for cooking and heating, the WBG will explore external partnerships to promote dissemination of high-performance stoves and sustainable production of woodfuels, while integrating community-driven development and other community-based operations where feasible. The WBG will help countries select energy sources with low emissions intensity; this assistance will include building capacity to identify and obtain concessionary international financing when low-emissions energy is more costly than the alternatives.

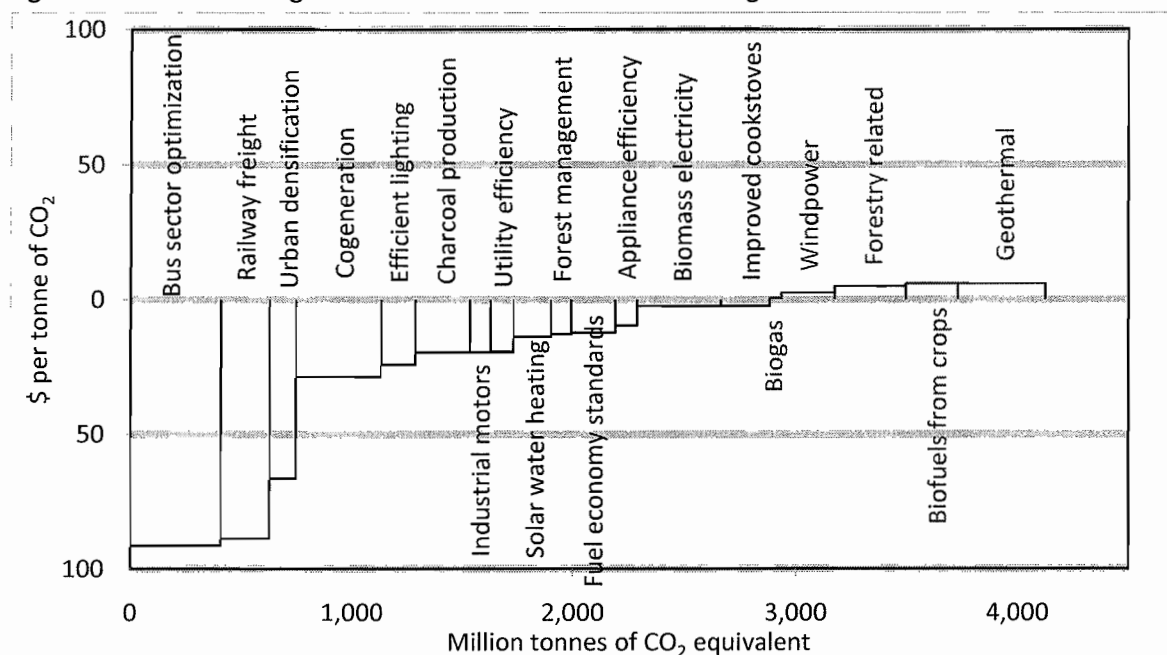
52 The WBG will work with governments to establish plans and strategies for extending access to electricity and improved cooking and heating solutions, and for enhancing the reliability of supplies. It will help develop national plans where they do not yet exist, and contribute to their implementation. A recent review of national policies found that 68 governments, including 35 in AFR, have targets for increasing access to electricity. These plans may need to be strengthened to include reliability as a performance indicator. Only 17 governments (13 in AFR) have set targets for modern fuels for household use, and 11 (7 in AFR) for “improved stoves” (UNDP and WHO 2009), signaling that much more work is needed in policy formulation. In partnership with other organizations, the WBG will help raise awareness among policy makers, work with others to give more visibility to this agenda, and help develop national plans.

53 The WBG will help decision makers adopt approaches and models tailored to their specific realities. As discussed in paragraphs 11 and 27, there is no universally applicable institutional or business model, and appropriate solutions are highly context-specific. The WBG will examine both supply-side and demand-side interventions and consider a variety of approaches depending on the local circumstances. Supply-side options include both grid and off-grid electricity supply systems with varying degrees of decentralization; regional energy trade (World Bank 2010f); public, private, and public-private investments as well as cooperatives; reducing losses in electricity (World Bank 2009b), district heating networks, and utilizing natural gas, especially if previously flared; pro-poor financing methods and sharply targeted subsidies; and multi- or single-purpose community-based forestry projects, sustainable and efficient charcoal production coupled with reform of charcoal production and trade, and improving supply reliability to make fuel switching more attractive. Demand-side options include high-efficiency equipment and appliances such as efficient lighting and fuel-efficient stoves. Joint supply- and demand-side interventions can yield mutually reinforcing benefits and contribute to strengthening the economic and environmental sustainability of access expansion and supply reliability improvement.

Countries with high rates of access to reliable modern energy services

54 The WBG will increase the emphasis on low-emissions energy sources for countries with high rates of access. The WBG will work with all countries to adopt low-emissions sources whenever they are financially viable, and will particularly target assistance in this area in countries with high levels of access to reliable energy. Diversifying into renewable energy and maximizing energy efficiency can reduce vulnerability to future energy shortages and price volatility as well as strengthen environmental sustainability. Ranking different options across the economy by cost-effectiveness, such as for GHG emissions (see Figure 5 for an example), is a useful way of comparing interventions across sectors and helping governments focus on low-cost, high-return interventions. Technology cooperation and transfer, innovation, and deployment of commercial-scale renewable energy will be important elements, along with support for market reforms that promote clean energy generation and energy efficiency improvement, including smart grids. Innovation here implies technical advances as well as new financing and business models. Where there is potential for exporting electricity from renewable energy to developed countries (such as exports of concentrating solar power from the Middle East and North Africa [MNA] to Europe, a program supported under the Arab World Initiative), the WBG will participate where there will be a substantial positive impact on local economic development, for example through financing the development of domestic renewable energy using the export earnings or benefits in terms of employment in manufacturing equipment.

Figure 5: Illustrative Marginal Abatement Cost Curve for Reducing GHG Emissions



Source: Adapted from *Low Carbon Development for Mexico* (Johnson and others 2010)

55 **Creating an enabling environment to foster private sector participation and investment is one of the most important transformational steps governments can take.** The World Bank has used partial risk guarantees and partial credit guarantees to stimulate private investment. The WBG's *infoDev* is developing support for a network of incubators under its Innovation and Entrepreneurship program (see Annex 1 for an example) and helping design Climate Innovation Centers (CICs) to provide financing and services to enable the private sector to profitably develop clean energy technology solutions in developing countries. A substantial scale-up of emerging lower-emissions energy sources can be effectively achieved by establishing efficient, commercially viable markets in which the private sector can significantly contribute. IFC can provide added value in several ways—direct financing, advisory services, and support for or partnerships with financial institutions such as commercial banks that often reach investors who are otherwise difficult to involve directly—and MIGA can facilitate foreign investment. With donor support, IFC's *InfraVentures* is helping develop new private sector projects by becoming involved in early-stage project design. Based on the potential of IBRD enclave loans and guarantees to provide flexibility and act as a catalyst for facilitating public-private solutions to financing investments, the WBG will continue to look for opportunities for such operations in IDA countries.

All countries

56 **The WBG will give priority to those activities that contribute to achieving both strategy objectives of increased access and reliability of modern energy services and sustainable development.** Increasing demand- and supply-side efficiency and conserving energy almost universally fall under the category of activities contributing to both of the strategy objectives. The WBG will examine the potential for promoting locally appropriate technology and institutional and market set-ups for access and energy efficiency. Steps that help reduce non-essential use of energy and facilitate a shift to more efficient appliances and equipment include eliminating universal price subsidies, installing meters for more accurate billing, and efficient payment collection. Other examples of achieving both objectives include providing electricity from biomass, micro-hydropower, solar power, or wind power to households,

shops, and community centers in remote areas; switching from solid fuels to biogas; promoting regional power trade of hydro- or geothermal power; looking for opportunities for combined heat and power; expanding a market for locally manufactured high-performance stoves; and substituting natural gas for coal. Transformative financial innovations include stimulating wholesaling investments in energy efficiency improvement and renewable energy through the banking sector (through credit lines and energy service companies).

57 The WBG will scale up its efforts to increase energy efficiency given its tremendous potential for improvement. Many energy efficiency measures have robust and high financial rates of return and lower the cost of energy use. By reducing overall energy consumption and making the total energy bill smaller, energy efficiency improvement can help extend access to the poor and enable them shift to modern energy, including renewable. Increasing efficiency entails not only technical solutions but also appropriate pricing policies (World Bank 2010g) and significant incentives for utilities to promote substantial demand-side management; innovative financing schemes; efficiency standards that are monitored and enforced; and widespread dissemination of information so that consumers, investors, and financiers can make informed decisions. Two examples of this last are the Green Leaf logo under the Efficient Lighting Initiative supported by IFC, which provides assurance to consumers that the lighting product's performance is certified by accredited laboratories; and the five-part quality-assurance strategy under Lighting Africa, a joint IFC–World Bank program that supports the development of affordable, clean, and efficient modern lighting solutions in AFR.

58 The WBG recognizes that increasing the efficiency of the existing energy infrastructure through rehabilitation, modernization, and adaptive management can be a cost-effective means of delivering more energy while reducing fuel consumption and GHG emissions. Examples include reducing transmission and distribution losses in power lines, insulation to minimize heat losses, eliminating leaks from pipelines, replacing existing boilers and motors with more efficient ones, and rehabilitating existing hydropower stations. In the case of increasing the efficiency of existing thermal generation plants (such as waste-heat recovery in a coal-fired power plant), the net impact on GHG emissions depends on whether the life of the infrastructure is extended as a result of rehabilitation beyond what it would have been otherwise, and whether there is a financially viable option of replacing the system with lower-carbon fuels and technologies should life extension not take place. The WBG will conduct such analysis in assessing rehabilitation options, as is already required for coal power projects.

59 The WBG will consider all forms of renewable energy, depending on the country's resource endowment, institutional and technical capacity, policy environment, availability of financing for cost differences, and trade-offs. Under some circumstances, geothermal power or off-grid small-scale renewable energy may be the least-cost option for extending access and ensuring environmental sustainability. Wind, solar, biogas, and biomass-based energy sources are expected to gain in importance. The WBG will engage in multipurpose hydropower projects of all types—reservoir, run-of-the-river, and off-grid—incorporating integrated resource management (Annex 2). The energy sector will work closely with the agriculture and environment sectors to consider whether, when, and how to provide assistance to countries for liquid biofuels; this will include assessment of social and environmental aspects such as land use change and competition for land and water. Financing is important, but it is not the WBG's only role. The World Bank will continue to help governments develop and implement such policies and regulatory incentives as feed-in tariffs or renewable portfolio standards, and strengthen the capacity of the institutions in charge. Analysis using a portfolio approach—taking both *delivery costs* and *price risks* into account—for long-term energy planning, assessment of institutional needs, identification of gaps in policy making, and rationalization of support for different subsectors in energy can all contribute to expanding the share of renewable energy.

60 The World Bank will provide assistance to countries to reform subsidies in the energy sector. This assistance will be provided so as to minimize market distortions and disincentives for energy conservation and ensure a level playing field for renewable energy. Such reformed subsidies should be fiscally sustainable, protect the poor, and be efficient in achieving other social objectives (World Bank 2010g). Eliminating universal price subsidies could free up funds for the national treasury, energy suppliers, or both; and improve the creditworthiness of utilities, enabling them to raise critically needed financing. The World Bank can help analyze the channels through which energy subsidies affect the economy, examine the incidence of consumer subsidies, assess policies to ameliorate the adverse consequences of subsidy removal for the vulnerable, and develop subsidy reform strategies.

61 Competitive markets and private sector investment and financing are crucial to achieving global objectives for access and addressing climate change. The experience of the last two decades has shown the suitability of a variety of approaches to using markets and engaging with private investors, depending on country circumstances. Establishing competitive markets and mobilizing private investment will be essential even where energy supplies continue to be dominated by public sector entities. Competitive market-based processes can help ensure the supply of energy at lowest cost, sometimes through stimulating new approaches and through more efficient allocation of capital among different opportunities to develop conventional energy as well as new technologies. Competitive markets can make best use of limited government and other funds intended to broaden access or bring down the cost of low-emissions alternatives. Some forms of market-based mechanisms are likely to be a feature of international sources of carbon finance. Private investors can bring capital and expertise, and private sector sources of financing can increase and lower the cost of funding available.

62 Governments need to create mechanisms and regulatory frameworks to promote competitive markets and facilitate private sector investment, risk taking, and financing. In view of the very long-term nature and high capital requirements of energy project development, the private sector needs an in-place, transparent, and predictable regulatory framework (ideally with a clear separation of the policy, regulatory, and commercial roles of government bodies) that provides assurances to investors of a level playing field and equitable treatment over a long-term planning horizon. Policies should be designed in a way that continually puts pressure on the firms both to improve their operational efficiency and pass efficiency gains on to consumers. The WBG has a strong continuing role to help governments design and implement tailored approaches, including the development of regulatory frameworks and capacity building; provide financing selectively for private energy projects; and, increasingly, help mobilize funds from various sources of financing, private and others.

63 Promotion of new clean energy technologies will steadily increase in importance in the WBG portfolio. The WBG will be a partner in innovation. Future WBG activities will either directly finance projects for specific technologies or facilitate new technology development through policy support, capacity building, and knowledge generation and sharing. An important aspect of these activities is South-South knowledge and technology cooperation and transfer. Activities can be financed through donor funds, climate-finance instruments, or the WBG's own funds. The WBG will adapt its approach to new technology promotion for varying levels of funding.

64 The WBG will scale up climate finance and explore options for new financing models and instruments. It will help strengthen the capacity of developing countries to benefit from carbon markets. Combined use of (possibly expanded) existing instruments and new instruments such as the Green Climate Fund potentially offers unprecedented opportunities to developing countries to accelerate the transition to a low-emissions economy. The WBG will help countries shift away from a project-by-project approach to programs of investments, design and provide incentives for development of low-emissions technology, and systematically integrate climate finance into public and private

investment decisions. In addition to climate finance, the WBG will explore other financing models and instruments for low-emissions energy systems.

65 The WBG will assist governments in assessing climate vulnerabilities and adaptation options in an increasing number of countries. Climate change can cause a variety of other changes, calling for resilience and adaptation: a higher or lower amount of hydropower generated, floods and droughts, higher demand for irrigation (and hence greater consumption of electricity or diesel fuel), greater demand for managing water flows to meet environmental needs, lower thermal power generation efficiency, higher energy demand in summer and lower demand in winter, and greater solar power potential. ESMAP has recently launched a hands-on energy adaptation toolkit which it is using in several ECA countries. IFC initiated a climate risk program in 2008 and recently published two reports, one related to business and the other to financial institutions (IFC 2010a and 2010b). The WBG will help raise awareness of climate change impacts and engage in a dialogue with clients on adaptation in the energy sector.

66 The WBG will finance greenfield coal power generation projects in IDA countries only, and in accordance with the WBG operational guidance on screening coal projects. The WBG fully recognizes that coal will continue to be used across developed and developing countries in the coming decades. However, given its limited resources, the WBG will restrict its financing in power generation to IDA countries for the purpose of increasing access and improving the reliability of energy services. No new coal-based power generation project will be financed in IDA-blend or IBRD countries.⁵ The WBG would, however, consider assistance for emerging technologies, such as coal-combustion plants with carbon capture and storage, in all countries. The World Bank is supporting institutional capacity building through the Carbon Capture and Sequestration Capacity Building Trust Fund, launched in December 2009 (Annex 1).

67 The WBG will support natural gas as a fossil fuel with the lowest carbon intensity. This support will be provided where its lower emissions potential can be reasonably demonstrated (see paragraph 41). Switching from coal to natural gas can offer great mitigation potential; for this reason, some 450 ppm scenarios call for an increasing share of natural gas in the energy mix (World Bank 2010b). Where available at a competitive price, natural gas is also a good complement to such intermittent renewable energy as wind and solar power. But natural gas tends to be underutilized in quite a few countries because there are many barriers to its commercialization. The World Bank can help on the policy and regulatory front; finance projects, especially those using previously flared gas; and provide guarantees. IFC and MIGA can promote private as well as foreign investments across the supply chain (Annex 2).

68 The WBG will be selective in financing upstream oil projects. Engagement in upstream oil will be viewed through the lens of its likely direct and indirect contribution to poverty reduction. LPG can help households switch from a solid to a cleaner-burning fuel, kerosene remains an essential lighting fuel for households without electricity, and gasoline and diesel are important automotive fuels. Where oil is exported, considerable revenue may accrue to the government, enabling expenditures on such vital public services as health, education, water and sanitation, and roads. A growing area of engagement is improving governance in licensing, revenue collection, and revenue management for upstream oil and gas. The WBG has pioneered the requirement for transparency of payments to government that has been followed by other international financial institutions and is now commonly viewed as best practice, and IFC is proposing to raise the bar for private investment through the

⁵ There is a handful of IDA-blend and IBRD countries, mostly very small economies, where less than half the population has access to electricity. For these countries, the WBG will assist in accelerating access expansion through policy formulation and generation technologies other than that based on coal.

introduction of new requirements for contract transparency. IFC's ability to set standards and push the transparency agenda is contingent on its ability to engage broadly with the private sector. Constraining its engagement to a limited universe of players might therefore undermine this role, an outcome to be avoided. The World Bank's engagement in EITI—implemented in more than 30 developing countries—has been increasingly broadened to include advice for proper design of the legal, fiscal, and contractual framework. The joint work with PREM on work across the value chain, including revenue management, will be strengthened with a focus on poverty reduction.

69 When requested, the WBG will help client governments assess civilian nuclear power in the context of the overall country energy sector analytical work programs, but will not finance nuclear power generation. Some client countries are considering nuclear power as an option in their energy balance and are seeking WBG support to analyze this option as part of their overall energy strategy. Because the issues are complex—with economic, financial, environmental, social, safety, and non-proliferation ramifications—the WBG will, instead of building internal capacity in this area, refer clients to leading institutions and academic centers of excellence that have this capacity in response to client requests for technical assistance.

70 Throughout the supply chain, the WBG will continue to help countries improve the sector's financial and operational performance and strengthen governance. The WBG will engage through policy dialogue and lending, capacity building, knowledge sharing, and global partnerships (such as EITI). The power sector in AFR illustrates an area in serious need of financial and operational performance improvement. The estimated hidden cost of inefficiency in that sector due to mispricing, unaccounted losses, and collection inefficiency is 1.9 percent of GDP (Foster and Briceño-Garmendia 2010). One consequence is a perverse situation in which predominantly well-off customers receive benefits they do not need—through subsidized rates, unbilled consumption, or both—leaving few or no resources to expand access. Worldwide, untargeted energy price subsidies merit policy attention because, all too often, they strand energy companies, the treasury, or both with large budgetary shortfalls. Governments should provide an enabling environment for investors and take steps to promote healthy and fair competition and protect consumers. The same essential elements for strengthening energy sector performance and governance are needed to put developing economies on an environmentally sustainable and climate-resilient path and make effective use of new technologies as well as climate-financing mechanisms, both existing and new.

71 Institutional development will be an important aspect of the WBG's engagement. Weak institutional capacity has been the primary contributor to the slow development of the energy sector in many developing countries and is the most common cause of unsatisfactory outcomes of World Bank-financed energy projects (see paragraph 35). Therefore, helping client countries strengthen the institutional framework within which sector entities function—the laws, regulations, and organizational capacity of partner entities—will remain an important focus of WBG engagement. Recent examples include the World Bank's engagement with hydropower developers working on key river basins, helping to bring their practices to international standards while simultaneously working with the government agencies responsible for planning and regulation.

72 The WBG will work with countries to empower women in the energy sector. The WBG will consider how to bring benefits to women as users of energy as well as how to enable women to become providers of energy services or make productive use of energy for income generation (Annex 5). As the primary custodians of household fuels in most cultures, women disproportionately bear the time and health burden of traditional use of solid fuels. As a result, childcare suffers, affecting children's development and education—the latter of which is further harmed by recruitment of children to collect biomass.

73 The WBG will look for opportunities to encourage local community involvement as part of sustainable solutions. A review of rural electrification efforts suggests that local community participation brings many benefits. Involving local communities from the start can help improve design (Peru, Vietnam), gain local support (Bangladesh), mobilize contributions in cash or in kind (Nepal, Thailand), and increase local ownership, contributing to operational sustainability. Early community involvement can also help identify those particularly in need of assistance and ensure that community voice and participation is embedded in the design. Many successful programs have made combined use of top-down and bottom-up initiatives (World Bank 2010a). Developing local capacity to operate and maintain installations and equipment can substantially ensure continuing use. Stories abound of solar panels and wind turbines in need of repair waiting for engineers from Europe or North America to arrive, and “improved stoves” that break down or no longer function as designed after just a few months. Public awareness-raising—especially about the merits of (more expensive) new appliances or fuels—as well as appropriate design can result, for example, in stove-users operating stoves with fuel-inlet doors closed and using chimneys, thereby taking full advantage of the newly installed stoves. Local community involvement and ownership can also help make production of woodfuels, and especially of charcoal, sustainable.

74 The WBG’s energy sector staff will work closely with other sector colleagues to help make energy use in their sectors more efficient. The energy sector staff can help identify and address cross-sectoral benefits and trade-offs and ensure coordination and consistency (Annex 4). Low-carbon strategy studies, financed by ESMA, are examples of cross-sectoral analyses examining options for reducing energy- and emissions-intensity across the economy. One important and rapidly growing consumer of energy is transport. Addressing the environmental costs of fossil fuel use in transport is a central tenet in “Safe, Clean, and Affordable... Transport for Development—The World Bank Group’s Transport Business Strategy for 2008–2012,” and the energy and transport sectors will seek opportunities to work jointly. Similarly, the energy sector will contribute to implementation of the WBG’s new urban and local government strategy, “System of Cities: Harnessing Urbanization for Growth and Poverty Alleviation,” which deals with energy use in cities, particularly with respect to urban planning, housing, and transport, and promotion of energy-efficient cities (such as through the Energy Efficient Cities Initiative). Agriculture uses electricity and diesel for irrigation and powering machinery, and the energy sector can contribute to improving the reliability of electricity supply as well as making energy sources cleaner—for example by switching away from diesel pumps. In addition, as discussed in the WBG’s “Agriculture Action Plan 2010–2012,” agriculture and forestry are suppliers of woodfuels and other forms of biomass-based energy, calling for collaboration with the energy sector.

75 The WBG’s six regions have set strategic directions based on the objectives and approach defined in this strategy. All have action plans to scale up energy efficiency improvement, expand renewable energy where economic, and strengthen supply reliability. Given their differing circumstances, each region has its own areas of focus. AFR is focusing on increasing access and providing adequate power for economic development, particularly through financing investments, and supporting sustainable use of biomass. SAR is focused on improving access and supply reliability through institutional development and financing investments. EAP and LCR, with a good share of middle-income countries, are focusing as much on the second objective of the strategy as on the first; as is MNA, which also specifically targets legal and regulatory reforms and power sector restructuring. ECA has an added concern about a possible energy crunch in the coming years, and hence a special emphasis on energy efficiency improvement as well as regional cooperation and other means of ensuring future energy supplies. Annex 6 describes regional approaches in more detail.

Results Framework

76 **The results framework is primarily anchored to achievement of (1) increasing modern energy access and reliability and (2) facilitating the shift to environmentally sustainable energy sector development.** Two considerations stand out in developing any results framework: attribution and ease of data collection. For example, it is relatively easy to measure access if a project is connecting individual households to grid or off-grid electricity or installing biogas digesters. But if a project addresses cross-border energy trade, heat or power generation, transmission (of electricity or natural gas) with no distribution component, or establishment of a regulatory framework for cleaner-burning fuels including redirection of previously ill-targeted subsidies, it is much more difficult to estimate the number of people who would gain access as a result. Yet the second category of projects is as important as the first in achieving one or both of the strategy's two objectives. And if data collection is very time consuming and labor intensive (and hence costly), the data are unlikely to be compiled systematically. Indicators in the results framework are formulated based on these considerations. The strategy considers three goals for the first objective and two for the second (Table 1). The large scale of many energy projects, varying levels of demand for different types of projects, and large uncertainties about external circumstances mean that WBG projects, programs, and outcomes in any one year are difficult to control. Projections for specific fiscal years in the last column for the first and fourth goals need to be interpreted in this light. The strategy also sets two targets to enhance operational effectiveness (Table 2).

Table 1: Results Framework for the Energy Sector Strategy

Objective	# Goal	Country-level indicators	Project-level indicators	Projected WBG contribution
Increase access to, and reliability of, modern energy services	1 Increase access to electricity	Number of people who lack access to electricity	Number of people newly gaining access to renewable electricity by household connection, disaggregated into grid and off-grid ^a Number of people newly gaining access to electricity by household connection, disaggregated into grid and off-grid ^a Megawatts (MW) of renewable generation ^a MW of new conventional generation (by fuel type) ^a Kilometers (km) of transmission and distribution lines built or rehabilitated ^a	New commitments in FY2012–15 will connect 25–30 million people by project completion and the new commitments in FY2012–20 will connect 65–80 million, with a review of these projections in FY2015.
	2 Increase reliability of electricity supplies	Number of hours of outages per year Percentage of enterprise value lost due to power shortage Share of power from back-up generators Number of days to obtain a new connection for electricity	Average interruption frequency per year in the project area ^a Technical and non-technical losses in percentage ^a MW of total new generation capacity installed ^a Km of transmission and distribution lines built or rehabilitated ^a	WBG contribution to reducing average interruption frequency per year in the project areas will be estimated based on data collected in projects adopting this indicator and on expected client demand.

Objective	# Goal	Country-level indicators	Project-level indicators	Projected WBG contribution
	3 Increase access to improved cooking and heating solutions	Percentage of households using solid fuels	Number of households benefitting from project components targeting household energy other than electricity in terms of amount of fuel consumed, cleanliness of combustion, or both	WBG contribution will be estimated during strategy implementation based on expected client demand
Facilitate shift to environmentally sustainable energy sector development	4 Curb the growth of energy-related GHG emissions	CO ₂ emissions intensity (tonnes of CO ₂ per unit of GDP) Energy intensity (megajoules of energy per unit of GDP) CO ₂ emissions per capita	GHG emissions (gross and difference between with- and without-project cases) for all investment projects in the energy sector, to be phased in over time Commitment amount of clean energy projects MW of renewable generation ^a Technical and non-technical losses in percentage ^a GHG emissions intensity of IFC portfolio	Increase the share of clean energy projects financed by the WBG from an estimated average of 67 percent in FY2008–10 to a target of 75 percent by FY2015
	5 Reduce exposure to indoor air pollution	Percentage of households using solid fuels	Number of households benefitting from project components that will reduce indoor air pollution	WBG contribution will be estimated during strategy implementation based on expected client demand.

a. Proposed IDA core sector indicator.

Table 2: Operational Effectiveness

	IDA baseline FY2007–09	IDA performance standard FY2012–14	IBRD baseline FY2007–09	IBRD performance standard FY2012–14
Gender Parameter				
Projects with gender analysis, gender-inclusive consultation, or both	24%	100%	21%	100%
IEG Satisfactory/Successful Rating^a	World Bank FY2007–09	World Bank FY2015	IFC FY2007–09	IFC FY2015
Percent of exiting projects rated satisfactory	69%	80%	85%	Minimum 75%

a. IEG approaches and scales are explained in appendix A of the 2010 annual report. World Bank projects are rated moderately satisfactory, satisfactory, and highly satisfactory; and IFC projects mostly successful, successful, and highly successful.

77 Goal 1 aims for 25–30 million people to gain access to electricity due to new commitments made by the WBG in FY2012–15 and 65–80 million in FY2012–20. Project-level indicators for electricity access follow IDA core sector indicators. The number of people in the projections includes both those

who are direct beneficiaries of projects and those who benefit indirectly from upstream projects involving, for example, cross-border power trade, generation, or transmission. The methodology for estimating the number of connections enabled by these upstream projects will be refined. The projected contribution by the WBG's new commitments in FY2012–20 will be reviewed and adjusted as more data as well as the results of analytical work on access become available. These projections are subject to large uncertainties, because the number of people connected will depend not only on the level of funding requested and provided, but also on the number of people connected per dollar of lending: energy source and technology (which affect how much electricity is supplied for a given level of installation capacity and the cost per unit of electricity generated), the breakdown of customers (residential, agriculture, industrial, commercial, and so on), how much goes to new versus existing customers, and average consumption of new consumers.

78 Project-level indicators are set for electricity reliability (goal 2). The strategy adopts the interruption frequency index as the indicator by which to assess the WBG contribution. Because this indicator is only now beginning to be monitored, projections of the WBG contribution will be estimated once more data become available. Even though reliability issues also apply to improved cooking and heating solutions—durability of higher-performance stoves and consistent delivery of LPG cylinders are two such examples—no corresponding indicators are envisaged at this time, as they would be extremely resource intensive to monitor for the foreseeable future.

79 A new methodology will be developed to estimate the WBG contribution for access of households to improved cooking and heating solutions (goal 3). For some projects, such as those involving installation of home solar water heaters, beneficiaries are fairly easy to identify. For many projects, however, counting beneficiaries presents greater challenges. The WBG will examine data collected by projects and carry out analytical work to determine how best to estimate the WBG contribution.

80 A new target will replace the share of low-carbon projects for global sustainability (goal 4). The SFDCC defined and set a target for low-carbon projects of 50 percent by FY2011.⁶ One problem with this classification is that not every project can be neatly categorized as either low or high carbon. Considerable subjective judgment involving inevitably contestable assumptions would be needed to categorize policy-related lending (such as a technical assistance loan for regulatory reform to enable greater competition in the market) and electricity transmission and distribution projects. There has been a call to steadily increase the share of low-carbon projects, potentially squeezing out activities that cannot be classified as low carbon but that are essential for achieving the first of the strategy's two objectives—such as projects aimed at improving the sector's operational or financial performance or enhancing governance—and in many cases the second objective, as with electricity transmission that may facilitate grid integration of renewable energy and expand its use. As a transition measure, this strategy sets a target for increasing the combined share of “clean energy” projects—low-carbon projects as currently defined, electricity transmission and distribution projects, and policy lending—from an estimated 67 percent in FY2008–10 (see paragraph 135 for more detail) to 75 percent by FY2015. Over the medium term, as the WBG tests and refines methodologies to conduct GHG emissions analysis of energy investment projects (see paragraph 85), clean energy projects will be defined as those in which differences in GHG emissions relative to alternatives or without-project scenarios are estimated to be zero or negative. Parallel efforts to develop methodologies for GHG emissions analysis are under way in forestry and transport.

⁶ Low-carbon projects to date have included renewable energy (including hydropower), demand- and supply-side energy efficiency improvement, gas-flaring reduction, waste-fueled energy, and budgetary support and technical assistance to reduce the use of fossil fuels and encourage switching to cleaner fuels.

81 **For local environmental sustainability, the energy sector will focus particularly on indoor air pollution (goal 5).** This focus, which arguably carries higher human costs than any other form of energy-related environmental damage (WHO 2002), is in addition to continuing compliance with WBG's safeguard and environmental policies and guidelines. It in turn calls for expanding work on various aspects of household fuels, as discussed above. As with goal 3, a new methodology will be developed during implementation of the strategy to define a suitable indicator

82 **The strategy sets performance standards for gender inclusion and project outcome ratings.** The strategy focuses on increasing community voice, inclusion, and participation to help ensure social sustainability. As part of this effort, gender analysis, gender-inclusive consultations, or both will be carried out for all projects (Table 2). Project performance assessment relies on IEG outcome ratings and aims to increase the percentage of exiting World Bank projects rated as satisfactory from the most recent three-year average of 69 percent to 80 percent in five years (Table 2); the Bank-wide standards for FY2011 are 70 percent for fragile states, 75 percent for IDA, and 80 percent for IBRD. For IFC, the IEG rated 85 percent of its energy sector projects as successful; these were typically committed five years earlier. More recent IFC energy sector projects (those approved in FY2006–08 and not yet closed) have been preliminarily assessed by IFC's Development Outcome Tracking System two to three years after approval; 78 percent of these projects were judged to have successful development outcomes. Going forward, IFC proposes to ensure that at least 75 percent of its energy sector projects are rated as successful by the IEG. No performance standards are set for MIGA, because it has too few projects in the energy sector for such standards to be meaningful.

Strategy Implementation

83 **The WBG has set an ambitious projection for its contribution to power generation capacity in AFR, and has made institutional development and strengthening of the sector's accountability framework a priority in SAR.** Fulfillment of these objectives will accelerate progress toward universal access and help provide electricity for economic growth in the WBG's two poorest regions with lowest rates of access. In AFR, the World Bank will work to contribute to the construction of 8 to 12 GW of additional generation capacity, in addition to 8 GW being constructed as part of the on-going portfolio. IFC and MIGA will add to these activities. In SAR, energy distribution services and development of regional and domestic energy markets are two of the three core lines of business for the World Bank, while IFC will address inefficiencies in the energy infrastructure. In addition, the World Bank will engage with key institutions over the long term in an effort to improve technical, commercial, safeguard, and fiduciary practices (Annex 6).

84 **All regions are scaling up efforts in energy efficiency improvement and renewable energy use.** These efforts rank among the top three priorities in EAP and ECA; they account for three of four top priority areas in MNA, and three of seven strategic areas in LCR. AFR will, in addition to focusing on efficiency improvement, scale up engagement in hydropower and sustainable consumption of biomass energy. In SAR, clean energy development is one of the three pillars of IFC's strategy; it is also one of three core lines business for the World Bank.

85 **The WBG will undertake GHG emissions analysis in energy investment projects as a business requirement to help countries identify lower-emissions alternatives and seek additional financing.** The practice of undertaking GHG emissions analysis will be extended beyond coal projects to other

investment projects.⁷ Such analysis will help develop and transfer knowledge on carbon footprinting to client countries, help achieve targets for reducing energy or emissions intensity in those countries that have set such targets, identify opportunities for energy diversification, and access low-carbon financing. The analysis will be conducted on the basis of the difference between with- and without-project cases and will draw upon information and estimates obtained using existing models and tools in economic and technical analyses (such as least-cost power generation models). Methodology development will continue (see paragraph 86) and staff training will be provided. The WBG will look to partner with donors to design methodologies, roll out learning programs, and help client countries carry out the analyses. The intention of this proposal is not to verify emissions reductions ex post, as in carbon finance projects, but to estimate emissions ex ante using a practical and feasible approach. The WBG will keep abreast of methodology developments outside the institution and modify its approach as needed. Gross emissions, emission differences between with- and without-project cases and between the project and other potential alternatives, and switching shadow prices per unit of CO₂ equivalent will be computed as appropriate.⁸ GHG analysis will be phased in over time as follows (see Table 3 at the end of this section):

- GHG analysis for all power generation projects will become a business requirement first and implemented in the second half of FY2012.
- GHG analysis will be phased in over two years for upstream oil, gas, and coal projects, transmission and distribution, energy efficiency improvement, and household fuels, as methodologies are developed and piloted and as experience is gained, and will be implemented for these projects in FY2014.

Methodologies also may be eventually developed for financial intermediation, technical assistance, and policy development lending.

86 The WBG will develop methodologies and tools to implement the strategy effectively, thereby contributing to knowledge generation and research. New indicators will be developed, and further methodology development and harmonization across the WBG—to the extent possible given different institutional roles—may be needed for existing indicators. For example, the methodology discussed in paragraph 77 for estimating the number of power connections indirectly enabled by upstream projects needs to be sharpened. Attention will also be devoted to the proper estimation of transaction costs and costs associated with performance risks, particularly for energy efficiency and renewable energy. Improving the accuracy of these estimates would enable generation of more refined cost-abatement curves, leading in turn to a better planning tool. These activities could eventually produce a suite of evaluation tools to assess projects and improve project selection and design.

87 The energy sector will seek to increase the average size of its projects to reinforce WBG operational efficiency. Like the rest of the WBG generally, the energy sector faces a flat budget constraint. There is a move to decrease the total number of projects and increase their average size. This trend may seem somewhat at odds with the goal of scaling up activities in areas where many potential projects—such as solar, wind, pico- and micro-hydropower, sustainable woodfuel production, and energy efficiency—tend to be small and yet require comparable resources to those for much larger projects. The high ratio of preparation and supervision costs to total project size is a considerable

⁷ There is a growing trend among multilateral financial institutions to require GHG emissions tracking. An April 2010 survey of 13 multilateral institutions found that 11 had a mandate to track GHG emissions for at least some projects, although methodologies and coverage varied widely (World Bank 2010h).

⁸ IFC, given the nature of its work and client base, is also using a tool for all real-sector investments that is more focused on gross emissions (Carbon Emissions Estimator Tool), consistent with the reporting required under the Performance Standards and with voluntary carbon disclosure reporting registries commonly used by the private sector.

disincentive to World Bank country management units to undertake such projects when the overall budget is held constant in real terms. Similarly, more IFC investment officers will be needed to deliver the same level of investment where projects are small and numerous, again increasing costs. An inadequate budget to prepare and supervise is one of the most prevalent disincentives for small projects. To an extent, these small projects can be (and have been) “cross-subsidized” by larger projects—such as policy development loans and credits, baseload power generation, transmission, distribution, and large-scale renewable energy, all of which are also needed for the strategy’s two objectives. The WBG will assess how best to balance large and small projects. Where feasible, small projects will be aggregated or subsumed in larger projects.

88 The WBG will increase interventions that are performance- or results-based. One component of the World Bank’s Investment Lending Reform is the development of a new results-based lending instrument. The WBG has some experience with projects where energy suppliers are paid based on pre-agreed delivery targets. For example, energy is the second largest sector in the subsidy scheme portfolio under the Global Partnership for Output-Based Aid (GPOBA) (Annex 2). The World Bank is using the experience gained from the GPOBA program to help client countries develop institutional arrangements for providing results-based support for clean energy production.

89 The World Bank’s Sustainable Energy Department will work closely with the IFC Climate Business Group to keep abreast of advances in new clean energy technologies, exchange information about policy and market developments, and identify opportunities for the WBG to scale up renewable energy and energy efficiency.⁹ These departments will also work with *infoDev*, particularly with respect to its CICs currently being piloted in India and Kenya, with other countries planned; business incubators; and its work with local SMEs both as energy producers and energy consumers. The WBG will aim to generate innovative knowledge, emphasizing the integration of information technology and energy technology. As appropriate, it will follow a venture capital model to help pilot and promote promising technologies for demonstration and potential replication. In general, however, disbursement of venture capital is not well suited for addressing the WBG’s underlying long-term access and equity goals.

90 The World Bank will form a team to strengthen its engagement in household energy. Aside from a few dedicated initiatives, WBG financing has not been aimed at household energy activities, nor are there likely to be many requests for traditional WBG financing to support such activities. Rather, most such activities likely form part of community-driven development projects whose scale is set based on beneficiaries’ priorities and which are funded to the extent possible by external grant financing. The World Bank’s household energy team will consist of staff from energy and other relevant sectors, and will draw on a larger pool of staff for brainstorming, feedback, and implementation of suggested household energy programs. Implementing initiatives with a large number of beneficiaries (such as programs distributing high-performance stoves; these and similar projects are best supported by civil society organizations and community-based actions, often with bilateral grants) is also not necessarily among the WBG’s comparative advantages. Thus, the WBG will establish partnerships with organizations that have been working effectively in this area. As an example of such a partnership, ESMAP in September 2010 joined the recently launched UN Global Alliance for Clean Cook Stoves.

91 The WBG will selectively support projects for the extraction of oil and gas:

- The WBG will target projects that will strengthen local access and supply reliability, or contribute to government and community resources and economic growth. These projects will

⁹ The World Bank established a new energy department in 2010. Its staff includes a newly appointed Chief Technical Specialist for Renewable Energy and Energy Efficiency, who will lead collaborative efforts with IFC’s Climate Business Group.

be selected in countries where the WBG has a strong role and from among those that meet WBG extractive industry project requirements involving, for example, revenue and contract transparency and governance.

- The WBG will give priority to investments in natural gas and in low-income countries.
- Oil investments in middle-income countries will be selective, and will focus on countries whose energy sector strategies take climate mitigation into account, seek to optimize energy sources, and pursue energy efficiency and conservation; and where investments in low-emissions projects are now being made or efforts are under way to identify and prepare such investments.

92 **A guidance note on gender in energy sector operations will be developed to foster performance standards.** The renewed focus on household energy in particular requires sensitivity to gender issues. The energy sector will work with PREM Gender and SDV to gain a better understanding of gender and energy poverty and prepare an operational guidance note to assist energy staff in incorporating gender-relevant components in their work.

93 **The WBG will train current staff and recruit future staff with a focus on strengthening expertise in increasing access to modern energy services, energy efficiency, and renewable energy.** Expanding this line of business in the coming decade will require staff who possess not only technical skills but also strong analytical skills that lend themselves to policy advice and knowledge sharing.

94 **The World Bank will continually update and improve the newly launched database of all energy lending projects to strengthen its transparency.** The database enables easy analysis of portfolio data by region, project type, and year.

95 A timetable for completing specific steps outlined above in implementing the energy sector strategy is provided in Table 3.

Table 3: Timetable for Household Energy, GHG Emissions Analysis, and Gender

Action	FY12 1H	FY12 2H	FY13 1H	FY13 2H	FY14 1H	FY14 2H	FY15	FY16
Form a household energy team		X						
Define mode of operation and program for the household energy team			X					
Establish external partnerships for household energy	X	X	X	X				
Conduct GHG analysis in all power generation projects		X	X	X	X	X	X	X
Conduct GHG analysis in all power projects including transmission and distribution				X	X	X	X	X
Develop and pilot GHG analysis methodologies for upstream oil and gas	X	X	X	X				
Conduct GHG analysis in all oil and gas projects					X	X	X	X
Develop and pilot GHG analysis methodologies for energy efficiency improvement projects		X	X	X				
Conduct GHG analysis in all energy efficiency improvement projects					X	X	X	X
Develop and pilot GHG analysis methodologies		X	X	X	X			

Action	FY12 1H	FY12 2H	FY13 1H	FY13 2H	FY14 1H	FY14 2H	FY15	FY16
for non-electricity household energy								
Conduct GHG analysis in all household-energy related projects						X	X	X
Prepare and consult on a draft operational guidance note on gender	X	X						
Issue a gender operational guidance note			X					
Review progress on gender performance standards and set new standards						X		

Note: 1H and 2H are the first and second half of the fiscal year.

96 **External factors, as well as internal financing constraints, pose risks to the implementation of this strategy.** Large swings in world oil and other essential commodity prices, another financial crisis, international climate negotiations that fail to establish a relatively high and stable carbon price, and less-than-expected concessionary financing for mitigation and adaptation are among the external factors that would reduce incentives to pursue a low-emissions path in the WBG client countries. Within the WBG itself, not raising adequate funds to support, for example, household energy activities would slow progress in areas targeted by the strategy. There are ways to mitigate these risks. First, the WBG will seek to obtain the financing and the leveraging of other resources needed to engage deeply in these areas. Second, as it has done in the past, the WBG will continue to promote low-emissions options even in the absence of strong external factors favoring such options. For example, the World Bank pioneered the Prototype Carbon Fund when the international financing framework for carbon finance was uncertain. This WBG championing will, however, take into account the fact that country commitment to lower-emissions options that are more costly or have low rates of return will—as with energy efficiency projects in times of low energy prices—be adversely affected if external factors drive down the financial incentives. Third, the WBG will continually examine and adjust its priorities to ensure that the core of the strategy can be implemented.

Next Steps

97 **A draft strategy incorporating comments received from CODE will be posted on the energy sector strategy Web site in Arabic, Chinese, English, French, Russian, and Spanish from the end of April to the beginning of June for global online consultation.** In addition, videoconference consultation meetings will be conducted in each of the six regions as well as in Europe, and a face-to-face meeting will be held in Washington, D.C. The comments received will be summarized, and a revised strategy incorporating both CODE and external comments will be submitted for the Board's consideration in July 2011

Annex 1: Consultation Process

98 The WBG held global consultations from January to September 2010 on an approach paper, based on the concept note discussed by CODE on July 8, 2009 and incorporating the comments received during the discussion. Entitled “Approach Paper,” the paper and annexes were posted on the WBG energy sector strategy Web site in October 2009 in English and soon thereafter in Arabic, Chinese, French, Russian, and Spanish. Some 2,100 participants—representing stakeholders from government, civil society, the private sector, and academia, among others—commented in 58 face-to-face meetings in 38 countries around the world, while another 170 submitted written comments. The feedback received through consultation meetings and written submissions are summarized below, together with the WBG’s response illustrating how the wide range of views expressed by the participants were considered in the writing of the strategy.

99 Participants in the face-to-face meetings, most of which were moderated by an independent facilitator, viewed a PowerPoint presentation based on the Approach Paper and were then asked to respond to the following six questions:

1. Where do you think the help of the World Bank Group in the energy sector in developing countries is most needed?
2. Does the proposed approach adequately address the needs of the poor and marginalized? If not, how could it be strengthened?
3. Does the proposed approach strike the right balance between meeting the needs and priorities of low-income countries and those of middle-income countries?
4. Where there are trade-offs between meeting the local energy needs of individual countries and reducing global greenhouse gas emissions, what principles should the World Bank Group follow in resolving the trade-offs?
5. What should be the role of the World Bank Group in promoting new technology and/or helping to transfer existing technologies to new markets, and how much weight should the Bank Group give to each?
6. What other suggestions or comments do you have?

The above questions were used to organize the discussion and draw out a general debate. For the purpose of summarizing the comments, a large majority of them can be summarized under four themes:

- Priorities and areas of engagement for the WBG
- Balancing energy sector development with climate change mitigation
- Defining the strategy—how to achieve the objectives
- Other comments

100 The leading sentences in bold do not necessarily represent majority views of consultation participants, but rather represent important strands of opinions that were expressed. Written comments from institutions for which the WBG received permission to make public can be found at <http://go.worldbank.org/I2P34IR3E0>.

Priorities and areas of engagement for the World Bank Group

Comment	Response
The proposed two objectives are appropriate but need some qualifications	
“Energy” in the first objective should include both electricity and fuels.	Agree.
Include “affordable” in addition to reliable in the first objective. The affordability criterion will help ensure that “clean” but expensive solutions are not imposed on developing countries, and especially in extending access to the poor.	Affordability is stressed, but not mentioned specifically in the first objective because increasing affordability means different things to different people, including how much to subsidize energy prices and the extent to which the financially cheapest options in the short term should be selected. The strategy, however, stresses that financially more costly solutions targeting global goals should not be imposed on the poor.
Environmental sustainability should continue to include local and regional environmental concerns, and should not be solely or even primarily about GHG emissions.	Agree.
Access of public service providers (clinics, schools, street lighting) to electricity is also important.	Agree, and provision of electricity to community centers is an IDA indicator for this reason.
Add a third objective in the form of combating vulnerability and improving resilience to price volatility, supply disruptions, resource depletion, and climate change.	These are all important but largely subsumed in the two objectives. An energy system that has not taken steps to minimize the adverse effects of price volatility, supply disruptions, climate change, and so on will find it difficult to assure access and reliability most of the time over the long run.
Continue to engage in policy analysis and advice, assistance for technical and regulatory issues, and capacity building.	
These areas arguably represent the WBG’s greatest comparative advantage. These are needed in every sphere of the energy sector: energy efficiency improvement, renewable energy development, infrastructure operation and maintenance, increasing access, making the sector financially sustainable, energy pricing, enabling productive uses of modern energy, increasing governance, and awareness-raising. Local capacity building is particularly important to ensure that projects continue after cooperation with international partners ends.	The WBG will continue to give priority to these tools to support the objectives of the strategy, together with lending. Indeed, sharing of global knowledge and policy experience customized to country conditions—helping policymakers manage trade-offs and advising them on how—is an integral part of the World Bank Institute’s renewal strategy.
Assist governments in long-term planning. Energy planning has disappeared from many low- and middle-income countries.	The World Bank will seek opportunities to highlight the importance of long-term energy planning and offer assistance as an important tool for achieving the strategy objectives.
Tackle access to modern household fuels more.	
The approach paper focuses too much on the power sector at the expense of other forms of energy. Billions of people continue to rely on traditional	Agree that the approach paper did not emphasize non-electric forms of household energy sufficiently. The WBG will form a core team of specialists working in this area, strengthen

Comment	Response
<p>solid fuels with serious health and environmental consequences. Access to clean cooking and heating solutions is important for empowering women. Reducing time spent on firewood collection enables engagement in productive activities, and can also increase school attendance by children. Promote biogas as a clean, renewable household energy.</p> <p>Promote sustainable production of woodfuels (firewood and charcoal) and improved biomass cookstoves. Help those households that have no choice but to continue to use solid fuels by ensuring that biomass is sustainably harvested and by contributing to the development and dissemination of improved biomass cookstoves.</p> <p>Promote fuel switching to LPG. Do not adopt the black-and-white position that fossil fuels are bad and renewable energy is good. Even if 2 billion households were suddenly to switch from biomass to LPG today, the net increase in GHG emissions globally would be small but health and gender benefits would be considerable.</p>	<p>upstream analytical work, form partnerships with other organizations working in this area, and develop lending project components upon client request where they are viable and sustainable.</p>
<p>Include interlinkages to other sectors that are large consumers of energy or suppliers of energy sources, with a view to greening their development.</p> <p>Fuel consumption in transport in particular accounts for almost a fifth of total world primary energy supply.</p> <p>Given that hundreds of millions of households in developing countries will continue to rely on biomass for the foreseeable future, sustainable production and harvesting of wood for household use and charcoal production, and energy-efficient production of charcoal, are both critical. The energy sector and forestry sector need to work closely together.</p> <p>As urbanization proceeds at a rapid pace, it is important to ensure that emerging cities are energy-efficient and making maximal use of low-carbon technologies and energy sources.</p> <p>Provision of safe water requires energy for pumping. Without coordination between energy and water sectors, progress in increasing access to safe water and in making efficient use of energy could both be compromised.</p> <p>Agriculture not only uses energy for powering equipment such as tractors and irrigation pumps but provides feedstock for biofuel production. The latter needs to be examined carefully, recognizing that the first priority in development is food security—strengthening energy security should not come at the expense of food security.</p>	<p>The interlinkages are important, and all the issues raised during the consultations are being tackled in the respective sectors. The transport sector, for example, is preparing a climate change flagship report, which includes the role of modal shifts and technical measures for increasing fuel economy. The transport sector is pursuing both supply-side measures, including implementation of technical changes, and demand-side measures to decrease energy inputs and balance supply and demand. The strategies of other sectors are not included in the energy sector strategy. The WBG's energy sector will work closely with other sectors where areas of work and interest overlap (see Annex 4 for other sectors generally and Annex 2 for woodfuels). In 2008, ESMAP launched the Energy Efficient Cities Initiative to help cities meet their energy challenges in partnership with other organizations, and the World Bank's urban sector is actively engaged in the initiative. For biofuels, see World Bank (2010i).</p>
<p>Promote productive uses of energy as well as development of local energy markets to reduce poverty and ensure the financial sustainability of the</p>	<p>LLC www.eenews.net</p>

Comment	Response
<p>sector.</p> <p>Asking the poor to spend a higher proportion of their income on energy consumption without increasing their cash-earning ability is unlikely to be sustainable in many circumstances. One way of increasing affordability is to integrate the poor in energy solutions, such as by making them producers of energy. Another is to promote productive uses of energy for income generation.</p> <p>Promote local businesses through provision of reliable modern energy, help increase productivity (for example, through switching from mechanical to motorized grinding), enhance access to appropriate forms of enterprise and consumer financing as well as technology, and develop local energy markets—to supply and maintain energy infrastructure—and foster associated entrepreneurship.</p>	<p>Agree that not having enough cash is the greatest obstacle to regular use of modern energy. The energy sector will seek to identify income-generation opportunities. As an example of job creation through local SMEs, the WBG's <i>infoDev</i> supports technology entrepreneurs and small business incubation, including providing enhanced business opportunities for thousands of SMEs. KML Grid Solutions—a start-up company founded in 2009 in South Africa focusing on providing energy-saving devices to municipalities and city councils—is an example of local entrepreneurs being supported by <i>infoDev</i>'s incubator network and has benefited from the Softart Business and Technology Incubator in Pretoria. <i>infoDev</i> plans to expand on these efforts with design and launch of CICs, which will help enable the domestic private sector to profitably participate in development, transfer and deployment of clean energy technologies that address local needs.</p> <p>IFC has been financing local entrepreneurs, such as Solar Power Company, a solar farm developer in Thailand. The World Bank's project in Mali, Household Energy and Universal Rural Access, provides two types of supports to local entrepreneurs: (1) upstream capacity development support through the rural energy agency for finalizing the business plans of rural energy service companies, and (2) co-financing an average of 75 percent of the initial start-up capital costs of all selected business plans, with the remainder being provided by local entrepreneurs.</p> <p>At the same time, the energy sector alone cannot raise income of all people. Many other parts of the WBG (health, education, water, agriculture, forestry, trade, labor) are working on poverty reduction, and the contribution (as well as limitations) of the energy sector should be understood in that context.</p>
<p>Be more selective.</p> <p>The approach paper envisages the WBG as doing just about everything. In so doing, the paper avoids making strategic choices. Accept a tightly defined and limited role focused on the WBG's core mission.</p>	<p>While the approach paper mentioned many areas of engagement, they are not meant to be engaged across all countries at all times. Rather, these diverse areas are mentioned in response to the fact that no one-approach fits all, each country has different needs, and meeting the specific needs of individual countries requires addressing a wide range of problems with correspondingly context-appropriate solutions.</p>
<p>In addition to staying out of nuclear power, reallocate resources away from activities that may have short-term benefits but potentially adverse long-term consequences. The WBG should be a lender of last resort. Fossil fuel projects are more financially viable than many low-carbon projects. As such, there is no compelling case for the WBG's involvement in fossil fuel projects. Where the WBG's involvement is really needed is financing energy sources and technologies that are not yet commercially competitive with traditional energy sources, or where the business case is</p>	<p>For climate-change related issues, see the next section. In extending access to the rural poor, even for isolated communities, fossil fuels may play an important role—diesel for backup generation to supplement solar and wind, for example. Kerosene, LPG, and natural gas as substitutes for biomass energy remain important, including for the urban poor. The WBG will be increasingly selective but will consider all means to extend access, depending on the circumstances.</p>

Comment	Response
weak and project preparation and implementation difficult, such as extending access to the rural poor.	
Broaden the scope of work on governance.	
<p>Include accountability to consumers and beneficiaries. Governance should encompass accountability, transparency, and public participation in decision making.</p> <p>Adopt the approach used in EITI, bringing the government, energy companies, and civil society to the same table in other areas of the energy sector. Ensure that both women and men participate in these processes.</p>	The strategy supports the introduction and improvement of information campaigns and creation of opportunities for feedback from the general public, particularly consumers. A period during which all parties can comment on proposed changes (tighter environmental standards, new tariffs in areas where there is price regulation, large infrastructure development) is one way of being transparent and inclusive and achieving the support of those who will be affected by the changes.
Engage in social issues more.	
More attention should be paid to the human rights of affected people, including indigenous people. The strategy should explicitly refer to human rights.	The strategy does not explicitly refer to human rights because, just as with “energy security” (which is not explicitly mentioned in the strategy), the term has different connotations for different people. Instead, the strategy refers to the WBG’s safeguard policies and guidelines, which address various aspects of human rights, including the World Bank’s indigenous peoples’ policy and involuntary resettlement policy and IFC’s Policy and Performance Standards for Social and Environmental Sustainability. An overview of the World Bank’s stance on human rights can be found at http://go.worldbank.org/72L95K8TN0 .
Project design should pay more attention to gender differences: there are differences in the needs for and use of energy, the ability to obtain credit, and the ability to pay. Women are also under-represented in decision-making processes and in the energy supply chain.	The strategy sets performance standards for gender and proposes scaling up programs on household energy, which affect women much more than men.
Local community participation and ownership both enhance the sustainability of energy programs and help reduce chances of vandalism.	Where a project has a local focus, the WBG will continue to strengthen work toward enhancing local consultation and community ownership.
Promote use of domestic energy sources.	
Reducing reliance on imported fuels is important, especially given high price volatility in recent years. Domestic energy sources create local jobs, and revenues accrue to the local community or the country.	Agree where doing so is economic. Promoting domestic energy sources at any cost for energy independence, such as through subsidized import substitution, is not necessarily optimal. There is considerable evidence from past experience with government-supported import substitution that infant industries subsidized to kick-start them frequently do not “grow up,” requiring permanent protection and with long-term costs arguably outweighing benefits.
Solar, wind, biogas, geothermal, and hydropower, particularly in rural areas, merit special attention. Biomass for power generation is another example.	Agree.
Using domestically-grown feedstocks or biomass residues to produce biofuels enables substitution of imported fuels while spurring rural development. Africa in particular can benefit by promoting production and	Where pursuing biofuels makes sense is country-specific, as described in the background brief on biofuels for the energy sector strategy (World Bank 2010i).

Comment	Response
possibly export of biofuels to Europe.	
Promote South-to-South cooperation.	
Areas of cooperation include knowledge transfer, energy trade, and technology cooperation.	The WBG will encourage countries to seek such cooperation, including facilitation of cross-border energy trade that can yield large mutual gains.
Help increase uptake of new technologies.	
The new technologies being promoted must be appropriate in financial, technical, and social terms, and adapted to the local circumstances as needed. Raise awareness and increase acceptance. All parties need to be better informed to build the momentum needed for a transition to a more sustainable energy sector.	Agree.
Technology <i>cooperation</i> should be the model. The type of technology transfer whereby a foreign firm from a developed country sells technology in a developing country and then leaves is not sustainable. The new technology being adopted should be co-owned, and enough local capacity should be created to operate and maintain the supply infrastructure.	Agree that a foreign firm flying in and out is often unsustainable, and local capacity should be developed so that the equipment installed can be properly operated and maintained without having to wait for an engineer from Europe for every repair. Local job creation is one important benefit of small-scale hydro, wind, and solar power. For this benefit to be realized, there is a need for technical and institutional capacity building in these markets. On the one hand, jobs should ideally be created where they are most needed—where the poor live, often in remote areas—but on the other hand, these are areas where people are least skilled. Lack of local capacity to maintain and repair solar panels, wind turbines, and other means of energy generation has been costly and reduced consumer confidence in some projects. This underscores the need for general capacity building as well as supporting SMEs.
Help create regulatory and policy certainty to spur investment and innovation.	What is important for policy and the regulatory framework is that they be predictable, clearly stated, internationally acceptable, and stable. If there is a good chance of policy reversal, if the regulations are ambiguous, or if it is not clear where policy and the regulatory framework will be two years from now, it would be more difficult for potential investors to take the decision to invest. These considerations will guide the World Bank's policy and regulatory advice.
Local ownership and production of new technologies is indispensable.	Local production has benefits, but not always possible or even desirable. For items requiring large economies of scale, it would not make sense for every small economy to try to manufacture them. Widespread local production would make more sense for small, relatively low-tech items sold in large quantities, such as improved-fuel-use/advanced-combustion cookstoves.
Efforts should be made to avoid a “picking winners” approach.	Agree, although there is always some element of guess work because widespread and sustained deployment, which is what a winning technology will deliver, cannot be guaranteed in advance for any technology.
Help strengthen local capacity for R&D.	R&D is not among the comparative advantages of the WBG. As such, R&D will not be a key area

Comment	Response
	of focus, but where supporting R&D appears appropriate, the WBG will give due consideration, as IFC is already doing very selectively with technologies in late stages of development that show promise for adoption in developing countries.
Recognize and respect intellectual property rights, in law and in practice. New clean technologies are protected by intellectual property rights and require large royalty payments. Consider how to assist developing countries by making these technologies affordable.	The World Bank can provide technical and policy advice on how to set up a patent regime. In contrast with pharmaceuticals and digital products and services, most studies have concluded that the extent to which patents become a barrier is unlikely to be significant for energy technologies, for which manufacturing and operational costs are high relative to R&D costs and significant operational know-how is necessary (World Bank 2011). Where new clean technologies are more expensive than the conventional alternatives, the WBG can assist by looking for concessionary financing.
Consider developing new financial instruments designed specifically for the risk profile of newly commercialized technologies.	As more experience is gained, possible options will be considered.

Balancing energy sector development with climate change mitigation

Comment	Response
The pursuit of synergies should be given high priority.	
There is enormous unexploited potential for increasing energy efficiency. Energy efficiency should be maximized across the supply chain and in consumption. Reducing the amount and costs of energy consumed is beneficial under all circumstances, but especially for the poor who are cash-constrained, and efficiency improvement can increase the affordability of modern energy services. Integrated resources planning should be an integral part of the WBG's work in the sector. Rehabilitation of the existing infrastructure to increase efficiency, where feasible, is an important example of supply-side efficiency improvement.	Agree.
Small-scale, off-grid renewable energy may be the most cost-effective means of extending access in rural areas.	It may indeed be the most cost-effective means in remote areas. Many rural areas, however, are more cost-effectively reached by grid extension, as the successful electrification project in Vietnam illustrates. The background paper on access (World Bank 2010a) discusses this in more detail. Both types of solution will be used, depending on suitability.
Natural gas is an economic bridging fuel, much lower in carbon intensity than coal or oil. Technologies using natural gas are commercially proven, while efficiency gains continue to be made.	Agree that efficient natural-gas-fired power plants can be much less carbon-intensive than coal- or oil-fired power plants on a lifecycle basis. The WBG will look for opportunities where natural gas use can be shown to lower lifecycle GHG emissions.

Comment	Response
<p>Hydropower projects, large and small, can meet the two objectives cost-effectively. Provided that the high upfront costs can be financed, it is an affordable option for ultra-low-carbon base-load power generation.</p>	<p>Provided that proper social and environmental safeguards are adopted, where resources are available and unlikely to be adversely affected significantly by future climate change, hydropower can be a good option. Where pumped storage is feasible, hydropower can also back up wind and solar power. Micro-hydropower can contribute to rural electrification. The WBG will examine all these options.</p>
<p>Nuclear energy can meet the two objectives cost-effectively. It is a commercially proven technology for ultra-low-carbon base-load power generation that can be used in many developing countries.</p>	<p>Agree that nuclear power is likely to play an important role in some or many economies in the coming years. That, however, is a separate issue from whether the WBG should be actively engaged.</p>
<p>For the poor, supplying more energy that is also affordable is the first priority.</p>	
<p>The burden of reducing GHG emissions should not be shifted from developed to developing countries, and especially to the poor. This discussion should not become a sermon from developed countries—which continue to emit at high levels—to the developing world which emits far less but is now told to control emissions. The many in the developing world, for whom subsistence is the issue, should not be made to sustain someone else’s better lifestyle. Renewable energy is generally more expensive, and that is why large subsidies (such as feed-in tariffs)—paid for either by consumers or taxpayers—are needed to support it globally and why even high-income countries have not shifted largely to renewable energy but continue to consume fossil fuels <i>and</i> build new coal-fired power plants. Those who say that developing countries should focus primarily on low-carbon technologies today do not understand poverty, or else they are acting like Marie Antoinette of France, saying of the poor, “Let them eat cake.”</p> <p>One problem is that the WBG does not work in, nor has any influence over, developed countries. Developed countries should be the first to pledge to phase out fossil fuels and demonstrate how costs of renewable energy can be brought down.</p> <p>Acknowledge the over-riding importance of development objectives, poverty reduction, and energy access. For countries with low per-capita carbon emissions and large energy shortages, the first of the two objectives is much more important than the second. Increasing affordability is of paramount importance. If access to electricity and modern household fuels is provided to all currently non-served households with today’s energy mix, the net increase in global GHG</p>	<p>Agree that the ability to pay for the additional costs of low-carbon measures and the level of access to reliable modern energy services are important considerations and will affect the paths followed by different countries. The WBG’s position is that, where low-carbon measures are more expensive, except where the country is willing to pay the premium, the WBG will help obtain concessional financing for the cost difference. Agree that developed countries must take the lead in reducing GHG emissions.</p>

Comment	Response
<p>emissions would still be very small. This also suggests that it would make sense to develop separate strategies for low-access/low-emitting/low-income and high-access/middle-income countries.</p> <p>The WBG must make a distinction between countries and regions with low access and negligibly small contribution to carbon emissions, and those mostly middle-income countries and emerging economies where greater attention to carbon intensity can be justified.</p> <p>The WBG is not, nor should it seek to become, another GEF.</p> <p>Sustainable development is best understood as a balance across environmental, economic, and social considerations.</p>	
<p>Poverty cannot be reduced unless climate change is tackled at the same time.</p>	
<p>As the <i>World Development Report 2010</i> recognizes, global warming threatens to reverse development gains. The problem at hand is not about a choice between growth and climate change. If developing countries follow the development path of developed countries, consequences for global warming will be serious and their growth potential will be dented, especially in Sub-Saharan Africa. The two objectives need to be pursued simultaneously.</p>	<p>Agree that low-income countries are among those who will suffer the most from climate change. The question is who should pay the price where the cost of a low-carbon measure is higher than the alternatives. Also, as the strategy explains, access of the poor to modern energy will hardly affect global GHG emissions. For this reason, this strategy maintains that obtaining reliable energy at the lowest price is critical for the poor, and that the WBG will continue to help countries select energy sources with low emissions intensity by building capacity to identify and obtain concessionary international financing when low-emissions energy is more costly than the alternatives.</p>
<p>The coming decade is the most critical one from the point of view of climate change. Acting with a long-term view is key.</p>	
<p>All actors should act in a way that is consistent with limiting the global temperature increase to 2 degrees Celsius. It is important not to lock developing countries into carbon-intensive energy infrastructure, which will have consequences for decades to come. This will also help these countries minimize risks associated with high and volatile fossil fuel prices in the future.</p>	<p>The key is for <i>all</i> actors to act together in a way that would be broadly considered equitable. Developed countries have contributed the most to the current stock of GHGs, are continuing to emit the most on a per capita basis, and have the greatest ability to pay for mitigation. As such, they should lead the way. Acting otherwise would diminish the credibility of the call on developing countries to act differently.</p>
<p>It is imperative that developing countries not repeat the mistakes of developed countries, which pursued carbon-intensive industrialization with the serious adverse consequences the world is wrestling with today. Assistance should be provided to enable developing countries to leap-frog and embark on a low-carbon growth path.</p>	<p>Moving to a low-carbon path is indeed a global imperative. That said, developing countries cannot be expected to do what developed countries themselves are not prepared to pay for. New coal-fired power plants continue to be built in developed countries, including dozens of low-efficiency sub-critical plants. Under these circumstances, assistance in the form of concessionary financing becomes critical.</p>
<p>For most or all of the poor, small-scale, off-grid renewable energy can most economically extend access to electricity. Low or zero-carbon solutions exist in abundance and are affordable.</p>	<p>For people living in remote, isolated areas, small-scale, off-grid renewable energy can be the most economic option. For solar or wind, it is necessary to have storage in the form of batteries or pumped storage, or else backup generation (diesel generation). Solar or wind backed up by</p>

Comment	Response
<p>The poor live in rural areas where extending the grid or delivering petroleum fuels is prohibitively costly. Solar home systems, solar water heaters, biogas, wind, and pico- and micro-hydropower are less costly and affordable. Off-the-shelf technologies are ready for the market and can meet the needs today.</p>	<p>batteries is not necessarily suitable for productive purposes, but can be adequate for basic household needs—lighting and powering a few small appliances (radio, TV). Solar and wind have no emissions at the point of energy generation, but it would be incorrect to characterize them as zero-carbon solutions, because there are emissions during manufacturing of materials for solar panels, solar water heaters, wind turbines, and so on, and GHG emissions should always be viewed on a lifecycle basis.</p> <p>Off-grid is not always cheaper than grid electricity in rural areas. Some Asian countries have rapidly expanded access using mainly grid electricity. One example is the Lao People’s Democratic Republic, which has increased access from 16 percent in 1995 to 69.5 percent today. About 96 percent of those with access are connected to grid electricity. In Vietnam, the rural access rate increased from 14 percent in 1993 to 94.5 percent in 2008, and this enormous progress in rural electrification was made primarily through grid extension. A study examining the economics of renewable energy in Sub-Saharan Africa found that decentralized renewable energy would be important for expanding rural access, but it would be the lowest-cost option only for a minority of households, even when likely cost reductions over the next 20 years are taken into account (Diechmann and others 2010).</p> <p>With rural-urban migration, the number of poor people who live in urban areas will increase. For this population, grid extension will be far cheaper than isolated off-grid.</p>
<p>Ensuring that projects involving fossil fuels are designed to be highly fuel-efficient is important, as is carbon capture and storage (CCS).</p>	
<p>High-income countries with high per capita emissions and energy consumption should lead in moving away from fossil fuels. For developing countries with low emissions and serious energy shortages, the only requirement should be that each fossil fuel project is more fuel-efficient than the last.</p> <p>The IEA estimates that if older, less-efficient coal-fired power plants are made as efficient as new ones, the average efficiency would rise from 29 percent to 45 percent, and annual global carbon emissions would be reduced by 1.4 gigatonnes, equivalent to about 5 percent of global emissions, or the total reduction targeted by the Kyoto Protocol on Climate Change. Such rehabilitation is clearly an effective approach to climate mitigation.</p> <p>It is widely acknowledged that fossil fuels will continue to play an important role in the coming decades. Developing countries should be encouraged to adopt the cleanest fossil-fuel-based technologies already available, and given assistance to support CCS when commercially feasible, not only financially but with policy, planning, and capacity building.</p>	<p>Agree that these are all important points. Beyond providing policy and technical advice, the question for the WBG is whether the WBG itself should finance these activities. The WBG will finance greenfield coal infrastructure only in IDA-only countries where two thirds of them are estimated to have electricity access rates lower than 50 percent. The WBG will consider financing path-breaking technologies such as CCS. Rehabilitating existing coal power plants aiming at improving energy efficiency can go a long way to improve local and global environmental sustainability. This strategy proposes that such projects be undertaken only after considering their impact on GHG emissions over the extended life of the plant in question, in compliance with the screening criteria for coal projects.</p>

Comment	Response
Including externalities and future price volatility in economic assessment of all projects should help assess the merits and costs of projects more objectively and on a common basis.	
Projected volatility of fossil fuel prices and cost reductions for renewable energy technologies should be included in all project assessments to eliminate a bias against renewable energy based on today's costs.	Analyses of all WBG projects, for which fuel prices are relevant, already include future projections of fuel prices over the economic life of the project, including sensitivity analysis on fuel prices.
Cheap carbon-intensive energy is no longer cheap if externalities are taken into account.	In economic terms, applications of carbon-intensive energy are no cheaper than low-carbon technologies if the price of carbon corresponding to the externalities is sufficiently high. For local externalities, environmental regulations that are sufficiently stringent can largely address the local environmental damage, and the question is how stringently the standards are set and enforced and how to tighten them over time. The question for global externalities is how high the price of carbon needs to be to make carbon-intensive energy financially the same as alternatives, and who will pay the difference. Switching prices of carbon range from negative to low—particularly if transaction costs are excluded—for energy efficiency improvement to high for some cases where low-carbon energy sources displace fossil fuels. Where the switching price of carbon is positive and unpaid for at present, consumers, government subsidies, or both have to make up the difference if the higher-cost option is adopted. High-income countries are most capable of internalizing the externalities and should take the lead in doing so. The WBG will assist countries that are interested in analyzing the comparative economics of different options and work through pros and cons of these options in their own individual circumstances.
Modern portfolio theory should be used to analyze the mix of energy sources for optimization. Taking costs as well as risks into account in this way will show the benefits of renewable energy more clearly.	In system-wide planning, modern portfolio theory should indeed be applied, although assumptions about future price volatility—which are subjective—will have a very large impact on the results. The World Bank will help governments consider the findings of portfolio analysis in their long-term planning.
GHG emissions analysis for every project—gross, net, pro-rate, project-based—can inform portfolio analysis and decision making.	The WBG will phase in GHG emissions analysis over time, as described in paragraph 85.
There is no silver bullet, no easy technological fix for reconciling development and climate change.	
The response to each situation depends on the local circumstances. Each situation should be assessed without precluding any energy sources or technologies in advance, and in consultation with, and with cooperation of, local actors.	Agree that, for any given developing country, all possibilities should be considered in the first instance. It does not follow from this, however, that the WBG itself should be involved in every technology. One technology the WBG has decided to exclude for financing is nuclear power.
Every technology, every energy source has a trade-off: financial vs. economic, short-term vs. long-term, and environmental—solar requires land clearance, or land and water, wind can interfere with	Agree.

Comment	Response
bird migration, and so on.	

Defining the strategy—how to achieve the objectives

Comment	Response
Set specific and ambitious targets for the two objectives.	
Set targets for the numbers of households with access to electricity and to cleaner fuels for cooking and heating.	For access to electricity, see goal 1 in the results framework. For improved cooking and heating solutions, the WBG will develop a methodology for setting an indicator during the implementation of the strategy.
Set increasingly stringent portfolio-based targets for mitigation. Suggestions include (a) 80 percent of the energy portfolio for renewable energy and energy efficiency by 2015, (b) 50 percent renewable energy by 2015 and 70 percent by 2020, (c) increasing lending for renewable energy and energy efficiency by 40 percent each annually, and/or (d) a declining share of lending for fossil fuels.	Goal 4 for climate mitigation is set differently for the reasons discussed in the section on the results framework.
Base targets on outcomes, not inputs.	The strategy sets outcome indicators wherever doing so makes sense and is tractable.
Do much more to make household fuel use cleaner and more convenient.	
Consider improved stoves initiatives. Work on sustainable agro-forestry for production of woodfuels. Promote biogas. Promote substitution of traditional solid fuels with LPG.	The WBG will carry out analytical work, provide policy and technical advice, and finance activities in these areas as suitable opportunities arise. For woodfuels, the WBG will consider when and how to support community-based forest and tree resources management. An example of sustainable production of woodfuels is support for community-based woodland management in the Household Energy and Universal Access project in Mali. Some of these activities will be carried out in other sectors of the WBG. An example is the work on charcoal production and trade in Tanzania, carried out by the environment sector.
Set phase-out target dates for coal and/or fossil fuels, or tighten criteria for fossil fuel projects.	
Suggestions for coal include the following phase-out dates and conditions: Stop lending for coal. Phase out lending for coal in all middle-income countries by 2012 and in all countries by 2015. Lend for coal only under a narrower set of conditions. Tighten the six coal screening criteria (siteresources.worldbank.org/INTENERGY2/Resources/CGN_20100331.pdf)	See the section on natural gas, oil, and coal in the areas of engagement as well as goal 4 in the results framework.

Comment	Response
<p>and/or their application.</p> <p>Offset carbon emissions from coal power plants by investing elsewhere in the power sector. Offset investments in fossil fuels by investing an equal amount in lending volume in renewable energy.</p> <p>Suggestions for fossil fuels include the following:</p> <p>Phase out lending for fossil fuels as soon as possible.</p> <p>Stop lending for fossil fuels by 2012.</p> <p>Stop lending for fossil fuels in all middle-income countries by 2015 and in all countries by 2020.</p> <p>Do not finance fossil fuel projects unless CCS is built in from the beginning.</p>	
<p>Include high-efficiency fossil-fuel-fired power plants and CCS in the WBG's mitigation agenda.</p>	
<p>Consider advanced technologies for high-efficiency coal generation as a means of reducing carbon emissions. Rehabilitating existing plants to enhance efficiency is equally important. Both represent a cost-effective way of decreasing net emissions.</p>	<p>The strategy supports energy efficiency improvement, including increasing efficiency of existing plants. Where coal is the fuel, our engagement will be guided by the coal screening criteria but restricting financing of greenfield coal-fired power plants to IDA-only countries.</p>
<p>Support CCS as a critical element in climate mitigation.</p>	<p>The WBG will provide support for CCS. One example is the Carbon Capture and Sequestration Capacity Building Trust Fund, launched in December 2009 and administered by the World Bank, which seeks to strengthen capacity and disseminate knowledge to help developing countries explore their CCS potential and facilitate inclusion of CCS options into low-carbon growth strategies.</p>
<p>Do not include any fossil fuel projects in the energy efficiency category or large hydropower projects under renewable energy.</p>	
<p>The WBG has been including energy efficiency improvement in existing power plants in low-carbon projects. These should be excluded.</p>	<p>Energy efficiency improvement to reduce fuel use is good for improving reliability and/or reducing energy poverty and reducing CO₂ emissions, and is no different in impact from demand-side energy efficiency improvement. As such, this category of measures can be just as effective and the WBG will consider them after considering the impact of possible life extension on lifecycle emissions.</p>
<p>Reservoirs in large hydropower stations emit significant amounts of greenhouse gases. As such, they should be excluded from low-carbon classification.</p>	<p>Please see Annex 2. The findings of existing studies and ongoing research suggest that GHG emissions from reservoirs are highly site-specific. As such, neither categorical inclusion nor exclusion would be appropriate and instead GHG emissions should be assessed on a case-by-case basis.</p>
<p>Support natural gas, large hydropower projects, and/or civilian nuclear power as a cost-effective way of achieving the two objectives.</p>	

Comment	Response
Clearly state support for natural gas as an important bridging fuel in the transition to a low-carbon economy. Support hydropower.	The WBG's position on natural gas is described in paragraph 67, and the position on hydropower is discussed in paragraph 32 and Annex 2.
Be open to financing nuclear, and certainly developing internal capacity to advise governments. Technology neutrality and climate change considerations require this openness. Nuclear energy is ultra-low carbon, commercially proven for baseload power generation, and can be deployed on a large scale globally. The WBG does not exclude any other commercially proven technology from its consideration, and there is no reason nuclear power should be the one exception.	While civilian nuclear power has attractive elements, on balance, the WBG considers concerns about safety, long-term disposal of nuclear wastes, and potential diversion to non-civilian use sufficiently serious as to require considerable additional resources to handle them adequately. There are competing demands on the limited resources at the WBG, and the need to be selective rules out financing of nuclear power at this time. Similarly, for developing internal capacity, we will not specifically develop it, but where appropriate we will refer client countries to other expert groups to ensure that interested countries receive the best advice on the possible development of nuclear power.
Modify the seemingly sweeping division of developing countries into low- (or IDA) and middle-income (IBRD) countries.	
There are pockets of very poor people in middle-income countries. Low-income countries can also benefit from technology leap-frogging. There are many other factors that influence how best the WBG can be involved in the energy sector of a country.	Agree, and the strategy's main focus is now those countries and areas within countries with low access and those with relatively high access, with a large emphasis on context-specific solutions.
Provide for an institutional structure and reform incentives to strengthen work on greening energy.	
Set up a team, a unit, or a board to promote new technology and renewable energy—a special unit or directorate for renewable energy as suggested in the final report of the Extractive Industries Review, an international advisory group to promote energy efficiency and renewable energy, an energy technology advisory board, or a new department linking energy to climate change.	In October 2010, the World Bank appointed Chief Technical Specialist for Renewable Energy and Energy Efficiency, who will be leading work in this area, while IFC created a Climate Business Group in September.
Create a dedicated fund for renewable energy and energy efficiency.	A large number of funds already exist for this purpose. A new fund will be considered if and when existing funds are seen to be inadequate.
Conduct GHG analysis for all projects. Internalize environmental and social costs of projects in investment decisions.	As paragraph 85 states, the WBG's energy sector will phase in GHG emissions analysis for investment projects in the sector. IFC began monitoring the carbon emissions of its real-sector investment projects in 2009.
Increase the pool of expertise in renewable energy, energy efficiency, and decentralized approaches. Capture this change in staffing and in operations manuals and guidelines. Reward staff for outcomes, not for project size.	Expertise in these areas will be strengthened through staffing and training. Where outcomes are disproportionately large for the project size, the information will be widely disseminated and lessons distilled for replication.

Comment	Response
Create an enabling policy and market environment.	
<p>Help set up a stable and appropriate policy and regulatory framework to attract investment and develop a thriving energy sector.</p> <p>Help private local energy service providers—who are the cornerstone of sustainable rural electrification—through capacity building, enabling policies, and effective financing schemes.</p> <p>Involve not-for-profit, community-based organizations and cooperatives in delivering energy. Support carefully selected local financial institutions to enable loans and credit to local energy access-oriented initiatives.</p> <p>Help develop infrastructure necessary to make projects viable (roads, ports, power). Support the local economy through community development (jobs, training, health).</p> <p>Promote mechanisms to create a global price for carbon.</p>	<p>Agree. The WBG will collectively tackle these areas, in the energy sector and in other sectors (transport, health, education, private sector development, and so on).</p>
<p>Assess and help implement feed-in-tariffs, green bonus systems, and renewable energy targets as part of national renewable resource plans.</p>	<p>Over the past decade, the World Bank has supported many developing countries in designing policy and regulatory frameworks to deploy and scale up renewable energy. Many WBG projects in renewable energy include components aimed at designing and strengthening policy and regulatory mechanisms in combination with activities to enhance institutional capacity. Assistance in the design of legal and regulatory frameworks, including financing mechanisms to attract private sector participation in renewable energy development, will remain an important area of focus for the World Bank.</p>
<p>Provide guarantees or examine the feasibility of establishing a guarantee fund for investments in renewable energy.</p>	<p>The WBG has been providing guarantees for renewable energy (such as MIGA's geothermal project in Kenya) and will continue to look for such and other opportunities to scale up investment in renewable energy.</p>
Fully embrace the recommendations of the World Commission on Dams and the Extractive Industries Review.	
<p>All large hydropower projects should take into account the recommendations of the World Commission on Dams.</p>	<p>Please see Annex 2.</p>
<p>The final report of the Extractive Industries Review in 2003 recommended that the WBG stop lending for coal mining immediately and for oil production in 2008.</p>	<p>For how the WBG will engage in fossil fuels, please see paragraphs 66, 67, 68, and 91.</p>
Give careful consideration to energy subsidy reform.	
<p>Subsidies are all too often regressive. Phasing down or removing fossil fuel subsidies helps conserve energy, promote energy efficiency improvement, and make renewable energy more competitive. Subsidies can also deter the sector from becoming financially viable, constrain supply, and adversely affect the efforts to provide access to the poor. Avoid mobilizing additional financing for renewable energy or energy</p>	<p>Phasing down or removing fossil fuel subsidies indeed helps make renewable energy more competitive and any energy price increase reduces the consumption of the previously subsidized energy. In reducing and eventually eliminating such subsidies, it is important to design compensating measures to assist the vulnerable. The background paper on energy subsidies discusses these aspects in more detail (World</p>

Comment	Response
<p>efficiency improvement where there are distorting subsidies. Assist in phasing out subsidies for fossil fuels.</p> <p>Address the adverse effects of subsidy removal on the poor by establishing adequate social safety nets.</p> <p>Promote subsidies for low-carbon energy sources and technologies.</p> <p>Do not adopt a universal subsidy removal policy for fossil fuels. These subsidies have their own benefits in developing countries. The poor can hardly afford subsidized fossil fuels, financially the cheapest energy source today. If these subsidies are removed, the poor will be pushed back further into energy poverty, because renewable energy is more costly even when compared to unsubsidized fossil fuels. Subsidy removal, recommended by the World Bank, has hurt the poor in the past.</p>	<p>Bank 2010g).</p>
<p>Be extremely selective about or stop lending for large-scale, centralized projects.</p>	
<p>Large-scale centralized power projects, and especially those for energy export or projects supplying energy to export-oriented industries, benefit the poor little. Power from large-scale generation plants is sent mostly to non-residential customers, and, among the residential customers, mostly to middle- and upper-class households. All too often, these projects bypass the poor entirely. Unless direct benefits to the poor can be clearly demonstrated, do not get involved in large-scale projects, including regional power pools.</p>	<p>Large-scale projects, which serve large and small consumers, are important for reducing energy poverty. Large consumers benefit the poor in a number of ways:</p> <ul style="list-style-type: none"> • They enable the power sector to achieve economies of scale, lowering the overall cost of supply to all consumers, including the poor, especially in urban and peri-urban areas. • Those without access are all too often unable to pay for the full cost of supply, including the cost of connection. The main source of funds to enable them to gain access is the revenue earned from other electricity users. If there are many large consumers and/or better-off small consumers, and a small number of poor households that lack access, the former can relatively easily cross-subsidize the latter. If there are few large and/or better-off small consumers, the revenue earned from them is unlikely to be sufficient to cross-subsidize numerous poor consumers. As explained in the background paper on access (World Bank 2010a), this is one reason why extending access in a country with a low overall access rate is particularly difficult. • Manufacturing, service sector, agribusiness, and other large consumers of electricity contribute to economic growth. Many developing countries have shown that economic growth driven by industry and service can reduce poverty. • Transmission projects help integrate renewable energy into the grid, which is necessary for increasing the share of renewable energy. <p>Export-oriented industries can reduce poverty. Trade can create formal sector employment, the garment sector in Lesotho being one example. Export-oriented industries also tend to be major employers of low-skill female labor, and their wages tend to be higher than those in domestically oriented industries. Countries with rapid economic growth—such as China, India, and Malaysia—have actively engaged</p>

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	<p>in international trade. Export-oriented manufacturing in these Asian countries have benefited low-skilled or unskilled workers more than skilled workers (Lee 2005). By tapping into world demand, developing countries can achieve economies of scale that they might not otherwise realize, sustain faster growth of many sectors, and increase wage employment. Countries—such as those in East Asia—that have been successful in world markets over the long haul have also used trade integration to increase skill levels. These benefits reduce energy poverty by increasing the ability of low-income households to pay for modern commercial energy.</p> <p>Where an energy source is shared between two (or more) countries, an energy export project across borders enables countries to take advantage of economies of scale and lower costs for all. Where the energy infrastructure for an export project does not provide energy directly in the exporting country, the question becomes that of revenue management: how the revenue generated will be used for poverty reduction. The World Bank's energy sector is working closely with PREM on revenue management.</p>
<p>Large dams emit GHG emissions and, if anything, contribute to global warming. They harm the local environment and cause social dislocations. Large-scale hydropower also makes a country's energy supply more vulnerable to global warming, potentially threatening energy security.</p> <p>Establish benefit-sharing mechanisms for local communities and the poor in large hydropower projects."</p>	<p>For GHG emissions, please see Annex 2. The findings of available studies and ongoing research suggest that GHG emissions from reservoirs are highly site-specific. As such, neither categorical inclusion nor exclusion would be appropriate and instead GHG emissions should be assessed on a case-by-case basis.</p> <p>Large-scale hydropower would normally be part of a regional power pool with associated interconnection and transmission systems, which would increase, rather than reduce, electricity supply and reliability. The right mix of domestic and regional power balance can indeed increase supply reliability and contribute to securing future energy supplies, and potentially even reduce electricity costs.</p> <p>The WBG is making efforts to strengthen its engagement in benefits-sharing at all levels and will continue to do so.</p>
<p>Include assessment of the vulnerability of the energy sector to climate change.</p>	<p>Work is underway in ESMAP to examine adaptation to climate change in the energy sector (see Ebinger and Vergara 2011 as an example of a recent publication as well as the Hands-on Adaptation Toolkit available at www.esmap.org/esmap/node/312), and this area of work will be expanded in the coming years.</p>
<p>Support large-scale solar projects, but ensure that they are replicable.</p>	<p>Through the CTF, the World Bank is supporting 1 GW worth of solar power.</p>
<p>Work on rehabilitating existing infrastructure.</p>	
<p>Work on rehabilitating and modernizing existing hydropower stations. Lack of work in this area is lowering both power supply reliability and efficiency, and having adverse effects on the environment.</p> <p>If the WBG must work on hydropower, concentrate on rehabilitating the existing</p>	<p><i>Directions in Hydropower</i> published by the WBG in 2009 (http://siteresources.worldbank.org/INTWAT/Resources/Directions_in_Hydropower_FINAL.pdf) specifically refers to rehabilitation of existing energy and water infrastructure portfolios—whether by restoring the original capability by repairing, replacing infrastructure components, or by updating/modernizing—as a viable and</p>

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<p>infrastructure.</p> <p>Existing infrastructure across the supply chain in need of repair is one of the serious problems facing many countries.</p>	<p>cost-effective step to increase access and reliability. Hydropower rehabilitation projects make up a sizable share of the WBG's hydropower portfolio.</p>
<p>Pursue large-scale projects that can lower costs of energy supply or help diversify energy sources.</p>	
<p>In low-income countries, encourage large-scale projects and centralized power generation aimed at lowering the cost per unit of energy.</p> <p>Promote cross-border projects.</p> <p>Promote integration of different energy sources, both in terms of location and type, to enable diversification.</p>	<p>The WBG will take on projects that can lower costs where appropriate, especially where lower costs from economies of scale can benefit poverty reduction or global environmental sustainability. Where diversification is to energy sources with lower emissions, the WBG will pay special attention to such options.</p>
<p>Work on assisting the growth of small- and medium-size enterprises within and outside the energy sector.</p>	
<p>Help develop local capacity and create jobs, especially in rural areas and poor communities.</p> <p>Help local development and production of improved stoves.</p> <p>Help strengthen continuing use of solar systems and improved stoves by providing local maintenance expertise.</p> <p>Develop SMEs using electricity and other forms of modern energy.</p>	<p>While the WBG will pursue SME development where suitable opportunities arise, (small-scale) industry development is generally outside the scope of the energy sector. As described above, <i>infDev</i> is helping the development of SMEs.</p>
<p>Consult widely, and involve those who lack voice.</p>	
<p>Actively support planning and decision-making processes that seek the voices of the poor and the marginalized.</p> <p>Work to enable women to participate more in productive economic activities using energy and in decision-making processes in the sector.</p>	<p>For WBG activities, participation of the poor, the marginalized, and women can be part of the existing stakeholder consultation process described below. For regulatory processes, the WBG can help strengthen the capacity of regulatory agencies to be more inclusive. Efforts to enable women to partake of productive economic activities are being undertaken in different sectors of the WBG and these efforts will be strengthened in the coming years.</p>
<p>Continue the consultation process started in the preparation of the energy strategy and involve civil society in the implementation. The first phase of the global consultations was open and inclusive. This approach to consultation should continue.</p>	<p>Consultation is an integral aspect of the WBG's operations. Consultations are held regularly for formulation of such important documents as Country Assistance Strategies, Country Partnership Strategies, and Poverty Reduction Strategies, and in project preparation and implementation. Operational policies require consultations with project-affected persons (including people who may become displaced and indigenous peoples), host communities, local non-governmental organizations, relevant government authorities, and relevant experts.</p>
<p>Reconsider the WBG's position on not financing pre-commercial-stage technologies, or technologies for which there are only one or two suppliers.</p>	

Comment	Response
<p>Promoting innovative technologies is important in an era that calls for a transformation of the global energy sector, and this may require reconsideration of World Bank procedures and approaches.</p> <p>Pre-commercial-stage clean energy technologies need support, and the WBG may be suitably positioned to provide that support.</p> <p>If something is worth pursuing, particularly in energy efficiency improvement, rules about competitive bidding should not preclude WBG involvement.</p>	<p>IFC has very selectively, and often with the support of donors, supported pre-commercial-stage technologies where these have offered promise for adoption in developing countries. The World Bank will consider under what circumstances supporting pre-commercial-stage technologies would make sense. Whether the World Bank's procurement rules would need to be modified is a broader question that goes beyond the energy sector, and will be considered in a broader context.</p>
Use traditional WBG financing instruments to promote climate change mitigation.	
<p>Donor financing should not count toward the achievement of low-carbon targets. Excluding donor finance will demonstrate where the WBG's core commitments lie.</p>	<p>Most developing countries are not willing to borrow using traditional IDA and IBRD instruments to undertake mitigation measures that are more costly than the alternatives, and many view having to use such resources, especially IDA, as being inequitable. Where a government or a private company is willing to use a traditional WBG financing instrument, the WBG will work with the interested parties.</p>

Other comments

Comment	Response
<p>Teams drafting the energy strategy and the environment strategy should work closely together. The two strategies and the strategic framework for development and climate change should all be consistent.</p>	<p>The two teams have been communicating regularly and there has been an officially designated point of contact in the Environment Department for the energy sector strategy.</p>
<p>Establish independent monitoring of the WBG's portfolio and implementation of the strategy.</p>	<p>For the portfolio breakdown, we believe that the recently initiated practice of posting a database for the commitment amounts by project type and institution on the Web further enhances the transparency of WBG projects. The Independent Evaluation Group will continue to monitor the energy sector's performance and report from time to time.</p>
<p>In large bureaucracies, including the WBG, it is difficult to be flexible beyond the scope of what is written in a strategy. But the WBG needs to be nimble, so that the strategy does not become a barrier.</p>	<p>Agree that the WBG needs to stay nimble.</p>

Annex 2: Household Fuels, Hydropower, and Natural Gas

101 This annex deals with issues related to household fuels, hydropower projects, and the role of the WBG in the production and use of natural gas. These three areas are discussed in some detail because the WBG will be paying particular attention to them in the coming decade: expanding work on household fuels and hydropower, and selectively engaging in natural gas where it can contribute to green development and energy poverty reduction.

Household fuels

102 **The search for improved cooking and heating solutions for households is expected to take considerably longer than attaining universal access to electricity.** Wood is by far the most dominant solid fuel, followed by coal, and by dung and charcoal tied for the third place. Unlike lighting and other purposes for which those without access to electricity purchase kerosene, candles, and batteries—in some cases incurring considerable cash expenditures, which could be redirected to pay for electricity—millions of households pay no cash to acquire fuels for cooking and heating but collect wood, dung, straws, or biomass residues instead. Any shift to a cleaner fuel or an improved stove would entail an additional cash outlay that would compete with other pressing needs for a limited household budget. And while virtually everyone considers electricity to be vastly superior to the alternatives and is willing to pay for it if the family is able, many—especially men, who do not get involved in cooking or heating in many cultures—do not consider cleaner cooking and heating solutions worth the extra cost, resulting in many seemingly well-off households continuing to use solid fuels (Bacon and others 2010).

103 **The WBG has some experience extending access to improved cooking and heating solutions using results-based interventions.** Recent examples are given in Table 4.

Table 4: Results-based Projects for Extending Access to Improved Cooking and Heating Solutions

Project	Project Details
Armenia: Access to Gas and Heat Supply for Poor Urban Households (GPOBA)	This GPOBA project, completed in December 2009, increased access to gas and heating services for 5,847 households (about 23,739 people) in urban multi-apartment buildings. The connections were delivered by a private monopoly and private energy-supply companies.
Armenia: Urban Heating Project (IDA)	This project, also completed in December 2009, delivered clean and affordable heating technologies in urban multi-apartment buildings. Private providers received payments for each poor household (estimated at 5,387) connected to the gas system, heating system, or both.
Colombia: Natural Gas Distribution for Low-Income Families in the Caribbean Coast (GPOBA)	Completed in March 2008, this GPOBA pilot connected an estimated 35,000 families to a natural gas distribution network. Cookstoves were also included as part of the connection. The project covered urban, peri-urban, and rural areas along the Colombian Caribbean Coast.
Nepal: Biogas Support Program (GPOBA)	Under the GPOBA component, private SMEs plan to deliver approximately 37,300 biogas plants for rural Nepalese households. The biogas plants provide access to clean and affordable energy for cooking and lighting. This on-going project builds on a previous multi-donor initiative.

104 **Switching to cleaner-burning fuels will be important in urban areas but biomass will remain dominant in many rural areas in the coming years.** Particularly in upper-middle-income countries, urban households will increasingly switch to natural gas, LPG, or electricity for cooking and heating. In

countries with adequate domestic natural gas resources, once a distribution network is established, natural gas tends to be the fuel of choice, as in urban Pakistan where two-thirds of all households use natural gas. It is possible to target natural gas price subsidies to the poor if metering is accurate and bill collection is efficient. It is much more difficult to target price subsidies for LPG, where leakage can be large (World Bank 2010g). For those who are able and willing to pay for LPG, assurance of consistent and reliable delivery of LPG is an important determinant of regular use. In low-income and some lower-middle-income countries, rural household energy is dominated by solid fuels, typically biomass, and in many countries in AFR, biomass use dominates across all income groups. Because of the continuing importance of biomass, the rest of this section focuses on woodfuels.

105 Globally, land clearance for agriculture is the most significant driver of deforestation.

Woodfuel demands are far less significant, but can have serious negative effects on forests and woodlands (areas with low tree densities, such as savannahs) where large and sometimes lucrative woodfuel markets create incentives for forest and woodland clearance, or where rural communities depend on fragile ecosystems that are already under environmental stress. During the 1960s and 1970s, population-driven demand for woodfuels in developing countries was believed to be on a course to far outstrip existing supplies, threatening widespread deforestation. Evidence emerging in the late 1980s and 1990s, however, did not substantiate these concerns. This earlier understanding led to a commonly held view at the time that tree planting measures could alleviate potential fuelwood shortages by producing new supplies, but woodfuel production schemes seldom generated the benefits envisaged. Instead, other adaptive responses to woodfuel scarcity at the household level—including conservation, fuel substitution, changed cooking habits, different uses of household labor—proved to be more effective as well as economically viable. There is growing evidence that rural landscapes can produce significant quantities of woodfuel without resulting in the loss of trees:

- For household energy, it is not necessary to uproot trees. Lopping off branches may cause forest or woodland cover to degrade, but is not likely to lead to forest loss. There is some evidence that this kind of lopping can even enhance woodland productivity.
- A sizable portion of biomass for household use can come from woody plant resources other than from trees in forests or woodlands—such as scrub and farm trees—and from deadwood and pruning.
- Rural people are keenly aware of the various benefits that forests, woodlands, and trees bring. Many have learned to manage forest and tree resources to produce a wide range of products of value to households.

The above observations notwithstanding, woodlands and trees (as well as a wide range of other natural resources) are sometimes subject to significant stresses in more fragile rural environments, particularly in arid and semi-arid lands. Woodfuel demands can exacerbate these stresses and contribute to the loss of tree cover, particularly where markets for charcoal and fuelwood increasingly source their supplies from remote distances, or where small-scale woodfuel-dependent industries (such as tobacco, brick kilns, and bakeries) and institutions (such as schools and hospitals) consume large quantities of charcoal and firewood (Deweese 1989; Arnold and others 2003).

106 Woodfuel-related issues need to be examined using a much broader framework than one based simply on household energy needs, because the supply of woodfuels is but one of multiple purposes that forests, woodlands, and trees on farms serve. Firewood prices, or the time it takes to collect firewood, alone cannot be used to judge the degree of wood scarcity, because there are important differences between physical and economic scarcities: trees in rural landscapes may not be available for use as woodfuel because they are more valued for other purposes, and even when trees are physically scarce, biomass energy supplies may still be sufficient for meeting local needs. The issues

surrounding labor use and woodfuel scarcity are similarly complex and the use of household labor for woodfuel collection needs to be understood by considering other factors that determine household labor allocation. The emergence of a firewood market is not necessarily a sign of wood scarcity, but may signal a community in transition from subsistence to a market economy and expansion of wage employment. Households burn dung, agricultural residues, and other forms of biomass, not necessarily because wood is scarce, but for a variety of reasons, including cultural and religious ones (Deweese 1989; Bailis and others 2005).

107 Reducing the amount of time and labor spent on fuel collection would greatly enhance the quality of life for tens of millions of adults and children. There are numerous benefits to reducing the amount of time household members spend on fuel collection. All will be freed of long hours of hard labor. Where children collect fuel, they can devote more time to schooling. Where the collectors are parents, they can use the time devoted to fuel collection on looking after their children instead—which could reap long-term benefits. Female collectors face security risks in many circumstances, which may be substantially reduced if they do not have to travel far or frequently to collect fuel. One possibility for reducing the need for fuel collection is to switch to a commercial fuel by using the time previously spent on fuel collection to earn an income, a portion of which can be used to pay for a commercial fuel. The evidence on the trade-off between fuel collection and income-generating activities, however, is mixed. Where people spend tens of hours collecting firewood, all too often wage employment and other forms of income generation are not readily available—that is, the time spent on fuel collection may not be the reason the poor cannot earn cash income, but they spend hours collecting wood because the opportunity cost of their time is very low in the absence of income-earning possibilities. There are also important seasonal dimensions. When agricultural labor is less in demand, more labor is available for other tasks, including woodfuel collection. Very few papers examining this issue have addressed statistical problems related to endogeneity and heterogeneity with rigor, but two recent studies with robust analysis of time allocation yielded mixed results. One investigated, among others, the impact of electrification on male and female employment in rural Kwazulu-Natal in South Africa and found that electrification increased female employment by 13.5 percentage points but had no statistically significant effect on male employment. The impact on female employment was not uniform: the response was in middle-poor and second-richest communities that had relied heavily on wood for cooking (and switched to electricity for cooking once connected). The employment effect was also larger for women in their thirties and forties, who appeared to have fewer child-care responsibilities (Dinkleman 2008). However, a recently published paper reporting the results of a careful analysis of reduced time spent on collecting water (the effects of which should be comparable to reducing time spent on fuel collection) in nine countries in AFR, MNA, and SAR found no evidence that time reduction led to greater off-farm work for women, and that there was little solid empirical evidence elsewhere either to support or refute the argument that freeing up women’s time would lead to more employment opportunities for them (Koolwal and van de Walle 2010). These findings highlight the importance of examining situation-specific evidence to tailor mitigation strategies to different circumstances, although making such interventions financially viable presents an enormous challenge.

108 Causes of seeming firewood scarcity need to be understood before interventions in forestry are made. Single-purpose fuelwood projects may make sense for meeting concentrated urban and industrial demands. The case for single-purpose forestry programs just to supply fuelwood in rural areas—as opposed to multiple-purpose tree planting and management schemes—is much weaker. Available evidence suggests that the supply-and-demand balance is seldom so tilted in favor of demand as to require interventions in forestry on a national scale. Early efforts to enable farm households to grow their own fuelwood were met with little success, because higher-value wood varieties were

cultivated, too expensive for households to burn. Experience suggests that, to ensure sustainability and positive outcome, interventions should be designed to provide as large an aggregate as possible of multiple benefits (Deweese 1989; Arnold and others 2003).

109 If not carefully designed, forestry projects designed to help increase the supplies of woodfuels can even harm the poor. Woodfuel retailing is a major source of income for the poor, including headloaders who are often among the poorest. The ease of entry into this market results in strong competition and low profit margins, making it a livelihood of last resort in many areas. One possible outcome of local collective management programs is that firewood sellers are forced to give up wood harvesting. In India, detailed studies of Joint Forest Management—involving partnerships between state forest departments and local communities—have found that, although most user groups in local communities benefited from the changes arising from the management program, the poorest headloaders were left worse off (Arnold and others 2003).

110 Thinking through how interventions in forestry may affect women is particularly important. The impact of interventions on women is not straightforward. Particularly in the earlier years, projects intended to increase access to woodfuels ended up replacing vegetation—previously used by local households for energy and grazing—with high-value timber. Where a forestry project leads to production of wood outputs that have attractive prices that are too high for the growers to burn at home, people may then have to travel longer distances to find firewood. In many cultures women are tasked with collecting wood, so any intervention that ends up placing wood for household energy farther away increases the time women spend on wood collection. Evaluations of forest management models in India show that women, who tend to depend on headloading as a source of income, are disproportionately disadvantaged by local collective management programs. Wood with commercial value can also lead to conflicts between men favoring income-generation and women requiring continuing supplies of firewood for household energy. While women may be involved in small-scale sale of wood, as the scale of operation and the corresponding income-generation potential increase, the business tends to be taken over by men, depriving women of an important source of income (Arnold and others 2003).

111 Continuing urbanization and possibly widening price differences with cleaner alternative fuels may call for greater attention to the reform of the charcoal sector. All too often, the charcoal sector falls largely outside the formal sector, is unregulated, and relies on unsustainable harvesting of wood without any payments for the feedstock. But vested and powerful interests frequently control the charcoal sector, posing a significant challenge to sector reform. Aside from political-economy difficulties, moving charcoal trade to the formal sector and steadily shifting to sustainable harvesting of woodlands for charcoal production may increase costs of supply. This makes efficiency gains in both supply and consumption critically important. Efficiency improvement measures can also create business opportunities for local entrepreneurs. Fuel switching among the better-off is also an essential element of charcoal policy so as to minimize demand growth (World Bank 2009c).

Hydropower

112 The WBG supports hydropower for sustainable growth. Many developing countries are and will continue to make large investments in energy and water infrastructure at all levels in order to enhance growth, generate wealth, and alleviate poverty. There is strong demand on the WBG to engage in, and provide assistance for, addressing hydraulic infrastructure issues and projects, tailored to specific country and regional circumstances. The WBG's engagement in hydropower is guided by the pressing need to increase access to, and the reliability of, modern energy services; increased attention by the

client countries to the benefits of regional coordination in multipurpose development programs and natural resources management investments; and the imperative to manage climate variability and change through adaptation and mitigation.

113 Sustainable development of hydropower is an important element of a comprehensive renewable energy program in addressing climate change. Hydropower is the largest source of affordable renewable energy. Because hydropower generation generally has low lifecycle GHG emissions, and because reservoirs can store energy and complement such intermittent energy sources as solar and wind, hydropower can play a critical role in mitigating GHG emissions, while multipurpose hydraulic infrastructure can support irrigated agriculture, and thus agricultural productivity and food security goals. Hydropower facilities with storage can help cope with climate variability and change through flood and drought management. In addition, multipurpose hydropower can also contribute to adaptation to increasingly difficult hydrology by strengthening a country's ability to regulate and store water, thereby mitigating flood and drought shocks.

WBG's approach and supporting strategies

114 The WBG's water, energy, and infrastructure strategies and business plans support increasing engagement in hydropower. The WBG believes that hydropower can help increase access to electricity and bring economic benefits while achieving sound environmental management. A deeper understanding of the link between hydrological variability and economic growth puts a premium on efficient water resources management and infrastructure, especially in the world's 260 international river basins, many of which have enormous untapped hydropower potential in developing countries. In addition to electricity generation, hydropower infrastructure with storage can support irrigation, domestic and industrial water supplies, and navigation.

115 A regional approach to developing hydropower can take advantage of economies of scale and reduce costs of electricity. Many small countries cannot afford to develop their potential hydropower on their own. Depending on the situation, regional integration is a sensible way to pool resources for electricity generation. A regional approach could reduce the number of large, stand-alone facilities through selectivity and regional economic, social, and environmental considerations, and relieve some small countries of the much higher cost of achieving self-sufficiency in electricity supplies. Regional power pools that allow the most cost-effective energy resources to be shared across countries can reduce electricity costs significantly. In AFR, for example, with 63 international river basins and with high potential for hydropower generation, a regional approach to hydropower is a viable way to meet a large share of the present and future demand for electricity. If pursued to its full economic potential, regional power trade could also significantly reduce the power system operational costs. These cost savings come largely from much lower operating costs by substituting thermal power, even though such substitution entails higher investment in capital-intensive hydropower generation plants and associated cross-border transmission in the short run. The returns to regional transmission investments can be quite high. Under regional power trade, a handful of large exporting countries would serve many power importers. The largest beneficiaries tend to be small countries without domestic hydropower resources. For these countries, the cost of building cross-border transmission would be paid back in a very short time. At the same time, regional projects do not preclude decentralized and off-grid hydro energy development in small countries. Supplemented by decentralized generation and other renewable sources, hydropower plays a key role in a low-emissions growth trajectory that would also reduce energy poverty.

116 The WBG recognizes that the size of a hydropower installation is not the most appropriate metric by which to categorize hydropower projects. The common categorization of hydropower projects by the size of the installation in megawatts as large or small does not appropriately capture the relevant technical, environmental, social, and economic aspects of these projects. Categorization of hydropower generation should be based on the impact and the degree to which the impact can be mitigated, rather than an arbitrary selection of a cut-off point for the level of megawatt capacity. Run-of-the-river hydropower generation is less sensitive to the physical size or level of output than a smaller hydropower facility with water storage. By contrast, solar, wind, and biomass energy sources also vary in size with different socio-economic consequences, yet they are not classified by size. More appropriate and useful categorization for hydropower would be reservoir, run-of-the-river, and off-grid.

Climate change

117 Hydropower infrastructure plays a role in climate adaptation. Climate change will exacerbate hydrologic variability—the consequences of changes in the long-term water balance and intensification of extreme weather events—and the challenge of managing a scarce resource subject to multiple demands. Many developing countries face the challenge of coping with significant variability in precipitation, both within and across years. Under these circumstances, infrastructure management and operation will need to adapt to more variable hydrology while also taking on water management, especially where multiyear storage is economically, environmentally, and socially feasible. Among a variety of adaptation tools, hydropower infrastructure can help meet increasingly demanding levels of storage for energy and water needs.

118 Avoided GHG emission through hydropower can be significant. Increasing the share of hydropower in the Indian energy mix from 24 to 35 percent, as proposed by the government of India, is estimated to reduce CO₂ emissions by 138 million tonnes a year—equivalent to 8.5 percent of emissions in India in 2015—by displacing coal generation. In AFR, increasing the share of hydropower through regional trade could save 70 million tonnes per year of CO₂ emissions. In Southern Africa, where power generation is currently dominated by coal, at \$15/tonne of CO₂, viable hydropower share can potentially increase by 50 percent and replace coal generation. If AFR were to develop the same share of hydropower potential as Canada, there could be an eight-fold increase in electricity supply. This additional supply will not only have low lifecycle GHG emissions, but will also help mitigate the local environmental problems associated with inefficient and polluting sources of electricity (such as small diesel power generators). As a suitable complement to solar and wind, hydropower can also increase the share of other forms of renewable energy, and at the same time enhance the reliability of electricity supply. Finally, hydropower offers a hedge against rising world fuel prices.

119 GHG emissions from reservoirs, particularly in the tropics, can be significant. Lifecycle analysis of GHG emissions from hydropower facilities with storage has been a subject of research and debate for many decades. Two sources of incremental GHG emissions are generally identified in connection with hydropower development: those associated with the construction phase, and those from decaying biomass in the reservoirs. The level of emissions from the reservoir surface can vary considerably, depending on the location of the reservoir—much lower in the cold climates and higher in the tropics—and whether the land had been cleared prior to inundation. Given the highly site-specific nature of incremental GHG emissions from reservoirs, hydropower projects should be carefully evaluated for the potential level of GHG emissions using the available local information, research, or both.

Learning from experience

120 **Sustainable growth is at the core of the WBG's hydropower development** in response to the energy and water needs in developing countries. Specific activities need to address the challenges of economic, environmental, and social sustainability facing hydropower development. The WBG has learned many lessons from past experience and has also benefited from debates and discussions around the report of the World Commission on Dams (1998–2000), its follow-up Dams and Development Project hosted by the United Nations Environment Programme (2001–2007), and the International Hydropower Association's Sustainability Assessment Protocol (2007–2010).

121 **The WBG's Operational Policies capture these lessons and provide guidance.** The lessons are also reflected in several sectoral assessments and policy papers: the WBG's Water Resources Sector Strategy (2003) included a framework for assisting countries in developing and maintaining appropriate stocks of well-performing hydraulic infrastructure. In 2009, the WBG reinforced that commitment in *Directions in Hydropower*, which outlined how the WBG may work in partnerships with national governments, the private sector, other multilateral development banks, and civil society organizations to support and help plan hydropower projects in developing countries. CEIF, Sustainable Infrastructure Action Plan, and SFDCC also echoed the need for investment in priority infrastructure for water services, including hydropower. In 2010, a progress report on the implementation of the Water Resources Sector Strategy, "Sustaining Water for All in a Changing Climate," called on the WBG to scale up support for hydropower as the largest source of renewable and low-emissions energy and reaffirmed its soundness and project implementation track record. Region-specific analyses and strategies—such as AFR's Infrastructure Agenda for Transformative Action and SAR's Climate Change Strategy—also point to the expanding role and the strategic development value of hydropower. Finally, following the IEG's 2010 evaluation entitled "Safeguards and Sustainability Policies in a Changing World – An Independent Evaluation of the World Bank Group Experience," the Board of Executive Directors endorsed a comprehensive updating and consolidation of the safeguard policies to be undertaken by World Bank management to better address both impacts and risks and to promote environmentally and socially sustainable development. The updating process started in November 2010 and will be completed by June 2012. In parallel, IFC is in the process of revising its policy on social and environmental sustainability and performance standards. The proposed standards are posted on IFC's Web site (www.ifc.org/ifcext/policyreview.nsf/Content/SustainabilityPolicy) and open to public consultation. Among others, the proposed standards cover aspects affecting indigenous peoples' communities, including those related to the free, prior, informed consent of such communities for projects that have an impact on them.

122 **The WBG will continue to support developing countries in strengthening their planning and implementation capacity in hydropower development.** Such support will include areas such as country-led strategic planning processes to enhance the evaluation of options and alternatives for energy and water management, tools and techniques for improved planning of sustainable hydropower development together with integrated water resources management, new ways of addressing climate risks and governance issues, and cost-effective implementation of planned projects. The WBG will support financing of sound priority investments emerging from such processes.

Natural Gas

123 **Natural gas is widely acknowledged as an important fuel in a carbon-constrained world.** It is a clean-burning fuel that also has the least carbon intensity of all fossil fuels. Its reserves-to-production ratio of 63 is higher than 47 for oil. It is important not to lump all fossil fuels into a single category. In the

scenario that stabilizes CO₂-equivalent concentrations at 450 ppm in the long run in *World Energy Outlook 2010* (IEA 2010a), natural gas consumption in developing countries needs to increase, and coal consumption decline, between 2010 and 2035. The final report of the Extractive Industries Review endorsed natural gas as a bridging fuel. Natural gas becomes even more important if system-wide planning for the power sector is used. Where the system has insufficient hydro storage capacity, and where the system has a non-negligible share of wind or solar or for peaking, natural gas is the least carbon-intensive generation complement for following the load. In cold-climate regions with high heating demand, natural gas is a clean fuel for space heating in winter.

124 Rapid urbanization across the developing world will increase the importance of natural gas in the coming decades. In part because of the need to establish a distribution network, natural gas is essentially an urban fuel, requiring large economies of scale and high population density. According to the United Nations, between 2010 and 2035, the urban population in developing countries will grow by 1.65 billion but the rural population will, if anything, decline slightly (UN 2009). Natural gas will become affordable to an increasing share of the population, contributing to cleaner air, shifting households from solid fuels to a clean-burning gaseous fuel, and, where natural gas displaces coal or oil, reducing GHG emissions (mainly in power generation and industry). Natural gas also reduces emissions of harmful local pollutants compared to oil, coal, biomass, and other forms of solid fuels if combustion of latter fuels is not accompanied by advanced exhaust gas control.

125 Because large natural gas reserves tend to be concentrated and because natural gas is much more difficult to transport than oil or coal, setting up the necessary infrastructure to enable gas trade is critical to expanding the use of natural gas. Natural gas can be moved by pipeline or by ship. Either way, the transmission and distribution infrastructure is capital-intensive to establish. But economic benefits to the countries connected can be very large. They gain access to energy that has local environmental benefits, the countries may have a chance to increase the diversity of their energy sources—a particularly important consideration in some countries in ECA that are overly reliant on hydropower—and energy supplies are increased. The lifecycle GHG emissions of imported natural gas depend on a number of factors (see footnote 4 in paragraph 41), although generally there is a significant reduction in emissions if conventional natural gas substitutes coal.

126 Large amounts of natural gas remain unexploited in developing countries. Natural gas is particularly difficult to develop: its monetization requires highly capital-intensive upfront infrastructure development, and the complexity of off-take agreements— all too often requiring payments by weak governments in developing country markets—add to the challenge. Significant policy and regulatory barriers exist in establishing a natural gas market. There are also small gas fields that may not be of much commercial interest to large petroleum companies but that have sufficient reserves for small-scale gas-to-power, which can provide critically needed electricity in those countries where access is low, where power outages are frequent, or both.

127 Continuing engagement of the WBG in natural gas can contribute to energy poverty reduction, enhancing the adequacy and reliability of energy supplies, and environmental sustainability. Where economic, combined adoption of natural gas, energy efficiency measures, and renewable energy can go a long way in enhancing environmental sustainability. The World Bank can help on the policy and regulatory front; finance projects, especially those using previously flared gas; and provide guarantees. IFC and MIGA can work across the supply chain, particularly in those markets where the private sector needs assurance provided by the WBG's presence.

Annex 3: Recent Strategies, Performance, and Portfolio

Current strategy

128 The current WBG strategies for the energy sector consist of *Fuel for Thought (FFT)*, a 1999 environmental strategy for the energy sector, and an informal 2001 strategy entitled “The World Bank Group’s energy program: poverty alleviation, sustainability, and selectivity” (2001 energy sector strategy hereafter).

129 **FFT stated that, despite its relatively small size and outreach, the WBG aimed to be at the forefront of the drive toward more sustainable use of energy.** The strategy was based on the WBG’s assessment that the best way to promote progress on global environment issues is to help clients tackle issues of national priority—particularly those where the contribution to poverty alleviation and other development objectives is clear-cut and relatively immediate, and to which there is therefore strong local commitment. The strategy also reaffirmed the WBG’s continuing support for projects with global benefits where the additional costs required would be fully funded by international sources, such as GEF.

130 **Some specific targets set in FFT have been met; notable among the areas with slower progress has been regional energy trade.** *FFT* set a number of targets, many of which were specific to WBG operational activities, to be met starting in FY2008 and as late as 2015. In the first half of the last decade, the WBG was active in fuel reformulation, and earlier in gasoline lead phaseout. Through global initiatives, technical assistance, and lending projects, the WBG has assisted in rehabilitating degraded facilities and areas and promoted environmentally sound exploration and production of fossil fuels, and more recently engaged in efforts to reduce gas flaring. Progress in realizing the benefits of cross-border energy trade has been slow, underscoring the difficulties of coordinating governments and energy companies and also reflecting the effects of the WBG’s increasing disengagement from the energy sector until 2003 (World Bank 2009a), although AFR has made a good start through the power pools. For mitigating the potential impact of energy use on climate change, the WBG was already actively engaged with GEF at the time of *FFT*. A year later, the first carbon finance fund was established, and the number of carbon funds and facilities has since grown to 12 with a business portfolio of \$2 billion.

131 **The 2001 energy sector strategy defined four lines of business and set several 10-year targets.** Unlike *FFT*, all targets set by the 2001 energy sector strategy were high-level, global goals not necessarily linked directly to WBG operations. The targets for increasing access to electricity, reducing CO₂ emissions intensity, and reducing energy intensity have been met. Good progress appears to have been made in setting up sector regulators. However, there has been virtually no progress in reducing the budgetary burden of the power sector, increasing private sector participation, and having a choice of more than one supplier of electricity or natural gas for industrial users. In all cases, there are large regional differences (World Bank 2009a). An emerging lesson, consistent with QAG and IEG evaluations, is that it was probably premature to set such high targets for sector reform when the underlying institutional capacity was weak.

Other developments

132 **The role of the WBG in extractive industries has received global attention.** Between 2001 and 2003, the WBG conducted a comprehensive assessment of its engagement in extractive industries (EI) in response to questions about whether such engagement is consistent with the WBG’s goals of sustainable development and poverty reduction. Oil, gas, and mining provide a significant source of

income for dozens of resource-rich countries, many of them poor, making sound resource management and adoption of pro-poor policies critical. The management response to the Extractive Industries Review, approved by the WBG's Board of Executive Directors in 2004, confirmed that the WBG should remain engaged in extractive industries and committed the WBG to be selective in its approach, with a greater focus on the needs of poor people and the rights of those affected by EI investments, a stronger emphasis on governance and transparency, and greater support for mitigating environmental and social risks. Since 2005, the WBG has reported annually on progress in its implementation. A number of its key recommendations, for example concerning broad community support as a requirement for WBG engagement in EI projects, have been incorporated in WBG policies. IFC has worked with investors in the project it supports to help ensure that communities benefit from projects, such as through support for "linkages" programs that help expand the involvement of local businesses in EI projects. IFC has established CommDev, a facility aimed at working with partners to develop and help implement good practice approaches to communities and EI investments.

133 SFDCC specified when the WBG could use its traditional financing instruments to support client countries to develop coal-based thermal power projects. An operational guidance note for the WBG staff issued in March 2010 further elaborates on the six screening criteria, which are given in Table 5. The scope covers coal-based thermal generation projects and programs targeting development of new power production facilities, associated transmission infrastructure for power evacuation, and rehabilitation and modernization of existing coal power plants. Rehabilitation and modernization projects are excluded from complying with criteria #2 and #5, in cases where rehabilitation projects reduce lifecycle GHG emissions relative to the relevant counterfactual defined by the team (depending, among other factors, on the expected increase in efficiency and increase in power generating capacity).

Table 5: WBG Criteria for Screening Coal-Based Power Projects

Criteria	Impacts
1. There is a demonstrated developmental impact of the project including improving overall energy security, reducing power shortage, or increasing access for the poor.	Significant increase in access to electricity and/or reliability of power supply for sustained economic growth and poverty reduction.
2. Assistance is being provided to identify and prepare low-carbon projects.	Identification and possible support to renewable energy, energy efficiency, and other low-carbon interventions, projects, and policies, and identification of associated reductions in GHG emissions, exploiting the synergies between World Bank/IFC/MIGA policy dialogue and action plans.
3. Energy sources are optimized, looking at the possibility of meeting the country's needs through energy efficiency (both supply and demand) and conservation.	Evaluation of existing plans on future energy requirements by incorporating energy efficiency (both demand and supply) and energy conservation interventions and quantifying their impacts. If not satisfactory, help in their establishment and implementation to facilitate a full cost economic comparison of supply and demand resources to meet energy needs capitalizing on the synergies between Bank/IFC/MIGA policy dialogue and action plans.

Criteria	Impacts
4. After full consideration of viable alternatives to the least-cost (including environmental externalities) options and when the additional financing from donors for their incremental cost is not available.	Project is confirmed to be the least cost after full consideration of alternatives and inclusion of environmental externalities in the analysis. In case other options are economically viable, availability of additional financing from donors to cover incremental costs has been actively pursued and assessed (but ultimately does not materialize).
5. Coal projects will be designed to use the best appropriate available technology to allow for high efficiency and, therefore, lower GHG emissions intensity.	Assessment of the appropriateness of the selected technology option, factoring in specific system constraints and size requirements, technical, local environmental situation, commercial availability of technology, and environmental performance.
6. An approach to incorporate environmental externalities in project analysis will be developed.	Develop a methodology for assessment of net local (SO _x , NO _x and PM) and GHG emissions at the project level. Such methodologies will be included in the analysis of alternatives and least-cost options in criterion #4.

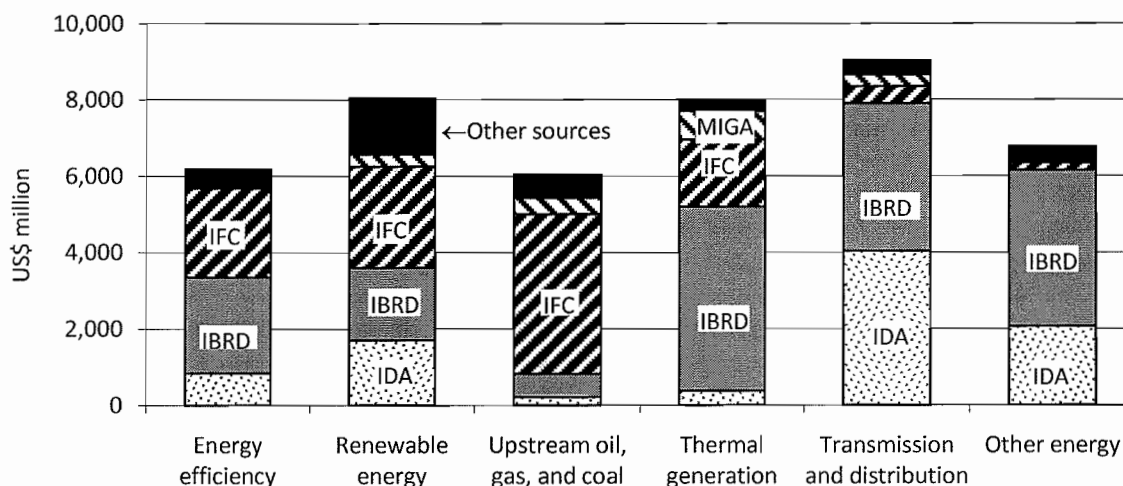
Source: "Operational Guidance for World Bank Group Staff: Criteria for Screening Coal Projects under the Strategic Framework for Development and Climate Change" (World Bank 2010d).

Notes: SO_x = oxides of sulfur, NO_x = oxides of nitrogen, PM = particulate matter

Portfolio

134 Figure 6–Figure 8 show cumulative and annual investments by institution and region for energy-related projects.

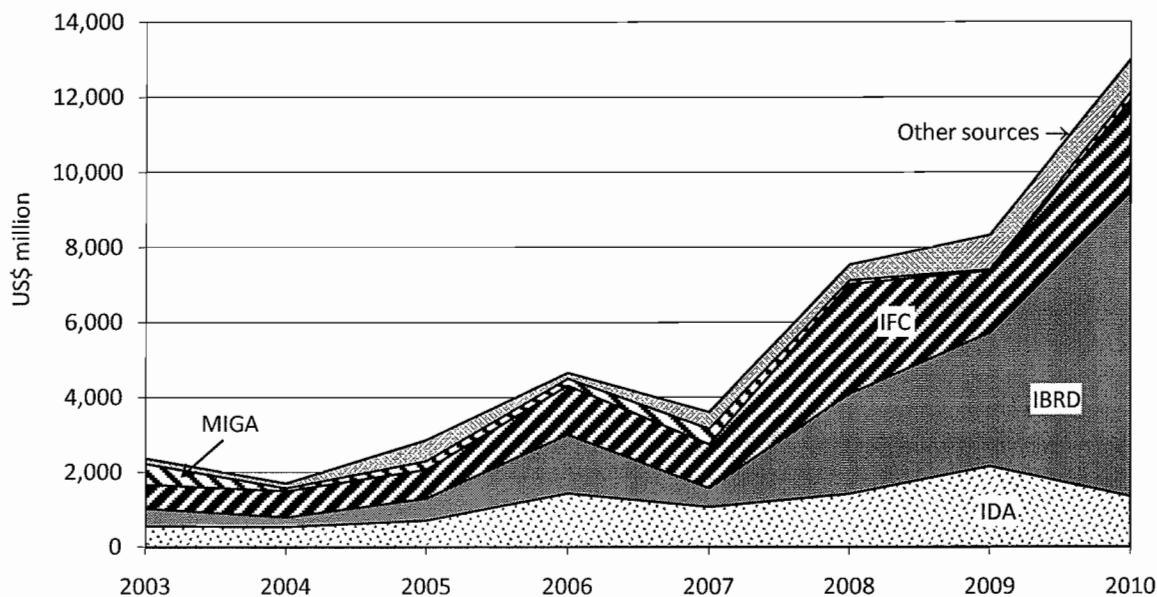
Figure 6: WBG Lending for Energy by Institution and Project Category in FY2003–10



Source: World Bank Group.

Notes: Other energy = projects where energy policy support is provided, such as energy sector development policy operations; other interventions where the form of energy cannot be clearly distinguished or where there are multiple energy subsectors supported within a single project that could not be classified into a specific subsector. Other sources = Carbon finance, CTF, GEF, guarantees, recipient-executed activities, and special financing.

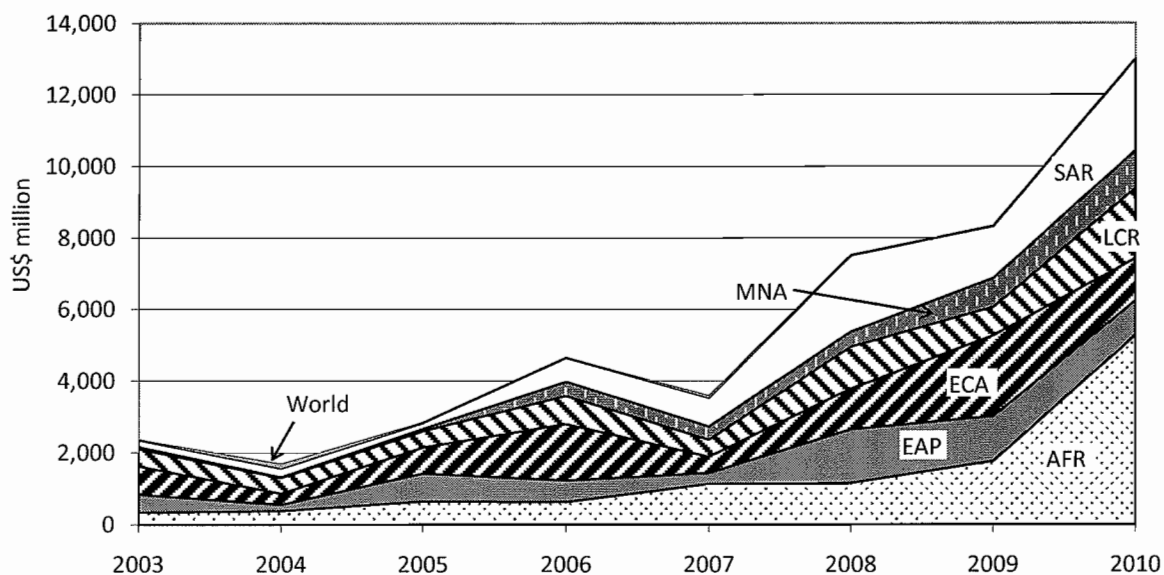
Figure 7: WBG Lending for Energy by Institution



Source: World Bank Group.

Note: Other sources = Carbon finance, CTF, GEF, guarantees, recipient-executed activities, and special financing.

Figure 8: WBG Lending for Energy by Region



Source: World Bank Group.

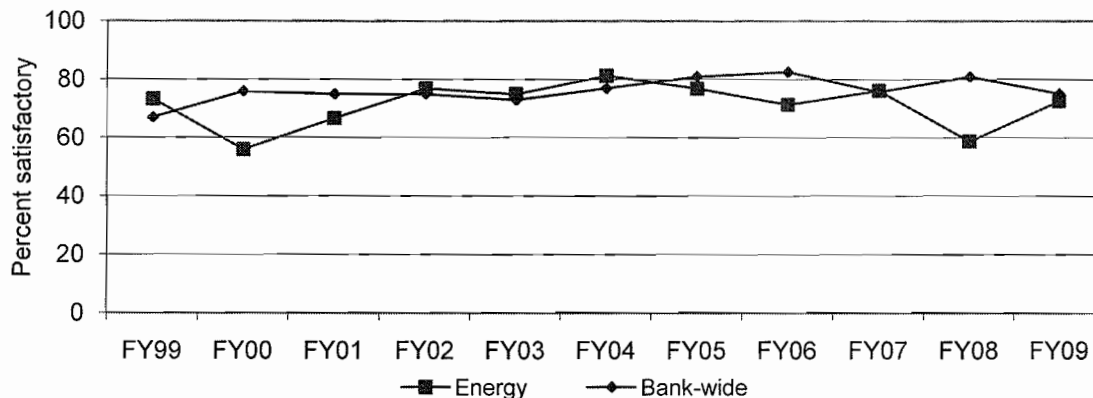
135 The above statistics include a number of projects outside of the energy sector (primarily energy efficiency investments in industry or financed by commercial banks generally) at IFC. For the purpose of setting a target for clean energy (goal 4 in Table 1), the calculations for establishing the baseline consider only the following categories of IFC projects:

- Oil and gas production, basic processing up to refining, pipelines up to end-users, infrastructure for liquefied natural gas, and oil and gas in power generation in the utility sector
- Coal production and electricity generation from coal in the utility sector
- Power generation, transmission, and distribution in the utility sector
- Energy efficiency in the energy sector
- Renewable electricity from hydropower, geothermal, solar, wind, and biomass co-firing

This selection of IFC projects changes the percentage of clean energy projects for the WBG as a whole in FY2008–10 from 69 percent, if the computation is based on projects in Figure 6, to 67 percent.

136 Figure 9 shows the percentages of World Bank projects in the energy sector exiting between FY1999 and FY2009 that were rated moderately satisfactory, satisfactory, or highly satisfactory by the IEG. The ratings capture 219 projects, mostly IDA and IBRD but also including GEF and special project finance. The number of projects exiting and evaluated ranged from 10 in MNA to 68 in ECA. The region with the smallest share of unsatisfactory projects was EAP (16 percent), followed by ECA (19 percent) and LCR (22 percent). Of the unsatisfactory exits in FY2000–09, 34 percent were in AFR, followed by 20 percent in ECA, 18 percent in SAR, 12 percent in EAP, and 8 percent each in LCR and MNA. In FY2007–09, 3 out of 4 exiting projects in MNA, 5 out of 8 in AFR, and 2 out of 4 in SAR were rated unsatisfactory, while all 9 projects in EAP evaluated by the IEG were found to be satisfactory. About half of the projects in AFR (51 percent), MNA (50 percent), and SAR (46 percent) were rated unsatisfactory. The percentage of IDA projects rated unsatisfactory was disproportionately high: 42 percent against IBRD's 24 percent during the period covered, and 42 percent against IBRD's 26 percent in FY2007–09.

Figure 9: Comparison of IEG Ratings of World Bank Energy Projects with Bank-wide Average



Source: IEG database as of December 2010.

137 In AFR, the projects that closed in FY2009 and earlier were all prepared between FY1991 and FY2002, a period when the World Bank tended to pursue a single approach to reform and privatization in the power sector, and pressed on with reforms and privatization in poorly organized power sectors with weak governance and regulation and expected the private sector to deliver, with mixed or poor results. Projects prepared after that period incorporated lessons outlined in paragraph 27 much more pro-actively, paying far more attention to the specific situation in each country, considering a wide range of approaches to reform, tailoring project design and expected outcomes accordingly, and leveraging resources and developing short-term solutions in the overall context of long-term objectives.

Annex 4: Inter-Sectoral Linkages

138 The principal linkages between energy and other sectors are described below, followed by suggestions for where the sectors could cooperate.

Transport

139 Provision of clean, affordable transportation fuels is important for environmentally sustainable, efficient, and affordable movement of goods and people. Poor performance in the downstream petroleum sector can adversely affect the transport sector by causing fuel shortages, supplying sub-standard-quality fuels, exacerbating price volatility, or causing prices to rise above those in an efficient market. The consumption of petroleum products in road transport, rail, aviation, and shipping is a significant contributor to global-warming emissions such as greenhouse gases and black carbon. As with the energy sector itself, transport in developed countries is a major source of such emissions, but the growth of developing countries is leading to a rapid increase in their global importance. Policies can help reduce the amount of transport that is used, encourage modal shift to lower-emitting forms of transport, improve the fuel efficiency of the different forms of transportation, and reduce emissions from incomplete fuel combustion that are harmful to health and to environment.

140 The energy sector will continue to work on improving the performance of the downstream petroleum sector, including efficiency in the supply chain and ensuring that the efficiency gains are passed on to consumers. The energy sector can help ensure that the fuels of requisite quality are available—gasoline, jet fuel, and diesel meeting the specifications in place—as well as alternative fuels, such as compressed natural gas or LPG, where there is a market for them as automotive fuels. While the transport sector will continue to lead with respect to transport dominated issues (such as modal split or financing bus-rapid transit systems), there will be policies of common interest to the two sectors, including pricing and taxation reform for petroleum products—removing subsidies or increasing taxes works to reduce use and hence emissions. Best practices for raising energy prices, while providing protection to low-income households, can draw on experience in the energy sector more widely. The effectiveness of price policies for reducing demand can also draw on experience of both sectors.

Urban

141 In the developing world, more than four-fifths of future population growth will take place in urban areas. Investing in low-emissions technologies, building to an optimum urban form, and enacting energy efficiency measures can help reduce the growth of GHG emissions in cities, which are responsible for about 70 percent of the world's total GHG emissions. The layout of urban centers plays an important role in determining total transportation flows—urban design and approaches to promote densification can encourage the use of more-energy-efficient modes of transport, reduce distances travelled to work, school, and entertainment, and reduce overall infrastructure capital and operating costs. Urban design, in terms of building construction standards and codes of practice, can play an important role in improving energy efficiency. Where the building stock is growing rapidly, stricter efficiency requirements can be effective. Programs to improve the energy efficiency of the existing stock can also make a large contribution.

142 Policies to encourage the uptake of energy-efficient standards and technologies are common to both sectors. Indeed, an important location for the implementation of energy efficiency projects is the buildings sector, which in the IEA's 450 ppm scenario will account for 30 percent of total energy savings by 2035 (IEA 2010a). This possibility opens the way for further collaboration between the two sectors.

Urban form and municipal operations are inextricably linked to a city's energy demand, and electricity in particular is a critical basic urban service. Indeed, the provision of energy to the urban poor, including slum dwellers, is an area of interest to both sectors and is one of the indicators in the results framework encompassing global dimensions in the World Bank Urban and Local Government Strategy.

Environment

143 The energy sector is closely linked to the environment sector through the common concern with local environment protection and climate mitigation and adaptation. Both sectors have an interest in moving toward green-development paths and finding policies and instruments for this purpose. For mitigation the energy sector is a key player, since its policies can directly help reduce GHG emissions. With respect to adaptation, much of the action required by countries that are or will be impacted by global warming is outside of the energy sector, and the environment sector will be working with other sectors to design and implement adaptation policies. For protecting local environment, existing safeguards policies will continue to play an important role. Traditional use of solid fuels is a significant concern to both sectors and encompasses not only emissions of harmful pollutants but also efficiency of solid fuel use and sustainability of biomass harvesting.

144 The energy sector will work in parallel with the goals expressed by the environment sector in the new WBG environment strategy under preparation. An important area of cooperation will be in addressing indoor air pollution from household use of solid fuels, whether through public education, knowledge generation and management about performance and proper use of high-performance modern stoves, or work on more efficient manufacture of charcoal. The two sectors will continue to exchange information in developing improved methodologies for estimating emissions from potential projects and policy interventions. Economy-wide studies, following the existing low-carbon studies commissioned by ESMAP, can form a valuable reference point for a country dialogue and can benefit from inputs from both sectors.

Agriculture, forestry, and rural development

145 Energy is an important input at many places in this sector. A global concern is the lack of access to clean energy for low-income households, who are disproportionately concentrated in rural areas. They may not have access to electricity and are likely to rely mostly on woodfuel or coal for cooking and heating, with its attendant costs of damaging indoor air pollution and, where firewood is gathered, time required for fuel collection. Rural access to electricity can enhance the growth of productive activities, and the superior lighting provided can benefit education. Modern forms of energy are also important for agriculture (pumping for irrigation, fuel for powering tractors, and for trucking agricultural products to markets). The biofuels sector is a topic where the two sectors overlap—the land management issues need to be analyzed as well as any potential GHG reductions that might be obtained from increased support for biofuels in a country. Supplies of woodfuels fall under forest and tree resource management.

146 The energy sector in its design of rural electrification schemes and projects can work closely with the rural sector to identify opportunities for effective programs, particularly where multiple modes of support to the rural communities are being sought. With respect to agriculture and small rural businesses, the energy sector's work on tariff structures that allow support to the poor, and on providing petroleum products at efficient prices through improving supply conditions, can support agricultural and rural development programs. Looking at agriculture as a supplier of energy, the WBG's "Agriculture Action Plan 2010–2012" considers agricultural aspects of biofuels as well as production and

use of forest products for energy, underscoring the importance of paying specific attention to improving women's access to assets (particularly land), finance, and services. The energy sector will work closely with the Agriculture and Rural Development staff in addressing issues associated with woodfuels (Annex 2) and other forms of biofuels.

Water

147 The water sector has two separate links to the energy sector. Where electricity is used for distribution of water, efficient pricing and provision of a reliable power sector service are important corollaries of regular power sector reform projects. Hydropower projects span both the water and energy sectors through their multi-dimensional outputs. The design of hydropower projects requires assessment of the impacts on the water management system, as well as the benefits to the power supply system.

148 Cooperation among the water, energy, and agriculture sectors on hydropower projects is already well established. Improving electricity supply and enhancing the efficiency of energy use in treating and distributing water can bring benefits to the water distribution sector.

Information and communications technology

149 The telecommunications sector has important links to the energy sector. The impacts of the power sector on telecommunications can be important where there is no electricity—cell phones need to be charged, and regular and backup electricity sources are needed for a cell site. Innovative business models using renewable energy with cellphone companies as anchor customers may help increase access to electricity in some rural areas. Integrated power systems rely on flows of information for their effective management, and the recent advances in integrating information and communications technology into metering, demand-side management, peak-load management, grid integration of intermittent renewable energy, regional system integration, system monitoring, control, and protection can lead to large improvements in efficiency as well as power system reliability and stability. This in turn can result in a reduction in energy losses, both commercial and technical, with attendant reductions in fuel use and emissions. These steps can also help lower telecommunication connection costs.

150 The recent developments in linking information technology to power system design and control are already earmarked for potential WBG projects in some countries. An ICT-energy sector working group was established in early 2010. The two sectors can experience an important synergy in exploring further developments and in learning from experiences in implementing these new technologies within the energy sector.

Health

151 A fundamental link between energy and health adversely affecting more than 2 billion people occurs through their heavy reliance on solid fuels for cooking and heating. The associated indoor air pollution is detrimental to health, especially of women and children who are most at risk. Reducing exposure to indoor air pollutants is highly effective in reducing morbidity and mortality. Policies to encourage the use of cleaner stoves, better cooking practices, and cleaner energy sources (such as biogas, LPG, natural gas, and, in some cases, electricity) are important options available in developing strategies that support development and energy access as well as protecting the environment.

152 Another link between the energy sector and the health sector is the provision of reliable electricity to clinics and hospitals. Lack of electricity, or provision of an unreliable service with blackouts and brownouts, result in a lower level of health service, especially in rural areas. Lack of lighting, refrigeration, and effective sterilization procedures enabled by electricity supply can be major constraints on the effectiveness of health care. Improvements in the access and quality of electricity resulting from improved supply to the population can therefore make an important incidental contribution to the health sector.

153 Providing electricity access or improved power supply warrants greater coordination and dialogue across sectors, including health. The benefits to clinics and hospitals of rural electrification or power sector upgrading programs and a more reliable supply should be born in mind in assessing potential project benefits. Conversely, health projects supporting construction of facilities can consider energy-efficient lighting, renewable energy, and other forms of low-emissions options. Programs in the energy sector to reduce indoor air pollution from better energy use and supply rest on work already carried out on the health effects of exposure to indoor air pollution. A wider awareness of these health costs and of ways of persuading households to adopt actions to avoid them will be an important part of the more ambitious program to benefit households from improved energy use. The two sectors could find synergy in the design of public awareness campaigns that already are well established in other areas of the health sector.

Education

154 The link between energy and education comes at three separate points. First, the provision of electricity to schools permits more effective delivery of educational services. Power projects in rural areas can raise education levels by providing lighting at home so that children can do more reading and school work, by keeping the lights and heat on in classrooms, and by enabling schools to use computers and other instructional equipment that need electricity. In urban areas, improving the quality of electricity supply enables more effective the use of computers and other forms of power-using apparatus in schools and colleges. Second, electricity projects also improve the likelihood that children will attend school, especially girls. The use of biomass for cooking, when the fuel is collected by household members, keeps the monetary costs of cooking low, but imposes costs in time for collection. In countries where such supplies are scarce, the time taken to collect biomass can be so substantial that children are withdrawn from school. Information campaigns could be important and these would require inputs from both sectors in order to bring the two aspects together in public awareness. More and better education can help improve energy use at home: there is evidence, for example that, everything else being equal, the household decision to switch to a gaseous fuel increases with the level of education of adult members.

155 Third, strengthening the provision of education is essential for training engineers, scientists, financial analysts, and other professionals and technicians who can run the energy sector, and who can contribute to technology innovation and implementation. Particularly important is raising the quality of education so that learning levels improve. Also important is reducing gender disparities in learning levels, especially in mathematics and science performance, and improving access to engineering education (Annex 5). The energy sector can inform the education sector about the skills gaps where education and training are especially needed. In addition, environmental education increases environmental awareness and capacity in the homes and communities. As has been the case with social information campaigns about health issues, the classroom can be an effective conduit of environmental information for the current and future generations.

Annex 5: Gender and Social Inclusion

156 **Social exclusion of certain groups—women, ethnic or religious minorities, or even a majority group not favored by the ruling class—slows their economic development and efforts to reduce poverty.** To work toward gender equality, the WBG seeks means to enhance women’s economic opportunity by increasing access to, among others, quality employment, business opportunities, credit, technology, and essential infrastructure services including modern energy. Similar efforts are being made to address the social inclusion of other groups. This annex discusses how the energy sector can contribute to overcoming social exclusion.

Gender

157 **The WBG’s three-year transition plan for gender underscores the importance of women’s gaining access to reliable modern energy services.** “A Three-Year Road Map for Gender Mainstreaming (2011–2013)” was presented to the WBG Board of Executive Directors in June 2010. It sees modern energy use as capable of lessening the time women spend on household and community chores and increasing their access to employment and entrepreneurship opportunities. The transition plan builds upon the WBG Gender Action Plan covering FY2007–10, which targeted four areas, including infrastructure, and called for a greater focus on gender in increasing access to energy

158 **Energy affects women and men differently, and gender disparities exist on both the demand and supply sides.** As consumers of energy, women and girls are, arguably, most affected by lack of access to improved cooking and heating solutions (Annex 2). As for electricity, women and girls benefit far more from the security provided by street lighting at night than men, and being able to use refrigerators and other electric appliances reduces women’s household workload. Consulting women and educating the affected communities about gender-specific issues in projects can strengthen project effectiveness. The Yemen Rural Energy Access Project included stakeholder consultations with women and men, providing information on the different gender roles played in electricity management (for example, women tended to be more involved in managing electricity consumption in order to reduce monthly bills). Benefits for women enabled by the project include improved awareness and openness, reduced efforts and higher efficiency of different home tasks through the introduction of home appliances, and opportunities provided by active participation in local electricity organizations. On the supply side, the energy sector tends to be dominated by men, except for such low sources of income as headloading firewood (Annex 2), and much work remains to reach gender parity in this regard.

159 **Reducing gender disparities in and through the energy sector requires heightened awareness and innovative approaches.** Many projects may include gender aspects, sometimes related to women as direct beneficiaries of project services. Examples include energy access projects, which can benefit from gender analysis and gender-sensitive design. The “Power to the Poor” program in the Lao People’s Democratic Republic specifically targeted female-headed households—preliminary field work by the World Bank suggested a much higher poverty rate among them than the national average—for electrification by providing interest-free credit and making the cost of electricity connection and use budget neutral. In just four months, the access rate among female-headed households in the 20 villages in the program increased from 63 percent to 90 percent. For other projects—such as for generation or transmission, cross-border trade, upstream oil and gas, and sector restructuring—women could be specifically targeted as beneficiaries in the environmental and social assessments. Extending access to reliable modern energy services benefits all people, but women differently from men. Where female-headed households are disproportionately represented among the poor, as in Lao PDR, serious

consideration may be given to targeting these households in extending access. For effective interventions in the woodfuel sector to benefit households, the complex interactions among fuel use, fuel markets, and labor markets must be understood. At times, projects intended to help women have caused them harm instead, as described in paragraph 110. Consulting women at the outset could identify areas where gender issues could be included in project design and implementation. On the supply side, making greater efforts to explore how more women can be included, as the mining sector has done, would be helpful. IFC provides support to women through microfinance institutions, and expects to increase its SME lending portfolio (covering all sectors) targeting women-owned SMEs by 15 percentage points by 2012. ESMAP's Gender and Energy Development Strategies Technical Assistance Program includes components on enhancing women's economic opportunities in energy SME development. Proactively seeking ways of including gender considerations would be critically needed to achieve the gender performance standards set forth in Table 2.

160 Cross-sectoral dialogue and collaboration is an integral aspect of gender equality work. For issues related to woodfuels, working together with the forestry sector is essential. Some gender disparities in the energy sector result from disparities in other sectors. An example is the shortage or total absence of female engineers, stemming from disparities in education and, particularly, mathematics and science training. Where women encounter more difficulties in gaining access to credit for connecting to electricity or in starting a business selling, for example, cookstoves, the energy sector would share the information with the financial sector (or, if the inability to obtain credit stems from women not having title to land, the agriculture sector) to aid in overall efforts to overcome these barriers.

Other socially excluded groups

161 The WBG's environmental and social safeguard policies are designed to avoid, mitigate, or minimize the adverse environmental and social impacts of its projects. Assessments examining various social dimensions and potential impacts and risks affecting vulnerable groups are an important starting point. The WBG is particularly concerned that the development process fully respect the dignity, human rights, economies, and cultures of indigenous peoples. A recent IEG review of safeguards and sustainability policies found that IFC assesses impacts on indigenous peoples as an integral part of community impacts.

162 Going beyond the principle of "do-no-harm," energy projects can, where conditions are suitable, explore how to target socially excluded groups for access expansion and other service provisions. The means to share the benefits of energy investments more equitably, and how to enable a greater voice for and participation of socially excluded groups, merit special attention. An example of a targeted intervention is the combined IBRD-GEF Integrated Energy Services project in Mexico. Mexico's electrification coverage is close to 97 percent. An estimated 3.5 million people remain without electricity; about 60 percent of those are indigenous. The project aims to increase access to efficient and sustainable integrated energy services in predominantly indigenous rural areas of Mexico. The project uses renewable energy, and one component provides technical assistance to increase productive uses of electricity and cofinancing—on a pilot basis—of a limited number of productive or microbusiness activities. Performance indicators include the number of new productive uses of electricity and the number of community and economic development projects facilitated by the use of electricity.

Annex 6: Energy Programs in the Regions

163 The WBG's six regions share many common challenges—and hence the strategy's two objectives forming common goals for the future work of the energy sector in the coming decade—but also face distinct issues specific to the individual regions' circumstances. This annex describes the context, issues faced, past areas of engagement of note, and suggested future action areas in each region.

164 MIGA and IFC will have core areas of engagement across the regions. IFC will provide financing for private sector energy investments, including public-private partnerships. In the power sector, IFC will support good practice technologies and, where possible, renewable energy, energy efficiency improvement, and less-GHG-intensive power sources such as natural gas. It will selectively support oil and gas production investments that are expected to generate sustainable development benefits for countries and communities. IFC will continue to reinforce the World Bank's engagement concerning governance by continuing to set standards for the private sector in areas such as revenue payment disclosure and contract disclosure. IFC will also partner with investors and others to help enhance the direct benefits that communities receive from projects that impact them.

165 MIGA will support foreign direct investments in the energy sector, on both the supply and demand sides. These investments could include stand-alone and independent projects as well as public-private partnerships. MIGA will also consider energy investments that contribute to lowering the GHG intensity such as natural gas, renewable energy, and efficiency improvements for end-users. Oil and gas investments supported by MIGA are expected to contribute significantly to sustainable development. MIGA will continue its joint activities with both IBRD/IDA and IFC to offer coverage for energy projects to private sector clients. Private sponsors and commercial lenders requesting MIGA's support will be required to comply with good business and operational practices, and reap positive development impacts for host countries. MIGA will continue to reinforce the WBG's emphasis on good governance by requiring compliance with (1) standards for the private sector regarding production/rights-linked revenue payments and contract-awarding disclosures, and (2) performance standards for environmental and social impacts of energy investments to enhance direct benefits for affected communities.

Africa

Challenges

166 AFR faces significant challenges in the energy sector. The entire electricity generation capacity of the 48 Sub-Saharan countries totals 78 GW, and 30 GW if South Africa is excluded—about the same as that in Norway, a country with only 0.6 percent of AFR's population. Moreover, the region's capacity has been growing very slowly since the 1980s, and as much as one-quarter of it is now unavailable due to age and poor maintenance.

167 Electrification rates are correspondingly low. Only 31 percent of the region's population has access to electricity. Per capita electricity consumption excluding South Africa averages only 124 kilowatt-hours a year, barely one percent of the consumption typical in high-income countries and hardly enough to power one light bulb per person for six hours per day. Excluding South Africa, AFR's nearly 800 million people consume in a year about as much electricity as the 19.5 million inhabitants of New York State (IEA 2010a). Scarcity of power and low access affects the delivery of social service and the quality of life. Without electricity, clinics cannot safely store vaccines, food goes wasted at home and in shops, and children cannot study at night. For other household energy needs, about 80 percent of people rely on traditional use of solid biomass (IEA 2010a), far more than in any other region of the

world. Deforestation can be a serious consequence of concentrated biomass use, especially in the outskirts of urban areas. And indoor air pollution resulting from incomplete combustion of solid fuels in traditional stoves is a leading cause of premature mortality and illnesses.

168 More than 30 countries in AFR have experienced power shortages over the last few years, resulting in load shedding and frequent interruptions to service. Power outages have caused large losses in forgone sales and damaged equipment for firms—6 percent of turnover on average for formal enterprises, and as much as 16 percent for informal enterprises. Therefore, many enterprises turn to backup generators, which in many countries now represent a significant proportion of total installed capacity. The economic costs of power outages, including the costs of running backup generators and of forgone production, typically range between 1 and 4 percent of GDP (Foster and Briceño-Garmendia 2010).

169 With escalating demand for power on the continent, between 70 and 80 GW of new generation capacity, or 7 GW per year for the next 10 years—about seven times the rate of construction during the last decade—would be needed to bring the region in line with the rest of the developing world. This entails developing a generation energy mix that is more cost-effective, scalable, sustainable, and adaptable to the local context. It also implies avoiding systematic bias toward a specific energy-planning model, seeking carbon-constrained technologies first, and considering carbon-intensive technologies only where no cost-effective or technically-feasible alternative exists.

170 An encouraging development is that many governments in the region are focusing on the energy sector, recognizing its impact on the business environment, equity, economic growth, and the quality of life. Comprehensive measures—including investments to expand electrification, improve supply efficiency, demand-side management, and tariff adjustments (to restore the financial viability of the utilities and to reduce subsidies), and aggressive mobilization of funding for new generation capacity—are evident in a number of countries, including Ethiopia, Ghana, Kenya, Mali, and Tanzania. While these measures may take several years in some cases to yield tangible results, there are encouraging signs already of improved indicators, demonstrating that the increased political will to tackle energy poverty is starting to pay off.

Causes

171 The geographical distribution of energy resources in AFR poses challenges for power development. While the continent is well endowed with a variety of energy resources, they tend to be concentrated in a few countries and away from major centers of demand. The small scale of most national power systems, the lack of power system interconnection, and the widespread reliance on expensive oil-based generation have made the cost of producing electricity in AFR exceptionally high.

172 Over the last decade, unprecedented GDP growth averaging nearly 5 percent per year combined with high population growth rates, especially in urban areas, has pulled the growth rate of demand for power to almost the same level as that of GDP. Yet generation capacity has increased by less than 3 percent per year. Under-investments in the power sector, weak institutional framework, and poor utility management have all contributed to this growing supply-demand gap. In some countries, supply shocks originating from droughts, oil price inflation, and conflicts have further widened the gap.

173 Current power sector spending is equal to 1.8 percent of regional GDP. The spending is disproportionately allocated to operation and maintenance, and only 0.7 percent of GDP is left to fund long-term investment. Over the last decade, on an annual basis, private transactions have averaged only

\$0.5 billion, and donor funding—which has at times been ad hoc and uncoordinated—has averaged only \$0.7 billion.

174 Widespread sector reforms geared to increasing private participation failed where governments were unable or unwilling to raise tariffs to cost-recovery levels, and funding for the elements of the sector that were riskier or not commercially viable (such as transmission) was lacking. Sector reforms also overlooked governance problems associated with state-owned enterprises, which are now reflected in deficient utility performance. The operational inefficiencies of power utilities, including distribution losses and revenue under-collection, cost the region 0.8 percent of GDP on average.

Opportunities

175 The region's hydropower and thermal potential can be effectively unlocked only by developing power pools, which allow member countries to share the resources for their collective benefits. It is estimated that regional power trade could save \$2 billion annually in power costs and reduce the overall long-run marginal cost of power by \$0.01 per kilowatt-hour overall (and up to 20 to 40 percent for some countries), while at the same time reducing annual CO₂ emissions by 70 million tonnes. Four regional power pools (West, Central, East, and Southern) have been established. They are at various stages of development depending on local and regional conditions, but all generally enjoy political support with good prospects for further strengthening. In addition to the trade benefits, power pools offer the advantage of enabling a generation portfolio of different complementary technologies that can increase system reliability and climate resilience. As such, regional power trade contributes to improving service and also puts AFR on a lower-GHG-emissions path.

176 At the political level, there is more solid collective will and action for regional energy development. Governments' stance on regional infrastructure development has never been stronger, as attested by the African Union's efforts to strengthen institutional coordination and financial mechanisms. The international community has come a long way in scaling up financing commitments for the region's infrastructure. Also, G20's increasing focus on infrastructure investment and private sector orientation opens opportunities to close the energy deficit in AFR and contribute to MDG delivery.

177 Capital flows from emerging financiers such as China, India, and Arab donors have reached unprecedented levels in the last few years, totaling \$ 1.1 billion annually, much above official development assistance (Foster and Briceño-Garmendia 2010). Chinese funded investments in generation account for a major part of these external flows. They tend to focus on large-scale power projects and may help expand generation capacity in AFR significantly. In particular, China's committed hydropower projects, if completed, will add 40 percent to the existing hydropower capacity in AFR (excluding South Africa).

178 The evolving economic and political landscape is enabling a strengthened commitment to energy development in AFR. The continent as a whole has experienced unprecedented and sustained growth in the past decade, with GDP growing by 4.9 percent per year from 2001 through 2008, more than twice its pace in the 1980s and 1990s. Foreign direct investment reached \$0.4 trillion in 2008, more than tripling the level in 2001. Had these developments been primarily due to a resource boom, growth would have not accelerated so broadly across sectors and countries. Arguably, more critical were government actions resulting in sound macroeconomic and structural reforms, reduced conflicts, greater political stability, and an improved business climate. The continent has been weathering the global economic crisis better than expected and growth has recovered to above pre-crisis levels. Emerging external and internal trends also promise to fuel AFR's long-term growth. At the international

level, the global search for commodities and foreign investors' appetite for new markets will increase the profitability of, and opportunities for, energy investments. Within the continent, urbanization and a growing labor force will lead to rising middle-class consumers with greater ability to pay for electricity.

Moving forward: areas of engagement

179 **Our vision.** The WBG is committed to scaling up its efforts, contributing to energy poverty reduction in AFR, and ensuring adequate and sustainable energy supplies for economic growth and social well-being. In particular, the WBG seeks four main outcomes:

- (1) Expanded access to reliable and affordable modern energy services, provided to people for lighting, cooking, and other household uses, and supporting delivery of social services
- (2) Adequate, reliable, and sustainable power supplies, enabling more businesses and households to realize their economic potential
- (3) Reversal of woodland loss and land degradation from unsustainable consumption of biomass energy
- (4) Sustainable development of local gas and oil resources that generate energy for local use and resources for countries and communities from exports

180 The ongoing portfolio of IDA- and IBRD-financed or guaranteed projects under implementation is projected to increase AFR's generation capacity by about 8 GW by 2015. This will allow expansion of power supply for electrification and for sustaining economic growth. Looking forward, between FY2012 and FY2015, the World Bank expects to continue similar levels of support to generation and transmission, with an emphasis on regional and sustainable energy resources. New IDA and IBRD commitments during that period will enable a further addition of 4 to 6 GW of new generation capacity by FY2020. The commitments during the period FY2016–20 are expected to be of the same order, contributing to additional generation capacity of 4 to 6 GW by FY2025. For electrification, new IDA/IBRD commitments during that period are expected to deliver 400,000–600,000 new connections a year, making the total for FY2012–15 1.6 to 2.4 million connections or 8 million–12 million people at approximately 5 members per household connection. The same will apply for the FY2016–20 period, translating to approximately 10 million–15 million. IFC also sees infrastructure in AFR, including the power sector, as a priority area and will add to the World Bank's activities.

181 **Core sector activities.** Five strategic areas of engagement have been identified as instrumental to achieving the above outcomes. The first outcome is an imperative from a social, poverty reduction, and political point of view and the WBG will continue placing the expansion of energy coverage at the top of its agenda. Tackling AFR's generation capacity deficit is a pre-condition for any effort to realize the second outcome, expanding access and providing adequate supply for sustaining economic growth. The WBG is strongly committed to scaling up regional generation and transmission capacity. Well-designed demand-side management and energy efficiency programs can also contribute considerably to reducing the power supply-demand gap. Improved planning and regulation at the sector level and better management at the utility level are prerequisites for successful energy-sector outcomes and are critical to achieving both the first and second outcomes. Finally, the World Bank has articulated a dedicated strategy to support sustainable supply and use of biomass, as stated in the third outcome.

182 Activities for each area of engagement are described below:

- (1) **Expanding electricity coverage.** Financing expansion to low-income households—who consume little electricity and account only for a small portion of utility revenues—will require concerted action, a systematic approach to planning, and significantly greater concessional financing from

development partners. The current project-by-project, ad-hoc approach in development partner financing has led to fragmented planning, volatile and uncertain financial flows, and duplication of efforts. The WBG will support access to electricity in urban and rural areas through multiyear programs of access roll-out based on national strategies and using sector-wide approaches (SWAps), supported by multiple development partners. Where grid extension is not economical, such as in dispersed rural areas, SWAps will integrate, where feasible, off-grid solutions based on appropriate renewable technologies driven by local resource availability. To this end, the WBG will support the implementation of new institutional models for rural areas, including innovative rural energy financing mechanisms to engage the private sector and local communities. The WBG will also help disseminate and promote the uptake of technology advances that have been successfully commercialized elsewhere. Among these, the *Lighting Africa* initiative is mobilizing and supporting the private sector to supply quality, affordable, clean, and safe lighting. The initiative encourages the use of technical innovations such as new light-emitting diode, fluorescent, and solar technologies. Thanks to *Lighting Africa*, off-grid lighting services are being incorporated into rural electricity access projects in several countries, including Ethiopia, Ghana, Tanzania, and Zambia. This initiative will be further expanded to at least a dozen other countries.

- (2) **Scaling up regional power generation and transmission capacity.** The WBG will support the development of next-generation of large-scale, transformative regional generation projects; blending of public and private capital; development of a variety of energy sources including hydropower, natural gas, wind, solar, geothermal, and, in compliance with principles set forth in paragraph 66, coal; and deployment of new technologies such as concentrating solar power (CSP). Once produced, electricity can flow across countries, but only if the needed cross-border transmission infrastructure is in place. Equally important is the harmonization of regulations and system operating agreements to facilitate trade. The WBG will help foster rehabilitation and expansion of cross-border transmission infrastructure as well as the necessary software and capacity for aligning regulation and operating systems.
- (3) **Improving sector planning and utility performance.** Improved planning involves regional integration as a means to harness diversified endowments and ensure that benefits are shared by all. Integrated planning entails providing supply- and demand-side opportunities in a level playing field to make energy more reliable and affordable. The World Bank will support regulation reforms geared to increasing cost recovery, rationalizing subsidies, and strengthening the financial viability of incumbent utilities. At the utility level, technical assistance and capacity building will be deployed to improve governance and foster oversight and transparency. Supply-side efficiency improvement programs will target technical and commercial losses and foster revenue collection. The WBG will partner with client countries to assess the benefits and readiness of smart grid technologies and provide technical assistance in areas of mutual interest. South-South cooperation will be enhanced.
- (4) **Rolling out demand-side management and energy efficiency programs.** The WBG will seek and scale up demand-side interventions that best fit the country-specific context so as to maximize efficiency gains. Demand-side interventions will encompass improving end-use energy efficiency and promoting more efficient utilization of the power system capacity through demand-side management techniques. Significant successes have already been achieved in programs investing in fluorescent light bulbs in about 10 countries, including Rwanda, Uganda, Ethiopia, Malawi, and South Africa. Notable cost savings have been observed, in particular during power crises, when most countries rely on expensive emergency generation. The WBG will scale up efforts by incorporating energy efficient appliances as part of the customer “connection

package,” thereby reducing expenditures on electricity for poor customers. The WBG will also support other demand-side management options such as solar water heaters and more efficient electric cook stoves, and facilitate the establishment of time-of-use tariffs, load control, and smart metering. The WBG will continue to work with its client countries to reduce power shortages and, when necessary, put the necessary processes in place to reduce consumption via demand-side participation, such as the market-based rationing program in South Africa in 2008, when the World Bank provided timely technical support.

- (5) **Supporting sustainable biomass supply and use.** The WBG will work in an integrated fashion across affected sectors to improve sustainability of woodfuel supply and use. A flagship intervention currently being prepared will focus on household energy and in particular among the poor. On the demand side, interventions will be two-fold. The first approach will reduce firewood and charcoal demand by stimulating the deployment of efficient cook stoves. A successful program has taken place in Ethiopia, where 2.2 million open fire stoves have been replaced to date by fuel-efficient ones. The second approach will examine the possibility of inter-fuel substitution whenever it makes technical and economic sense. Supply-side programs will support community-based approaches and revisit forest management systems and wood fuel production, emphasizing in particular multipurpose tree use and management. The WBG will work with client countries to improve the efficiency of charcoal production, including potential co-generation in larger sites.

Moving forward: manner of engagement

183 The client countries in the region are asking the WBG to do more and do it faster, which calls for rethinking the way the WBG does business. Scaling up concessional finance is obviously critical, especially for projects that are not commercially viable. But although increasing, IDA financing will remain small relatively to AFR’s vast needs. The resources and skills required to close the demand-supply gap are well beyond the capacity of any one institution; partnerships and leveraging are critical to achieve the scale required. Selectively identifying countries and projects with greatest transformative potential is also important for maximum impact. The World Bank will undertake at the core of its agenda the task of engaging partners and facilitating collective focus on key large-scale transformative projects for substantial scale-up of generation capacity and access. To that end, the WBG will work on three main fronts:

- *Leveraging investment by the private sector and other donors.* The World Bank will help countries deliver key sector reforms leading to strengthened regional power planning, improved investment climate, and more efficient and creditworthy utilities. IFC will provide advisory services and assistance to governments to help mobilize private investment.
- *Strengthening capacity for project development and execution.* In particular, the World Bank will need to bolster its role as a catalytic financier for large and commercially-viable generation projects. Nevertheless, traditional donors will continue to play a critical role and the World Bank is uniquely positioned to foster coordination among multiple partners and coalitions.
- *Enhancing its knowledge-broker role and mobilizing technology, skills, and resources for world-class energy solutions.* Internally, the WBG will need to remove bottlenecks that prevent an effective response to clients and discourage partnerships with the private sector and donors. But the WBG’s response will also need to support energy supply and end-use that are environmentally sustainable in the long term.

184 Efficiency, effectiveness, and sustainability are the new challenges facing the WBG in promoting energy development in the region, and success will depend mostly on the ability to structure and

organize the work differently. The WBG has identified an implementation roadmap that envisages six main components:

- (1) **Leveraging private sector finance.** The World Bank will continue supporting clients in delivering key sector and utility reforms that contribute to improving the investment climate and the viability of incumbent utilities—and hence creditworthiness and access to domestic and international private capital. The World Bank will also help clients to improve their institutional capacity for project development. The World Bank can work with IFC and MIGA to increase the pool of bankable projects, leverage new options, develop innovative financial instruments, and partner with emerging investors. IFC will continue to use its InfraVentures Facility to identify possible early-stage infrastructure projects that can be brought to full development. Risk mitigation will be particularly instrumental for offsetting regulation failures and risk aversion and raise private participation in the power sector.
- (2) **Harmonizing aid.** The WBG will engage at the international level to catalyze new commitments, new partners, and new approaches to energy development. To avoid duplication of efforts, the WBG will work to strengthen coordination among partners and help focus on areas where the parties can work together effectively, complementing existing structures and processes (such as the Infrastructure Consortium for Africa and the African Development Bank's Program for Infrastructure Development in Africa) and adding value to energy development.
- (3) **Improved responsiveness to clients and stakeholders demand.** Addressing the multifaceted energy challenge will require the WBG to strengthen integration across sectors and expand technical skills. In particular, while energy sector staff members will have their competencies improved and expanded, they will need to work with staff from other sectors, and work particularly closely with environmental teams to integrate environmental objectives.
- (4) **Improving performance and governance in extractive industries.** The WBG will continue to engage countries with oil and gas resources to improve sectoral performance, adopt high standards of governance (for example, through continuing engagement in EITI), and promote community-oriented development. IFC will provide financing and support for the sustainable development of oil and gas resources for local use and export. As important as developing gas resources is reducing flaring. The gas flared annually in Africa could produce 200 terawatt-hours of electricity, more than twice AFR's current power consumption (excluding South Africa). The environmental benefits of avoided flaring are also large and countries with significant flaring may benefit from carbon credit trading.
- (5) **Integrating response to climate change.** The WBG will mainstream a framework for action that balances energy development needs and environmental objectives. The WBG will partner countries in greening the energy mix by supporting the low-carbon technologies that are more cost-effective, scalable, and adaptable to the local context. In particular, the WBG will assist its clients to integrate climate considerations in policy and regulatory instruments, understand cleaner alternatives, build requisite capacity, and take advantage of green financing options. The WBG will play a critical role in supporting regional trade, which allows unlocking and efficiently developing the renewable energy potential in the trading area.
- (6) **Increasing South-to-South cooperation.** South-to-South cooperation has two main components: investment and knowledge-sharing. The increasing role of emerging financiers has led to new actors, interests, and modalities in the power sector in AFR, changing the landscape for borrowers, traditional donors, and international financial institutions. The WBG will need to develop effective ways to partner with emerging financiers to leverage funding for critical large-scale investments and also help financiers and borrowers to maintain good standards for

investment practices, including transparency, public scrutiny, and environmental and social responsibility. The WBG will support South-to-South cooperation to channel knowledge and capacity exchange from utilities that operate in similar governance-challenged and difficult political-economy settings. Some successful initial efforts for knowledge sharing have included Brazil, China, and India.

East Asia and Pacific

185 The EAP region has set six priority areas of focus in the energy sector in the coming years. The region has recently completed a flagship report, *Winds of Change: East Asia's Sustainable Energy Future* (Wang and others 2010), and is finalizing a second flagship report on energy access in the region, *One Goal, Two Paths*. Based on the consultations conducted during the preparation of these reports and their findings, the region plans to focus on the following six areas:

- (1) Improving energy efficiency
- (2) Increasing energy access
- (3) Scaling up renewable energy
- (4) Introducing new technologies and low-carbon energy solutions
- (5) Promoting regional energy trade and market integration
- (6) Advancing sector reforms and financial viability

The WBG has been contributing to each of these areas through analytical work and financing for some time. While relative importance attached to each priority area varies from country to country, priority ranking will be broadly in the order shown above for the region as a whole.

186 The countries in the EAP region have made significant progress in reducing energy intensity, but still have a long way to go in improving energy efficiency. To attain the sustainable energy development scenario examined in the flagship report, EAP's major economies have to halve their energy intensity by 2030. The major constraints to increasing energy efficiency are inherently institutional. Improving energy efficiency on a larger scale requires a suitable institutional framework, technical and management capacity, and strong coordination and cooperation at every level of the government. The WBG can help EAP countries develop and implement policy and institutional reforms, financing mechanisms, and market-based delivery mechanisms. The WBG has mainstreamed supply-side energy efficiency in its operations, but can do more to strengthen and scale up demand-side energy efficiency for which the potential is much higher. Examples of World Bank programs to increase energy efficiency include assistance for developing a master plan for national energy conservation in Indonesia and supporting financial intermediaries to promote energy efficiency financing (through IFC China Utility-based Energy Efficiency facility) and green financing—including trade in energy saving certificates—in China.

187 Energy access is still an unfinished agenda where more than 170 million people still do not have access to electricity and more than 1 billion lack access to clean and efficient cooking and heating solutions. EAP countries can be broadly categorized into three groups: (1) those with low access (less than 30 percent for electricity and 20 percent for improved cooking solutions), which tend to have more than 40 percent of the population living under \$2 (valued at purchasing power parity) a day; (2) those with access rates in the vicinity of 65 percent for electricity and 40 percent for improved cooking solutions; and (3) those with access rates to electricity exceeding 90 percent and improved cooking solutions higher than 50 percent. For the latter, no country is yet close to achieving universal access and there is an urgent need to address the high human cost of not using clean-burning fuels or advanced combustion stoves for solid fuels. For electricity, in the countries with low access—Cambodia, Myanmar,

Timor-Leste, and most Pacific Islands—there is a need to make a serious commitment to expand grid electricity and strengthen the existing policy and institutional framework suited for programmatic scale-up of off-grid electricity. In medium access countries—Indonesia, Lao People’s Democratic Republic, Mongolia, and the Philippines—the challenge is to maintain the momentum or accelerate the pace for expanding grid electricity and build momentum for rapidly scaling up off-grid electricity. In near-universal access countries—China, Thailand, and Vietnam—last-mile expansion of the grid needs to be completed and innovative delivery systems for remote households need to be developed and implemented. Across all countries, there is scope for upgrading quality and reliability of the power grid. The WBG will contribute to the activities needed to expand access, including employment of proven low-cost options, exploring new solutions for off-grid electrification, making better use of a proven entity (such as national and regional distribution utilities), making the supply chain for petroleum products more efficient (especially in Pacific Island countries), supporting fuel switching from solid fuels to cleaner-burning fuels where the latter are affordable, and mainstreaming higher-performance cookstoves.

188 All EAP countries have plans to scale up renewable energy, but need to create a greater enabling environment. The number one barrier to scaling up renewable energy is its higher financing costs compared to those for fossil fuels. Expanding grid-connected renewable energy requires enabling legal, policy, and regulatory frameworks and long-term financing. In addition to providing direct financing, the WBG can assist EAP countries in developing and implementing steps to create an enabling environment, such as through establishing appropriate feed-in tariffs, and provide grants to fund pre-investment activities, resource assessment, and capacity building. A programmatic approach—such as the China Renewable Energy Scale-up Program which integrates policy dialogues, institutional strengthening, project financing, and carbon financing—can be particularly effective, as is the financial intermediary approach used in the Vietnam Renewable Energy Development Project or IFC risk sharing facilities for banks in the Philippines and Vietnam.

189 In the long run, shifting the energy sector to a sustainable development path will depend critically on its technological transformation in both energy supply and use. Advanced energy technologies that the region may consider include integrated gasification combined cycle accompanied by carbon capture and storage, offshore wind power, geothermal in countries such as Indonesia and the Philippines, smart grids, and electric vehicles. There are advances in energy storage and solar power technologies, and there exists large scope for adopting various forms of demand-side management and energy management systems, including near-zero emission buildings with smart net metering, distributed generation and micro-grids, and efficient and clean transport solutions. The WBG can tap the CTF, GEF and other grants to support development and deployment of promising new clean technologies and adoption of international quality standards. Few existing financing sources pay for the high incremental costs of new technologies, and hence additional financing mechanisms are needed. IFC can also support manufacturing side of solar and storage technologies.

190 Strengthening regional cooperation through joint institutional development, strategic planning activities, and investments can contribute to greater regional integration and energy trade. There are many opportunities for renewable energy and hydropower trade in the region, particularly in the Greater Mekong sub-region. Underdeveloped power grid systems and lack of a regional framework for power trade is currently inhibiting expansion of renewable energy. More can be done to make market rules compatible and to harmonize technical and regulatory principles. There is also considerable scope for expanding capacity for liquefied natural gas and developing regional gas pipelines. Natural gas is an important fuel for reducing the carbon intensity of power generation in the near to medium term. Regional energy trade can help share costs, reduce carbon intensity, and secure energy supplies, all to

the benefits of the participants. The WBG will help promote regional integration and energy trade, including through the establishment of the Southeast East Asia power coordination center jointly supported with the Asian Development Bank.

191 The enormous financing needs faced by the region will not be met without ensuring financial viability in the energy sector. The sustainable energy development scenario is estimated to require an additional \$80 billion a year—or about 0.8 percent of regional GDP—above the business-as-usual scenario in order to stabilize CO₂ emissions by 2025. Such large financing needs will not be met unless investors are assured of the financial viability of the sector. Indicators for viability include a sound macro-economic framework, cost-reflective tariffs, a stable and transparent regulatory regime, healthy and fair competition on the market, well-targeted policy support and concessional financing to cover the higher costs and risks of clean energy solutions, and gradual introduction of environmental externalities in the energy pricing. The WBG will work with governments to strengthen the financial viability of the energy sector in each country through policy advice, institutional strengthening, transaction-specific advice (to create model transactions), and sharing of knowledge and lessons from international experience and best practices.

Europe and Central Asia

Context

192 With a population of 480 million, the ECA region comprises 30 countries in Central and Eastern Europe and the Commonwealth of Independent States. The region has been hardest hit by the global economic and financial crisis—experiencing the largest reversal in economic growth, greater decline in foreign capital flows, and sharper fiscal deterioration than any other region. The number of poor and vulnerable has risen by 12 million in 2009, instead of falling by 10 million as expected.

193 There are active energy lending and/or advisory programs in 23 countries. ECA region is the most inefficient WBG region in terms of energy consumption, accounting for 5 percent of the world's GDP but 10 percent of energy demand. On average, more than half of the energy sector assets in ECA client countries are estimated to be more than 30 years old and in general inadequately maintained.

Key issues

194 Mitigating the looming energy supply and vulnerability crisis. Most ECA countries face the prospect of medium-term energy supply shortfalls and supply volatility/uncertainty—both in electricity and primary fuels such as natural gas. Business environment surveys have indicated that the growing supply reliability problems are an impediment to investment. The contributing factors include the following:

- (a) Chronic underinvestment in the energy production and supply infrastructure. The ECA region's legacy of having abundant and over-sized energy supply infrastructure, with its associated inefficiencies, has eroded with insufficient maintenance.
- (b) High price volatility and supply shortages. Countries that rely on imported natural gas to meet energy needs (Armenia, Belarus, Bulgaria, the Kyrgyz Republic, Moldova, Tajikistan, Turkey, and Ukraine) face volatile prices, and some also face declining price subsidies previously provided by the suppliers (the Russian Federation and Uzbekistan).

The annual energy investment needs to meet demand reliably are estimated to be in the order of 3 percent of GDP. While the current economic crisis has moderated energy demand, the countries need to take advantage of this slowdown to prepare for a possible energy crisis.

195 Reducing energy wastage on both the supply and consumption sides. ECA countries waste a lot of energy in production, transmission, and utilization. The sources of energy waste include low efficiency in power and heat production (potential savings of more than 15 percent of primary energy consumption is economically feasible with modernization), gas flaring and venting (representing more than \$10 billion in value, and 253 million tonnes of CO₂-equivalent in emissions), and inefficient industrial stock and buildings, where estimates of potential savings range from 10 to 25 percent of energy use. The potential savings remain untapped due to many obstacles: low energy prices, lack of payment discipline, insufficient information on suitable technologies, too few contractors and service companies, and financing constraints.

196 Tackling the global and local environmental trade-offs. CO₂ emissions relative to GDP in the region are among the highest in the world. In 2005, Russia was the third-largest CO₂ emitter, after the United States and China; Turkey now has the largest annualized CO₂ emissions increase in ECA. Many ECA countries including the region's EU member states have a substantial reliance on domestic coal that will not be easy to reduce. While several initiatives to shift to a low-carbon energy future have been initiated in many ECA countries, of which renewable energy and energy efficiency are key components, deeper and more fundamental changes in the underlying energy resource choice and conversion/use technologies are expected to present significant incremental financial costs.

197 Financing impacts and constraints. ECA countries' ability to secure private and commercial financing for investments in the energy sector has been dramatically impacted by the financial crisis, to a far greater extent in comparative terms than in the rest of the world. This has occurred as the banking systems in several countries had a large western European banking group presence through acquisitions principally during 1995–2007. The systemic decline in liquidity has impacted the ability to raise funding for necessary capital investments. It has also affected the ability and/or willingness of the banking sector to actively engage in financing energy efficiency investments. These issues need to be systematically addressed to effectively respond to the problems noted above. More recently, spreads on bond issues have increased in Central and Eastern Europe owing to contagion effects from the fiscal and banking sector problems in more developed EU member states.

198 Strengthening regional cooperation on energy development and trade. Regional cooperation on electricity production and gas transportation can yield huge economic savings and boost supply security in ECA. Given the power system sizes, the actual and potential natural gas requirements, and the complementarity of their resource base (hydropower in some countries, thermal potential in others), large gains can be achieved. These include enhancing system reliability, cooperative/bundled contracting ability for natural gas, and water-sharing protocols that maximize mutual benefits. Strengthening the southeast Europe regional energy market, enhancing transparency in gas transit arrangements for Russian gas to Europe, defining institutional arrangements for gas purchase and transit from the Caspian, and developing energy trade within Central Asia and with South Asia are among the key regional opportunities. The challenges include (1) strengthening nascent cooperation protocols—for example, the Energy Community Treaty covers nine ECA client countries in southeast Europe and the Central Asia Regional Economic Council; and (2) developing suitable risk management arrangements and institutions to facilitate private and public investment and cross-border collaboration.

World Bank Group energy sector areas of focus

199 The World Bank will engage in the following focal/program areas to address the issues discussed above.

200 Supporting fundamental energy market policy and institutional reforms and climate change action. Technical assistance and advisory programs to support policy reforms to advance energy market development and pricing reforms in power and gas sectors and end-use energy efficiency are core elements of the ECA energy program in the client countries provided in conjunction with investment lending and associated services. The World Bank also works with governments and energy policy institutions through significant energy development policy loans (such as in the Kyrgyz Republic, Poland, Serbia, Turkey, and Ukraine).

201 Energy efficiency and renewable energy scale-up. The World Bank will help develop markets and support services (energy service companies, energy efficiency agencies) for energy efficiency and renewable energy financing programs through banking intermediaries and energy efficiency funds (Armenia, Bulgaria, Croatia, former Yugoslav Republic of Macedonia, Russia, Turkey, Ukraine, Uzbekistan). In some cases, as in Armenia, Croatia, Poland, Russia, these will be in conjunction with GEF grant programs. The World Bank has pioneered the use of CTF concessional resources for climate change mitigation with programs in Turkey, and later in Ukraine, to promote low-carbon programs and projects. Energy efficiency programs in public buildings are ongoing in Armenia, Belarus, Moldova, Montenegro, and Serbia.

202 Supply efficiency improvement. Given the state of the energy infrastructure in the region, supply improvement programs focus on hydropower plant rehabilitation (Montenegro, Tajikistan, and Ukraine), transmission and distribution rehabilitation and enhancement (Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Serbia, Tajikistan, Turkey, Ukraine, and Uzbekistan), and district heating infrastructure improvements (Armenia, Belarus, Moldova, and Montenegro).

203 Regional energy trade and cooperation. Efforts in this area include the following: Adaptable program loans to support the establishment of an integrated regional market in southeast Europe (Albania, Bosnia and Herzegovina, FYR Macedonia, Montenegro, Romania, Serbia, and Turkey); the Central Asia/South Asia Regional Electricity Market and Central Asia–South Asia transmission line for power exports from Central Asia to South Asia; managing the development of the Caspian Development Corporation to facilitate gas exports from Turkmenistan to Europe including the Balkans (the Energy Community gas ring is being considered for implementation with the European Commission and other European international financial institutions; and the Central Asia Energy Water Development Program, a comprehensive program to build energy and water security for Central Asia through enhanced regional cooperation by improving diagnostics and analytical tools to better understand options and trade-offs for energy-water integration, establish regionally owned platforms for dialogue, and invest in regionally significant energy and water infrastructure.

204 Promotion of private sector and foreign direct investments. The ECA region pioneered the use of partial risk guarantees to promote electricity distribution privatization in Albania and Romania. Given the reduced appetite for private investment in critical energy infrastructure facilities, the World Bank envisages the expanded use of the guarantee instrument to bring in private investment through public-private partnerships and direct investment, such as for hydropower and regional cross-border energy trade projects and prospective privatizations. Policy dialogue and other work on energy market and institutional reforms help countries improve the business environment in the energy sector to remove obstacles and attract private investors and financing.

Latin America and the Caribbean

205 **There are more than 550 million people in the region, which has high access rates and one of the lowest-emissions power sectors in the world, with about 60 percent of generation from hydropower.** With even modest rates of economic growth, the demand for electricity is likely to double over the coming 20 years, whereas the potential for economic growth is much higher. While access to electricity is high at nearly 95 percent, there are large differences in access rates among and within countries. Although some countries have significant petroleum resources—including Brazil, Bolivia, Colombia, Ecuador, Mexico, and República Bolivariana de Venezuela—others, notably Central America and the Caribbean, are still highly dependent on imports of petroleum products to fuel their electricity sectors. These and other factors—including social and economic development, population growth and migration, and geography—will affect energy development in the region in the future, particularly the power sector.

206 **The overarching challenge for LCR in the power sector is meeting increasing demand with secure, high-quality, and affordable sources of electricity.** Because power generation in many countries will remain highly dependent on petroleum imports for the foreseeable future, a second challenge is coping with high and volatile oil prices in the short to medium term, while taking steps to reduce oil dependency over the longer term. A third challenge is to overcome the operational inefficiencies in the electricity sector among both public and private entities; this is a precondition for improving delivery of energy services and reducing costs. A fourth challenge is to reduce inequalities in electricity delivery services, including providing power to the estimated 35 million people in the region who currently lack it, and reducing subsidies to high-income consumers. A fifth challenge relates to the sustainability of power systems in both local and global terms: minimizing air pollution and GHG emissions from electricity production and consumption and improving the resilience of power systems to climate change and other natural disasters.

LCR strategic approach

207 Through its lending, critical analytical work, and active involvement in the energy policy dialogue and knowledge sharing, the World Bank's Energy Unit, IFC, and MIGA are responding to the Region's energy challenges in a number of ways.

- **Supply-side investments, particularly for renewables.** One of the central themes of the WBG's support is to help countries ensure sufficient and secure electricity supplies. On the production side, the focus has been on renewable energy—which can help LCR increase supply, reduce dependence on oil, and support climate-friendly power generation—including through the provision of assistance on regulatory frameworks, capacity building, and financing of plants. New operations supporting transmission and distribution have been prepared, including for Brazil, Paraguay, and the Dominican Republic. IFC has supported renewable power projects in a number of countries, including Chile, Colombia, Mexico, and Peru.
- **Promoting energy efficiency.** Improving energy efficiency, both on the demand and supply sides, is one of the lowest-cost ways of meeting the energy supply-demand balance. The potential for energy efficiency has been examined through country-specific and regional analyses, while energy efficiency projects are being undertaken that promote the adoption of more efficient equipment, new regulations, and the development of public institutions in Argentina, Brazil, Honduras, Jamaica, Mexico, and Uruguay.
- **Strengthening public and private sector entities.** Governance of the sector and corporate reform at the enterprise level have been important in reducing power sector losses and

improving the sector's overall performance. Operations in the Dominican Republic, Honduras, and northeast Brazil have supported utility strengthening.

- **Reducing inequality and increasing access.** Rural access, particularly focused on providing electricity to remote rural areas, has been and continues to be a priority for the World Bank in LCR. Rural electrification programs, many of them using distributed renewable energy technologies, have been undertaken in Argentina, Bolivia, Honduras, Mexico, Nicaragua, and Peru. Such operations have helped establish a business model for rural electricity access, which is often a core component of a country's rural electrification programs. The Energy Unit is also beginning to look more systematically at gender aspects, such as in the use of biomass for cooking in Central America. In the case of IFC, investments in Haiti and Brazil have extended access to rural poor.
- **Incorporating climate into energy planning.** Analytical work has provided the basis for the World Bank's climate change work in LCR, including the production of low-carbon development studies in Brazil and Mexico. Support programs for renewable energy and energy efficiency have been at the core of the World Bank's support for climate mitigation. On the adaptation side, the objective is to promote energy systems that are less vulnerable to climate change and natural disasters, including a plan for the Caribbean and other smaller countries that are disproportionately affected by climate impacts.
- **Regional integration.** Linking country energy systems through intercountry connections can contribute to a regional power system that can help meet electricity demand in an efficient, cost-effective, and clean way. Regional integration can allow more efficient use of the region's energy resources and help diversify its energy matrix. Analytical work on regional integration has been undertaken for Central America and the Caribbean, as well as for the region as a whole through an assessment of future electric supply and demand.
- **Sustainable gas and oil development.** The WBG (primarily IFC) supports sustainable development of gas and oil resources that can help provide local energy and supply regional and other export markets, while generating revenues for governments and sustainable benefits for local communities.

208 These poles of activities are designed to address LCR's energy challenges in multiple dimensions. For example, end-user energy efficiency actions target improving affordability of energy consumption for the poor at the household level, enhancing the reliability and affordability of current and future energy supplies at the national level, and reducing GHG emissions at the global level (see Table 6).

Table 6: Addressing LCR's Electricity Challenges

Strategy	Secure electricity supply	Vulnerability to oil price volatility	Operational inefficiencies	Inequalities, especially in access	Climate change and natural disasters
Supply-side, including renewables	●	●	—	◐	●
Promoting energy efficiency	●	◐	◐	◐	●
Strengthening sector entities	◐	—	●	—	—
Increasing access	◐	—	—	●	—
Incorporating climate in energy planning	◐	◐	◐	—	●
Regional integration	●	◐	◐	—	◐

● = Fully applicable; ◐ = partially applicable; — = not applicable

Financing program/analytical work

209 Over the past two years, lending by the World Bank's Energy Unit has averaged more than \$1 billion, up from less than \$100 million over the previous several years. Loans have supported renewable energy and energy efficiency policies and investments in Mexico, energy efficiency and rehabilitation of the power distribution system in northeast Brazil, power sector rehabilitation in Haiti, transmission and distribution system expansion and rehabilitation in Paraguay, and rural electrification in Argentina and Peru. In the same period, IFC has provided financing of more than \$600 million for a range of private development projects in the energy sector, including thermal and renewable energy power generation and gas and oil production sector.

210 **Analytical and advisory assistance has figured prominently in the work program of the World Bank's Energy Unit.** Two multisectoral low-carbon development studies have been completed for Brazil and Mexico, contributing to these countries' assessments of opportunities to promote sustainable development. Another important analytical area of focus over the past two years has been the energy sector in Central America, where studies have evaluated short- and long-term measures to strengthen and diversify the energy matrix, improve the regulatory and policy framework, and promote regional integration. The World Bank has also conducted studies on exploring opportunities for regional integration in the Caribbean. The topics covered include the use of electricity auctions to expand generation, managing short-term crises in power supply, regulatory reforms to promote wind power, ways to mitigate the environmental and social impacts of wind power projects, assessment of the impact of climate change on hydropower generation, managing volatile oil prices, and an assessment of regional future electricity supply and demand for LCR.

211 **The World Bank's Energy Unit is increasingly reaching out to clients to disseminate international lessons, including through policy dialogue and knowledge sharing.** For example, the unit cosponsored with the Central American Integration System a meeting for the energy ministers of Central America; and, prior to the December 2010 international climate conference in Cancún, cosponsored with the Mexican government and the Inter-American Development Bank a senior-level international conference on energy efficiency and access.

Looking forward

212 The strategy for the coming years will continue to look for opportunities to provide value-added to the WBG's client countries, focusing on innovation, discussions of energy policy, and sharing lessons from LCR with the rest of the world and vice versa. Among the topics that are expected to increase in importance are climate finance, low-carbon development, regional integration, managing the impact of oil price volatility on the sector, and opportunities for transformation in the power sector from technological changes. IFC expects to provide financing for power generation including renewable energy, power distribution, and oil and gas production and associated infrastructure.

Middle East and North Africa

Context

213 **Small but growing population.** The MNA region is smaller than other regions, with a population of about 330.9 million in 2009; this population is largely urban (58 percent). At an average population growth rate of 3.4 percent in 2009, MNA is the fastest-growing region in the world.

214 **Economic divergence.** With an average per capita GDP of \$3,202 across the region, the variation in income distribution across the various MNA countries is significant. The region includes high-income countries like Kuwait and Saudi Arabia, middle-income countries like the Arab Republic of Egypt and Morocco, and low-income countries like the Republic of Yemen and Djibouti.

215 **A region rich in natural resources, but unevenly distributed.** MNA has about 57 percent of the world's proven oil reserves and 41 percent of its proven natural gas resources. However, great gaps exist between countries rich in natural resources and those dependent on importing such resources.

216 **Significant potential for renewable energy.** The MNA region is endowed with significant renewable energy resources, especially solar and wind, which can be developed to meet not only the needs of the MNA countries but also those of the neighboring regions.

217 **Near-universal electricity access with some unserved areas.** With an average electrification rate of about 90 percent and many countries performing close to 100 percent, overall access to electricity is good. However, an estimated 28 million people still lack access to electricity in the region, especially in rural areas, and about 8 million people rely entirely on biomass for cooking and heating.

Key energy sector issues and challenges

218 There are considerable differences in the situation of the energy sector in the region and solutions will have to be tailored to each individual country and situation. There are, however, a number of common issues.

219 **Political uncertainty.** Recovering from the recent global crisis, parts of the region have, since early 2011, been facing unprecedented political developments with potentially far-reaching implications. These developments will affect the energy sector, at least in the short term, as governments face increasing fiscal pressure to meet the populations' demand for the creation of jobs and safety nets, and private investments and economic growth slow due to political uncertainty.

220 **High world oil prices with large price volatility affect public finance.** Energy subsidy bills tend to rise and fall with the price of crude oil, because controlled retail prices tend to be sticky. High fuel prices have strained the finances of many net importing countries, both at the government and utility levels, and have increased the opportunity costs of subsidized energy at home for the oil exporters. Uncertainty about the oil price outlook is seriously complicating fiscal and sector planning, and the political crisis in the region—which includes some of the world's most important global energy producers—is amplifying the level of uncertainty.

221 **Price distortions in energy supply.** In most countries where oil and gas resources are large, price distortions are considerable, and cost recovery in electricity is low. In many countries, this has led to inefficient use of supply, high intensity in energy use, increasing environmental problems, and a rapidly increasing burden on government finances. In countries that are net importers of fossil fuels, price distortions are generally smaller, and cost recovery in the electricity sector has been somewhat better. However, the challenges these countries face in coping with high oil prices while financing rapidly growing demand for energy in general, and electricity in particular, remain. Overall, there is much scope in the region for reducing the supply cost of electricity, improving the efficiency of supply and energy conservation, and developing renewable energy resources.

222 **Growing energy demand.** Urbanization and economic growth are putting pressure on existing infrastructure and generating relatively high demand for new investments. Over the next 30 years, the region's total investment needs in energy are estimated at more than \$30 billion a year, or about 3 percent of the region's total projected GDP over the period (which is three times higher than the world's average).

223 **Lack of regional energy infrastructure and effective cooperation.** In the past, the region depended largely on oil for power generation. This dependence was substantially reduced in the 1990s as gas became a desirable substitute, owing to its superior economic and environmental attributes. In recent years, gas availability has become a serious issue, as countries such as Jordan, Kuwait, the Syrian Arab Republic, the United Arab Emirates, and others have realized that their available gas supply options are not sufficient to meet the needs of power and industry sectors. This has triggered a search for sources of imported gas, electricity, or both, which has in turn led to various attempts to construct cross-border infrastructure facilities. However, effective regional energy cooperation for enabling energy imports and exchanges is still lacking.

224 **Lack of electricity reform.** In most of the region, electricity sectors operate by centralized procurement rather than through liberalized markets, and the private sector's role—with some notable exceptions—is relatively minor.

World Bank Group's role and strategy

225 **Help ensure a secure, reliable energy supply.** Adequate energy supply is a basic condition for economic growth, the provision of social services, and an improved standard of living. The WBG's assistance in helping maintain a reliable energy supply will be even more important as some of the

countries and the region as a whole are facing unprecedented political developments, which will pose significant economic and social challenges during the transition period. The WBG will likely be requested by the countries to help deal with these challenges through increased analytical work and project lending in the energy sector.

226 Promote the use of renewable energy resources. Although many of the energy resource-poor countries have started to promote renewable energy resources such as wind power, solar power, and hydropower, there remains considerable scope for further development, especially in light of current high oil prices. The World Bank is supporting a regional CSP program in MNA under the Arab World Initiative. The CSP Scale-up Program aims to support deployment of large-scale CSP and cross-border energy trade projects and facilitate critical mass of replicable investments to benefit from economies of scale. Investments will include transmission backbone to reinforce regional integration and about 1 GW CSP generation capacity. The program has secured \$750 million from the CTF and is envisioned to include private and public funds, concessional and no-concessional, to total about \$5.6 billion. If CTF-type financing were greatly scaled up, as envisaged in the Cancún Agreements, the World Bank would undoubtedly face massively increased demands for renewable energy lending in MNA, given the region's substantial wind and solar resources. The regional strategy thus envisages two distinct scenarios: one with very high volumes of renewable energy financing, and one with more modest volumes.

227 Promote the efficient and sustainable use of energy resources. This can be accomplished through (1) the introduction of appropriate pricing policies in the oil, gas, and electricity sectors that provide incentives for increasing efficiency; (2) adjusting prices in a phased manner that ensures cost recovery and creditworthiness of enterprises in the sector to enable them to access domestic and foreign capital markets to finance their expansion, while protecting vulnerable groups through lifeline rates and/or well-targeted subsidies; and (3) where relevant, revenue management. Given the sensitive nature of pricing reforms, the World Bank has primarily provided technical assistance and studies to aid in government decision making.

228 Assist in improving energy efficiency and reduction of energy intensity. Apart from the introduction of appropriate pricing policies and other incentives, this assistance includes (1) facilitating the introduction of energy efficient equipment and standards, (2) establishment of energy services companies and development of appropriate financing mechanisms, (3) introduction of stricter building codes and load management devices for large residential consumers of electricity and industrial and commercial entities, and (4) help with the reduction of gas flaring. The World Bank has used numerous instruments to provide support for the adoption of energy efficiency policies; for example, in Saudi Arabia through its Reimbursable Technical Assistance program, and in Jordan and Tunisia through GEF and IBRD lending.

229 Help improve the overall investment climate, particularly in the context of political developments in the region. This effort should enable the private sector to invest in the energy sector and help improve management and efficiency of supply. Private sector participation could, apart from sale of assets or shares in existing companies, include various forms of concessions and management contracts; private independent power and water producers; contracting out operation and maintenance, billing, metering, and bill collection and other services; and other forms of public-private partnership. Participation by the local and regional private sector should be encouraged; attention should be given to the development of domestic capital market instruments. For instance, the WBG provided a partial risk guarantee to Jordan to support private investment for the construction of a power plant in Amman East. Two partial risk guarantee operations are currently under preparation for

Jordan. These instruments may become more important in light of the political uncertainty in the region and increased political risks perceived by private investors during the transition.

230 Promote regional energy trade and cooperation. This effort should be aimed at securing energy supply through diversification of resources. WBG assistance could include supporting the development of a framework for the institutional and regulatory aspects of energy integration among the Arab countries as well as facilitating the promotion and development of cross-border projects including providing finance from its own funds, and mobilizing resources from other donors and the private sector. The WBG could also support integration of the region's energy markets with those of the neighboring regions, including Europe and Sub-Saharan Africa.

231 Assist in implementing legal and regulatory reforms. These reforms should separate policy making, regulation, and operations, and emphasize the necessity of providing energy at the lowest possible cost while taking into account the need for sustainable use of natural resources, as well as opening up the sector for private sector participation and the introduction of competition. Where feasible, this would include the promotion of increased use of natural gas for power generation, development of renewable energy resources, better integration of electricity and water production (desalination), and promotion of regional trade in electricity and natural gas. In this regard, the World Bank has undertaken studies on electricity integration in the Mashreq, Maghreb, and Gulf Cooperation Council countries. The World Bank is currently working with the League of Arab States to design a framework for regional integration within the Arab world.

232 Assist with the restructuring and improved governance of the energy sector. Depending on the situation in the country and size of the power system, this could include unbundling of integrated utilities into separate companies for generation, transmission, and distribution, and the establishment of an independent systems operator. Even when privatization is not immediately anticipated, this would enable transparency to increase and introduce benchmark competition. Such activities have primarily been provided through lending operations; examples include the Republic of Yemen and West Bank and Gaza. In West Bank and Gaza, the Electric Utility Management Project has successfully helped the distribution sector transition from being highly fragmented to a more cohesive utility-based model that will undergo further consolidation over time. A regulator has been established to unify tariffs, design operating standards, identify entry and exit rules, and so on. In the Republic of Yemen, the Power Sector Project is providing similar technical assistance support to aid the government in unbundling the vertically integrated electricity sector. The WBG should also endeavor to help countries improve corporate governance and accountability. It could offer similar assistance in other energy subsectors, especially gas.

South Asia

Context

233 With 1.5 billion people, South Asia is home to nearly a quarter of the world's population. India is by far the most populous country, with 1.1 billion people, followed by Pakistan (166 million), Bangladesh (160 million), Nepal (29 million), Afghanistan (23 million), Sri Lanka (20 million), Bhutan (700,000), and Maldives (300,000).

234 South Asia has enjoyed robust economic growth, averaging an annual 6 percent over the last 20 years. After a short, steep decline in 2008 (mainly in India) due to the global financial crisis, growth in the region has rebounded and prospects are for it to soon reach and exceed precrisis levels.

235 **Despite high economic growth, poverty in the region remains high.** South Asia has the largest concentration of poor people in the world, with more than 1 billion people living on less than \$2/day. Expanding economic development opportunities is a key focus of the region's governments.

236 **Climate change is a key regional concern.** Geography, coupled with high levels of poverty and population density, has rendered SAR especially vulnerable to the impacts of climate change. This is most evident in Bangladesh and Maldives, which face an existential threat from rising sea levels, as do major population and economic centers in India and Pakistan. In addition to the impact of glacial retreat on water availability, the dependence on rain-fed agriculture means that all South Asian economies would be adversely affected by the more variable rainfall and higher temperatures associated with global warming and climate change.

Key energy sector issues and challenges

237 **Among the highest priorities is addressing the region's low access to modern energy.** With a largely rural population base and low access to modern energy services, there is high dependence on traditional fuels: noncommercial biomass is still the dominant energy source, constituting more than 80 percent of the fuel mix in Afghanistan and Nepal, and 30 percent in India and Pakistan. According to the IEA, more than 600 million people in the region lacked access to electricity in 2009. The access rate ranged from less than 20 percent in Afghanistan to more than 75 percent in Sri Lanka, and averaged about 60 percent across the region (IEA 2010a). Rural access to electricity is much lower, and virtually nonexistent in Afghanistan. Low access to modern energy sources in rural areas compromises productivity, particularly opportunities for nonfarm employment for the 60 percent of the region's labor force currently engaged in agriculture. However, there is rapidly rising demand for modern commercial fuels, spurred by rising wealth and steadily improving access.

238 **Investment climate surveys consistently identify the lack of reliable power as a major constraint to industrial growth and investment in the region.** Power shortages are endemic across the region; the associated economic cost has been estimated to be as high as 7 percent of GDP in India alone. Improved performance of the sector is thus clearly necessary for ensuring sustained and inclusive growth.

239 **The major consuming countries are heavily dependent on fossil fuels.** Fuel sources and options for power generation vary significantly across the region's countries. While Afghanistan, Bhutan, and Nepal are highly dependent on hydropower, Bangladesh, India, and Pakistan rely heavily on fossil fuels for their power sectors—oil, coal, and gas and oil, respectively. Sri Lanka is dependent on imported oil and will commission its first large, imported coal-based power plant in 2010–11.

240 **The region's renewable energy potential is largely untapped.** India has significant hydropower potential in absolute terms (150,000 MW), but this is small compared to the country's energy needs. It could be supplemented by imports of hydropower from Nepal (whose potential is 40,000 MW) and Bhutan and wind power from Sri Lanka, but transboundary energy trade agreements have made limited progress. Pakistan has a potential of 40,000 MW of hydropower generation, which is more than twice the existing peak demand in the country. The development of the region's renewable energy resources has not kept up with demand for reasons that vary across countries and states, but include poor governance and weak decision-making processes, inadequate market development, and limited commercialization (and a consequent paucity of private investment on acceptable terms). Strategies to lower emissions by diversifying into cleaner sources of power are also constrained by energy endowments.

241 An inadequate power supply infrastructure and poor service quality continue to plague the region.

- In India, more than 60 percent of firms rely on captive power—the peak power deficit is 16.6 percent and the energy deficit is 9.9 percent. The reliability, fuel efficiency, and environmental performance of about 20,000 MW of coal-based generation capacity need to be improved, transmission bottlenecks limit interregional power trade to about 27,950 MW against a target of 37,000 MW by 2012, and state distribution systems are undermaintained and unable to meet demand. On the positive side, availability-based tariffs and tighter performance norms have increased plant load factors, enhancing asset utilization.
- Peak power shortages in Bangladesh have increased from about 500 MW in 2003 to about 2,000 MW—its generation base of about 4,500 MW has not changed significantly over the last several years. Gas shortages are increasing.
- Pakistan’s power system of about 19,000 MW is experiencing severe shortages of as much as 5,000 MW due to underinvestment in generation, transmission, and distribution.
- Because the region’s power network is largely unintegrated, cross-border power trade is very limited.

242 Weak sector institutions and utility governance compromise sector performance. The accountability, operational efficiency, and customer service orientation of restructured entities remain low. In Afghanistan, India, and Nepal, more than 40 percent of the electricity supplied into the state-level transmission systems is lost because of both technical and nontechnical reasons, and cost recovery from tariffs is only about 80–90 percent in most countries. As a result, the financial condition of the sector remains fragile, resulting in slow commercialization and a high degree of budget dependence. In Bangladesh, increasing losses of the power board have led to delays in payment to the independent power producers and the natural gas sector’s inability to maintain reliable gas supply to the power sector. In India, distribution losses were estimated at approximately \$9 billion during 2009–10. To the extent that industrial tariffs continue to cross-subsidize households and farmers, the sector is exposed to a high degree of politicization. With a few exceptions, processes for ensuring regulatory independence, competence, and accountability need significant improvement.

243 Sustainability and climate change considerations are increasing in importance. The sector development strategies of the larger countries in SAR—India, Pakistan, Bangladesh, and Sri Lanka—all include an increased reliance on coal to meet their energy requirements over the short to medium term. India is the main player in terms of CO₂ emissions. It is currently the sixth largest GHG emitter in the world and accounts for 4 percent of global GHG emissions, although per capita emissions are low. Coal-fired power plants comprise 53 percent of total capacity in the country, with the sector responsible for 50 percent of the country’s CO₂ emissions. While these emissions are likely to continue to grow until at least 2040, India has significant potential for following a lower or higher carbon growth path, depending on its policies, institutions, and the international support it receives, as outlined in the June 2010 World Bank report “Energy Intensive Sectors of the Indian Economy: Path to Low Carbon Development.” If the government were to implement the full set of policies identified in its 2006 Integrated Energy Policy report, there is scope for reducing emissions relative to the reference scenario by about 30 percent by 2030. Key measures include (1) improving the efficiency of supply and consumption of energy; (2) expanding the proportion of natural gas, hydropower, and nuclear power in the fuel mix; and (3) reducing energy intensity in the transport sector.

244 Despite these daunting challenges, there has been significant progress, and the WBG has played its part. Through lending and nonlending support, the WBG has played an important role in

fostering promising examples of successful and potentially enduring reforms that auger well for the sector:

- **Model organizations**, such as the Rural Electrification Board, Power Grid Corporation, and independent power plants in Bangladesh; the National Thermal Power Corporation, PowerGrid, and some state power companies in India; the Ghazi-Barota hydropower company in Pakistan; and several regulatory bodies including India's Central Electricity Regulatory Commission, and state commissions in Andhra Pradesh and Maharashtra
- **Broad governance and service improvements** in Andhra Pradesh, Maharashtra, and West Bengal in India; in rural Bangladesh; and in Karachi
- **Private investment** through successful procurement and operation of independent power producers in Bangladesh and Pakistan (more than 2,000 MW of IFC-funded projects); the commissioning of the 1,020 MW Tala hydropower project in Bhutan, primarily for export to India, along with investment in private hydropower generation in India and Pakistan such as investments in AD Hydro (India) and Laraib (Pakistan); support of private sector liquefied natural gas terminals in India (Petronet) and Mashal (Pakistan); successful privatization of distribution services in parts of India (but with scope for further improvements); and support of private sector investment in distribution in Pakistan with the financing of Karachi Electric
- **Subnational finance** such as a nonsovereign guaranteed World Bank–IFC subnational loan to the Maharashtra State Transco
- **Renewable energy development** for rural areas in Bangladesh (solar home systems), Nepal, and Sri Lanka; investment in biomass power and grid-tied solar power in India
- **Policy frameworks** such as India's Electricity Act of 2003, as well as greater and better organized pressure on political leaders and service providers from civil society and consumers to deliver better services at fair prices

World Bank Group's role and strategy

245 **The mission of SAR's energy unit is to reduce poverty by helping the countries in the region formulate policies and implement programs that improve the efficiency and expand the reach of energy infrastructure and services.** IFC, with its focus on the private sector, shares the World Bank's mission to fight poverty with passion and professionalism for lasting results. Better access to good-quality and efficient energy services not only leads to higher economic growth and household incomes, but also improves human development and enhances the quality of life—particularly for those who do not presently enjoy access to modern energy services.

246 **The World Bank's regional energy sector strategy supports institutional development and prioritizes strengthening of the sector's accountability frameworks.** In responding to the challenges detailed above, the World Bank's assistance strategy in SAR draws on experience over the last decade in supporting reform-intensive energy programs. It recognizes that the varying quality and general weakness of sector institutions is the key constraint on development of the sector.

247 **IFC's regional strategy has three pillars: climate change, inclusive growth, and regional integration.** IFC's strategic pillars are well served by investments through the private sector and public-private partnership models in the energy sector, especially with a focus on low-carbon growth. IFC will selectively support oil and gas production investments that are expected to generate sustainable development benefits for countries and communities. It will reinforce the WBG's engagement concerning governance by continuing to set standards for the private sector in areas such as revenue

payment disclosure and contract disclosure. It will also partner with investors and others to help enhance the direct benefits communities receive from the projects affecting them.

248 The World Bank's regional energy program is aimed at creating and/or strengthening institutions for effective service delivery and regulation, facilitating the effective functioning of domestic and regional electricity markets, and promoting clean energy options to meet country demand. To deliver its program of financial, technical, and analytical assistance most efficiently, the SAR energy unit has developed three core business lines:

- **Energy distribution services.** This set of engagements concentrates on improvement of quality and efficiency of service delivery through support for distribution utilities, including for organizational transformation, corporate governance, and business practices. It also includes attention to improving rural supply and moving toward universal access.
- **Regional and domestic energy markets.** By focusing on the expansion of transmission capacity at both the regional and national levels, this business line facilitates the development of efficient electricity markets and interregional power transfer. It provides technical support on load dispatch functions and energy trading within the broader objective of enhancing sector governance through assistance to regulatory and competition authorities.
- **Clean energy development.** This business line covers clean power generation through support for hydropower projects, renewable energy development (including distributed generation for improved rural access and services), and solar power (both thermal and photovoltaic). It also includes a focus on energy efficiency through support for the rehabilitation of thermal power plants, for enhancing the efficiency of power transmission and distribution through loss reduction and smarter grids, and for demand-side measures to increase energy efficiency.

249 Going forward, the SAR energy program will continue to employ lending and nonlending instruments to address both first- and second-generation issues in the sector. First-generation issues include access, asset creation and maintenance, sector and corporate governance, efficiency; while competition, private sector participation, securing reliable energy supplies, climate change, and regional energy trade are among the salient second-generation issues. Policy frameworks for reform and investment are evolving at different rates in the various countries, but implementation and institution/capacity building remain a major challenge. The World Bank's regional program involves close collaboration with other sectors as well as with IFC, MIGA, and other development partners.

250 The World Bank's regional energy program will continue to seek selective, in-depth, long-term engagements with key sector institutions, with a focus on improving technical, commercial, safeguard, and fiduciary practices. For instance, the World Bank has introduced ideas such as resource corridors and the use of tools like river basin analyses and cumulative impact assessments in its environmental analysis of hydro projects. It is also exploring mechanisms to share benefits with local populations that are linked with livelihood programs. The World Bank is bringing new technologies to the attention of counterparts, working to improve the transparency and objectivity of procurement practices, and making efforts to increase the effectiveness of dispute resolution mechanisms. With core objectives of supporting the development of a low-carbon growth path for the sector and improving service delivery across the supply chain and to the last mile, the strategy reflects the view that institution building, business process reengineering, and improvement of business fundamentals are more likely to yield sustained results and better outcomes than one-off project-level interactions. As exemplars of good practice, strengthened institutions can themselves build implementation capacity in other institutions and have broader "knock-on" systemwide effects that would dwarf the original World Bank intervention (as is the case with Power Grid in India, which now provides technical assistance to state transmission utilities across the country). In addition to service providers (supply chain) and policy makers/regulatory

authorities, the World Bank will also continue its active engagement with stakeholders on the demand side of good services and governance.

251 **IFC's focus areas in the region will continue to be low-carbon alternatives for energy generation and addressing inefficiencies in the energy infrastructure.** This will be accomplished through investments in transmission and distribution projects. IFC has been taking the lead on catalyzing several renewable energy investments using new technologies (such as various solar technologies and applications) through the private sector.

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