KIPPRA Policy Brief

Improving public policy making for economic growth and poverty reduction

Strategies for Securing Energy Supply in Kenya

There is a close relationship between economic growth and quality of life, on one hand, and demand for energy, on the other. A country cannot experience high levels of economic growth if energy supplies are constrained. Lack of adequate and reliable supply of energy reduces the potential for achieving major structural changes in rural and urban economies. There is also the critical relationship between energy and the environment. The environment provides raw materials for the energy industry. The environment, on the other hand, is the recipient of the residues of energy production and consumption, and fossil fuels are the largest contributors to air pollution. The emissions, especially carbon dioxide, methane, nitrogen and sulphur oxides are responsible for changes in the atmosphere that are affecting the global climate.

Unsustainable increased use of biomass energy causes deforestation and land degradation. Since energy is crucial to achieving sustainable development goals, the challenge lies in finding ways to reconcile this necessity and demand for energy with its impact on the natural resource base.

Given the central role of energy in the economy and also its potential for poverty reduction and wealth creation, it is critical to assess how Kenya can secure energy supply in the future in order to achieve Vision 2030. Currently, there are serious constraints in energy supply in Kenya, which include low access to modern energy services, high cost of energy, irregular supply and high cost of energy investments. The ambitious Vision 2030 targets will exacerbate this problem.

Policy Issues

There is a huge unmet demand for electricity in Kenya. In 2000, the unmet demand for electricity was approximately 25 per cent. The biomass energy deficit was estimated at 60 per cent in 2004. Access to forms of modern energy is very low. The per capita consumption of electricity in Kenya is very low at 121 kWh compared, for example with 12,235 kWh for US, 6172 kwh for South Korea, 1970 kwh for Brazil, 769 kwh for China and 411 kwh for India. The national access rate for electricity of about 15 per cent is below the average of 32 per cent for developing countries.

Another problem with energy in the country is the high cost. The price of petroleum products has not only been rising in the world market but also in the domestic market. At times, the domestic price has remained high despite drops in international crude oil prices and an appreciating domestic shilling. Diesel

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is 71.1 per cent, 44 per cent, and 87 per cent cheaper in Malaysia, China and Egypt compared to Kenya, while motor spirit is 60 per cent, 48 per cent, and 70 per cent cheaper, respectively. The cost of electricity in Kenya is also high. For instance, the cost of electricity is four times the cost in South Africa, the country's main competitor in the region, and more than thrice the power tariffs in China. This high cost is compounded by irregular supply. On average, Kenyan firms lose 9.5 per cent of total output as a result of power outages and fluctuations. This loss excludes the loss from damaged equipment as a result of power fluctuations, which for some firms averaged Ksh 1 million in 2001.

Another related problem with energy is security of supply. Given the uncertainties (both price and availability) surrounding continued supply of petroleum from the Middle East, and changing weather patterns yet hydropower is the major source of electricity, security of energy supply is very critical.

Policy Questions

In order to secure sustainable supply of energy in Kenya, we need to ask ourselves various policy questions:

- What is the status of the energy sector in Kenya?
- What lessons can Kenya learn from other countries in coping with energy challenges?
- How can Kenya cope with energy challenges and, in particular, meeting energy requirements that are crucial in achieving economic objective of Vision 2030?

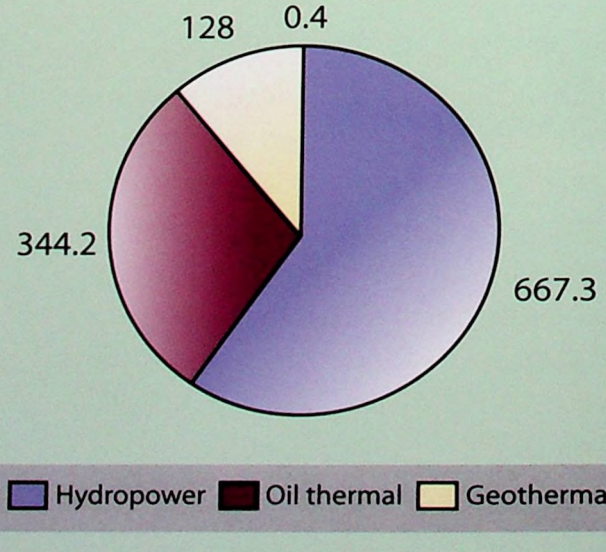
Overview of the Energy Sector

Sources of energy

There are three main sources of energy used in Kenya: wood fuel, petroleum and electricity accounting for 70 per cent, 21 per cent, and 9 per cent, respectively, of total energy consumption. Renewable energy is also becoming important although it remains insignificant in the country's overall energy mix.

The major sources of electricity are hydropower, geothermal and thermal. The installed power capacity as at June 2006 was 1,155.0 MW, distributed as follows: Hydro Power 677.3 MW, Oil Thermal 344.2 MW, Geothermal 128 MW, and wind 0.4 MW (KPLC, 2006; Figure 1). The key players in the power sector are Kenya Power and Lighting Company (KPLC), Kenya Electricity Generating Company (KenGen), Independent Power Producers (IPPs), Energy Regulatory Commission (ERC) and the Ministry of Energy. The generation of electricity has several players, chief among them being the state-owned KenGen and four IPPs (Tsavo Power, Iberafrica, Power Inc and Agreko.

Figure 1: Effective power generation in Kenya (MWs), 2006.



KenGen accounts for about 82 per cent of the country's total installed generation capacity, while the three large IPPs account for about 18 per cent of electricity generated. Agreko has been brought in under the emergency power generation plan. Mumias Sugar Company has also been supplying power to the national grid since September 2005. KPLC has power purchase contracts with KenGen and the IPPs. The effective capacity is 1,075 MW against a peak demand of 1050 MW.

IPPs entered the domestic market in late 1997 with a combined capacity of 87 MW. The entry of IPPs into the sub-sector was in response to shortages in power supply. While contracts with IPPs were initially rigid and the unit cost of their electricity very high, the contracts are now much more flexible and can be stopped or revised within a short period.

Petroleum energy is exclusively imported and is mainly used in transport, commercial and industrial sectors. The country's imports of petroleum products accounted for about 16 per cent of the total import bill in 2002 and consumed about 31 per cent of the country's foreign exchange earnings from merchandise exports.

Kenya's oil imports have not seen major shifts apart from the sharp increases during the power crisis of 1998 to 2000 when the country imported extra tonnes of oil to meet increased demand for thermal electricity generation. In 1998, the country imported 2,157.7 tonnes of crude petroleum and 1,387.8 tonnes of petroleum fuels. This declined to 1,493.4 and 1,023.5 tonnes, respectively in 2002 mainly due to the increase in hydro electricity generation and ease of power crisis in the country. Fuel consumption rose from 2,633,626 cubic meters in 2003 to 3,730,620 cubic metres in 2006. Despite the zero rating of Liquefied Petroleum Gas (LPG) in 2004 and the Common External Tariff in 2005, consumption of LPG is still low.

With biomass energy, wood fuel has remained the most important source of energy in Kenya, accounting for about 70 per cent of the country's total energy consumption. About 80 per cent of the population depends on it for domestic needs, providing 90 per cent and 85 per cent of rural and urban households' energy requirement, respectively. This state of affairs has major implications on sustainable development. Unsustainable harvesting, without efforts on reforestation and on-farm planting of wood lots, often leads to deforestation and land degradation.

Alternative sources of energy include solar energy, windmills, power alcohol and biogas. Programmes for their increased development and use have been formulated and are intended to supplement and conserve, where appropriate, other major sources of energy. Since they are renewable, these sources of energy have the potential to contribute to social, economic and environmental dimensions of sustainable development.

Policy, legal and regulatory framework

Kenya has effected a number of policies to address energy issues in support of its development challenges. These include formulation of a national energy policy and improvements in the energy planning process amongst others.

The national energy policy has a number of broad objectives, including ensuring adequate, quality, cost effective and

affordable supply of energy to meet development needs, while protecting and conserving the environment. These are contained in the Economic Recovery Strategy (ERS) and Sessional Paper No. 4 of 2004 on Energy.

The Energy Act 2006 addresses the current disparities in the energy sector regulations and brings regulation and enforcement of energy sector activities under one body, the Energy Regulatory Commission (ERC). The Act also created the Rural Electrification Authority (REA) to manage the Rural Electrification Programme and the Rural Electrification Fund.

Lessons from Other Countries

Experiences from already developed countries (US and EU), rapidly grown countries in the recent past (China), innovators in energy utilization (Brazil) and those that Kenya aspires to catch up with (South Korea, Malaysia, and South Africa) show that energy challenges are still considerable. Most of them rely on cheaper sources of electricity such as coal, have their own domestic sources of petroleum and gas, and are also undertaking further exploration both locally and internationally. Co-operation in energy provision and diversification of importing sources of petroleum products are also being pursued to increase energy security. The use of renewable sources of energy is still lagging behind although there are on-going efforts (largely fiscal incentives) to increase their contribution to the energy share.

Denmark, Germany and Spain rely on wind energy and they have been able to do this through generous government subsidies. With the exception of Malaysia and South Africa, nuclear energy is a significant share in the energy mix. Brazil is the most successful with biofuel but this has come from use of compulsory legislation in blending. The US is also considering legislations and a package of incentives to increase production and use of biofuels. These countries are also supporting programmes in energy conservation and efficiency and Research & Development. Considerable changes in policy, legal and regulatory frameworks have been undertaken in order to stimulate private sector participation and increase efficiency.

A key strength in Kenya is that the country has relatively been able to meet her energy needs compared to the neighbours—Tanzania and Uganda—that have had persistent power shortages. Per capita consumption of power in Tanzania is 46 kWh while only about 3 to 5 per cent of Uganda's population has access to electricity. Kenya accounted for almost 60 per cent of commercial energy consumption in the Great Lakes Region in 2001. In the same year, Kenya consumed 3.98 billion kilowatthours (Bkwh), Tanzania 2.75 Bkwh and Uganda 1.62 Bkwh. The installed grid capacity (MW) by 2003 was Kenya 1,160, Uganda 240, Tanzania 863, Ethiopia 450 and Eritrea 60.

A number of proactive measures have been undertaken to address challenges in the energy sector. These measures include: revamping KPLC management, publication of Sessional Paper No. 4 of 2004 on Energy, the general development of the sector under the World Bank-funded Energy Sector Recovery Project, and enactment of the Energy Act 2006. Other interventions include oil, gas and coal exploration, on-going biofuel initiatives, co-generation from sugar factories, wind and solar initiatives,

afforestation and agro-forestry, and energy conservation and efficiency.

The main weaknesses in the energy sector in Kenya include high cost of energy, high cost of energy investments, low access to modern energy services, inefficiency, inadequate data, inadequate capacity, inadequate legal and regulatory framework, environmental degradation and inefficiency. However, there are opportunities that are emerging while others need to be initiated that include diversification of sources of petroleum products, availability of renewable technologies, regional initiatives and possibilities of nuclear energy. The main threats facing the energy sector in Kenya are climate change, insecurity, and volatile world oil prices.

Secure Energy Supply

The strong correlation between GDP growth and energy demand means that future demand levels, security of supply, energy mixes, production levels and general market dynamics will increasingly become key issues. The following strategies need to be considered in order to secure Kenya's energy supply.

Increase the supply of energy services

Energy demand will continue to rise as population rises and the need for services increases. Thus, measures are needed to increase the supply of energy services. This includes promotion of small hydro projects, co-generation with sugarcane factories, increased use of natural gas to generate electricity, enhancing wind power generation, and increasing geothermal production. Fiscal incentives such as tax holidays for investors and duty exemption for imported hardware in these areas should be considered. Investors in power projects in the rural areas may require considerable longer tax holidays.

Currently, there are measures being undertaken to ensure adequate supply of petroleum products. Kenya Pipeline Company (KPC) is fasttracking capacity enhancement of the Mombasa Nairobi pipeline which, on completion, will double the current flow rate of 440,000 litres an hour. There are also on-going efforts to increase the supply of LPG.

Biomass supply strategies include on-farm agro-forestry, village woodlots, community forests, afforestation and re-afforestation programmes, appropriate technologies for production of charcoal, and promotion of improved cooking stoves and charcoal kilns.

Introduce policy, legal and regulatory reforms

The envisaged ERC must encourage and enhance competition to ensure that lower prices and more value-added services are realized. Competition will encourage innovations that may ultimately reduce consumer prices. This can be achieved through adoption and enforcement of fair, clear and effective market rules and by ensuring that consumers are provided with sufficient information to make informed energy-related decisions. Unbundling of transmission and distribution of electricity should therefore go on.

In the petroleum sub-sector, incentives are needed to encourage the entry of independent dealers to enhance competition. Policies are needed to be developed with regard to wood fuel, charcoal, and biofuel. The envisaged

ERC, in co-operation with other agencies, also needs to develop and maintain an energy emergency response plan to mitigate any unforeseen disruption.

Energy conservation, efficiency, and technological advances

Energy conservation and efficiency are tools to achieve lower costs, reduce harmful environmental impacts, improve productivity and provide greater value to consumers. Energy conservation is a matter of changing attitudes, thus increased awareness can make a positive impact. Continued and enhanced information/ education of consumers about the advantages of energy conservation and efficiency is critical. The government can act as an advocate for energy efficiency and sustainability through public education, training, and procurement programmes. Since energy efficiency is seriously under-funded, the government, in partnership with the private sector and civil society organizations, should increase funding for energy efficiency programmes, and provide incentives to utilities and energy companies to undertake advocacy activities. All the efficiency increasing opportunities along the energy value chain should be exploited.

Research, Development and Demonstration (RD&D)

Government supported RD&D may bring technological advances that help reduce reliance on fossil fuels. Thus, there is need to provide public funding for energy related RD& D technologies, processes and services. Domestic, regional and international partnerships should be sought.

Because of the high risk inherent in R&D investments, the government should grant more direct, up-front grant support based on the concept of risk sharing to the private sector. The country should consider incentive schemes to boost R&D activities, particularly to encourage the private sector. These schemes could largely be tax-based.

Reduce oil dependency

Oil's total dominance as a transportation fuel is a cause of concern. However, plug-in hybrid engines, biofuels and other technologies can reduce Kenya's oil dependency. Fiscal incentives such as duty free importation of hybrid vehicles, government procurement of such vehicles for its fleet, and legislation on compulsory blending of fuel are likely to be helpful.

Broaden and change the energy mix

There is need to diversify the energy resource base as much as possible. This can address the risks of supply disruptions or price volatility of a single fuel. Strategies to encourage supply and use of alternative fuels is the best way forward.

Strengthen public institutions

The capacity of public institutions in the energy sector needs to be enhanced through additional financial and human resources for them to fully discharge their mandate. Increased collaboration with civil society organizations should also be facilitated to ensure better outcomes. The on-going privatization in KPLC and KenGen should continue in order to inject efficiency.

Exploration

The government must continue to encourage exploration of oil, gas, coal and geothermal

in the country. Thus, there is need to increase government and private sector funding for oil, natural gas, coal and geothermal exploration. The planned establishment of Geothermal Development Company is expected to undertake geothermal resource assessment including exploration, appraisal and production drilling in prospective areas.

Attracting internal and external financing

Both internal and external financing is needed for energy investments since sources for domestic funding are limited. The government can finance environmentally and socially preferable energy options through financial incentives and low-cost loans. Incentives to attract capital from external sources for energy investments are both desirable and urgent. The envisaged Rural Electrification Authority could, with the help of community leaders, use resources from the Constituency Development Fund (CDF) to finance small and micro power projects in the rural areas. The country could also explore funding opportunities provided by the Clean Development Mechanism facility.

Regional co-operation

Regional energy development co-operation with other countries in the region offers an effective and mutually beneficial option. It is critical for Kenya to be proactive in forging cross-national partnerships in exploration, investment, transportation, and distribution. Opportunities abound with coal and natural gas in Tanzania, oil in Sudan, Tanzania, and Uganda, and hdro power in Uganda and Ethiopia. Kenya ought to adopt the model of China in seeking such partnerships.

Conclusions and Policy Implications

Evidence from other countries shows that Kenya can cope with energy challenges even with the ambitious Vision 2030 targets. However, there is need for appropriate interventions that secure the supply of energy services in the country.

- Incentives are required to promote the development and use of renewable energy. Tax incentives such as duty waivers, duty reduction and removal of VAT on imported components of renewable energy technologies are needed to promote their uptake. There is need for the government to consider a 100 per cent depreciation allowance in the first year of operation, tax holidays of up to 10 years for power plants using renewable energy, and tax holidays on dividends income made from investments on domestic sources. Provision of credit facilities for consumers and entrepreneurs to acquire renewable energy hardware is also crucial. The government could give incentives to financial institutions to encourage such lending.

- The government should aim to reduce oil dependence by procuring hybrid vehicles for its fleet, tax incentives for importation of such vehicles, and legislation on blending with biofuel.

- Energy conservation and efficiency should be encouraged. The government should act as a catalyst by increasing procurement of energy efficient products. Proposals to reduce vehicle congestion, for example through mass transport systems, bypasses, and enhanced roads maintenance programmes; land use planning that

locates jobs, services and housing in close proximity; price and tax incentives; standards and labelling; creation of energy efficiency funds by financial institutions; and requiring mandatory energy efficiency audits by financial institutions as a prerequisite for lending could be considered.

- Increased oil, gas, coal and geothermal exploration can be done through increased government funding for these activities, encouraging public-private partnerships, and up-front government grant support to reduce risks to the private sector.

- Support for research and development in the energy sector through international partnerships for R&D programmes are important. Incentive schemes that are largely tax-based to encourage the private sector could be considered.

- Consistent harmonization and integration of energy policy with other related sectoral policies is crucial.

- Strengthening public institutions to supply energy services and also improve long term planning through increased funding and staff development are crucial. Improved ministerial co-ordination is important especially with regard to long term planning so that energy needs for each sector are factored in. Capacity building for communities is also important in order to promote agroforestry and community woodlots.

- Nuclear energy should be considered as a long term measure to increase the energy mix and also cope with supply challenges.

- Proactive measures in regional co-operation in the provision of energy services are needed. Considerable opportunities exist through regional collaboration for Kenya to access energy in the region cost-effectively. This should include exploration, investments and distribution. Diversifying sources of imported oil and also importing alternative fuels further increases energy security.

- Finally, an energy policy research institute should be established. Given the complexity of energy issues, it is opportune to have an energy "think-tank".

About KIPPRA Policy Briefs

KIPPRA Policy Briefs are aimed at a wide dissemination of the Institute's policy research findings. The findings are expected to stimulate discussion and also build capacity in the public policy making process in Kenya.

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