



## GHANA

### Economic Indicators

Population 1998 (million)	18.5 million
Population Growth	
GDP 1997 (US\$ million)	\$ 3.8 billion
GDP Growth 1990-5 (%)	4.6%
Inflation Rate (1999)	20.8% Jan 1998 15.3% Jan 1999
GNP/capita 1995 (US\$)	390
GDP/capita 1998 PPP (US\$)	1800
Foreign direct Investment (US\$ million)	
African Competitiveness ranking	
Human Development Index 1995 (%)	0.473
Local Currency and Exchange Rate	100 Cedi=2.5\$ (Jan.2000)
Stock Exchange	Yes
Number of Households rural/urban	2.3 / 1.5 million
People per Household rural/urban	5 / 4.5
Access to electricity (% of population)	25%



### Overview

There are several factors favouring the use of sustainable energy technologies for service provision in rural areas in Ghana. Ghana has a low level of electrification, an established renewable energy sector and government policies favourable to financial and institutional sector reform. Economic growth is sound, although inflation remains high. Negative aspects which threaten successful deployment include conflicting public sector goals and the resulting lack of energy policy coordination.

A quarter of Ghana's 3.8 million homes are electrified. Electricity satisfies about 10% of total energy demand and is mainly produced from hydro sources. The average unelectrified household in Ghana uses firewood and charcoal to meet the demand for process heat, and kerosene and dry cells for lighting. Black and white TVs, radios and tape players are becoming quite popular in rural areas, powered by lead-acid batteries or dry cells. LPG Distribution in rural areas is rare, but several bottling facilities exist in urban centres across the country. Efforts are also being made to develop low-cost gas appliances for dissemination in rural areas. Predominant environmental issues linked to energy resources are deforestation (22,000 hectares or 2.1% per annum), desertification and land degradation (soil erosion).

Application of modern RE technologies in Ghana is rather small, even though drought over the last few years has caused a significant power shortage and reinforced the need for additional power sources. The Ministry of Mines and Energy has created a Renewable Energy Development Programme and a Self Help Electrification Programme to help rural communities hook up to the grid. About 700 PV and 40 small hydro-systems are installed in Ghana to date.

## Institutional Profile

Under the National Electrification Scheme (NES), Ghana's Government proposed expenditure of about US\$350,000 for renewable energy between 1996 and 2000, especially for the development of solar energy industries. The Government is committed to electrifying all communities with a population size of over 5000 by 2020. RE technologies such as PV are included<sup>1</sup>, mostly through the *Self Help Electrification Program (SHEP)*<sup>2</sup>. Plans also exist for the Volta River Authority to build a 300MW thermal power plant, while Ghana National Petroleum Company is installing a 150 MW natural gas power plant. The Global Environment Facility (GEF) and the Spanish Government conduct programmes in the country.

Empretec Ghana Foundation and the National Board for Small Scale Industries (NBSSI) have been active over the last couple of decades facilitating the development of private enterprises in Ghana.<sup>3</sup>

## Government Energy Organisations

Organisation	Activity
Volta River Authority (VRA), Electricity Corporation of Ghana (ECG) and the Northern Electricity Department (NED) of VRA	National electricity generation and transmission, Government owned
Energy Sector Development Program, initiated by the former National Energy Board (NEB), now under MOME	National Energy Policy
Ministry of mines and Energy (MOME), (renewable energy unit)	National Energy Policy
Solar Laboratory at Mechanical Engineering Department of the Kwame Nkrumah University of Science and Technology (KNUST), Agricultural Engineering Department of KNUST(biogas development), Physics Department of the University of Ghana, CSIR, FORIG	Research & Development

## Investment Climate

### *Macroeconomic Situation:*

Ghana is currently experiencing good growth, but high inflation. With weak export earnings, and a falling cedi, the current account-deficit is estimated to have been 9% of GDP in 1999. Forecasts predict that GDP growth will remain relatively strong, recovering from the (EIU estimated) growth rate of 4.2% in 1999 to 5.2% in 2000 and 5% in 2001. If Ghana sticks closely to its IMF adjustment programme aid inflows should continue to bridge the financing gap. It is expected that the cedi will remain weak in 2000, falling by 26%, although the depreciation should slow to 10% in 2001. Monetary policy was tightened in the last quarter of 1999 to bring inflation back under control, and will be unchanged in 2000 in order to offset a marginally expansionary fiscal policy.<sup>4</sup>

### *Business Environment:*

Economic reforms have created a new business environment for the private sector. They include removal of price controls, the lowering of the corporate tax, sales tax and excise tax, removal of controls on interest rates, bank charges and credit allocation. The private sector can now source equity and loans through

venture capital companies, equity through the Ghana Stock Exchange and equipment from leasing companies. Current trade liberalisation includes tariffs reduction to a maximum of 25% and the abolition of the import licensing system.

**Privatisation:**

The Government has accelerated its program of divestiture of state owned enterprises and rehabilitation of roads, ports and the telecommunication systems, and highlighted the promotion of private sector participation in the power industry in its “Ghana Vision 2020”. “Through public-private partnerships and joint ventures into commercial viable Ghanaian power utilities the state-owned entities transform themselves and assume a leadership role in the development of the proposed West Africa Power Pool.”<sup>5</sup>

**Power Sector:**

In the power sector the Government has introduced Independent Power Production (IPP) schemes, and reforms, such as increasing low electricity tariffs towards international levels. Since the mid-1980s the Government of Ghana has been financing projects using small levies on petroleum products. The US\$ 250,000 raised annually is paid into an Energy Fund and used to promote renewable energy and energy efficient projects. (According to the EIU, there may be a need though for greater co-ordination of an increasing number of power projects that have been proposed since the 1998 power crisis.<sup>6</sup>)

Institutional reforms of existing power utilities, including the establishment of Independent Power Production (IPP) schemes, aim to shift the power sector away from its monopolistic and centralised structure. To support the development of IPPs, a new utility, the National Transmission Utility (a subsidiary transmission company) will be registered to manage distribution on the national interconnected system. This will be structured as an exclusive license.

Price Index (1998 estimates)

Energy source	Cost	Note
Petroleum products	1 Cedi/litre <sup>7</sup>	
Electricity tariffs	3US cents/kWh <sup>8</sup>	Residential or Commercial
PV Panels Costs	\$/Wp	Retail or wholesale volume
SWH Costs	\$/m2	

**Taxes and Tariffs**

The **corporate tax** rate in all sectors is 35 per cent except for income from non- traditional exports (8 per cent). **Tax holidays** are available depending on sector (i.e. 10 years for rural banks, 5 years for agriculture and agro-industry) **Locational incentives** (tax rebate) are also available, ranging from 25% to 50% rebates (50% being for industries located outside regional capitals). **Capital expenditure** for research and development can be fully deductible. **Accelerated depreciation allowance** is applicable to all sectors except banking, finance, commerce, insurance, mining and petroleum. Almost all sectors are allowed five years for **loss/carry-over**. **Reduced import duties** on solar energy equipment range from 27% to 5%; although the Ministry of Mines and Energy has said that there is a complete waiver of all import duties on solar panels.

### **Country-specific Barriers**

Despite Government activities in RE technologies, financial schemes available to entrepreneurs and consumers are still rare and the range of policy instruments narrow. Mechanisms for maintenance of renewable energy equipment are weak and the awareness of RETs is in general not well developed. Low electricity tariffs discourages the use of alternative forms of energy production.

## **MARKET AND APPLICATIONS FOR RENEWABLE TECHNOLOGIES**

### **Solar Thermal**

- Resource

Ghana has a good solar energy resource, receiving daily solar irradiation of between 4 and 6kWh/m<sup>2</sup> and a corresponding annual sunshine duration of 1800 - 3000 hours. Solar radiation levels are higher in the northern regions which include a large portion of the rural areas of the country.

- Applications / Market Opportunities

Water heating for hotels and clinics. Solar ovens as replacement for wood-fuel ovens in domestic and small-industrial sectors.

- Origin of Hardware

(locally manufactured, including number of suppliers)

### **Photovoltaic systems**

- Resource

same as solar water heating

- Applications

Telecommunications, rural health installations and water supplies.

- Existing Installations

About 700 solar PV systems have been installed across the country, including 400 communication systems, 70 refrigeration systems, water pumps and other applications<sup>9</sup>.

- Origin of Hardware

### **Biomass/gas**

- Resource

#### **need this**

- Applications

Several biomass resources have been used successfully, e.g., cookstove technologies for urban areas (so far about 30,000 Ahibenso and 5,000 sawdust stoves have been disseminated), biomass fired dryers, pyrolysis and briquetting (targetted for commercial consumers). Potential also exists for biogas electricity generation and cogeneration, the latter so far being absent due to low electricity prices.

- Existing Market Opportunities

About 70% of total national energy consumption is accounted for by biomass in either the direct or processed form<sup>10</sup>. Fuel wood and charcoal are the dominant end products in use although crop residues and other non-woody materials also find some usage.

## **Wind**

- Resource

Wind velocities prevailing in the country have been considered too low to encourage wind technologies but new measurements are now being taken by the Energy Commission and private developers and the results are expected to give a more favourable picture.<sup>11</sup>

## **Small Hydro**

- Resource

It is estimated that Ghana has the potential for 2,000 MW of new hydro power. About 1,205 MW of this total is expected to be produced from proven large hydro sources while the rest will come from small hydro sources. It is estimated that there are about forty (40) Small Hydro Plant (SHP) sites in Ghana, where small hydro is defined as any hydro installation rated at less than 10 MW.

- Existing Installations

Until recently virtually all of Ghana's electricity was produced from two large hydro dams on the Volta river at Alosombo and Kpong which combined have a capacity of about 1.1 GW out of a total installed capacity of about 1.5 GW.

In spite of the considerable resource base, no SHPs have been developed in the country.

- Origin of Hardware

## **Other**

### Programmes and Organisations

<i>Organisation</i>	<i>Project</i>
Danida/ MOH Solar Project	PV Refrigeration, Lighting, Water Pumping and Heating, <i>Equip</i> rural or small health sectors with reliable tech.
CIDA-UR/UST Renewable Energy Project	Small-Home-Systems (SHS), battery charging, water distillation,
UST/GTZ solar pump project	Radial Flow Centrifugal water pump
MOME (special unit, in close collaboration with the Volta River Authority (VRA/NED)) UNDP/GEF	UNDP/GEF, GEF grant of \$2.5 mil. Ghan.Gov.\$0.5 million for establishment of RE-based rural energy services company (RESCO) to provide <i>Off-grid solar</i> electrification to initially 13 villages
MOME	2 Solar Service Centres  Funding through a \$185 million (306,177 million Cedis) syndicated loan provided by IDA, ORET of Netherlands, DANIDA, Nordic Development Fund (NDF) and Caisse Francaise de Developpement (CFD), the rest of 105,066 million Cedis was to be the local component of the program
MOME Wachiau Project	2.1kW Solar Battery Charging Centre Battery operated home systems (BOHS)
MOME Spanish Solar Project	concessionary loan of the Spanish Government of \$5million <i>Off-grid solar</i> electrification of 10 villages, Home, school & community systems, water pumps, streetlights
MOME Solar Thermal Projects	Crop dryers for reduction of post-harvest losses <i>Improve</i> quality of agric. produce for high export prices
CIDA-University Of Regina, in collaboration with the University of Science and Technology of Ghana	Solar Service Centres (SSC), installed in rural communities since 3.1995  CN \$1.24 , of which CIDA (Canadian International Development Agency) contributes \$900,000 with the remaining amount donated by the participating universities  .
The Ghana Solar Energy society (GHASES)/GEF also Ghases/Women's World Banking	GEF Small Grants Project and Women's Works Banking micro-credit scheme Training/marketing for improved charcoal stove; Administration of a micro-credit scheme
Sun Oven	Production and marketing of Solar Ovens

## REFERENCES

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7. Tropic Gas Ltd, Accra (LPG distribution)

8. Energy Products Ltd., Tema (low-cost LPG stoves manufacture and distribution)

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Economist Intelligence Unit

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<sup>1</sup> Energy assessments show that it is cheaper to electrify communities using decentralised systems when they are more than 20km from the electric grid.

<sup>2</sup> Communities who were eager to receive electricity supplies ahead of the NES scheduled dates were encouraged to initiate their own project through the establishment of the SHEP. Under the SHEP, communities who have raised funds to purchase local materials such as low-tension poles, and are ready to provide communal labour to erect the poles are considered and assisted to complete their electrification projects. The government is also required to provide technical and financial support for construction of the network.

<sup>3</sup> Abeeku Brew-Hammond p.10

<sup>4</sup> The Economist Intelligence Unit, Country Report Ghana, p.1

<sup>5</sup> Ghana Vision 2020, quoted in Abeeku Brew-Hammond, p.12

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<sup>6</sup> EIU, p.1

<sup>7</sup> 1 Cedi/litre =about 2.5 US cents per 100 litres

<sup>8</sup> Bulk supply tariffs for produced power is dependent on the mode of generation. These tariffs have since September 1998 been set for hydro systems at 90 Cedis per kWh (US cents 3.75/kWh in early 1999 and US cents 2.25/kWh in early 2000) and for thermal systems at 139.2 Cedis per kWh (US cents 5.8/kWh in early 1999 and US cents 3.5/kWh in early 2000). On the average 95.0 Cedis /kwh (US cents 4.0/kwh in early 1999 and US cents 2.5/kWh in early 2000) is the bulk tariff for all generating options in the country.

<sup>9</sup> [Ministry of Mines and Energy, 1998]

<sup>10</sup> KITE, 1999a

<sup>11</sup> Abeeku Brew-Hammond p.29