



renewable
energy
& energy
efficiency
partnership

Angola

Section 1: Energy provision¹

1.1 Main fuel sources for direct use and power generation

Angola has large domestic reserves of crude oil², which are mainly exported³ and hardly used for the country's own energy production. Angola has a small natural gas production industry, which is used for the industry sector. The main source of energy for residential use is traditional biomass. Angola had proven oil reserves of 9.0 billion barrels (bbl) as of January 2008. Angola has 9.5 trillion cubic feet (Tcf) of natural gas reserves as of January 1, 2008. With the considerable increases in proved natural gas reserves and government policies to end natural gas flaring, plans are underway to convert much of the natural gas into Liquefied Natural Gas (LNG) for export with some to be used for domestic electricity production. Biomass is used as the sole source of energy for heating and cooking by some 80% of Angolans. Most local governments outside Luanda, rely on diesel generators. Luanda has significant thermal generating capacity and oil companies rely heavily on it for their activities. The Angolan Government is planning to utilise national uranium deposits to develop a nuclear energy industry. This potential source of electricity is still in its planning phase.

1.2 Degree of reliance on imported energy

Some of Angola's domestic product requirements are met with local energy resources. The remaining demand is met by imports of gasoline, jet fuel, kerosene, distillate fuel oil, LPG and other products. Angola is developing plans for a new oil refinery. Approximately 67 percent of generated electricity comes from hydroelectric plants and the remaining 33 percent from conventional thermal sources such as diesel generators. A small interconnection exists with Namibia.

1.3 Extent of connection to electricity network (households and businesses; rural and urban)

¹ Based on information collected from: <http://www.eia.doe.gov/emeu/cabs/Angola/pdf.pdf>, <http://www.iie-angola-us.org/power.htm>, <http://www.pressreleasepoint.com/angola-%C2%96-towards-energy-strategy>, <http://www.energyrecipes.org/reports/genericData/Africa/061129%20RECIPES%20country%20info%20Angola.pdf>, <http://www.africaneconomicoutlook.org/en/countries/southern-africa/angola/>, <http://www.lea.org.ls/AboutLEA/RERA.php> and http://www.city.ac.uk/economics/dps/discussion_papers/0713.pdf

² Angola is the third largest oil producer in Africa behind Nigeria and Libya and is expected to have significant oil production increases in the short-term as new offshore projects are undertaken.

³ Angola exports more than 90% of its crude oil primarily to China and the US.

Less than 20% of Angola's population has access to electric power, and blackouts occur frequently. The sector suffers from war-related impacts on the infrastructure that will continue to be a challenge to national reconstruction and development in the near future. Significant portions of the power generation and transmission systems have suffered serious damage as a result of the war. In consequence there is, outside Luanda, only local generation and no and/or limited distribution network.

1.4 Any capacity concerns (power generation and/or transmission/distribution)

The Country Utility Installed Capacity in 2008 was estimated at 1128 Megawatts (MW). The Available Capacity in April 2008 was estimated at 943 MW. Power outages and surges are frequent and overall there is an acute shortage of electricity in the country. The lack of capacity of the distribution network is due to natural ageing of the equipment, its poor maintenance and lack of investment, as well as the effects of war. As a consequence, the supply is unstable and coverage is very poor. None of the substations outside Luanda are fully operational and many require complete rehabilitation.

Electricity consumption has also been severely constrained by the war. The growth in electricity demand has been less than 2 percent on an annual basis.⁴

Several large projects are planned to increase the generating and distribution capacity of the country. The rehabilitation of the Luanda distribution system has already started. Important investments are needed to ensure that Angola's generating and distribution capacity meet its current needs. Angola plans to spend more than US\$500 million over the next 20 years on building and restoring power facilities.

1.5 Potential for renewable energy, energy efficiency and co-generation (i.e. any authoritative assessments)

The main potential for renewable energy is the hydroelectricity sector. Angola has an estimated hydropower potential of 150 000 GWh/year (not defined as technically or economically feasible), of which about 65 000 GWh/year are considered to be firm potential. Some 150 hydro plants could be built, excluding mini and micro plants (of less than 2 MW). There are approximately 10 hydro plants constructed in Angola. Some US\$200 million will be spent on dam rehabilitation. The country has 5 main dams. Seven further hydro plants, with a total installed capacity of 16,505 MW, are planned. Hydroelectric facilities generate around two-thirds of Angola's electricity.⁵ Biofuel production has been undertaken in Angola as well as a shift toward the development of LNG, as a cleaner source of energy.

Section 2: Energy market

2.1 Ownership (state/municipality/private/mixture) of electricity and gas utilities and other sources of energy

⁴ This results from a combination of the near total collapse of industrial activity, reportedly presently working at around 10 percent of its nominal capacity, and the fact that the vast majority of the population has only very limited need for electricity as some 75% of Angolans subsist on less than \$1 per day.

⁵ The Matala dam, which began operations in 2001 on the Cunene River, is the main source of electricity in southwest Angola. The Cambambe dam (180 MW) on the Kwanza River, the Mabubas dam (17.8 MW) on the Dande River, and diesel generators are the main sources of electricity in northern Angola. In northeastern Angola, Russian-based Alrosa Vneshtroy LDA is building the Chicapa hydroelectric dam (16 MW capacity) on the Tchicapa River, which is due to begin operations in March 2008. Odebrecht, a Brazilian construction company, has partially completed the construction of a hydroelectric facility at Capanda on the Kwanza River. Work on the 520-MW plant began in the mid-1980s, but was suspended due to the civil war. The first of four planned hydraulic turbines began generating electricity (260 MW) in January 2004. Russian-based, Technopromexport, installed the second phase (260 MW) in mid-2007. In addition to second phase construction, new transmission lines are being built to carry power generated by the dam. The completed Capanda project will nearly double Angola's electricity generating capacity.

In 1976, the Angolan government created a national oil company (NOC) called the Sociedade Nacional de Combustiveis de Angola (Sonangol). In 1978, Sonangol became the sole concessionaire for oil exploration and production in Angola.⁶

The electricity sector in Angola comes under the Ministry of Energy and Water. The public utility in charge of electricity generation and transmission is Empresa Nacional de Electricidade (ENE). ENE is also responsible for the supply to the main urban centres, excepting Luanda, where distribution is the responsibility of EDEL (Empresa de Electricidade de Luanda).

Three separate electrical systems are used to supply electricity throughout Angola. The Northern System supplies the provinces of Luanda, Bengo, Kuanza-Norte, Malange and Kuanza-Sul. The Central System provides for the provinces of Benguela, Huambo and parts of Bie. The Southern System supplies to Huila and Namibe provinces. The government aims to link the systems there to create a national grid through the South African Power Pool (SAPP).

2.2 Extent of competition in power generation and energy retail

Currently, it seems that the power generation and energy retail is mainly under the monopoly of the previously mentioned public state entities. However, there have been policy and regulatory drives to stimulate private participation in the national power generation market, for example, the private operator, Alrosa.

2.3 Structure: extent of vertical integration of generation/ transmission/ distribution/ retail⁷.

Two vertically integrated public utilities are mainly involved in generation, transmission, distribution and retail. It is currently a monopolistic situation (state owned monopoly). There is no significant vertical integration.

Section 3: Energy policy framework

3.1 Existence of an explicit energy policy framework and key policies or not – what role is envisaged for sustainable energy?

The National Reconstruction Programme and associated policies for Angola indirectly address the energy sector development through building and restoring power facilities. The main policy document seems to be the "Development Strategy of Angola's Power Sector", 2002, aimed at ensuring sustainable and reliable energy supply, including stimulation of the private sector participation, in both the urban and rural areas.

3.2 Any current energy policy debates/developing legislation

The main debates in Angola in the energy sector seem to be the transformation of the energy market sector to ensure the participation of Independent Power Producers (IPP) and the challenges that this presents from a policy, regulatory and economic perspective. The financial sustainability of the ENE is also an important element for the future of the energy sector.

⁶ <http://www.eia.doe.gov/emeu/cabs/Angola/pdf.pdf>

⁷ http://www.unctad.org/sections/wcmu/docs/c2clp_ige8p26unctadtable_en.PDF

3.3 Any specific policies or programmes to promote sustainable energy

In terms of renewable energy, national and international investments have been undertaken to ensure the effective development of the hydroelectricity sector.

3.4 Any major energy network or sustainable energy studies available

It is important to note that the United States and China have conducted research on the energy and electricity sectors in Angola. The OECD, the World Bank and specialised energy related agencies have also undertaken various studies in this field. Through this research, the following book seems to provide the most comprehensive information on the electricity sector: "Private solutions for infrastructure in Angola", World Bank, Public-Private Infrastructure Advisory Facility, Published by World Bank Publications, 2005.

3.5 Role of government in energy policy – which departments are involved?

The Ministry of Energy and Waters (MINEA), especially its National Directorate of Electricity, is the umbrella body of the Government that governs the sectors of Energy and Water, being responsible for the development of their policies, planning, coordination, supervision and control of activities related to the recovery and rational use of the national water and energy resources. The Directorate is also tasked with the proposal and promotion of the implementation of the policy pursued by the energy sector. The Ministry of Finance (which sets the electricity tariffs) and the Ministry of Planning are also involved in the development and implementation of the energy and electricity policy and regulatory framework.

3.6 Any government (or government funded) agencies with a specific role in sustainable energy and/or environmental protection (with an energy role)

It is important to note that two main regional networks seem to considerably influence the future of the Angolan energy and electricity sectors, namely the Southern African Power Pool (SAPP)⁸ and the Regional Electricity Regulators Association of Southern Africa (RERA). The aim of both of these bodies seems to be to address the electricity and energy sectors from a regional (SADC) perspective. Both of these entities provide specific guidance and directions on financial, regulatory, strategic and infrastructural matters for the development of the sectors in Angola and other SADC countries.

3.7 Any energy planning procedure in place

The ultimate objective seems to be the creation of a single national electricity transmission system that connects all regions into one integrated grid. Rural electrification also seems to be a priority. The "Development Strategy of Angola's Power Sector", 2002, states the following main objectives: increase access to electricity by 46% by 2015, reduce regional asymmetries, and "unbundle" the ENE.

⁸ Created in 1995, the Southern African Power Pool (SAPP) aims to provide reliable and economical electricity to the consumers of each member. The national utilities participating in the SAPP are Angola's Empresa Nacional de Electricidade (ENE), the Botswana Power Corporation (BPC), the DRC's Société Nationale d'Electricité (SNEL), the Lesotho Electricity Corporation (LEC), Malawi's Electricity Supply Commission (MESC), Electricidade de Mocambique (EDM), Namibia's NamPower, South Africa's Eskom, the Swaziland Electricity Board (SEB), Tanzania Electric Supply Company (TanESCO), Zambia Electricity Supply Corporation (ZESCO) and Zimbabwe Electricity Supply Authority (ZESA), as well as Mozambique's Independent Power Producer, Hidroelétrica De Cahora Bassa, and the transmission company, Motraco, a joint venture of Eskom, EDM and SEB. SAPP's coordination centre is located in Harare, Zimbabwe (Energy Information Administration, 2005).

Section 4: Energy regulation⁹

4.1 Is there an energy or utility regulator? When was it established?

A Government decree (1996) established a national regulator "Instituto Regulador de Sector Electrico" to supervise the national electricity sector, encompassing electricity related law implementation, electricity concession/license, and import/export of electricity. It does not have the authority to set prices/tariffs and to issue concessions/licences. The regulator has an administrative board and others specialised boards (tariffs and financial). The president of the administrative board is elected by the Council of Ministers. It is financed by the state Budget. Considering its composition and funding, its independence can be regarded as limited in some extents.

4.2 Degree of independence of the regulator from government (legal structure, who appoints the regulator and board)

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4.3 Regulatory framework – legislation, duties, powers (any references to environment, sustainable energy)

Various laws and regulations have been promulgated regarding the energy and electricity sectors.¹⁰ The General Electricity Law of 1996, seems to be considered as one of the most important statutes in terms of the electricity sector, especially with regards to the private sector involvement in the sector. In terms of the Law, the Council of Ministers has the power to grant concessions (power capacity superior to 1MW or when there are more than 50 000 inhabitants) and provincial governments have the power to grant licences. The Law of Delimitation of the Sector of Economic Activities, 2002, is also very important. The Decret 43/01 sets out the procedure in terms of concessions.

The Land and Urban Planning Law clarifies land ownership and tenure. Environmental protection regulations require an Environmental Impact Study for investment projects in areas such as petroleum, mining, power stations and road construction. New licensing regulations in the energy sector provide stronger legal protections for private investment in infrastructure projects such as building dams, power plants or electricity distribution grids.

International experts recognised that current electricity reformations taking place in Angola would reduce the barriers to investment significantly. The country's latest investment laws

⁹<http://www.minea.gv.ao/listagem.aspx?sid=e97108d2-92bb-4faf-a8f8-ee781071cf69&cntx=gqqlacEsZMffMY3wGxH5QhPvAb58xb8vW5XaaGIXLS5ndjUw6%2FQeQi350di9acCBlycChIV52Gx2dEtq7g9cRA%3D%3D>

¹⁰ Including as some of the main ones: *A ENE.U.E.E. rege-se pela lei nº 11/88, de 9 de julho e pelo presente estatuto e, no que não estiver especialmente regulado, pela legislação aplicável em vigor no país; Lei nº 14-A-96 Conduta de todos os que produção, transporte, distribuição e utilização de energia eléctrica; Lei Geral de Electricidade O presente diploma estabelece os princípios gerais do regime jurídico do exercício das actividades de produção, transporte, distribuição e utilização de energia eléctrica; Decreto nº 45-01 Regulamento de distribuição de energia eléctrica; Decreto nº 41-04 Regulamento de licenciamento de instalações de produção, transporte e distribuição de energia eléctrica; Decreto nº 27-01 Lei geral do exercício de actividades de produção, transporte, distribuição e utilização de energia eléctrica; Decreto Lei nº 4-02 Criação de uma entidade reguladora das actividades exercidas no sector eléctrico nacional; Decreto-Lei nº 3-00 Criação do Ministério de Energia e Águas; Resolução nº 21-02 Estratégia de desenvolvimento do sector eléctrico de Angola; Resolução nº 13-03 Proposta do saneamento financeiro do sector eléctrico de Angola, Empresa de Distribuição de Energia de Luanda.*

should facilitate foreign and domestic investors equal access to investment incentives and enabled the participation of private investors in public infrastructure projects.

4.4 Regulator's roles – key tasks (e.g. price controls, promoting competition etc), actions to date, any action/role in the sustainable energy field)

The national regulator supervises the national electricity sector, encompassing electricity related law implementation, electricity concession/license, and import/export of electricity. It does not have the authority to set prices/tariffs and to issue concessions/licences.

4.5 Have any regulatory barriers to sustainable energy been identified and if so what are they?

Industry experts have suggested that Angola needs to ease state controls on electricity prices and offer incentives to attract private investment.