INTRODUCTION AND OBJECTIVE

The Angolan government invited the International Energy Agency (IEA) to conduct an in-depth review of its energy sector, based on the peer review mechanism for IEA member countries. The objective was to assist the government in its efforts to develop energy policies consistent with international best practice.

The IEA sent a review team to Angola in May 2005 to collect information and to conduct interviews with senior energy officials and other stakeholders. The present report, which includes recommendations for priority action, is the result of the review team’s work.

CONTEXT

In 2002 Angola emerged from almost three decades of civil war that left much of its infrastructure destroyed or damaged and a large part of its population displaced. Largely as a consequence, Angola currently ranks low among African countries in many human development indicators. Increasing access to modern energy sources in a sustainable manner could help improve livelihoods directly, as well as indirectly through the promotion of economic development.

The focus of this report is on those energy sub-sectors likely to play the largest role in meeting domestic demand for modern energy services; notably electricity and oil products. Given the extremely large role biomass currently plays in meeting the bulk of most households’ energy needs, this sub-sector is also featured, with emphasis on improving the sustainability of its use.

The important upstream oil sub-sector is also covered, but is not meant to be a focus. Most benefits to the country from oil production, which is almost entirely
offshore, accrue in the form of export revenues. These are currently critical to the Angolan economy, representing over 80% of the government’s budget and 52% of GDP in 2004. (The government’s share of oil revenues that year was approximately USD 5.7 billion or about 45%.) A well-formulated upstream oil development policy can help improve the sustainability of these revenue flows. However, the main bottleneck in the flow of benefits from this sub-sector to the population in Angola’s case does not appear to be the size or sustainability of such revenues – already large and expected to increase significantly. Rather, as for many other oil-producing countries, the main bottlenecks appear to be related to government revenue management and budgeting, issues beyond the realm of energy policy and not the focus of this report. Nonetheless, Angola has made progress in revenue management and transparency in recent years, e.g., by publishing the critical diagnostic of its oil revenues performed by consulting firm KPMG, identifying most oil revenue flows and creating a unified budget that incorporates spending that was previously off-budget.

While Angola is potentially rich in terms of oil export revenues, we have made our recommendations based on the assumption that significant funds from this source may not be available for investment in other energy sub-sectors and in the general economy for the next 4-6 years. This is due in part to the government’s past policy of relying on oil-backed loans, which effectively mortgaged a large portion of oil revenue flows. Furthermore, revenue streams from many new projects will take several years to begin accruing to the government, since the oil companies will first need to recover their investment costs, which have been relatively high in Angola’s deep and ultra-deep offshore regions. So far the international community has proven reluctant to fill the financing gap in the absence of what it generally has considered to be insufficient progress by the government in coming to agreement with the International Monetary Fund (IMF) on needed financial reforms. Finally, any investment of government funds in the energy sector will need to compete with other pressing social needs, e.g., in health and education.

The report therefore takes as its point of departure that government investment resources available to the energy sector could be scarce in the short-to-medium term, that such funds will need to be carefully prioritised, and that emphasis should be on attracting private investment through improved transparency of oil revenue management and also more generally. In a broader perspective, there is a strong need to diversify economic activity in order to ensure more sustainable growth and employment.

Another important contextual issue is the poor state of statistics in Angola, both in terms of availability and quality. This hinders analysis of the economy, the establishment of priorities among competing investment needs, and the eventual development and execution of appropriate policies.
**OVERVIEW OF ENERGY SUB-SECTORS AND CROSS-CUTTING ISSUES**

This section provides an overview of the main energy sub-sectors, including brief descriptions of infrastructure, institutions and main issues. It helps set the context for the recommendations that follow.

**Electricity**

Most existing infrastructure in the electricity sector was built well before independence, which occurred in 1975. Much was damaged during the civil war or has not received routine maintenance, in part due to war-related access problems. Only a small percentage of the population has access to electricity, and service is
generally unreliable. Improving access to electricity services is critical to Angola’s economic and human development.

State-owned ENE has 900 MW of installed capacity on three non-interconnected networks and several smaller isolated grids. Only about 70% is operational, though this is an improvement over the civil war period. Hydro accounts for a little over 60% of installed capacity, while the rest is primarily diesel-fired thermal.

Generation in the Northern grid contains significant overcapacity, though major outages occur in all three networks due in large part to significant problems in transmission and distribution. The Central and Southern grids are often supply-constrained. A major goal of the government and ENE is to interconnect the three main systems to exploit the North’s over-capacity. There are hopes that a proposed power transit project from the Democratic Republic of Congo to South Africa could link Angola’s three major grids along the way.

State-owned EDEL is responsible for distribution in the capital, Luanda, which accounts for over 65% of the country’s consumption.

There are also a number of small grids, some of which were once part of larger systems but now isolated due to damage to the transmission network. Many municipal authorities in large towns also run their own isolated generation and supply services. In addition, most industries and many households have their own backup generation to compensate for frequent outages of grid supplies, leading to very high electricity costs for many consumers in practice, despite low tariffs.

Almost all isolated and backup systems run on diesel. Extremely poor conditions on road and rail networks make fuel supply to these isolated systems difficult.

The Ministry of Finance sets electricity tariffs that are uniform throughout the country. These currently are at levels that do not cover costs. There are plans to raise tariffs to cover long-run costs to ensure sufficient investment income for rehabilitation and expansion. However, low bill collection rates may be a more serious problem.

Estimates for the share of population with access to electricity vary from 8% to 20%. This wide range is due primarily to uncertainties regarding the size and number of isolated municipal grids and household generating sets, the number of illegal connections, and even uncertainty about the size of the country’s total population.1

As of mid-2006 the government had yet to decide ENE’s final structure. According to MINEA and ENE, the main option currently being considered is to break the utility into a number of separate generation companies that eventually could be privatised, leaving ENE to focus primarily on transmission. There is no plan yet regarding how the eventual electricity market will look, including how independent generating companies and possible new private entrants would sell their power.

1. Estimates vary by source as widely as 12-19 million, though most fall between 14-17 million.
Although Angola is a member of both the Southern African Power Pool (SAPP) and Energy Pool of Central Africa (PEAC), it currently does not have any interconnections with its neighbours, apart from isolated lines serving several towns on the country’s southern border with Namibia.

**Upstream oil**

Crude oil has been commercially exploited in Angola since its discovery onshore in 1955. Commencement of production offshore the coastal enclave of Cabinda followed shortly afterwards. The sector has grown rapidly since then, and especially after 1980, facilitated by the successful attraction of large foreign investments and technological expertise from the major international oil companies. Angola is now sub-Saharan Africa’s second largest oil producer after Nigeria, producing approximately 1.46 million barrels per day in 2006. Production is expected to come increasingly from deep-water offshore fields, with higher production costs and more challenging technological requirements, as shallower, more mature fields closer to shore gradually decline.

Angola’s upstream potential is likely to remain promising throughout the next decade, due to its favourable geology and reserve base, recent exploration successes, and relatively attractive fiscal terms, as well as recent and anticipated advances in deep-water production technology. Along with a heightened competition for scarce hydrocarbon resources internationally, these factors have helped renew interest in the Gulf of Guinea as a major oil supply source, and are likely to ensure that Angola becomes an increasingly important exporter to international markets, particularly the United States and China. Based on oil companies’ investment plans, production capacity is expected to double by 2010.

The capital-intensive oil sector continues to dominate Angola’s economy. Record high crude oil prices have led to a huge government tax windfall (USD 1.71 billion in 2004 according to the Ministry of Finance). Oil revenues now represent approximately 80% of the government’s budget and 45% of its gross domestic product. Angola’s economic development will depend heavily on how it manages and uses these revenues. The government’s record to date has been mixed, due in large part, it notes, to the situation created by the long civil war.

In 2004, a new petroleum law came into force that seeks to standardise future production sharing agreements and further clarify the roles of the Ministry of Petroleum, Sonangol and the operating companies, in an effort to attract more private and foreign investment.

**Downstream oil**

The downstream oil sector in Angola covers refining, trade, distribution and sale of petroleum products.

Until recently, Angola’s one refinery covered most of the country’s domestic consumption. Since the 2002 cease-fire, both consumption and imports of key products such as gasoline, diesel and jet fuel have increased substantially. While Angola is nominally a net exporter of oil products, this is mostly due to exports of fuel oil.
Use of LPG by households for cooking is widespread in larger cities and suburban areas, but heavily subsidised. Although the country produces some LPG in its refinery and offshore, the latter is mostly exported, while most LPG used domestically is imported.

Most domestic oil product prices in Angola are subsidised. Over the past few years the government has been raising prices gradually in an effort to eventually eliminate subsidies, but has had to contend with dramatically rising world oil prices that move the “goalposts”.

Prices that are fixed below cost and uniform throughout the country give few incentives to private companies to engage in distribution and sales of oil products, especially outside Luanda, and can also be seen as a cause of cross-border smuggling of oil products. The few exceptions benefit from subsidised wholesale prices from Sonangol. The government plans to create a competitive distribution market within the next few years, include unbundling Sonangol logistics and storage from its service stations, but has yet to fully clarify the details and regulatory framework. Efficient distribution is also severely hindered by the poor conditions of roads and railroads.

Angola’s one refinery, located near Luanda, is inefficient and its output subsidised. Sonangol plans to build a new export-oriented refinery in Lobito to process the deep-water sour crudes that are forming an increasing share of the country’s oil output, though has yet to find a strategic partner.

Gas

Almost all gas reserves and production in Angola are associated with oil. Approximately 70-80% of associated gas is flared. The government has declared that all new fields must be zero-flare and that routine flaring should cease at existing fields by 2010. Flaring reduction plans generally have focused on re-injection and a proposed project to build an onshore liquefaction plant in Soyo for LNG exports.

There is currently no gas infrastructure or gas use, with the exception of LPG for cooking (see, Downstream oil). Projects to use gas domestically could be developed as spinoffs to the LNG scheme, but likely would be limited to the area around Soyo, some 300 km away from the main potential demand centre of Luanda. Other barriers to an eventual gas industry include lack of a clear government strategy and regulatory framework for onshore gas transportation and marketing, as well as lack of ownership rights to the gas by the oil companies that produce it.

Biomass

Some 80% of Angolans rely on biomass for most of their energy needs. Wood fuel is mostly used in rural regions, while charcoal is preferred in peri-urban areas, due to its lower transport weight. Most of the unsustainable use of biomass appears to come from cutting trees for making charcoal to supply peri-urban areas.

Angola’s biomass resources are substantial. Due in part to the long-running civil war, such resources have been left relatively undisturbed in many parts of the country. However, severe local deforestation has occurred around most large cities, e.g., extending for a radius of 200-300 km around Luanda. Such deforested zones are
growing yearly, in turn raising the transport costs of charcoal, which make up the largest part of the price.

The inefficient use of biomass in Angola can lead to serious health damage from indoor smoke pollution. Smoke from inefficient cookstoves contains thousands of health-damaging substances, which provoke respiratory diseases, such as asthma and acute respiratory infections; obstetrical problems, such as stillbirth and low birth-weight; blindness; and heart disease.

Important issues for the government to address in order to ensure sustainability of biomass use include efficiency of the charcoal production process (e.g., more efficient kilns), efficiency and safety of end-use (e.g., more efficient and safer stoves), and addressing the lack of energy alternatives.

Given that biomass use is primarily a function of poverty and lack of energy alternatives, biomass policy ideally should be set in a coordinated way that deals with the full supply chain. While the Ministry of Forestry monitors biomass resources and issues licenses for charcoal production and trading, no government department covers the policy issues that influence the demand for biomass. Moreover, the forestry ministry’s resources appear to be inadequate to its limited tasks, as the bulk of biomass production and trade reportedly is unlicensed.

PRIORITY RECOMMENDATIONS

This section presents priority recommendations, keeping in mind current limitations on financial and administrative resources. These priorities could form the basis of an eventual energy strategy. The priority recommendations are followed by a list of additional recommendations.

Electricity: improve collection before raising tariffs

The electricity sector requires significant investments but is not able to generate sufficient funds for a number of reasons. These include not only tariffs that do not cover costs, but low collection rates. Simply raising tariffs may in fact increase the non-payment problem if not accompanied by efforts to improve billing and collection.

While raising tariffs to cover costs and investments will be necessary, the government, after consultation with the utilities, should focus immediate attention on finding ways to encourage increased collection of existing tariffs. This could include the government imposing more rigid budget constraints on the utilities.
Electricity: improve information and metering systems

It is difficult to make informed policy and prioritise investments without adequate statistics and the information systems to produce them. Most electricity sector statistics are incomplete and/or outdated. Virtually no statistics are available concerning self-generation in major urban areas, or generation, transmission and distribution by provincial and municipal governments. Comprehensive and reliable information concerning the demand, generation and use of electricity and its flow throughout the system, from each generating unit to each end-user, is important to all electricity sector activities, including sector governance, planning, finance, tariff design, control of losses, billing, collections, operations and maintenance. In order to greatly enable performance improvements in the sector, it is important to make such information readily available to managers.

The government and utilities should prioritise and authorise adequate funding for the design and implementation of a modern information management and performance monitoring system for the entire electricity sector, including the implementation of a comprehensive and reliable metering system to support it.

Upstream oil: continue efforts to fully implement new Petroleum Law

The upstream oil sector has been Angola’s most vibrant industry, operating successfully and attracting foreign investment for decades. Oil revenue continues to account for a significant portion of GDP and government revenues. In 2004, the government passed a new petroleum law, which seeks to standardise future agreements and to strengthen and clarify roles, including for the Ministry of Petroleum. Attracting foreign investment and technical expertise will be increasingly important as exploration and production move into deeper waters. The government should be complimented in its intention and efforts to fully implement the Petroleum Law of 2004.

In order to fully implement the Petroleum Law of 2004 the government should strengthen necessary resources in the Ministry of Petroleum and other relevant agencies so that they are able to carry out their increased duties. It should also ensure that the regulatory framework provides sufficient stability for existing contracts and for continued attraction of foreign investment.

Upstream oil: continue efforts to improve transparency of oil revenues

Angola’s economic development will depend to an important extent on how it manages and uses its oil revenues. Increasing the transparency of such flows will be key to such management. While the government’s record to date has been mixed, it has made some significant progress in recent years.
Building on recent progress, the government should enhance coordination between the Ministries of Finance and Petroleum, Central Bank and other financial, governmental and international institutions in its efforts to improve transparency in the management of oil revenues.

**Downstream oil: continue to liberalise product prices**

The reliable supply of oil products will be important for facilitating economic growth. The country currently suffers from unreliable supply, especially in areas away from the coast. Although the government is raising oil prices towards world levels, oil products are still sold below the cost of production (taking into account the rising world market price of crude oil), and the government is obliged to subsidise the difference. The situation becomes more complicated the farther one gets from supply depots on the coast, since final prices are uniform throughout the country. The subsidy Sonangol receives does not appear to be clearly related to location but a subsidy to cover its costs of supply generally.

The government should continue its efforts to liberalise product prices, which ideally should reflect the cost of transportation. However, if the government feels incentives are necessary to encourage service to certain regions (e.g., remote areas), it should make any aid transparent and available to all distribution companies. In such cases, care should be taken to avoid creating incentives for smuggling, which effectively subsidises consumption in neighbouring countries.

**Downstream oil: clarify regulatory framework for competitive oil product distribution**

The government plans to liberalise oil product distribution in order to encourage private investment and has produced an outline of its plans. However, the future regulatory framework remains to be worked out. In the meantime, Sonangol maintains an effective monopoly and remains heavily subsidised. (Although a second distributor operates in the Luanda region, it is a joint venture involving Sonangol and has a fixed margin.)

Further clarifying the regulatory framework affecting private companies in the downstream oil sector will help reduce barriers to entry, thereby increasing competition and increasing efficiency in distribution to the consumer.

**Downstream oil: prioritise investments in transportation and storage infrastructure**

Two major infrastructure bottlenecks in the product distribution system appear to be the extremely poor condition of roads used to transport products and the lack of operating storage capacity around the country.
The government should continue its efforts to improve transport infrastructure (both road and rail), required both for efficient and equitable distribution of petroleum products and for economic development more generally. It should also encourage investments to increase storage capacity.

**Gas: clarify gas development strategy and investment framework**

Because of the various risks involved in starting a gas industry from scratch, investors may be reluctant to invest the large sums necessary unless they see that the government has a clear gas development strategy that is backed by a regulatory framework to help diminish the risks — as well as a favourable investment climate more generally. Incentives may be further reduced by the fact that the oil companies usually do not own the gas they produce: According to the concession regime, all gas not used by the oil companies in their own operations (e.g., to enhance oil recovery) belongs to Sonangol.

In order to encourage companies to develop the country’s gas reserves and projects to use such gas, the government should clarify its gas strategy and investment framework. The government’s consultation of potential users and investors as a first step should be commended.

**Gas: continue efforts to reduce flaring**

Up to now, a high portion of associated gas has been flared or vented. The government of Angola is moving towards implementing a zero-flare policy, including through greater enforcement of existing legislation, stronger environmental protection measures, and development of a liquefied natural gas (LNG) project.

The government should be encouraged in its efforts to reduce flaring of associated gas, including more stringent application of existing legislation.

**Biomass: address biomass within wider framework of household energy needs**

A high portion of Angola’s final energy consumption is biomass, particularly wood fuel in rural areas and charcoal in peri-urban areas. Production of charcoal appears to contribute most to deforestation, especially around urban centres. The government has responded to the deforestation problem by banning the cutting of trees, although it is not able to enforce this in much of the country, due to a number of factors, including manpower shortages. Charcoal use is largely a response to lack of alternative energy sources (e.g., LPG and kerosene) in some areas, as well as inability to afford sufficient supplies of these alternatives in others. Addressing the deforestation problem will require a coordinated policy approach that takes into account demand-side factors.
The government should consider allocating more funds to the current programme for sustainable management of forestry resources. More importantly, however, it should seek to address the deforestation problem in a more integrated way that incorporates the demand side, including recognition of charcoal use as a response to lack of energy alternatives. This may require closer coordination between the Ministries of Energy and Water, Agriculture (Forestry Department), Urbanisation and Environment, Finance, and Petroleum.

Statistics: improve capability to collect and disseminate relevant energy statistics and other socio-economic data

Reliable statistics are an important requirement for making sound government policy, including in the energy sector. Among energy statistics, those for upstream oil appear to be of reasonable quality, but elsewhere quality and coverage need improvement. Policy development in the energy sector requires not only energy statistics, but also a wide range of socio-economic data.

The government should improve its capability to collect and disseminate relevant statistics in the energy and other sectors, and improve coordination and data sharing between government departments. It may wish to seek the assistance of international institutions, e.g., the United Nations and the International Energy Agency in this regard.

**ADDITIONAL RECOMMENDATIONS**

**Electricity**

Transfer tariff-setting powers from government to an independent regulator: in order to ensure adequate investment funds in the sector and reassure potential investors, the government should consider transferring tariff-setting powers to an independent regulator.

Clarify licensing and regulatory procedures for small systems: in order to promote electrification, the government should ensure a light-handed regulatory approach that removes barriers and clarifies and simplifies procedures for setting up small electricity generation and distribution projects.

Consider formalising informal urban and peri-urban distribution networks: the utilities should be encouraged in their consideration of ways to formalise and encourage electricity distribution networks operated by entrepreneurs as one way to increase access to electricity. This should involve eventual licensing by the regulator and inspections to ensure consumer safety. Tariff regulation is also desirable, but may not need to be an initial priority.
Publish grid expansion plans: to remove uncertainties for rural electrification entrepreneurs, the government should provide an expansion plan for the grid that is updated regularly (as called for in para. 176 of the 2002 Strategy), or at a minimum indicate areas that it will definitely not expand into for a set period of time.

Promote rural electrification by removing barriers: while the government is probably correct to focus immediate resources and attention on rehabilitation of existing infrastructure, it should not miss opportunities to promote entrepreneurial approaches to rural electrification by ensuring removal of administrative barriers while maintaining minimum safety standards through “light-handed” regulation. Success of such a programme could be enhanced by operation of a rural electrification fund to lower the financial hurdle of initial connection charges, as well as by creating or encouraging the establishment of entities to provide technical and institutional support to entrepreneurs.

Make any subsidies transparent and available to all suppliers in a particular area: as recognised by the 2002 Strategy, tariffs should reflect the cost of supply to different geographic locations and customer types. If some element of subsidy or cross-subsidy is considered desirable in particular areas, it should be transparent and made available to all suppliers in that area, including eventual private sector ones. Otherwise, private sector suppliers may face difficulties charging cost-covering rates to potential clients who can point to lower rates nearby.

Review and update electricity sector design and operating procedures: in order to ensure that large new investments and subsequent system operations are cost-efficient, the government (ideally through the regulator) should review international best practice and require modern national standards and norms to be established to guide the design, construction, and performance of the electricity sector. In establishing these important standards and norms, the views and inputs of all important electricity sector stakeholders should be sought, including representatives of existing and potential new electricity customers.

Adopt an appropriate internationally acceptable set of environmental standards to guide the expansion of the electricity sector: a lot of time and expense is required for a country to develop its own environmental study and compliance requirements. This has led many developing countries to adopt the environmental requirements of the World Bank or some other internationally recognized institution, at least on an interim basis. It is recommended that Angola examine the actions of other countries at or near their level of economic development and adopt an appropriate internationally acceptable set of environmental standards and rules to guide the study, approval, and implementation of its electricity sector and other major infrastructure projects.

Ensure adequate share of electricity investment to distribution: since the poor shape of distribution networks appears to be one of the most important bottlenecks in electricity supply, ENE and EDEL should ensure that a sufficient portion of scarce investment funds is directed to distribution. The planned refocus of short-term investment needs under the 2004 “Investment Portfolio” appears to represent an improvement over planned allocations in the 2002 Strategy in this regard.
Assess and prioritise human resource development needs for the electricity sector: given the critical importance of skilled manpower in the development of the electricity sector, and the importance of this sector to the development of the country, the government and the utilities should undertake a comprehensive assessment of short, medium and long-term human resource needs in the sector and implement a sector-wide human resources development plan.

Consider solar energy for autonomous rural energy services and for niche urban markets: the government should continue to look for autonomous options, like stand-alone PV, for meeting energy needs of rural population, including for hospitals, schools and telecommunications, with specific attention to local conditions and should develop a clearer strategy.

**Upstream oil**

Transfer of Sonangol’s concessionnaire/regulatory roles: accelerate the re-organisation of Sonangol with a view to divesting its government functions.

**Downstream oil**

Improve incentives for Luanda refinery efficiencies: the government should be encouraged in its plans to re-negotiate the terms of the protocol regulating the prices of refined products that Sonangol purchases from the Luanda refinery. This should be aimed at improving incentives to increase operating efficiencies, decreasing the need for government subsidies.

Government is right not to invest own funds in new refinery: given the pressing need for increased social investments in the country and the risk of refinery investments, the government is probably correct in its decision not to directly invest its own money in the proposed new refinery but to treat this as a commercial decision by Sonangol.

Limit protection of Sonangol Distribuidora: any protection measures intended to help allow Sonangol Distribuidora to adapt to new competition conditions should not become barriers that undermine private-sector opportunities to increase the availability of petroleum products to the public on an economically sustainable basis.

**Gas**

Consider options for promoting development of an internal gas market: in evaluating uses for gas brought to shore, the government should ensure that it fully considers options for promoting development of an internal gas market.
Cross-cutting issues

Increase human and institutional capacity to review and monitor environmental regulations and EIAs: the government’s capacity to review and monitor environmental regulations and Environmental Impact Assessments (EIAs) is low. The government should ensure adequate financing to boost such capacity. As part of such efforts, it should consider research exchange programmes with international institutions, including regional ones.

Target LPG subsidies at the initial purchase price of stoves and cylinders: in order to increase the number of people that are able to use LPG, as well as the amount of LPG Sonangol is able to bring to the market, the government should consider reducing subsidies for LPG and instead target them at the initial purchase of stoves and cylinders required for LPG use.

Invest in human capital and infrastructure as part of a strategy to help households climb the “energy ladder”: the government should increase investment expenditures on human capital and basic infrastructure (e.g., health and education, clean water, sanitation and roads), in order to increase income levels. This in turn will increase the ability of households to move up the “energy ladder”. Investments in human capital will also help the country to address substantial skills shortages, including in the energy sector.