



Government of Republic of Malawi

NATIONAL ENERGY POLICY FOR MALAWI

JANUARY 2003

**Ministry of Energy and Mining,
Private Bag 309,
Lilongwe 3,
Malawi.**

Telephone: 01 770688
Fax: 01 770094/771954
E-mail: doenergy@malawi.net

PRESIDENTIAL FOREWORD

In my Foreword to the *Vision 2020* (1998), I did challenge managers of various sectors of our national economy to come up with sound policies, strategies and programs that can practically support the realization of our collective aspiration to build a prosperous nation, a nation whose economy is technologically driven and one that would have attained a middle income status by the year 2020.

This challenge was more recently echoed in the *Poverty Reduction Strategy* (2002), which forms a centre pin of my Government's development agenda, where both public and private sector agencies are invited to support the *Vision 2020* by developing and implementing '*pro-poor projects*'. The need to urgently respond to these calls is underscored by our recognition that poverty, which is rampant in the country with 65% of the people living on less than a Dollar a day, is an unacceptable condition for a people living in the 21st Century.

It is in this vein that I feel gratified that, after following a highly consultative process, Malawi has concluded this first ever integrated *National Energy Policy* outlining plans on how the Energy Sector is to contribute to the national goals of poverty reduction, industrialization and economic growth.

The relevance of this Energy Policy to the aforementioned aspirations cannot be over-emphasized. Developments in the Energy Sector have a direct bearing on the success of development initiatives in any economy. Energy is a crucial input into any industrial processing and serves as the life-blood for modern transport systems, be it road, water, rail or air services. Furthermore, as an economic good or service, energy is also a source of revenue for Governments in the form of royalties, taxes, among others. Its production and distribution industries provide a livelihood to thousands of people who are employed therein.

I therefore urge all stakeholders to be forthcoming in supporting the implementation of this Policy.

Dr. Bakili Muluzi

**PRESIDENT OF THE REPUBLIC OF
MALAWI**

MINISTERIAL FOREWORD

This Energy Policy represents a foremost advance in our endeavor to improve the governance of the Malawi Energy Sector (MES) for an array of reasons. First, it is the first ever integrated Energy Policy to be produced by Malawi since her attainment of political independence from Britain in 1964. Second, it presents the most comprehensive analysis ever done for MES opportunities, challenges, inter-fuel linkages, and effects of interplays among energy, economy, environment, and poverty. Thirdly, it outlines urgent measures to address known challenges and convert opportunities into implementable projects. Fourth, it represents an unprecedented commitment by Government to involve the private sector in MES development by undertaking key market and legislative reforms to ensure fair competition in a regulated market scenario. Lastly, the policy is a portrait of a national consensus, built through a process of extensive and intensive national consultations, about priorities and targets that must be met by individual entities in the energy production, distribution and regulatory chain.

At the centre of this Policy is the whole question of *poverty reduction*. GoM takes the view that the task of reducing poverty is a multi-sectoral issue with three critical elements: *promoting opportunities* (i.e. creating jobs, providing modern energy services in support of efforts to provide road infrastructure, quality education, water, sanitation and health services); *facilitating empowerment* (i.e. laying political and legal basis for inclusive development, establishing administrations that foster growth, equity and fair play, promoting gender equity, tackling socio-economic barriers and supporting pro-poor initiatives); and *enhancing security of energy supply* (i.e. developing national programs to prevent, prepare for and respond to macro-economic dislocations and natural calamities, and designing national systems for risk management).

In linking energy to these overall anti-poverty strategies, the Energy Policy outlines three key goals: *competition, transformation, and governance*. The realization of these goals entails a paradigm shift towards private sector delivery, emphasis on strengthening decentralized energy service markets, thinking holistically, promoting competition where possible, and where necessary, introducing regulation. It is in this vein that major MES market reforms have been proposed with a view to maximizing the sector's contribution to poverty reduction and economic growth.

This Energy Policy has been a result of extensive and intensive consultations led by a multi-disciplinary Task Force, who I salute for their hard work and cooperation. Special vote of thanks is extended to the World Bank and UNDP who generously provided their financial and technical support.

It is my sincere hope that the sense of national ownership derived from the consultative process will make the Energy Policy practically implementable for the betterment of the people of Malawi.

Harry Thompson, M.P.
**MINISTER FOR NATURAL RESOURCES AND ENVIRONMENTAL
AFFAIRS**

ACKNOWLEDGEMENTS

This Energy Policy is the result of an intensive and extensive consultative process, involving a variety of stakeholders from all sections of the Malawi society. While it is not possible to mention all who contributed to the development of the Policy, we would not do justice if we do not mention the few that we believe made substantial contributions.

A 23-member multi-disciplinary Task Force, led by the Department of Energy Affairs, was set up to drive the process of developing the Policy. This Task Force comprised a cross section of stakeholders from Government, private industry, non-governmental organizations, civil society and large energy consumer groups, to whom we are indebted. A full list of the Task Force members and people who attended the many consultative meetings is provided in Annex C. Intellectual support was provided by one national and one international consultants, namely, Dr. Davis Ng'ong'ola of DHN Consulting Firm and Prof. Phil O'Keef, of ETC (UK) Foundation, respectively.

A core team of policy experts from the Department of Energy Affairs (DoEA), headed by Dr. Charles R. Kafumba, Director of Energy Affairs, provided the bulk of drafting, technical, editorial and secretarial support and thus deserve special accolade. These are: Messrs Harry W. Chitenje, Lewis B. Mhango, Odala Matupa, Gideon G. Nyirongo, Paul Mphwiyo, Dennis Mwangonde, Diliza W. Nyasulu, Khumbolawo Lungu and Ms. Grace A. Mloza.

Political direction was provided by Hon. Hetherwick Ntaba, MP, Minister of Energy and Mining, under whose jurisdiction DoEA falls. Overall leadership of this Policy preparation process was bequeathed by Mr. George C. Mkondiwa, Secretary for Energy and Mining.

The development and publication of the Energy Policy would not have been possible without the generous financial and technical assistance of the World Bank and UNDP. The Government of Malawi is therefore greatly indebted to these cooperating partners for their invaluable assistance.

LIST OF ABBREVIATIONS AND ACRONYMS

AFREC	African Energy Commission
AIDS	Acquired Immune Deficiency Syndrome
AMI	Aerial Maritime International
ARET	Agricultural Research and Extension Trust
AU	African Union
AvGas	Aviation Gas
BOOT	Build, Own, Operate and Transfer
BOP	Balance of Payments
BSI	Biomass supply industry
BU	Business unit
CAMA	Consumers Association of Malawi
CDM	Clean Development Mechanism
CEEDS	Centre for Energy, Environment and Development Studies
CPI	Consumer Price Index
CRO	Coal Retail Operator
CSI	Coal Supply Industry
CWO	Coal Wholesale Operator
DEVPOL	Statement of Development Policies (1987-96)
DOE	Department of Energy
DSM	Demand-Side Management
EP&D	Economic Planning and Development
EAD	Environmental Affairs Department
EIA	Environmental Impact Assessment
ESCOM	Electricity Supply Corporation of Malawi Ltd
ESI	Electricity Supply Industry
EU	European Union
FOB	Free On Board
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Greenhouse gases
GJ	Giga Joules
GoM	Government of Malawi
GWhr	Giga Watt hour
HIPC	Highly Indebted Poor Countries
HIV	Human Immunodeficiency Virus

IBLC	In-Bond Landed Cost
IEA	International Energy Agency
IEP	Integrated Energy Policy
IGAs	Income Generating Activities
IPD	Independent Power Distributor
IPP	Independent Power Producer
IRP	Integrated Resource Planning
kV	kilo Volt
kWhr	kilo Watt-hour
LF&GSI	Liquid Fuels and Gas Supply Industry
LPG	Liquid Petroleum Gas
LRMC	Long Run Marginal Cost
MAREP	Malawi Rural Electrification Programme
M&E	Monitoring and Evaluation
MBS	Malawi Bureau of Standards
MCCCI	Malawi Confederation of Chambers for Commerce and Industry
MDC	Malawi Development Corporation
MEP	Malawi Energy Policy
MES	Malawi Energy Sector
MIDCOR	Mining Investment Development Corporation
MJ	Mega Joules
MNREA	Ministry of Natural Resources and Environmental Affairs
MW	Mega Watt
NEGEC	National Electricity Generation Company
NCW	National Consultative Workshop
NECO	National Electricity Council
NEP	National Energy Plan
NESIP	National Energy Sector Implementation Plan
NGOs	Non-Governmental Organizations
NOCMA	National Oil Company of Malawi
NSREP	National Sustainable and Renewable Energy Programme (1997)
OAU	Organization of African Unity
O&M	Operation and Maintenance
ORES	Other Renewable Energy Sources
ORESSI	Other Renewable Energy Sources Supply Industry
PC	Privatization Commission
PCC	Petroleum Control Commission
PIL	Petroleum Importers Limited
PPA	Power Purchase Agreements
PPC	Petroleum Pricing Committee
PRSP	Poverty Reduction Strategy Paper

PWA	Passengers Welfare Association
PV	Photovoltaic
RBM	Reserve Bank of Malawi
R&D	Research and Development
RCW	Regional Consultative Workshop
REIAMA	Renewable Energy Industry Association of Malawi
RETs	Renewable Energy Technologies
RoR	Rate of Return
RTOA	Road Transport Operators Association
SADC	Southern African Development Community
SAPs	Structural Adjustment Programmes
SAPP	Southern African Power Pool
SHS	Solar Home Systems
SOCAM	Society of Accountants in Malawi
TECRET	Testing and Training Centre for RET
TOE	Tonnes of Oil Equivalent
UN	United Nations
UNCB	United Nations Convention on Biodiversity
UNCD	United Nations Convention on Desertification
UNCED	United Nations Convention on Environment and Development
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention for Climate Change
USA	United States of America
Wp	Watt peak

LIST OF FIGURES

Fig 1:	Consultative Process
Fig 2:	Schema Showing Levels of Integration in Energy Policy
Fig 3:	Steps Followed in Developing the Malawi Energy Policy
Fig 4:	Schema Showing Energy System Components
Fig 5:	Energy Consumption by sector, 1996
Fig 6:	Commercial Energy Usage by Sector, 1996
Fig 7:	ESI Current Market Structure
Fig 8:	ESI New Market Structure
Fig 9:	LF & GSI Current Market Structure
Fig 10:	LF & GSI New Current Market Structure
Fig 11:	LF & GSI New Market Arrangement
Fig 12:	CSI Current Market Structure
Fig 13:	CSI New Market Structure
Fig 14:	ORESSI Current Market Structure
Fig 15:	ORESSI New Market Structure
Fig 16:	Legal Framework for the Energy Sector
Fig 17:	Institutional Framework for Energy Sector Governance

LIST OF TABLES

Table 1:	Projected Energy Mix in 2010, 2020, 2030, 2050
Table 1:	The Efficiency Difference of End Use Devices
Table 2:	Distribution of Biomass Resources by Region

LIST OF BOXES

Box 1:	Opportunities and Challenges in the Household Energy Demand
Box 2:	Opportunities and Challenges in the Electricity Supply Industry
Box 3:	Opportunities and Challenges in the LF and CSI
Box 4:	Opportunities and Challenges in Coal Supply Industry
Box 5:	Opportunities and Challenges in Biomass Supply Industry
Box 6:	Opportunities and Challenges of ORESSI

ENERGY MEASUREMENT AND CONVERSION TABLES

(a) Prefixes for SI Units

PREFIX	SYMBOL	POWER (10 ^h)	PREFIX	SYMBOL	POWER (10 ^h)
EXA	E	18	DECI	d	-1
PETA	P	15	CENTI	c	-2
TERA	T	12	MILLI	m	-3
GIGA	G	9	MICRO	μ	-6
MEGA	M	6	NANO	n	-9
KILO	K	3	PICO	p	-12
HECTO	H	2	FEMTO	f	-15
DECA	D	1	ATTO	a	-18

(b) Conversion Factors for Different Energy Sources

Fuel Type	Natural unit	Density (tonnes/m ³)	(Heating Values)	(i) Conversion Factors
Malawi Coal	Tonne	n/a	24.9 GJ/T	
LPG	Tonne	0.54	45.5 GJ/T	
Gasoline	Tonne	0.74	44.0 GJ/T	
Jet Fuel	Tonne	0.83	43.2 GJ/T	
Paraffin	Tonne	0.83	43.2 GJ/T/ 35MJ/Litre	
Diesel	Tonne	0.87	42.5 GJ/T	
Ethanol	Tonne	0.78	16.54 GJ/T	
Electricity	GWh	n/a	3600 GJ/GWh	
Wood	m ³	0.71	11.4 GJ/ M ³	
Charcoal	Tonne	n/a	33.1 GJ/T	
Biomass	Tonne	n/a	13.3 GJ/T	

Baggasse	Tonne	N/A	7.8 MJ/kg
----------	-------	-----	-----------

(c) Derived SI Units of Measurement

④ DIMENSION	UNIT	SYMBOL
Area	Square meter	m ²
Volume	Cubic meter	m ³
Speed	Meter per second	m/s
Acceleration	Meter per square second	m/s ²
Frequency	Hertz	Hz (=1/s)
Pressure	Pascal	Pa (= N/m ²)
Volume Flow	Cubic meter per second	M ³ /s
Mass Flow	Kilogram per second	Kg/s
Density	Kilogram per cubic meter	⊕ Kg/m ³
Force	Newton*	N (= kg.m/s ²)
Energy	Joule**	J (=N.m)
Power	Watt	W (= J/s)
Energy Flux	Watt per square meter	⊕ W/m ²
Calorific Value	Joule per kilogram	J/kg
Specific Heat	Joule per kilogram Kelvin	J/kg.K
Voltage	Volt	V (=W/A)

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Notes:

* The force exerted by a mass of 1 kg equals 10 N

** Note that J = W.s.

(d) Conversion of Non-SI Units for Energy

NON-SI UNITS FOR ENERGY	SYMBOL	EQUIVALENT IN SI UNITS
Erg	Erg	10 ⁻⁷ J
Foot pound force	Ft.lbf	1.356 J
Calorie	Cal	4.187 J
Kilogramforce meter	Kgf.m	9.8 J
British Thermal Unit	Btu	1.055 x 10 ³ J
Horse power hour (metric)	hp.hr	2.646 10 ⁶ J
Horsepower hour (British)	Hp.hr	2.686 x 10 ⁶ J
Kilowatt hour	KWh	3.60 x 10 ⁶ J
Barrel of oil equivalent	b.o.e.	6.119 x 10 ⁹ J

Ton of wood equivalent	t.w.e	9.83×10^9 J
Tonne of coal equivalent	t.c.e.	29.31×10^9 J
Ton of oil equivalent	t.o.e.	41.87×10^9 J
Quad (Pbtu)	-	1.055×10^{18} J
Terra watt year	Twy	31.5×10^{18} J

TABLE OF CONTENTS

<i>Presidential Foreword</i>	<i>i</i>
<i>Ministerial Foreword</i>	<i>ii</i>
<i>Acknowledgement</i>	<i>iv</i>
<i>List of Abbreviations and Acronyms</i>	<i>v</i>
<i>List of Figures</i>	<i>viii</i>
<i>List of Tables</i>	<i>viii</i>
<i>List of Boxes</i>	<i>viii</i>
<i>Energy Measurement and Conversion Tables</i>	<i>ix</i>
<i>Table of Contents</i>	<i>xi</i>
<i>Executive Summary</i>	<i>xv</i>

PART 1

1.0 RATIONALE FOR INTEGRATED ENERGY POLICY	1
1.1 Background.....	1
1.2 Rationale.....	2
1.2.1 Links Between Energy and Development	2
1.2.2 Resource Opulence and Underdevelopment.....	3
1.2.3 Energy Planning.....	4
1.3 Formulating Energy Policy.....	7
1.3.1 Consensus Building for National Ownership.....	7
1.3.1.1 Expert Consultation.....	8
1.3.1.2 Public Consultation.....	8
1.3.1.3 Literature Review.....	9
1.3.2 Synergy Building for Integration.....	12
1.3.3 Identification of Policy Drivers.....	16
1.4 Structure of the Energy Policy Document	16

PART II

2.0 THE CONTEXT OF ENERGY POLICY	19
2.1 Introduction.....	19
2.2 International Context	20
2.2.1 Expanded Diplomatic Base.....	20
2.2.2 The Global Economy.....	21
2.2.3 The Global Environment.....	21
2.2.4 International Finance Capital	22

2.2.5 Regional and International Bodies	22
2.3 National Context.....	23
2.3.1 Physical Characteristics	23
2.3.2 Demography.....	24
2.3.3 The Economy.....	24
2.3.4 Extent of Poverty in Malawi.....	27
2.3.4.1 The Malawi Vision 2020.....	28
2.3.4.2 Poverty Reduction.....	31
2.4 Energy Sector Overview.....	34
2.4.1 Energy Resources.....	34
2.4.2 Uses of Energy.....	35

PART III

3.0 POLICY GOALS, OBJECTIVES AND PRIORITY ACTIONS.39

3.1.Introduction.....	39
3.2 Energy Sector Policy Goals.....	39

PART IV

4.0 ENERGY DEMAND SECTORS..... 53

4.1 Introduction.....	53
4.2 Household Sectors.....	54
4.2.1 Urban Household Energy Demand.....	55
4.2.2 Rural Household Energy Demand	62
4.3 Agriculture and Natural Resources Sector.....	63
4.3.1 Commercial Farming	63
4.3.2 Smallholder Farming	65
4.3.3 Energy Production Through Agriculture.....	65
4.4 Industry, Mining and Construction Sectors.....	66
4.4.1 Energy Efficiency in Industry.....	66
4.4.2 Environmental Management	67
4.4.3 Reliability of Electricity Supply.....	67
4.5 Transport	68
4.6 Social Services.....	68

PART V

5.0 ENERGY SUPPLY SECTORS.....70

5.1 Introduction.....	70
5.2 The Electricity Supply Industry.....	70

5.2.1 Opportunities and Challenges for the ESI.....	72
5.2.2 GoM Goals and Objectives for the ESI.....	73
5.2.3 ESI Policy Framework and Process.....	78
5.2.4 Promoting Private Sector Participation and Competition....	79
5.2.5 ESI Market Reforms	80
5.2.5.1 Elements of the ESI Reform Programme.....	80
5.2.5.2 Market Structure and Commercial Arrangements...	84
5.2.6 Rural Electrification.....	87
5.2.6.1 Objectives and Implementation.....	87
5.2.6.2 Subsidies for Rural Electrification.....	89
5.2.6.3 Grid Options.....	90
5.2.6.4 Off-Grid Options.....	90
5.2.7 Regulation and Role of Government	91
5.2.7.1 Regulation.....	91
5.2.7.2 Role of Government.....	93
5.3 Liquid Fuels Supply Industry.....	94
5.3.1 Opportunities and Challenges.....	96
5.3.2 Objectives of LF & GSI Reforms.....	98
5.3.3 Outline of the LFSI Reform Programme.....	102
5.3.3.1 Upstream Activities.....	103
5.3.3.2 Downstream Activities.....	105
5.3.3.3 LF & GSI Regulation.....	108
5.3.3.4 Role of Government.....	110
5.3.3.5 Environment, Health and Safety.....	110
5.4 Coal Supply Industry.....	111
5.4.1 Opportunities and Challenges.....	113
5.4.2 CSI Market Structure	116
5.4.3 Trucking.....	116
5.4.4 Regulation	119
5.4.5 Role of Government	120
5.4.6 Coal Environment, Health and Safety Issues	120
5.4.7 Clean Coal Technologies	120
5.4.8 Combustion Efficiency	121
5.4.9 Coal Dust Management.....	121
5.4.10 Coal Bed Methane	121
5.5 Nuclear Energy Industry.....	122
5.6 Biomass Supply Industry.....	122
5.6.1 Deforestation: Causes and Effects	126
5.6.2 Opportunities and Challenges.....	128
5.7 Other Renewable Energy Sources Supply Industry.....	130
5.7.1 Opportunities and Challenges for ORESSI.....	132

5.7.2 Nature of the ORESSI Market Reform.....	134
5.7.2.1 Supply and Warehousing.....	134
5.7.2.2 Retail Market (Installation and Maintenance).....	135
5.7.3 Financing Mechanisms.....	137
5.7.4 Regulatory Framework.....	137
5.7.5 Role of Government	138

PART VI

6.0 CROSS CUTTING ISSUES	140
6.1 Introduction.....	140
6.2 Energy Pricing	140
6.3 Energy Planning	142
6.4 Government, Institutional Framework and Capacity Building	144
6.4.1 Governance Instruments	144
6.4.2 Institutional Framework.....	145
6.4.3 Capacity Building	150
6.5 Research and Development	151
6.5.1 Research and Development in LF & GSI.....	151
6.5.2 Research and Development in CSI.....	152
6.6 Energy Statistics and Information	152
6.7 Energy and Gender	153
6.8 Energy and Climate Change	155
6.9 Regional Integration and International Cooperation.....	156
6.9.1 Electricity Trade.....	158
6.9.2 Petroleum Trade.....	159
6.10 Energy Efficiency	159
6.10.1 Energy Efficiency in Industry and Commerce.....	160
6.10.2 Energy Efficiency in Households and Institutions.....	160
6.10.3 Energy Efficiency in Transport.....	161

PART VII

7.0 THE WAY FORWARD.....	163
7.1 Sub-Sector Reform Strategies.....	163
7.2 National Energy Sector Implementation.....	163
7.3 Energy Framework Law.....	163
7.4 Monitoring and Evaluation.....	164

REFERENCES..... 165

Annex A: Malawi's Social Indicators 2000..... 167

Annex B: Objectives and Short Term Strategies and Priority Actions. 168

EXECUTIVE SUMMARY

1. Motivation for Integrated Energy Policy

The motivation for this Integrated Energy Policy (IEP) is founded on three main considerations. Firstly, developments in the energy sector have an important bearing on the success of economic development initiatives in any country. Energy is a crucial input into the different demand sectors of the economy, be it households, agriculture and natural resources, transport, industry, mining and construction. Economic development is positively associated with per capita energy consumption. Similarly, prevalence of intensive manufacturing activities is positively associated with use of modern sources of energy such as electricity, liquid fuels, gas and coal. Additionally, energy is an economic good in its own right, creating employment opportunities and generating government revenue. In Malawi, the energy sector employs nearly 60,000 workers and the petroleum industry alone provides GoM in excess of MK 1.5 billion in taxes each year.

Secondly, although Malawi is relatively well endowed with energy resources (i.e. biomass, coal, perennial rivers for power generation, and adequate sunshine for photovoltaic and other solar applications), their full potential is far from being realized. A number of structural, operational and institutional challenges must be met to unlock this potential: the country is landlocked and dependent on neighbouring states for access to seaports; an IEP to guide energy investments has been lacking; public investment in the energy sector has plummeted due to donor fatigue and general economic decline; international oil prices are unstable; industrialization is minimal; energy supply industries are inefficient and monopolistic; technologies are mostly static and usually imported; illiteracy rates are high; poverty is abject with 65% of the population living below the poverty line; urban-rural dichotomies are acute; effects of nature on lake levels and the flow of the Shire River, upon which the country almost wholly depends for power generation, are substantial; and deforestation resulting from agricultural clearing, urbanization, dependence on biomass for energy, among other factors, is rampant. It is widely acknowledged that overcoming these challenges requires a holistic approach, which recognizes links among the different types of energy and between energy and the economy, a process that can only be achieved through an

IEP. In addition, the country's "island" electricity transmission system denies access to regional electricity trading opportunities.

Thirdly, while planning is essential in formulating policy for, and investing in, energy, the approach to it is changing rapidly in response to the new global challenges of liberal policies following the end of the Cold War and the general recognition of the dismal performance of the modern nation states in delivering quality and affordable energy services. The change from one party dictatorship to a democratic system of government and subsequent adoption of liberal economic policies has been one of the most significant changes. Other changes include; the re-emergence of the private sector as a key investor in energy development and delivery; emergence of regional energy trading opportunities as a result of globalization and regional integration; growing international concerns over environmental issues, particularly adverse effects of Green House Gases (GHGs) emission. One of the effects of these changes has been the change in the meaning of, and approach to, energy planning and the subsequent shifts in paradigms as follows:

- a) From supply and its technology to demand driven planning;
- b) From short-term crisis-management to long term strategic development management;
- c) From social services to commercial services delivery;
- d) From national (in-ward looking self-sufficiency) focus to international focus on investment and competitive advantage; and
- e) From first formulating policies to first looking at poverty reduction and environment.

The changes in planning approaches have entailed a redefinition of the role of the State in general and the functions of the ministry responsible for energy affairs in particular.

The role of the State has fundamentally changed from direct investment and control to policy formulation and governance (regulation). However, it is fully recognized that markets do sometimes fail and do not always adequately respond to the State's social, economic, environmental and security concerns. Consequently, some form of State involvement is acceptable, but this needs to be properly defined, managed and channelled to avoid state-industry conflicts. Rural electrification, provision and management of subsidies to cushion the poor, are some areas in which the State ought to be engaged directly.

In order to adequately deal with these scenarios, GoM had to devise innovative and pro-active strategies and policy guidelines to stir development of the energy sector in the new millennium. The Department of Energy Affairs in the Ministry of Energy and Mining has therefore formulated this first IEP to address these new planning challenges.

2. Levels of Integration

Malawi's energy supply system is made up of five components: biomass, electricity, liquid fuels and gas, coal and other renewables. To achieve consistency, all components were integrated as basis for formulating this IEP. Integration was achieved at four levels. The first was national, in which GoM ensured that the policy reflected the aspirations of the Malawi Vision 2020. GoM also checked all energy policy objectives and strategies for consistency with the country's overall development objectives as stipulated in its Poverty Reduction Strategy Paper (PRSP, April, 2002). The second included other policies and acts such as forestry, environment, local government (decentralisation), private sector (privatisation), *inter alia*. The third level consisted of a framework for integrating policy at sub-sector level by ensuring that policies and projects specified for one energy sub-sector are consistent with the goals, policies and projects for others. Finally, an assessment of the components for each sub-sector was made to allow for a least cost development path in the short and medium-term time horizons.

3. Integrated Energy Policy Formulation Process

The IEP formulation process pursued a consultative and interactive approach in order to: a) build consensus among the key stakeholders and thus place ownership of the IEP in the public domain so as to improve chances of implementation success; b) establish synergies and thus avoid conflict between the IEP and other related policies; and c) identify policy drivers from the national and international environment.

The consultative process entailed expert consultation, public consultations and a literature review. A 23-member multidisciplinary task force comprising a cross section of stakeholders from government, private industry, non-governmental organizations, civil society, and large energy consumer groups was set up with intellectual support from one national and one international consultant.

Public consultations took place in regional and national stakeholders' symposia and in public hearings; political clearance was provided by established channels of government.

4. Goals and Objectives

This IEP provides a transparent and dynamic operational framework for the Malawi Energy Sector (MES). It also provides guidelines on energy development, supply, use, distribution, pricing and industry governance. The GoM expects the energy policy to achieve the following three long term goals:

- a) Make the energy sector sufficiently robust and efficient to support GoM's socio-economic agenda of poverty reduction, sustainable economic development, and enhanced labour productivity.
- b) Catalyse the establishment of a more liberalized, private sector driven energy supply industry in which pricing will reflect the competition and efficiency that will develop in the reform process; and
- c) Transform the country's energy economy from one that is overly dependent on biomass to one with a high modern energy component in the energy mix as shown in the table below.

Energy Mix Projections 2000 – 2050

	2000	2010	2020	2050
Biomass	93.0	75.0	50.0	30.0
Liquid Fuels	3.5	5.5	7.0	10.0
Electricity	2.3	10.0	30.0	40.0
Coal	1.0	4.0	6.0	6.0
Renewables	0.2	5.5	7.0	10.0
Nuclear	0.0	0.0	0.0	4.0
TOTAL	100%	100%	100%	100%

Source: Department of Energy Affairs (November 2002)

5. Specific Objectives

GoM's strategic objectives in the energy sector are:

- a) Improving efficiency and effectiveness in energy supply industries;
- b) Improving security and reliability of energy supply systems;
- c) Increasing access to modern energy services;
- d) Enhancing economic development and rural transformation;
- e) Improving energy sector governance; and

- f) Mitigating environmental, safety and health impacts of energy production and utilization.

Annex A of this policy elaborates strategies, priority actions for implementation and targets to be achieved in the next six (6) years for each objective and energy sub-sector.

6. IEP Implementation Instruments

The following documents will be developed as instruments for IEP implementation.

- a) National Energy Implementation Plan;
- b) A Legal Framework, including, but not limited to:
 - Energy Regulation Act;
 - New Electricity Act to replace the existing Electricity Act, 1998
 - Rural Electrification Act
 - Downstream Liquid Fuels and Gas Supply Act
 - Renewable Energy Supply Act
 - Downstream Coal Supply Act

B. c) Monitoring and Evaluation Framework

7. Reforms

Recent reviews of the performance of MES supply industries reveal a general decline in the efficiency of service delivery, financial performance and management.

To address the challenges noted above, GoM undertakes to reform the MES supply industries of electricity, liquid fuels and gas, coal and other renewable energy sources through market restructuring and promoting private sector participation. GoM sees competition and private sector as key components in enhancing MES's efficiency and effectiveness and ensuring that investment requirements are met within the industries without recourse to GoM's budget.

The reforms that GoM will undertake are designed to answer four critical elements of establishing a liberalized MES: market structure showing how the energy market will be organized in their natural formations, commercial arrangements showing how individual elements of the market will be relating to each other, ownership patterns defining the separation of roles between the state and the private operators, and regulation addressing governance and legal issues.

The reforms, which GoM will undertake are depicted in Figures: 7, 8, 9, 10, 11,12,13,14 and 15.

PART I

1.0 RATIONALE FOR INTEGRATED ENERGY POLICY

1.1 Background

Since attaining political independence from Britain in 1964, Malawi has not had an integrated energy policy (IEP) with which to guide developments in the energy sector and to maximize their contribution to national economic growth. Policy guidelines and strategies were available, but were scattered through a number of documents addressing very specific sectoral issues in electricity, liquid fuels and gas, other renewables, biomass and coal. Examples include: *Statement of Development Policies 1987 – 1996 (DEVPOL)*; *National Energy Plan 1987 – 1996*; *National Sustainable and Renewable Energy Programme (NSREP) 1997*; *Least Cost Power Sector Development Plans, 1986 – 1995, 1998 – 2008, and Electricity Act, 1998*.

The most comprehensive is the DEVPOL and the accompanying National Energy Plan (NEP), but a review of all of them reveals a number of shortfalls and they have out-lived their contextual usefulness as support documents for development. Although some of the issues articulated in the documents are still relevant, for example, deforestation and the high prices of imported fuels, the proposed strategies are not in keeping with the post Cold War geo-political climate and the attendant developmental concerns of poverty reduction, globalization, liberalization,

decentralisation and sustainability. They also fall short of an IEP. Although DEVPOL recognizes the existence of linkages among the various energy industries, it is preoccupied with strategies that were deemed necessary to maintain security of energy supply during the Cold War.

The Government of Malawi (GoM), which adopted political pluralism and liberal economic policies in 1994, realizes that this policy vacuum is neither beneficial nor desirable. On the one hand, the lack of an IEP led to a fragmented policy, which contributed to the waste of resources in misguided investments. On the other hand, the post-Cold War political and economic dispensation not only requires a more focused, efficient and effective energy sector, but also a paradigm shift in energy planning methodologies from the reactive crisis-management to development-management in which the energy sector must be seen to contribute to specific national goals.

This Malawi Energy Policy (MEP) presents GoM's policy goals and objectives for the energy sector in support of its initiatives in poverty reduction and rural transformation. It sets out strategies and priority actions that must be implemented over a period of six years divided into two equal concurrent time horizons of three years each (i.e. short-term covering the first three year period; and medium term covering the following three year period).

1.2 Rationale

Four important considerations justify the preparation of this Energy Policy.

1.2.1 Links Between Energy and Development

Many studies provide sustained evidence from a large number of countries

demonstrating the strong two-way linkage between energy and economic development. Energy is crucial to industry and is the life-blood of modern transport. The countries that have made the greatest strides in development are those that use the greatest quantities of energy resources per capita. But the structures of energy sectors also dictate the possible development paths a country can take. For instance, those that depend on modern forms of energy (for example, electricity, coal and oil) tend to be engaged in energy intensive manufacturing industries. Those dependent on traditional fuels (that is, firewood and charcoal) commonly have economies based on producing low energy intensive, primary commodities and exporting a few unprocessed agricultural products and minerals.

Energy is also a commodity in its own right, produced, stored and sold like any other economic good or service. This makes energy establishments sources of revenue for governments (in taxes, levies and royalties) and the employers of millions of people worldwide. Because energy infrastructure is capital intensive, investments require careful planning to balance the needs of the principal energy users and the needs of other social sectors. Since this investment can be public or private or a mix of the two, it is essential to provide clear guidelines clarifying the roles of the state and of private players. This will serve to reduce conflicts and ensure the efficiency and effectiveness of service delivery. Like any other commodity, energy production and delivery raise a number of important cross cutting issues, such as pricing, environmental management, legislation, etc.

1.2.2 Resource Opulence and Underdevelopment

Although Malawi is relatively well endowed with energy resources [i.e. biomass, coal, perennial rivers for power generation and round the year sunshine for solar applications] their full potential is far from being realized. A number of structural,

operational and institutional challenges must be met: the country is landlocked and dependant on neighbouring states for access to seaports; public investment has been reduced due to increased donor fatigue; international oil prices are unstable; industrialization and modern technologies are minimal, and the latter are usually imported; illiteracy rates are high; poverty is abject; urban-rural dichotomies are acute; the effects of nature on lake levels and the flow of the Shire River are substantial. It is generally recognized that overcoming these challenges calls for a holistic approach, which recognises links between the types of energy and between energy and the economy.

1.2.3 Energy Planning

Planning is essential in formulating policy for, and investing in, energy; but the approach to it is changing rapidly in response to the new global challenges following the end of the Cold War and the general recognition of the dismal performance of the state in delivering energy services. The replacement of one-party dictatorships by politically plural systems and the consequent adoption of liberal economic policies, which have entailed the retreat of the state from direct economic management, has been one of the most significant changes. Others are the re-emergence of the private sector as a key investor in energy and its delivery; the emergence of regional and international trading opportunities consequent on globalisation and regional integration; growing international concern over environmental issues, particularly the adverse effects of greenhouse gas (GHG) emissions on the global climate.

One effect of these developments has been a change in the meaning of, and approach to, energy planning. It can no longer be a matter of central government calculating energy demand and then determining the investment needed to meet it. Energy planning now means taking cognizance of market liberalization and the

private sector and of synergies between energy demand and supply on the one hand, and economic development and the environment on the other. This shift has a number of implications in both the methodology of planning and the role of central government in the process. Paradigm shifts in energy planning and the formulation of policy must include movement:

- a) ***From supply and its technology to demand driven planning***: this change is founded on the reality that energy users do not need energy for its own sake. They demand it for lighting, cooking, heating, cooling, etc. These services can be supplied from several forms of energy production, electricity, coal, biomass, petroleum products, etc. Planning must start from an understanding of the needs of the end users and then must identify the supply chains that best meet the demand under a given set of circumstances;
- b) ***From short-term crisis management to long-term strategic development management***: energy planning must be pro-active, not reactive. Because the concerns of the Cold War have long been removed, government can now afford to turn away from short term crisis management towards medium and long term development management which would allow the energy industry to play its rightful role in supporting the goals of national economic development such as poverty reduction. Such planning would help government to achieve its national development goals and to place itself in a position of internationally competitive advantage.
- c) ***From social services to commercial services***: since there is a major difference in the motives of the state and of the private sector in investing in energy (the former provides social services and public infrastructure, the latter is moved by

the demands of commerce and profit maximization), modern energy planning must establish a new set of incentives to persuade private investors participate in liberalized energy markets. Appropriate macro-economic fiscal and monetary policies, legislation and regulatory frameworks to regulate competition, all become pre-requisite conditions for involving the private sector.

- d) *From national (inward looking self-sufficiency) focus to international focus (outward looking) on investment and competitive advantage:* the pre-occupation with security during the Cold War and the resultant military conflicts forced many countries to pursue policies for national self-sufficiency, even where they did not make economic sense.
- e) *From first formulating energy policies to first looking at alleviating poverty and at the environment:* these changes in approach have called for a redefinition of the role of the state in general and the functions of central government ministries responsible for energy affairs in particular. The role of the state has fundamentally changed from that of direct investor and regulator to that of policy formulator and governor. However, it is fully recognised that markets do sometimes fail and do not always respond adequately to the state's social, economic, environmental and security concerns. Some form of state involvement in order to secure those objectives, which the private sector is not normally expected to fulfill, is therefore necessary. Rural electrification, which inherently produces low returns on investment, and the provision of subsidies to cushion the poor, become good candidates for government involvement.

In Malawi's case, all these issues require innovative and proactive integrated strategies to stir the energy sector. It is for this reason that the Ministry of Natural Resources

and Environmental Affairs (MNREA), through its Department of Energy (DoE), has formulated this first IEP for Malawi in an attempt to make the energy sector more responsive to the development needs of the country. This document is intended to provide a transparent and dynamic operational framework for the energy sector as well as guidelines on matters related to energy development, supply, use, distribution, pricing and governance. GoM expects this policy to achieve three specific goals:

- a. To make the energy sector sufficiently robust and efficient to support adequately GoM's socio-economic agenda of poverty reduction, sustainable economic development and enhanced labour productivity;
- b. To catalyse the establishment of a more liberalised, private sector driven energy supply industry in which pricing will reflect the competition and efficiency that will develop in the reformed process; and
- c. To transform the country's energy economy from one that is overly dependent on biomass to one with a high modern energy component in the energy mix as shown in Table 1 in Part III.

1.3 Formulating the Energy Policy

In developing MEP, DoE pursued a consultative and interactive approach designed to achieve the following objectives:

building consensus among the key stakeholders and confidence in the formulation process, so as to enhance the chances of success in implementation and thus to make the general public owners of the policy;
establishing synergies between energy and other sectors and in that way avoid conflicts between MEP and other related policies; and
identifying policy drivers.

1.3.1 Consensus Building for National Ownership

As Figure 1 illustrates, the consultative process entailed expert consultations, public consultations and a literature review.

1.3.1.1 Expert Consultations

A 23-member multi-disciplinary Task Force was set up to develop MEP. It comprised a cross section of stakeholders from government, private industry, non-governmental organisations (NGOs), civil society and large energy consumer groups. Intellectual support was provided by one national and one international consultant.

1.3.1.2 Public Consultations

Public consultations took place in regional and national stakeholders' symposia and in public hearings; political clearance was provided by established channels of government.

a) Stakeholders' Symposia

- i)* The first national consultative workshop (NCW) was held in September, 2000 and attracted 80 participants drawn from central and local government, chief executives of various parastatals, NGOs, civil society groups, traditional Chiefs, large consumer groups and political parties represented in Parliament. It outlined issues and challenges for the energy sector and its outcome was recorded in a report of proceedings (September, 2000). Discussions for the workshop were based on issues papers prepared by members of the Task Force.

- ii)* A series of regional consultative workshops (RCWs), three in number (one for each of the three administrative regions of the Northern, Central and Southern Regions), were held during the period January – February 2001 with 150 participants. Their purpose was to validate the energy sector issues and challenges identified at the first NCW and to serve as the first instrument for soliciting public views on possible interventions in addressing challenges. The consultations took the form of question and answer sessions based on a series of policy questions outlined in the first Energy Policy discussion document, known as the “Energy Policy Green Paper”.
- iii)* The second NCW, convened in June 2001, had the same members as the first. It was to provide the public with a chance to comment on the draft Malawi Energy Policy White Paper (MEPWP). It also served to test the validity of the policy goals, objectives, strategies and priority actions before their presentation for adoption by policy makers.
- iv)* The MEPWP was also presented and discussed at a gathering of Principal Secretaries. They met in their capacities as heads of ministries, key Government policy makers and as Controlling Officers for various sectoral programmes which impact on energy. The workshop took place in July 2001 and was attended by 45 Principal Secretaries and Chief Executives of energy supply industries and regulatory bodies, and other government officials. The meeting was chaired by the Secretary to the President and Cabinet, who doubles as Head of the Civil Service.

b) Political Clearance:

Political clearance took the form of presentations to the three branches of Government: the Executive was represented by the Cabinet Committee on Natural Resources and Environment and full Cabinet; Parliament was represented

by the Parliamentary Committee on Natural Resources and Environment and the Judiciary was represented by the Attorney General's office.

1.3.1.3. Literature Review

The formulation of policy involved the collection and analysis of secondary data. Among the documents reviewed were the policies of other sectors synergetic with the energy sector, the policies of other countries and the sub-sector issues papers developed by the Task Force. Specific documents are listed in Annex A.

These processes were followed by a series of consultative workshops to solicit comments and inputs, on the definition of opportunities and challenges based on the descriptions provided by Issues Papers, from a wider constituency of stakeholders. These comments formed the basis for developing the *Malawi Energy Policy Green Paper (2001)*. This document was used as resource for constructing the first draft MEPWP, which was in turn subjected to a series of further public presentations and peer reviews through NCWs and RCWs. The process of consultation, leading to the preparation of the final draft MEPWP, took 19 months from June 2000 to December, 2001. Figure 1 illustrates the stages followed and key actors consulted in the formulation process.

Figure 1: Energy Policy Formulation Consultative Process

1.3.2 Synergy Building for Integration

To achieve consistency, an attempt was made to combine all components of the energy system into an integrated energy plan. This will allow the energy sector to attain results greater than the sum of the individual parts, such as the Electricity Supply Industry (ESI), Liquid Fuels and Gas Supply Industry (LF&GSI), Coal Supply Industry (CSI), or Other Renewable Energy Supply Systems Industry (ORESSI) or Biomass Supply Industry (BSI), if they remain uncoordinated and fragmented.

As illustrated in Figure 2, integration was achieved at four levels. The first was national, in which GoM ensured that the policy reflected the aspirations of the Malawi Vision 2020. GoM also checked all energy policy objectives and strategies for consistency with the country's overall development objectives as stipulated in its Poverty Reduction Strategy Paper (PRSP, April, 2002) and in other policies. The second included forestry, environment, local government (decentralisation), private sector (privatisation), etc. The third level consisted of a framework for integrating policy at sub-sector level by ensuring that policies and projects specified for one energy sub-sector were consistent with the goals, policies and projects for others. In the fourth, an attempt was made to assess the components of each sub-sector in a way that would allow for a least cost development path to be specified in the short and medium-term time horizons. Figure 3 illustrates the steps followed in developing the MEP. As in any other sector, the steps elaborated in this figure require clarity in:

- a) defining problems or challenges and opportunities;
- b) identifying the underlining causes of the problems and challenges;
- c) identifying policy drivers;
- d) identifying potential solutions to the challenges and strategies for exploiting opportunities; and

e) monitoring and evaluating (M&E) the impact of policies once their implementation has commenced.

Figure 2: Schema Showing Levels of Integration in Energy Policy Formulation

Figure 3: Schema Showing Elements of IEP Formulation Process

1.3.3 Identifying Policy Drivers

In identifying policy drivers for the MEP, the drafting team was guided by two main considerations. The first was based on the realization that any process of formulating policy is conditioned by the structure of the individual sector under examination. In the present case, that structure is set out in Figure 4. It is clear that any IEP must cover both demand and supply in the energy system. Consideration should also be given to a range of cross-cutting issues, including pricing, environment and planning. The second consideration is based on the recognition that the energy sector does not operate in a vacuum. It is part of a wider economic system, which defines the national and international context of its developments. Among the national factors are fiscal and monetary policies, physical characteristics, economic structures and levels of development. International factors include the nature and pattern of diplomatic ties, geopolitics, the performance of the global energy markets and the world economic and political order.

1.4 Structure of the Energy Policy Document

The MEP is divided into seven parts, including the present section, which reflect the logical flow of issues derived from Figure 4 and the statement on drivers in Section 1.3.3. The contents are summarised below.

- Part I explains the rationale for the MEP, and the approaches, planning processes and drivers used in developing this energy policy.
- Part II is a brief description of the international and national context in which this policy finds its meaning and relevance. The section also presents policy objectives, strategies and a summary of priority actions in order to simplify their identification and to facilitate understanding of the document.

- Part III provides an overview of energy policy goals and objectives. It also details priority activities that GoM has identified for implementation in the short term (2003 - 2005) and medium-term (2006 – 2008) in support of policy objectives.
- Part IV discusses challenges in the energy demand sectors and identifies critical policy positions addressing these challenges. For ease of analysis, the document focuses on five key sectors: households (rural and urban); agriculture and natural resources; industry, mining and construction; transport; and social services (for example, health, education, community development, government).
- Part V analyses the energy supply sub-sectors of electricity, liquid fuels and gas, coal, nuclear, biomass and other renewable sources of energy. GoM policy positions in this area are outlined by sub-sector.
- Part VI covers cross-cutting issues including pricing, planning, governance, research and development, capacity building and gender.
- Part VII provides mechanisms for monitoring and evaluating energy policies and for the way forward in formulating policy.

Figure 4: Energy System Taxonomy

PART II

2.0 THE CONTEXT OF ENERGY POLICY

2.1 Introduction

Malawi, like many other developing countries, is undergoing major economic, political and social transformations, made possible by the end of the Cold War. Among the most important developments relevant to energy are the adoption, in 1994, of a multi-party system of government, the resulting liberal economic policies that led to the gradual withdrawal by the state from direct participation in economic investment (*liberalisation*), its replacement by local government (*decentralisation*) and the involvement of the private sector and NGOs. Others include the cessation of military conflicts in neighbouring states which led to the restoration of trade routes and the improved security of energy supply; the collapse of apartheid in South Africa, its inclusion in the international family of free nations and the end of its campaign of sabotage and destabilisation. Calls for regional integration through SADC and, most recently, continentalisation through the formation of the African Union (AU) and the African Energy Commission (AFREC) are also of great importance.

These developments have direct and indirect consequences for the structure and operational efficacy of many sectors, including energy. Major paradigm shifts are necessary to allow a bold and imaginative mindset and new way of conducting government business. The energy supply industries and their structures of governance must be transformed to meet the new policy goals dictated by the new environment.

Before establishing energy policy objectives, it is of utmost importance that the international and national context within which the IEP must be formulated and the issues affecting the sector are adequately understood. These have three dimensions: the broader economic, social and environmental policies and forces, both national and international; the size and nature of the energy sector; the identification of opportunities and of challenges. The sector must be enabled to contribute adequately to the government's overall development goals of poverty reduction, sustainable development and improved productivity.

2.2 International Context

2.2.1 Expanded Diplomatic Base

Malawi's policy for international relations shifted significantly after the change in government in 1994. The country has emerged from diplomatic isolation and has significantly increased the number of states with which it has diplomatic ties, many of them have opened resident missions in Malawi. By including Arab and Asian states, the composition of the diplomatic mix has also changed fundamentally. In 1990-92, some of Malawi's traditional partners had withdrawn in an effort to pressurise GoM to change its system. They have since returned, but with a different development agenda emphasizing environmental conservation, good governance, transparent government, human rights and related issues.

All this has a significant impact on energy policy and its strategies. Contemporary international development policy emphasises soft rather than infrastructure investments. Since the energy sector largely calls for hard investment, it must enter through a back door if it is to benefit from new development policies. That back door is environmental protection and poverty reduction. More specifically the United

Nations Framework Convention for Climate Change (UNFCCC), which emphasises conservation, demand-side management and renewable energy technologies (RETs), provides the key to sustainable development. Since over 80% of Malawi's development is financed from abroad, its new diplomacy has an important role to play in the level, source and areas of foreign investment. These developments need adequately to be reflected in the MEP by adopting priorities reflecting the new diplomatic mix. For example, oil rich Arab countries may be interested in raising investment in the LF&GSI rather than the ESI.

2.2.2 The Global Economy

With increasing globalisation and the dominance of market ideology, the flow of goods and capital is rapidly becoming dominated by private finance, which dwarfs official foreign aid. This makes it imperative that if capital is ever to flow to the energy sector, energy policy must encourage transparent pricing and promote private sector participation.

2.2.3 The Global Environment

Growing concern for the physical environment has rocked development debates in recent years. The UNFCCC notes that, internationally, the energy industry's GHG emissions have a larger environmental impact than those of most other economic sectors. The Kyoto Protocol requires member countries to take decisive steps to reduce them and put in place mitigating measures, for example. It has also put in place financing mechanisms, through carbon trading under the Clean Development Mechanism (CDM) and the Global Environmental Facility (GEF), to assist developing countries in meeting their environmental obligations. Governments around the world are insisting that development activities undergo stringent environmental impact assessments (EIAs). Malawi, through the Environmental

Policy (1996) and Environmental Management Act (1997), has laid down guidelines for EIAs. Developments in energy production are subject to the same measures. Other mitigating measures include a general call to invest in more environmentally benign energy systems such as micro-hydros, solar energy systems and other renewables whose emissions of GHGs are known to be negligible. Consumers are also being pressed to take measures to improve efficiency in energy use by adopting more efficient combustion systems and implementing demand-side management (DSM). As a signatory to the UNFCCC, the United Nations Convention on Desertification (UNCD) and the United Nations Convention on Biodiversity (UNCB), Malawi intends to play a constructive role in the alleviation of global emissions and environmental degradation.

2.2.4 International Finance Capital

The international finance market is changing its lending policies. The Bretton Wood Institutions, which previously lent funds to developing countries for infrastructural development, are now investing more in social programmes. Conditionalities for aid have also increased and private capital is beginning to take its place. This has a profound effect on the way in which developing countries can conduct their development business and how they can find capital. The challenge is to create a catalytic environment with appropriate checks and balances for transparency, legal frameworks, and fiscal and regulatory regimes, which attract domestic and international investment, while ensuring that national development goals are not compromised.

2.2.5 Regional and International Bodies

Malawi is an active member of a number of regional, continental and global organisations with strong agendas for energy development. Regionally, the most

important body is the SADC, which advocates regional integration and cooperation. To this end, SADC has, through its *Energy Protocol (1996)* and its *Energy Cooperation Policy and Strategy (1996)*, identified four key areas in which energy can contribute to regional integration: trade in energy, investment and finance, capacity building and training, the exchange of information and the sharing of experience. The establishment of the Southern African Power Pool (SAPP) and SADC Energy Commission has cemented institutional modalities for attaining these policy goals. At the continental level, the AFREC is part of the Organisation of African Unity's (OAU) transformation from a loose political unity and organ of solidarity to an economic union with its own continental parliament modeled on the European Union (EU). This makes it imperative that national energy policies are compatible with regional aspirations.

2.3 National Context

2.3.1 Physical Characteristics

Located in Southern Africa, Malawi is a small, landlocked agricultural country with a total area of 118,484 km², of which 20% is covered by water, mainly Lake Malawi. The altitude ranges from almost sea level to over 3,000 metres. Rainfall ranges from 800 mm to over 2,500 mm per annum in low and highlands, respectively. It has a cool dry season (May - August, mean temperature of 17⁰C), a hot dry season (September - October, mean temperature of 29⁰C) and a hot wet season. Average daily solar irradiation is 21.1 MJ/m²/day. This climate allows the growth of tropical and sub-tropical crops including cereals, tobacco, cotton, sugar and tea. The country is divided administratively into three Regions (Northern, Central and Southern), which, in turn, are divided into 28 districts.

2.3.2 Demography

The 1998 Population and Housing Census estimated Malawi's population at 9.8 million. Of these, 4.8 million were males (49%) and 5.0 million were females (51%). The overall sex ratio (number of males per 100 females) was 96 and about 24% of the households in Malawi are headed by females.

The population grew from about 8.0 million in 1987, representing an intercessor growth rate of 1.9% per annum. At regional level, the Northern Region grew the fastest from 900,000 in 1987 to 1.2 million, representing an annual growth rate of 2.7%. The population in the Central Region grew from 3.1 million in 1987 to 4.0 million in 1998 and that from Southern Region grew from 4.0 million in 1987 to 4.6 million in 1998, representing annual growth rates of 2.4% and 1.4%, respectively.

In 1998, the overall population density (number of persons/km²) was 105. The Northern Region was the least densely populated (46 persons/km²), whereas the Southern Region was the most densely populated of the three regions at 146 persons/ km². The population density in the Central Region stood at 113 persons/ km². The 1998 census also revealed that the majority of Malawi's population live in rural areas (86%) and most of them are smallholder farmers. The *1997-98 Income Household Survey* estimated that 32.3% of smallholder households cultivate between 0.5 and 1.0 hectare.

2.3.3 The Economy

Agriculture is the mainstay of Malawi's economy. It supports 86% of the population residing in rural areas and accounts for 36% of the Gross Domestic Product (GDP), 90% of export earnings and 46% of wage employment. Over 80% of the labour force is engaged in agriculture. Principal exports include tobacco (64%), tea (15%-20%),

sugar (8%), cotton (2.5%), coffee (2.5%) and pulses (2.6%). Malawi has a good supply of fresh water and moderately fertile land, but no substantial mineral resources have been discovered. Indicators suggest that just over 65% of Malawi's population live below the poverty line. Per capita income was estimated at US \$220 in 1999. Income distribution is highly inequitable with a national gini-coefficient of 0.4 (estimated at 0.37 and 0.52 for rural and urban areas, respectively).

Since political independence from Britain in 1964, the GDP has grown rapidly and the volume of exports has expanded. Despite a relatively poor resource base, a high population density, inefficient and unstable access routes to external markets, Malawi managed to achieve a growth rate of 6% a year throughout 1978. Agriculture was the main source of that growth, which then affected sectors like construction and manufacturing. Significant progress was also made in meeting the educational, health and other basic needs of the population.

After a remarkable performance during the late 1960s to mid 1970s, Malawi's economic performance slackened during 1979-81, largely due to external shocks (for example, oil prices, regional civil wars and the subsequent temporary closure of Malawi's traditional trade routes), which led to deteriorating terms of trade. These external problems revealed major structural weaknesses in the economy:

- a narrow export base, mainly composed of a few agricultural commodities;
- a stagnant smallholder agriculture;
- a heavy dependence in the industrial and energy sectors on imports;
- a deficient framework of incentives;
- inefficient public enterprises;
- a weak institutional capacity for planning and managing public resources;

- inefficiencies in production as a result of price controls; and
- overvalued exchange rates.

To deal with these weaknesses, GoM initiated a number of structural adjustment policies (SAPs) aimed at improving the macro-economy. As a result of these adjustments together with a number of other policy interventions, some positive growth was obtained, particularly in 1982 and 1995, but the incidence of poverty remains very high (65%). The economy is currently threatened by a global anti-smoking campaign and, at policy level, there are ongoing discussions to consider its implications for Malawi's economy and to work out strategies, including crop diversification, for averting a major dislocation.

Since 1964, Malawi's agricultural sector has developed a two-tier structure, comprising smallholder subsistence and commercial estate sub-sectors. They are largely differentiated by landholding sizes, the legal and institutional rules regulating land tenure and, until recently, crop production and marketing input supply and pricing, as well as the provision of extension services. Restrictions separating the two have been relaxed, but the sector remains highly dualistic and the benefits of separation are yet to be assessed.

The smallholder sub-sector comprises farm families locked into largely subsistence agriculture on 1.8 million hectares of land under a system of customary land tenure. The use of simple and traditional technologies, low returns, high seasonal labour fluctuations and women playing a vital role in production are all characteristics of smallholder production. Small landholdings, declining soil fertility, the use of unimproved varieties of crops, negligible fertiliser use, high post-harvest losses and limited access to credit facilities and extension services combine to hinder the

productivity of smallholder agriculture. Nonetheless, smallholder agriculture accounts for 80% of the country's food production, 90% of agricultural employment and about 15% of GDP.

Estates take up 13% of Malawi's land area under leasehold or freehold tenure. They mainly grow cash crops, such as tobacco, tea, coffee, sugarcane and pulses. Estate agriculture accounts for 25% of the GDP, 90% of export earnings and generates 45% of formal employment. As a result of higher levels of technology and of its relatively easy access to imports, credit, agricultural services and markets, productivity on the estates is higher than in the smallholder sub-sector. Various studies have shown that most of the estate land (55-76%) is unutilised or under-utilised.

2.3.4 Extent of Poverty in Malawi

Malawi is one of the poorest countries in the world and ranks 169 out of 173 countries in the *UNDP Human Development Index, 2000*. Poverty in Malawi is a pervasive problem, affecting about 65% of the population who live below the poverty line, defined as being unable to fulfill nutritional requirements and meet essential non-food needs. Rural and urban poverty are estimated at 61% and 51%, respectively.¹ The pervasiveness of poverty in Malawi is reflected in high infant, under-five and maternal mortality rates, in low life expectancy, high household food insecurity, high illiteracy, population growth, deforestation, the rates of HIV/AIDS infection and the high gender imbalance (see Malawi's social indicators in Annex B). Map 1 illustrates the geographical distribution of the extent of poverty in Malawi.

¹ This definition was used in the Poverty Alleviation Strategy document, however, in its recent poverty analysis, the Malawi Integrated Strategy Survey, 1997-98, the Malawi Government has linked the definition of poverty to a set of welfare indicators. According to Malawi Government Profile of Poverty, 1998, the poverty line is that level of welfare which distinguishes poor households from non-poor households, expressed in the same unit as the consumption based measure of welfare where welfare means the total daily per capita consumption and expenditure reported by a household. This is made up of four items: total food consumption; total non-food and durable goods expenses; estimated use value of durable consumer goods, for example, vehicles and furniture; actual or imputed rental value of housing for the household. The sum of all reported expenditure on and consumption of these items for a household, adjusted to daily and per capita figures, constitutes the household welfare indicator.

2.3.4.1 *The Malawi Vision 2020*

The Malawi Vision 2020 provides a framework for the preparation of short and medium term plans.² It defines national goals, policies and strategies designed to help the Government, the private sector and society in general to improve development management. The Malawian Vision is that:

“By the Year 2020, Malawi, as a God-fearing nation, will be secure, democratically mature, environmentally sustainable, self-reliant with equal opportunities for active participation by all, having social services, vibrant cultural and religious values and a technologically driven middle-income country”.

² His Excellency the President, Dr. Bakili Muluzi, officially launched the Malawi Vision 2020 in March 1998

Map 1: Incidence of Poverty in Malawi

In the section dealing with the development of economic infrastructure, including energy services, *Vision 2020* advocates the provision of efficient energy supplies as a key pre-requisite for achieving economic development and middle-income status. The Vision laments the inadequacy of the supply of modern energy systems and the limited access to modern energy services. It cites a number of issues that have contributed to these problems and which must be addressed if the sector is ever appropriately to support the Vision. The high cost of energy service production, the unreliability of supply due to monopolistic market structures, underdeveloped services, siltation resulting from deforestation, lack of competition and cultural inertia are all high on the list of challenges, which must be met.

The Vision recognizes that an efficient supply of electricity requires a constant supply of water through conserved catchment areas, connections to power lines in neighboring countries, industry liberalization and the privatization of some functions of the ESI, encouragement for the widespread use of electricity through inexpensive electrical reticulation and wiring design and the installation of pre-pay meters. Civic education about electricity is seen as central to any initiative for increased access. In the case of liquid fuels and gas, the Vision notes that while better, cheaper guaranteed supplies of petroleum products are needed, their attainment has been thwarted by high costs, insufficient reserves and dependency on imports. To meet the demand requires improved efficiency in procurement, transportation and storage to reduce costs, together with investment in exploration as well as in pipelines and storage facilities.

The Vision is emphatic in its call for restructuring the production of energy by improving the delivery of electricity and liquid fuels and gas and thus reducing the dependency on woodfuel. It admits, however, that woodfuel is needed in the short

run until other forms of energy are more readily available. The role of other renewable forms of energy is recognised as a medium to long-term solution.

2.3.4.2 Poverty Reduction

Because most Malawians live in absolute poverty, GoM has made poverty reduction its main policy agenda for national development. The Poverty Alleviation Programme was launched on 25th August 1994. A Presidential Council on Poverty Alleviation and a National Steering Committee were set up to guide the development of the framework for policy and operational strategy. This has led to the formulation of the PRSP, 2002 under which, since January, 2001, debts have been converted into development assistance through the Heavily Indebted Poor Countries (HIPC) Programme. Malawi's energy sector is one of the main beneficiaries of the HIPC programme's infrastructural development provision. The PSRP says:

“Every Malawian should have access to basic necessities and should be able to develop and exploit his/her potential to lead a productive, dignified and creative life through social, economic and political empowerment...”

The World Bank argues that no society has been able to develop without access to adequate and affordable modern energy. It enables communities, *inter alia*, to light their homes and schools, refrigerate their supplies and support productive businesses, thereby helping to improve their education, employment opportunities and quality of life.

Lack of modern energy hurts the poor in Malawi. Energy is a priority in their consumption bundle and yet they are victims of exclusion, pollution and price distortions. The rural poor depend on inefficient traditional fuels (wood, crop

residues and dung), vastly inferior and polluting sources of energy and indoor pollution is a leading cause of respiratory ailments. Women bear most of the drudgery of collecting, processing and utilising these fuels. In rare cases, electricity is used for lighting, but the poor mainly use paraffin, candles and wood fires. These provide poor illumination and cause eyestrain.

Access to and improved energy services will directly increase the ability to raise income and enhance the well-being and sense of empowerment of the poor by:

- a) reducing drudgery, time and effort spent gathering traditional (biomass) cooking fuels;
- b) increasing labour productivity through irrigation, crop processing and mechanisation;
- c) improving illumination through use of higher quality lights that directly enable educational attainment and income producing entrepreneurship;
- d) reducing health risks through use of cleaner burning fuels and better cooking equipment;
- e) facilitating improved access to information and markets through radio, television and electronic communication;
- f) empowering people by increasing access to fuels for daily living and expanded fuel choice;

Improvements in the availability and quality of energy services for small firms and communities will indirectly benefit the poor by:

- a) creating jobs, both farm and non-farm, thus reducing overall unemployment and opening up more diverse livelihoods;

- b) enhancing service delivery and quality in health (lighting, equipment, refrigeration), water and sanitation (pumping, purification) and education (lighting and entertainment);
- c) easing pressures on destructive natural resource exploitation, particularly the depletion of forests for woodfuel.

GoM recognises that reducing poverty is a multi-sectoral or cross-cutting issue. The energy sector alone cannot be instrumental in addressing it since the poor do not live their lives in individual sectors. Investments in energy, as well as in other sectors of the economy (such as health, education, water, sanitation, transport, communications and other rural and urban infrastructural services) are important for the energy sector to be effective. Anti poverty strategies identified by the World Bank's World Development Report 2000/2001 have three elements: (a) promoting opportunities including job creation, providing credit, road infrastructure, electricity, markets for produce, schools, water, sanitation and health services; (b) facilitating empowerment, which means laying the political and legal basis for inclusive development, creating public administrations that foster growth and equity, promoting inclusive decentralisation and community development, promoting gender equity and tackling social barriers and supporting poor people's social capital; (c) enhancing security by developing national programmes to prevent, prepare for and respond to macro shocks (for example, financial and natural), designing national systems for social risk management that are also for growth and tackling the problem of HIV/AIDS.

In linking energy to these overall anti-poverty strategies, the World Bank argues that the energy sector's own poverty alleviation goals should be embedded in the developmental strategy of the country concerned and be derived from the overall poverty alleviation goals and priorities. In addition, the energy sector's unique

characteristics should be taken into account in determining how the sector will contribute to the overall goals. The Bank proposes three energy sector anti-poverty goals: (a) increased incomes, (b) increased well-being and (c) increased voice and security. Strategies for achieving these goals would include: making energy markets work better, energising rural transformation, and reducing environmental impact. These strategies would entail paradigm shifts towards private sector delivery, emphasis on strengthening decentralised energy service markets, thinking holistically and exploiting high value added synergies from key cross sectoral linkages, promoting competition where possible and, where necessary, introducing regulation. The paths from the goals of GoM and the energy sector's strategies for realising them are elaborated in Parts IV, V and VI of this Policy document.

2.4 Energy Sector Overview

2.4.1 Energy Resources

Malawi is endowed with several sources of energy: biomass, coal, many perennial rivers for hydropower generation, high solar irradiation (estimated at 21.1 MJ/m²/day) is adequate for photovoltaic and photo-thermal applications, wind energy (wind speeds averaging 2 - 7 m/second) for water pumping and other minor applications, hot springs for geothermal power and uranium deposits for nuclear power generation. Petroleum products are exclusively imported. For planning purposes, these resources are conveniently categorised into five sub-sectors:

- a) biomass (firewood, charcoal, crop and industrial residues),
- b) electricity (hydro and thermal),
- c) liquid fuel & gas (petrol, diesel, paraffin, ethanol, Gel-Fuel, avgas, JetA1, LPG),
- d) coal and peat,
- e) other renewables (solar, wind, biogas, mini and micro-hydros).

Malawi's energy balance is dominated by biomass. These sources account for 97% of production. Fifty-nine percent of this biomass is used in its primary form as firewood (52%) and residues (7%), the remaining 41% is converted into charcoal in traditional earth moulds at estimated thermal efficiencies of between 12% - 14%. These efficiencies are much lower than those obtained from modern charcoal carbonisation kilns (for example, Retorts, Bee-Hives, Mark V) whose efficiency is estimated at nearly 35%.

The only major indigenous sources of commercial fuels are coal (55,000 tonnes in 2000), uranium deposits at Kayerekera in northern Malawi and electricity (almost all hydropower with an installed capacity of 304 MW in the year 2000). About 97% of the petroleum products are imported, the remaining 3% comprises locally produced ethanol, which is blended with petrol. The existing annual production capacity for ethanol is estimated at 18 million litres.

Other renewables have so far made little contribution. The application of RETs (including solar home systems (SHS), biogas, wind energy plants, mini and micro-hydros) is a relatively new phenomenon. This low uptake has largely been due to relatively high up-front costs, the absence of appropriate institutional delivery mechanisms and a poor track record, exemplified by large numbers of non-operative systems. For instance, of the estimated 5,000 SHS installed to-date, only 50% are in working condition.

2.4.2 Uses of Energy

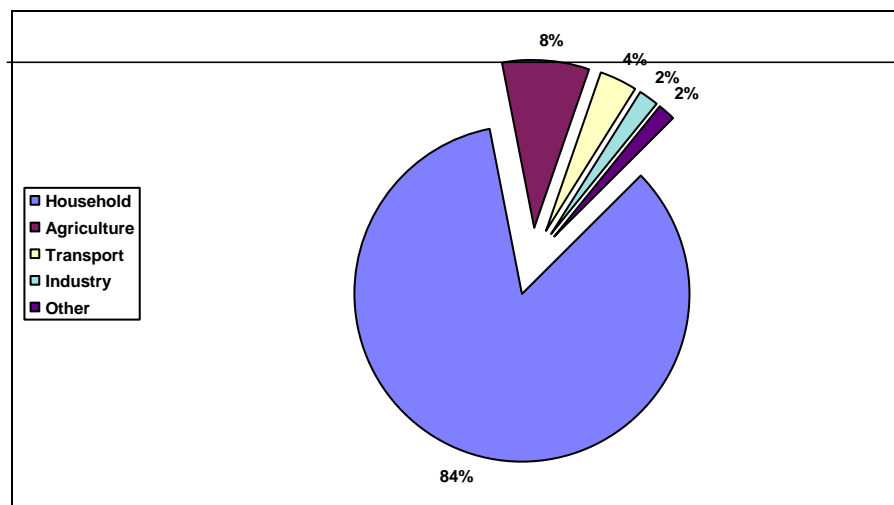
In 1996, the annual per capita energy consumption in Malawi was estimated at 12.5 GJ, or 0.29 TOE. This compares unfavourably with the per capita average of 80 GJ

for upper-middle income countries and over 200 GJ in high income economies. Much of Malawi's energy is consumed in traditional end-use and conversion technologies (for example, firewood and charcoal cookstoves, tobacco curing barns) whose efficiencies are relatively low at 10 – 12%. Because access to modern commercial fuels like electricity is very low and because of low per capita disposable incomes, only a very small proportion of Malawian households use high efficiency stoves.

As Figure 5 illustrates, the household sector is the dominant energy user, accounting for about 84% of total consumption. The remaining 16% is used in the agricultural and natural resources sector (8%), transport (4%), industry and mining (2%), and other social services (2%). Biomass, principally firewood and charcoal, is its source and accounts for an estimated 93% of demand. Liquid fuels, electricity, coal and other renewables contribute, respectively, 3.5%, 2.3%, 1.0% and 0.2% to the total demand. Rural households account for 58% of woodfuel consumption, urban households use 12%.

Because they commonly use charcoal, urban households use more firewood per capita than their rural counterparts. Industries such as tobacco and tea estates account for 20%, brick making, fish smoking and other small-scale cottage industries use the remaining 10%. An estimated 48% of woodfuel is from sustainable yield, but 47% is taken from natural woodlands and is therefore unsustainable. The remaining 5% comes from other biomass sources, including crop and industrial residues.

Figure 5: Energy Consumption by Sector, 1996



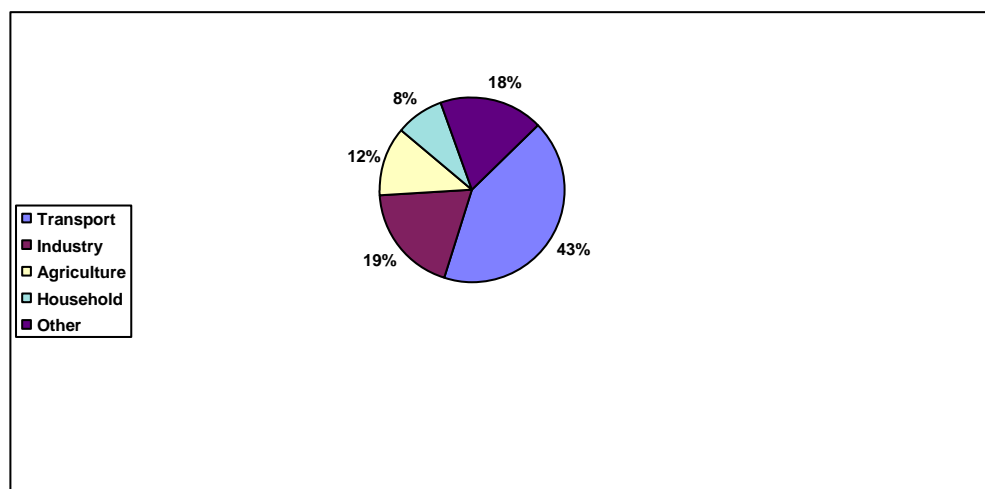
Source: Adapted from the 1996 Energy Balance in DoE (1996) Household Energy Consumption Survey

Of commercial energy, that is, liquid fuels, electricity and coal, transport is the chief consumer (43%), followed by industry and mining (19%), other services (18%), agriculture (12%) and households (8%) (see Figure 6). The transport sector is also the largest consumer of liquid fuels. Paraffin (kerosene) and LPG are important cooking fuels in many developing countries, but they are rarely used in Malawi principally because of their relatively high price. Paraffin and candles are used for lighting, mainly by households without electricity.

Liquid fuels and gas account for almost two-thirds of total commercial energy consumption and a limited storage capacity makes Malawi very vulnerable to oil price fluctuations and to flooding in neighbouring countries, which may lead to interrupted supplies. GoM anticipates that, for the foreseeable future, most of Malawi's population will continue to be smallholders with limited disposable incomes and

reliant on traditional farming technologies. It also acknowledges that various energy conversion and end-use technologies have, for a long time, remained static because of inflexible fiscal policies, a lack of incentives, low investment, a culture of limited entrepreneurship and other social attributes.

Figure 6: Commercial Energy Usage by Sector, 1996



Source: Adapted from the 1996 Energy Balance in DoE (1999) Household Energy Consumption Survey

GoM finds this situation neither sustainable nor acceptable if it is to succeed in its goal of stimulating economic development and reducing poverty. It calls, therefore, for a radical paradigm shift in development approaches. Significant investments in the energy infrastructure are required to transform rural economies and modernise agriculture in general and agro-processing technologies in particular. More creative fiscal policies are needed to promote greater access to modern sources of energy and more energy efficient conversion technologies and end-use appliances.

PART III

3.0 POLICY GOALS, OBJECTIVES AND PRIORITY ACTIONS

3.1 Introduction

In this section, we define energy sector goals and objectives as well as outline priority actions with which GoM will attain its objectives. Activities are prioritised on a time scale of six years divided into two equal concurrent time horizons of three years each.

3.2 Policy Objectives

The objectives of Malawi's energy policy are to:

1. improve efficiency and effectiveness of the commercial energy supply industries;
2. improve the security and reliability of energy supply systems;
3. increase access to affordable and modern energy services;
4. stimulate economic development and rural transformation for poverty reduction;
5. improve energy sector governance; and
6. mitigate environmental, safety, and health impacts of energy production and utilization.

In pursuing these objectives, GoM hopes to achieve the following long term strategic goals:

- 1) make the energy sector sufficiently robust and efficient to support GoM's socio-economic agenda of poverty reduction, sustainable economic development, and enhanced labour productivity;

- 2) catalyse the establishment of a more liberalised, private sector-driven energy supply industry in which pricing will reflect the competition and efficiency that will have developed through the reform process; and
- 3) transform the country's energy economy from one that is overly dependent on biomass (93%) to one with a high modern energy component in its energy mix. A biomass - commercial energy mix target of 50% - 50% is set for 2020 as shown in Table 1.

Table 1: Energy Mix Projections 2000 - 2050

	2000	2010	2020	2050
Biomass	93.0	75.0	50.0	30.0
Liquid Fuels	3.5	5.5	7.0	10.0
Electricity	2.3	10.0	30.0	40.0
Coal	1.0	4.0	6.0	6.0
Renewables	0.2	5.5	7.0	10.0
Nuclear	0.0	0.0	0.0	4.0
TOTAL	100%	100%	100%	100%

Source: Department of Energy Affairs (November, 2002)

The above mentioned policy objectives are elaborated below.

OBJECTIVE 1: IMPROVE EFFICIENCY AND EFFECTIVENESS OF THE COMMERCIAL ENERGY SUPPLY INDUSTRIES;

Recent reviews of the performance of Malawi's commercial energy industries reveal a general decline in the efficiency of service delivery, financial performance and management. The system and operational inefficiencies of the power supply industry are seen in: high technical and non-technical losses (up to 18%) due to long transmission lines; lags in maintenance and investment in the network; low liquidity

following the poor macro-economic performance of the national economy (for example, the depreciation of the Malawi Kwacha); setting of tariffs below the Long Run Marginal Cost (LRMC); failure to collect revenue - accounts receivable typically exceeding 90 days; failure to meet local and external debt and increased dependency on financial subventions from government; low labour productivity measured by the number of customers per employee (35 customers/employee compared to a global average of 130 customers/employee); high frequency and increased duration of faults; low connection levels (3,000 per annum); inadequate maintenance; failure to attract private investment due to an inappropriate regulatory framework which, at present, invariably supports a vertically integrated public monopoly.

In the liquid fuels supply industry, symptoms of inefficiency are high non-technical losses apparent in the illegal, home-based service outlets; inadequate supplies and intermittent shortages, particularly due to the concentration of retail outlets in Blantyre, Lilongwe, Mzuzu and Zomba and to limited internal storage capacity; collusion in sourcing and margin fixing which arise from lack of an appropriate regulatory framework and the limited size of a market with a small number of operators and a lack of transparency and competition; failure to maintain a 20:80 ethanol/petrol blend due to limited ethanol production capacity.

The coal supply industry failed to meet local demand because of its low productivity and investment and reliance on obsolete technologies; serious distribution bottlenecks caused by monopolies in haulage; the failure to penetrate new markets (for example, tobacco curing and households); and inappropriate pricing.

Inefficiencies in renewable sources of energy are: high initial costs due to the lack of competition and inappropriate fiscal policies; high incidences of failure in RETs

arising from poor installation and maintenance; a lack of spare parts; inappropriate fiscal regimes which impose high indirect taxes on RETs; a failure to penetrate new markets and a dependency on donor funded public projects.

To deal with these challenges, *GoM will undertake major reforms of the commercial energy sector and so improve technical and economic efficiency and effectiveness in service delivery. Policy instruments will include market restructuring and, wherever appropriate, the promotion of competition through private sector participation.*

OBJECTIVE 2: IMPROVE THE SECURITY AND RELIABILITY OF ENERGY SUPPLY SYSTEMS;

Electricity

Difficulties in the security and reliability of power supplies result from: dependence on the Shire River for hydropower generation and the problems caused by frequent drought and the siltation consequent on deforestation; the instability of power systems due to limited maintenance and investment; the lack of connection between Malawi's transmission system and that of its neighbours, which denies the country access to the emerging intra-regional trading opportunities through SAPP. GoM has observed with concern that, in recent years, these challenges have resulted in capital flight as many industries have closed down or new investors have failed to invest because of these limitations. Others have been forced to make unplanned investments in their own generating capacity, which have decreased their competitiveness.

To address these challenges, GoM will institute policy measures designed to:

- a) strengthen the stability and reliability of transmission and distribution through direct public investment;*
- b) reduce dependency on the Shire River for power generation by exploiting other hydropower sites and developing coal and biomass thermal plants;*
- c) take advantage of the emerging power import/export opportunities by interconnecting with neighbouring countries.*

Liquid Fuels and Gas

Malawi is a net importer of liquid and gaseous fuels and lacks a refinery. Supplies are vulnerable to international oil prices, global events and marketing arrangements. They are also seriously affected by the value of the Malawi Kwacha against the US Dollar. The sensitivity of the economy to fuel imports is revealed in proportion of transport costs in the import bill (60%). Since Malawi is landlocked it depends on the cooperation of neighbours for the continuous and unhindered availability of sea-ports and transit routes and handling facilities. This renders fuel haulage into Malawi subject to high-level diplomacy requiring inter-governmental activity.

Given the strategic importance of fuel to the economy, *GoM will undertake measures to reduce Malawi's dependence on imports by supporting import-substitution energy industries and by establishing institutional arrangements*

that provide an adequate balance between public and private participation in the supply of liquid fuels and gas in the country. Specifically:

- a) GoM will work with SADC and other international partners to promote oil and gas exploration;*
- b) GoM will work with the private sector to encourage the expansion of fuel-ethanol production capacity to maintain a 20:80 petrol-ethanol blend and support other fuel-ethanol applications such as ethanol-diesel blends, gelfuel, etc;*
- c) GoM will support Research and Development (R&D) into new fuel-ethanol applications and into other materials, to complement sugar by-products, for its production;*
- d) GoM will require oil supply companies to diversify fuel haulage routes and modes of transport through appropriate legislative instruments e.g. licensing arrangements;*
- e) Because of the sensitivity and strategic nature of the LF & GSI, GoM will in addition to maintaining a regulatory role, be actively involved in upstream activities through public investment in the National Oil Company of Malawi (NOCMA). NOCMA will be responsible for spearheading oil and gas exploration, and managing the country's strategic fuel reserve facility; and*

f) GoM will increase the country's storage capacity by acquiring, establishing and maintaining inland and coastal strategic fuel reserve facilities equivalent to 60 days consumption cover

Coal

Despite the fact that Malawi has large coal reserves and experience in commercial coal mining dating back to 1985, supply has failed to satisfy demand, so that 80% of the country's requirements are imported from Namibia, Mozambique, South Africa, Zambia and Zimbabwe. Problems of investment, limited exploration and reliance on obsolete mining technologies are some of the constraints limiting supply. In recent years, the reliability of the supply of local coal has also been adversely affected by distribution bottlenecks caused by the mine owners' monopoly of its transport. This last problem has effectively prevented some large users from buying local coal and forcing them to import at higher cost.

In order to address these bottlenecks, *the DoE will work closely with the Mines Department and the Geological Surveys Department to expand privately invested coal-mining in the country and to break the trucking monopoly by rationalising coal trucking to allow other players to participate.*

Biomass

GoM notes that the availability and quality of biomass for energy is declining because of rising pressure on land and forest resources by agriculture, urbanisation and the energy needs of the urban poor. Symptoms of this problem are manifested in the increased distances and time taken by users to collect or buy firewood, the increased use of inferior materials (for example, leaves and agricultural residues), the reduced

number of hot meals taken in a day and the increased incidence of eating raw food (for example, fruits and salads). This affects people's nutritional status adversely and imposes a high opportunity cost in time that could have been used to improve the economic status of the families by, for example, engaging in income generating activities (IGAs).

While the DoE will work closely with the Forestry Department in designing measures for improving the security and reliability of biomass supply, GoM recognises that a more sustainable and realistic solution to the fuel wood crisis, which is strongly linked to poverty, lies in finding affordable alternative sources of energy. In this regard:

- *GoM will promote the use of affordable alternative energy sources for all fuel wood users through capital subsidies, tax breaks, technical and institutional support for market priming activities involving RETs industries*

OBJECTIVE 3: INCREASE ACCESS TO AFFORDABLE AND MODERN ENERGY SERVICES

The need to increase access to modern energy services is emphasized in the PRSP statement on basic necessities:

“Every Malawian should have [unhindered] access to basic necessities and should be able to develop and exploit his/her potential to lead a productive, dignified and creative lifestyle through social, economic and political empowerment.”

Access to modern energy services is still far from satisfactory and is inconsistent with the aspirations of both Vision 2020 and PRSP. Modern forms of energy account for a

dismal 7% of demand. Only 4% of the population has access to electricity. This is made up of 30% of urban households (principally in Blantyre, Lilongwe, Mzuzu and Zomba) and a mere 0.5% of rural households with access to electricity. This is a very low coverage by SADC regional standards, whose average rate is 20%. A number of households, particularly in rural areas, are still using biomass and other inferior fuel systems for lighting (in, for example, open and wick paraffin lamps). The implementation of GoM's rural electrification scheme was driven by strictly commercial rather than by socio-economic considerations. This had the effect of limiting the scope and speed of the programme.

In order to address these challenges, *GoM will promote policies leading to increased access to affordable, modern energy services for households, agro-industries, cottage industries and institutions that depend on traditional fuels.*

Specific strategies will include:

- a. promoting the use of low cost technologies through tariff and other appropriate instruments;*
- b. reviewing GoM's fiscal policies so as to make modern energy services and end-use appliances affordable;*
- c. accelerating rural electrification;*
- d. expanding and rationalizing the geographical distribution of liquid fuel and gas retail outlets through licensing arrangements; and*
- e. promoting R&D into alternative modern fuels, for example, the possibility of using gelfuel to replace more costly options.*

OBJECTIVE 4: STIMULATE ECONOMIC DEVELOPMENT AND RURAL TRANSFORMATION FOR POVERTY REDUCTION

Malawi's economy is mainly dependent on agriculture dominated by subsistence farmers who, in turn, rely on static traditional farming technologies based on human and animal power. The failure to use modern energy severely limits productivity and the full exploitation of the land's potential. It has also affected Malawi's ability to take full advantage, for irrigation, of the large water reserves in Lake Malawi and the many perennial rivers. More effective use could enhance crop diversification and the production of high value crops. The high cost of energy and problems in the reliability of supply have also affected the pace of industrialisation and confined production to the export of primary goods. In this respect:

- *GoM will provide fiscal and tariff-based incentives to encourage the industrialisation and modernisation of agriculture and for its diversification into irrigated production.*

Rural areas have very limited access to modern energy services. This limits the scope of economic activity and the quality of social services such as health and education. GoM recognises that providing rural areas with modern sources of energy would transform them by opening new income generating opportunities in cottage industries (for example, small-scale welding, milling and other agro-industrial processing, irrigation and community water supply). It would also reduce the drudgery of farm work, extend working hours and improve the quality of commerce, schooling and the health service. Access to modern entertainment and information would be another benefit, which, with all the others, would enhance rural standards of living and quality of life. The other effect of providing energy for rural livelihoods

would be to reduce rural-urban migration. GoM notes that earlier large investments in rural growth centres for the purpose of applying brakes on rural-urban migration failed because of an inability to recognise the critical role of modern energy in the delivery of social services. To address these imbalances:

GoM will embark on a long-term rural energisation programme to transform rural communities into more productive centres and so contribute to poverty reduction.

OBJECTIVE 5: IMPROVE ENERGY SECTOR GOVERNANCE

The institutional framework for the energy sector is weak and fragmented; frequent changes in central coordination have contributed to institutional fragmentation and a lack of consistent policies. This problem is compounded by housing the legal instruments governing energy sub-sectors - electricity, liquid fuels and gas, biomass, renewable energy and coal - in different institutions that often do not synchronise their activities. Regulatory institutions are also fragmented and, since the energy market is small, in some instances institutions have only one monopoly to regulate, a costly arrangement.

GoM recognises that this institutional framework is grossly inadequate and cost ineffective. The success of any market reforms designed to promote efficiency through competition is dependent, to a very large extent, on the existence of an independent, coherent, transparent and efficient regulatory mechanism.

Consequently, it is the intention of GoM to put in place institutional and legal instruments that will adequately support its reforms and generally improve energy sector coordination. Specific interventions include:

- a) the formulation of an Energy Framework Law in the form of an Energy Regulation Act and related sub-sector legislation, including the Electricity Act, the Rural Electrification Act, the Liquid Fuels and Gas Act, the Coal Act, the Biomass Act, and the Other Renewable Energy Services Act, to provide a legal basis for improved energy sector governance;*
- b) the establishment of a sector-wide Energy Regulator to regulate all commercial energy supply industries;*
- c) making adequate budgetary provision to DoE and other public energy institutions to improve their operational efficiency and effectiveness.*

OBJECTIVE 6: MITIGATE ENVIRONMENTAL, SAFETY, AND HEALTH IMPACTS OF ENERGY PRODUCTION AND UTILIZATION.

Empirical evidence shows that there are strong two-way links between energy, the environment, health and safety. Leaks from refineries, trucks and storage facilities can seriously pollute water bodies and endanger both aquatic and terrestrial life. Coal production causes air, water and land pollution. Large dams often lead to the destruction of the environment, the displacement of people and flooding. Deforestation leads to the siltation of dams, drought will lower water levels in rivers, and both may affect hydropower generation. The use of many non-renewable energy

sources contributes to the emission of the GHGs that cause global warming. Some emissions, such as carbon monoxide from charcoal, are major causes of sudden death in unventilated houses. Carbon dioxide and smoke/soot are known to cause respiratory and other diseases.

As a signatory to various international conventions on the preservation of the environment, and realising that energy is one of the major culprits of environmental degradation, *GoM undertakes to ensure that all energy development programmes do not unduly compromise the environment, health and safety.*

The key to this policy is the implementation of the following initiatives:

- a) subjection of all projects to stringent EIAs in line with the provisions of the Environmental Act;*
- b) undertaking public awareness campaigns to inform energy producers and users of the dangers of various energy production and utilisation systems;*
- c) promoting environmentally benign energy technologies including RETs, unleaded petrol, clean coal, etc through a combination of subsidies, tax breaks, and other fiscal incentives as appropriate;*
- d) promoting energy conservation in households, industry, commerce and institutions through technical assistance, information services, tax breaks, tax rebates, and other incentives;*
- e) developing projects that will facilitate carbon trading under the CDM.*

The realisation of the overall objectives calls for the identification of short and medium term strategies. A list of such strategies and associated priority actions is given in Annexes C and D, respectively. This list of strategies and priority actions will

further be developed into a **National Energy Sector Implementation Plan (NESIP)** showing the current situation for each priority action, performance indicators, targets, implementing agency, human and financial resource requirements, and time-schedules.

PART IV

4.0 ENERGY DEMAND SECTORS

4.1 Introduction

The Malawi *Annual Economic Report (2000)* deals with national accounts as part of the budgetary process and has divided the economy into ten sectors: energy and mining; agriculture and natural resources; tourism affairs and services; physical planning and development; transport and communications; industry and commerce; labour relations and employment; environmental protection and conservation; scientific and technological services; and other services. For the purposes of identifying opportunities and assessing challenges for energy policy, this division presents two methodological problems. First, the categorisation does not coincide with international sector classification, which makes comparisons difficult. Second, some categories (for example, environmental protection, labour relations and employment, scientific and technological services) are not energy utilisation centres and are not applicable to the present exercise. To get round these problems, the economic sectors have been regrouped into five: households (separated into rural and urban); agriculture and natural resources; industry, mining and construction; transport; and social services (that is, commerce, health, education, banking, tourism, communications, etc).

In the section below we identify opportunities and challenges for the energy sector emanating from each of these five demand sectors. We also specify priority actions to be undertaken by GoM in order to take advantage of opportunities and overcome challenges.

4.2 Households

Malawi's Population Census of 1998 counted 2.3 million households, each of which averaged 4.3 people. Eighty four percent of these households are in rural areas, the remaining 16% are urban. Biomass supplies satisfy about 99% of household energy demand. The remaining 1% comes from electricity (for lighting and, to a lesser extent, cooking), paraffin and candles (for lighting). The biomass is principally firewood (80%), charcoal (8.8%) and crop and industrial residues (11.2%). Although it is available, Malawian households do not use coal, principally because of the lack of appropriate end-use appliances and its high cost. Dependence on traditional primary energy sources on this scale is, on the one hand, an indication of abject poverty and, on the other, an extremely high incidence of low-cost traditional biomass conversion technologies, end-use cook-stoves and appliances.

Although most Malawians live in rural areas, Malawi's economic structure is dichotomous and heavily biased in favour of urban centres. In addition to holding enormous political power and influence, urban households have a monopoly of modern infrastructure and social amenities (for example, education and health services), enjoy relatively high-income levels and have more access to modern energy. On the other hand, rural households have low disposable incomes and very little access to modern energy services. Modern infrastructure is minimal in rural areas, yet, apart from being energy demand centres, they also provide sources of energy (firewood and charcoal) and food for urban areas. This means that the two areas face different energy challenges. For instance, while deforestation is a direct issue in the rural areas from which firewood and charcoal are supplied, energy pricing may be the central concern in urban areas. This makes it imperative that the MEP must be equitable and sustainable and relevant to the peculiar issues affecting both rural and

urban households. Box 1 outlines the opportunities and challenges in the household sector. Issues affecting rural and urban households are elaborated below.

4.2.1 Urban Household Energy Demand

Malawi's urban population is concentrated in four major towns, Blantyre, Lilongwe, Mzuzu and Zomba, which together account for 80% of the urban population and 11% of total population. If we include minor towns (i.e. district administration centres and townships), urbanisation in Malawi is 16% and the urban population growth rate is estimated at 5% per annum. A large part of this population (52%) has moved to these towns from rural settlements in the last ten years. This has contributed to a high incidence of urban poverty, estimated at 51%, with matching pressure on government to invest in social services. The urban pull factors include relative affluence, the availability of good modern social amenities including schools, hospitals, electricity and potable water and what is generally perceived as the availability of employment. Malawi is long and narrow, so the four towns, running from north to south, are more than 350 km apart except for Blantyre and Zomba, which are 70km apart.

Although the level of urbanisation is relatively low, Malawi's urban income structure, the spatial distribution of towns which have little room for new people and the rate of urbanisation all raise peculiar challenges for GoM which have an impact on energy supply, distribution, operational costs and pricing. The most relevant challenges are: the dependency on biomass from unsustainable sources; dependency on charcoal produced by inefficient carbonisation technologies; reliance on end-use devices with low energy efficiency; limited access to modern energy services; the high cost of end use appliances; adverse impacts of the urban household energy mix on the environment and on health and safety. These issues are discussed below.

Box 1: Opportunities and Challenges in the Household Energy Sector

OPPORTUNITIES	CHALLENGES
<ul style="list-style-type: none"> ▪ Biomass is available free of charge from customary land ▪ A large population without access to modern forms of energy. This is a potential market for modern energy estimated at 96% for electricity (70% urban and 99.5% rural) ▪ A conducive legislative environment to facilitate empowerment and increase opportunities for private participation. For example, multiparty democracy, Decentralisation Policy, 1999, and Local Government Act, 1999; Investment Promotion Act, 1991; Public Enterprise (Privatisation) Act, 1996; Electricity Act, 1998; and the policies of liberalisation pursued by GoM ▪ GoM has adopted Poverty Reduction as its central development goal ▪ Malawi has qualified for debt relief through HIPC. This makes more resources available for infrastructural development, including energy 	<ul style="list-style-type: none"> ▪ Large number of households (84%) depend on biomass and 99% of household energy is produced from it ▪ Few affordable options to biomass are available ▪ Charcoal dependency with a low conversion efficiency (12% - 14%) ▪ Inefficient end-use technologies (traditional cooking stoves have an efficiency of 10%- 12%) ▪ Poor macro-economic climate (high domestic inflation, low currency values) ▪ Low disposable per capita incomes (\$220) ▪ Large income distribution inequalities ▪ Abject poverty (65% living below poverty line) ▪ Environmental, health and safety hazards of biomass and liquid fuels used in households

Source: DOE (2001) *Proceedings of Principal Secretaries Symposium*, 28th July, 2001.

1. Dependency on Firewood and Charcoal

Like their counterparts in rural areas, urban households in Malawi depend on firewood (84%) and charcoal (65%). Other important sources of energy in urban households are paraffin, candles and electricity (80%, 41%, and 31%, respectively).

LPG is used by 1% of urban households and 4% use paraffin for cooking (half use paraffin only occasionally). Some paraffin is used as starter fuel to light charcoal fires.

Similarly, LPG is used infrequently as a backup for cooking and illumination. Firewood is used mainly for cooking (76%), water heating (22%) and space heating (2%). Charcoal is used for cooking (48%), ironing (24%), space heating (16%) and water heating (12%).

Seventy-nine percent (79%) of urban fuelwood users collect some wood themselves which results in more lopped branches. Forty three percent buy some, and 24% buy all, of their fuelwood. While almost all fuelwood used by rural households is collected free of charge, that used by urban households is purchased. In 1996, the wood consumed by urban households was estimated at 1.241 million tonnes, of which 844,550 tonnes (68%) was in the form of charcoal. Because most urban dwellers live in the four major towns, 86% of the wood was used in them. Most of it (85%) was purchased in local markets, the other 15% was obtained free of charge from local sources.

Charcoal is more convenient than unprocessed wood and is mainly used by middle and upper income families. But, because of the high incidence of the use of charcoal by urban dwellers, the urban annual per capita consumption of firewood of 1.56m³ is higher than in rural areas (0.85m³). This is because charcoal is produced in traditional carbonisation kilns whose yields are very low (7 tonnes of firewood produce 1 tonne of charcoal). This compares unfavourably with the conversion ratios of other carbonisation technologies - metal kilns (1:4), brick kilns (1:3) and retorts (1:2.5). Nearly all charcoal comes from indigenous wood, which is slow to grow and is harvested from customary lands without replanting programmes. In this light:

GoM will take measures to reduce the dependence on firewood and charcoal by increasing access to affordable and reliable alternative sources of energy.

GoM will undertake to design special energy programmes that include activities that will generate alternative incomes for households currently involved in firewood and charcoal vending.

Details of GoM's policies for improving the efficiency of charcoal carbonisation are dealt with in Part V, BSI section.

2. Low Efficiency of End-Use Devices

Several end-use devices are currently in use, but their efficiency varies widely, see Table 2.

a) Firewood End-Use Devices

Firewood users still cook on three-stone cookstoves (91%). Only 20% of the traditional metal stoves are used for cooking, but half the households owning improved ceramic cookstoves use them regularly. The factors that influence such choices are unclear. It is possible that firewood users do not find either metal or ceramic stoves very convenient. Since the three-stone stove is free, cost may also be a reason. Given that most households depend heavily on firewood and are using the least efficient three-stone stove, energy losses are very high. To address these dislocations:

GoM will devise promotional strategies aimed at expanding the use of improved ceramic firewood stoves in poor urban households and at reducing the proportion of households using three stone cookstoves to 50% by 2020.

Table 2: The Efficiency of Different Household End Use Devices

Fuel Type	End Use Device	Efficiency
Firewood Cooking Devices	Traditional 3-Stone	10 - 14%
	Traditional Metal Stove	20%
	Improved Ceramic Stove	30%
Charcoal Cooking Devices	Traditional Metal Stove	21%
	Improved Ceramic Stove	35%
Briquette Cooking Devices	Traditional 3 Stone	14%
	Traditional Metal Stove	20%
	Improved Ceramic Stove	35%
Paraffin Cooking Devices	Single Wick-Stove	35%
	Pressure Stove	45%
LPG Cooking Devices	10-Pound Budget Top	45%
	9.5 kg 2-Burner Stove	45%
Electricity Cooking Devices	1-4 Hot Plate Cooker	65%
Lighting Devices	Candles	1.57 lumen/watt
	Traditional Paraffin Lamp	0.21 lumen/watt
	Wick Lantern	0.21 lumen/watt
	Electricity – Candescent Lamp	0.10 lumen/watt
	Electricity - Fluorescent Lamp	n.a.

Source: Arpaillage (1996) “Urban Household Energy Demand Side Strategy” (Department of Energy, Lilongwe) for end-use efficiency of devices using firewood, charcoal, LPG, electricity and paraffin; CEEDS (2000) “Biomass Briquette Extension Production and Marketing Evaluation” Report (UNDP, Lilongwe) for briquettes end-use device efficiency

b) Charcoal End-Use Devices

A survey shows that 72% of charcoal consumers have recently switched from metal to improved ceramic charcoal stoves, only 25% still use metal stoves. The rate of use of the ceramic stoves is estimated at 90%. This is a very encouraging development, which needs to be consolidated if efforts to reduce charcoal utilisation are to be sustainable. The remaining challenge is the strong household preference for

indigenous hardwood based charcoal, which directly increases deforestation. To circumvent these problems, *GoM will:*

- i) for the sake of efficiency continue to promote improved ceramic charcoal stoves for urban household use through publicity campaigns, institutional capacity and technical support to NGOs*
- ii) actively promote the use of charcoal from sustainable sources including government plantations*

c) Lighting Devices

The *1995 Urban Household Energy Demand Survey* indicated that lighting is the principal end-use of paraffin and grid electricity in urban households. Devices for lighting are generally those with lower levels of efficiency, measured in lumen per watt. For instance, over 90% of the electric bulbs used in households are of the incandescent type, which are low in efficiency compared to fluorescent lights. A large number of households use one-wick paraffin lamps or hurricane lamps for lighting, which are also relatively inefficient. *Since this presents an opportunity for energy conservation, GoM will put in place an energy management programme aimed at promoting efficient lighting devices.* Other more detailed measures are discussed in the relevant cross-cutting issues section of the Energy Policy.

3. Access to Modern Energy Services

Urban household energy consumption consists of biomass 94%, electricity 4% and paraffin 2%. Only about 30% of the urban and 0.5% of the rural population has access to grid electricity. This is attributed to many factors, the most important of

which include: physical limitations imposed by the paucity of power lines; low disposable incomes and the high incidence of poverty in urban areas (51%); high first cost requirements (for example, reticulation, capital contribution and connection charges); high cost of imported end-use appliances (for example, cookers and fridges). The situation is similar in the case of liquid fuels and gas. Although 80% of urban households have access to paraffin, it is only used in small quantities by poor households, mainly for lighting (94%), very few use it for cooking (2%) and the remaining 4% use it for a combination of household chores - cooking, lighting, refrigeration and starting biomass fires. Urban households do not use coal in Malawi and their access to RETs has been hindered by high up-front costs, lack of credit and poor delivery. Therefore:

GoM is committed to increasing urban household access to modern energy by reviewing fiscal policies to allow a reduction in first costs, including those for end-use appliances.

4. Access to Low Cost Technologies

Since urban poverty is acute, it could take a very long time before people can afford to make use of modern forms of energy. In this regard:

GoM is determined to increase access to modern energy services by promoting the use of low cost technologies including pre-wired boards and load limiters in the electricity sector, paraffin and gas stoves in the liquid fuels and gas sector and coal stoves.

5. Mitigating Impact of Energy Production and Utilization on Environment, Health and Safety

Studies have shown that biomass users are exposed to extremely high levels of particulate emissions. These have adverse effects on health, including causing acute respiratory illness in women and children. Dependency on woodfuel also leads to environmental degradation, soil erosion and desertification. *GoM's policies in this area are outlined in Part VI, section 6.10.2.*

4.2.2 Rural Household Energy Demand

The incidence of poverty among rural households is very high at 61% and the availability and quality of modern infrastructure, including schools, hospitals, electricity, liquid fuel and gas outlets and roads is generally low. Most people are smallholder farmers, making their living from low levels of agricultural production and off-farm casual work (*ganyu*). Those in formal employment are usually *ganyu* labourers on commercial estates or engage in firewood and charcoal production and marketing. It is estimated that nearly 55,000 farmers are involved in off-farm employment as biomass producers and roadside wholesalers. Acute poverty means that most rural houses are temporary structures of unburned bricks thatched by grass. Such structures restrict the possibilities for providing modern energy services.

Paraffin is mainly used for lighting and relatively little is used in rural areas. Alternative lighting consists of candles, wood fires and, in rare cases, mains electricity. Paraffin is relatively more readily available in urban than in rural areas. This is also true for the other liquid fuels such as petrol and diesel. This demonstrates the inequality between the rural and urban areas in the delivery of modern energy services.

Challenges facing GoM, include: low access to modern energy services, deforestation and imbalances between urban and rural areas. For rural households to escape this apparent poverty trap, GoM will:

- a) promote investment in modern energy infrastructure, including rural electrification, RETs and the establishment of rural service stations for liquid fuels and gas to transform and rejuvenate rural economies.*
- b) Empower Malawian entrepreneurs and artisans, through the ownership of liquid fuel and gas retail outlets and participation in modern energy distribution networks.,*

4.3 Agriculture and Natural Resources

About 8% of all energy and 12% of commercial energy is used by the agricultural and natural resources sector. Nearly 60% of the solid fuel used in this sector comes from biomass residues (cotton seed husks, bagasse, saw dust, rice husks etc.); 25% is fuelwood and the remaining 15% is coal. Agro-industrial production of most export crops, such as tobacco and tea, relies almost exclusively on fuelwood. This sector also accounts for just over 20% of fuelwood usage, second only to households. Agriculture is pursued both commercially and for subsistence.

4.3.1 Commercial Farming

Commercial farmers have, on the whole, adequate access to energy supplies. Most tobacco, tea, coffee and rubber growing areas are supplied with grid electricity and the majority of these farms are electrified. They are well supplied with liquid fuels and gas, some hosting retail outlets for use by other farmers. The key challenge is not so

much that of availability and access, but of pricing, distribution and efficiency. In areas where grid power is unavailable, most farmers have their own diesel or petrol driven generators. In recent years, following a general decline in the reliability of the grid and a relatively high maximum demand tariff, private generating capacity has increased. To improve the situation:

GoM undertakes to review the electricity tariff structure in order to ensure that it provides adequate incentives for agricultural development.

Although the Forestry Act requires all tobacco estates to dedicate 10% of their land to tree growing as a means of sustaining their woodfuel supply, many tobacco farmers relying on fuelwood from indigenous woodlands do not observe this regulation. One consequence has been a growing deficit of wood for tobacco curing, which forces many farmers to travel long distances to purchase woodfuel. If this is not checked there is a danger that the future of tobacco growing may be in jeopardy as plantations may not be sufficient to sustain the industry.

Farmers producing flue-cured tobacco could reduce their woodfuel consumption. The Agricultural Research and Extension Trust (ARET) has found that modest investment in existing curing barns and improvements to furnaces can achieve dramatic results in energy saving. It also established that alternative fuels, such as coal, could be used for curing tobacco and drying tea. To take advantage of these opportunities:

GoM in collaboration with ARET is committed to promoting alternative sources of energy for tobacco curing, principally coal as a base fuel and electricity for improved forced draft.

4.3.2 Smallholder Farming

Unlike commercial farming, which is relatively highly mechanised, smallholders commonly use simple technologies based on animal and human muscle and have little need for modern forms of energy. GoM realises that while mechanisation increases productivity, mechanising smallholdings could, in the short to medium term, lead to massive labour displacement and the loss of rural livelihoods. This would, in turn, aggravate rural unemployment and migration to urban areas. Any attempt to mechanise smallholding would have to be selective and matched with parallel investment in alternative employment. Investment in energy infrastructure would be essential in driving such a policy. In this vein:

GoM's interventions in the smallholder sector will be linked to the rural energisation programme summarised in section 4.2.2.

4.3.3 Energy Production through Agriculture

Although the agricultural sector consumes relatively little energy, its contribution to the supply of biomass is crucial.

Many agricultural, forestry and agro-forestry products, by-products and residues can serve as raw materials for processing into modern bio-fuels, suitable for the operation of fuel-driven technologies at high efficiencies. Bio-fuels include briquettes, biogas, gelfuel and ethanol. The Dwangwa and Nchalo sugar plantations' production of waste materials in the form of bagasse and molasses is 60,000 and 90,000 tonnes respectively. Some of the bagasse goes to thermal power generation for the producer's own use. Nearly two-thirds of the molasses are converted into ethanol fuel at the 18 million-litre ethanol plant in Dwangwa. Ethanol can also be produced from starchy materials such as cassava, potatoes, maize, cane sugar etc. Further down

the chain, the production of ethanol produces a waste called vinasse, which can be used in biogas production.

Policies for this area are adequately covered in Part V under BSI

4.4 Industry, Mining and Construction

Industry, mining and construction together account for about 2% of total energy consumption, despite this they use 19% of the country's commercial energy. Industrial use is important because the cost competitiveness of Malawian industry in world markets can be influenced by energy pricing policies and conservation measures (e.g. DSM) put in place by industry.

4.4.1 Energy Efficiency in Industry

To ensure low cost per unit of energy and its efficient use, industry should select the type of energy required for particular purposes carefully. For instance, given the disparities in costs it is cheaper to heat water with steam than with electricity and a well-designed industrial plant would use electricity for lighting, electric motors and computers and steam for sterilising, cleaning and water heating.

In the past, industry in Malawi has paid little attention to energy efficiency despite evidence for its potential value. Energy audits have not been carried out so the real energy cost of industrial equipment is not known. However, Malawi participated in a *SADC Industrial Energy Management Project* whose objective was to provide industries with the ability to analyse their energy efficiency and to develop cost-effective plans for implementing improvements in it. The project facilitated the delivery of three sets of auditing equipment for hire by industry. This equipment is not fully utilised. Consequently:

GoM, through its energy management programme, will continue to press industries to subject their installations to energy audits as part of their overall DSM activities.

4.4.2 Environmental Management

The environmental impacts of energy utilisation in industry and mining can be minimised by using cleaner energy end-use technologies, environmental performance audits and the internalisation of environmental costs. A collective effort is needed to mitigate the impact on the environment of energy use in industry and it must involve all the stakeholders concerned with environmental issues, locally and internationally. Pursuant to this:

The DoE will, in collaboration with Environmental Affairs Department (EAD), formulate industrial policy guidelines to mitigate the effects on the environment of energy use in industry and to prevent the contravention of any environmentally sensitive policies supported by Malawi's major trading partners.

4.4.3 Reliability of Electricity Supply

Unreliable electricity supplies are liable to cause accidents, damage equipment and machinery and, most importantly, affect production and so lose revenue. Poor and unreliable power supplies have led to many players in industry to invest in emergency, diesel powered generators. This has resulted in additional and unplanned production costs. In extreme cases, it has led to closing down of factories, increased unemployment and grave dis-investment. In this respect:

GoM will ensure the supply of reliable grid power by undertaking major reforms in the ESI as proposed in Part V.

4.5 Transport

Transporting people and goods is an essential social and economic service in any economy. Malawi's transport systems are by air, rail, road and water, of which road transport is the most important, followed by rail. The transport sector accounts for about 43% of the country's commercial energy consumption. Nearly 96% of transport energy is derived from imported petroleum products and the remaining 4% from locally produced ethanol fuel, which is blended with petrol. Since Malawi is a non-oil producing country and dependant on imported petroleum products, the pricing of transport energy is heavily influenced by external economic trends and the performance of the Malawi Kwacha on the money market.

Malawi is now facing the challenge of facilitating equitable access to affordable public transport. For the energy sector, this requires policies and strategies that ensure a year round availability of affordable and reliable liquid fuel supplies in both rural and urban areas. Related challenges concern the efficient use of transport fuels and minimising their environmental effects.

Policy interventions to deal with challenges in this area are discussed in Parts V, section 5.3 and VI, Section 6.2.

4.6 Social Services

Social services include commercial entities such as hotels, restaurants, etc. and private and governmental institutions, such as schools, hospitals and prisons. These account for 2% of the country's total energy consumption and 18% of the total commercial

energy, mainly in the form of electricity, coal and, to some extent, woody biomass and gas. In cases where biomass is used, it is used inefficiently and so exacerbates localised deforestation. Energy efficiency improvements in institutions that use biomass are seldom effected, however some institutions have invested in energy efficient technologies, reporting 40% - 50% fuelwood savings. Others have invested in alternative energy sources such as bio-latrines for gas production.

There is still a large number of public institutions including schools, hospitals, prisons and border posts with no access to electricity or other modern forms of energy. The supply of modern energy is critical in improving their services. For instance, electrification would enable rural clinics to refrigerate vaccines, to extend their services and to perform minor operations. The same is true for schools, which could extend the hours that teachers devote to preparation and the hours in which students can study. Evidence has shown that providing electricity to schools dramatically improves pass rates. For these reasons:

- a) GoM will continue the electrification of public institutions through its on-going Malawi Rural Electrification Programme (MAREP) using grid and off-grid options as described in Part V, section 5.2.6.*
- b) GoM will also embark on an appropriate DSM programme for the social sector as described in Part VI, section 6.10.*

PART V

5.0 ENERGY SUPPLY SECTORS

5.1 Introduction

Malawi's energy supply sector has five key components: electricity, liquid fuels and gas, coal, biomass and other renewable sources of energy. There is a sizeable and, at present, unused deposit of uranium in Northern Malawi. Although no plans yet exist for it, it is imperative that GoM should make known its position on the opportunity these deposits provide for the development of nuclear power. A separate section is dedicated to nuclear power generation as a future source of electricity.

5.2 The Electricity Supply Industry

Malawi's ESI generates electricity by hydro, thermal (largely diesel and gas based) and photovoltaic (PV) systems. Hydropower generation is the largest source, PVs are used in modular form for telecommunications, lighting and water pumping in rural areas where there is no grid power. A significant number of commercial and industrial enterprises have installed their own diesel and petrol driven generators. There is no wind turbine generation because the winds are inadequate for large-scale power generation. Some wind power is used for pumping water.

The commercial ESI is dominated by a publicly owned and vertically integrated power utility, the Electricity Supply Corporation of Malawi (ESCOM) Ltd., which was established by an Act of Parliament in 1957 (revised 1963 and 1998). In the year 2000, ESCOM's total installed capacity was estimated at 304 MW. Of this, approximately 285MW (94%) is generated by hydropower and the remaining 19MW (6%) is thermal. Except for a small mini-hydro plant at Wovwe (4.5MW) in Karonga,

all ESCOM's generation capacity is located along the Shire River, the main natural outlet for Lake Malawi. This makes Malawi's power generation system very vulnerable to the considerable variations in the lake's levels and, hence, flow rates on the Shire. Power transmission is principally through the 132kV network, although both 66kV and 33kV lines are also used for this purpose. Distribution is at 33kV, 11kV and 400/230V.

To get a national picture, we must add to ESCOM's capacity that of private generators, which, according to a recent survey by the electricity industry regulator, the National Electricity Council (NECO), is estimated at 51.3 MW, giving a total installed capacity of 355.3 MW, a very small system even by regional standards (capacities for Zimbabwe, Zambia and Tanzania are 1961 MW, 1800 MW, and 655 MW, respectively).

Electrification from PVs is still insignificant, but recent studies by the DoE (1998) show that about 5,000 systems rated between 45–60 Wp have been installed and the number is rising. A new market priming programme for solar energy under Rural Electrification initiatives anticipates that a further 10,000 PV systems will be installed and the non-working systems rehabilitated in the next five years in an attempt to increase access to electricity in rural areas.

Access to electricity in Malawi is very low (see section 3.2, Objective 3) and demand is highly skewed in favour of industrial and large commercial customers who consume approximately 60% of the total. Domestic users account for around 25%, the remaining 15% goes to small commercial consumers. ESCOM's records for 2001 show that there are only around 104,000 accounts, of which 85,000 are domestic. Although this number is very low, domestic consumption is very high by sub-Saharan

African standards, averaging 3,600kWh/year. Peak demand in 2000 was 196.5MW and total consumption was 902GWh. Demand has been growing at between 6% and 8% a year.

5.2.1 Opportunities and Challenges for the ESI

GoM has identified a number of opportunities and challenges arising from the current ESI market structure. These are summarised in Box 2 and elaborated below.

Box 2: Opportunities and Challenges in the ESI

OPPORTUNITIES	CHALLENGES
<p>a) Resource Base</p> <ul style="list-style-type: none"> hydropower potential of 745 - 1670MW, 21 m tonnes coal for thermal power generation; 0.63m tonnes uranium for nuclear power 60,000 ha biomass to provide 50MW of power; large pool of qualified engineers; <p>b) Economic opportunities</p> <ul style="list-style-type: none"> import and export opportunities through SAPP; 96% of population un electrified load forecasts of 6% per annum. <p>c) Legislation and Enabling Environment</p> <ul style="list-style-type: none"> Electricity Act, 1998 for liberalisation Electricity Regulator established and functional Fair Trading and Competitions Act, 2000 Investment Promotion Act, 1991 Private Enterprise (privatisation) Act (1996) Relative peace & geo-political stability in SADC; Regional cooperation & integration in SADC SADC Energy Protocol SADC Energy Policy and Strategy Paper 	<p>a). Technical Challenges</p> <ul style="list-style-type: none"> 99% dependency on hydropower 99% dependency on one river, Shire River high technical and non-technical losses (18%); high system instability & unreliable supplies low labour productivity (35 customers/employee) low rates of new connections (3,000/year); poor plant performance & low availability (75%) high distribution faults (40/100 consumers); non-connectivity to neighbouring countries. <p>b) Economic Challenges</p> <ul style="list-style-type: none"> inadequate transmission & distribution investment high customer default rates large accounts receivable (90 days of billing); tariffs below long run marginal cost (4c v 6c) inappropriate tariff (RoR vs Incentive based); high capital contributions and connection fees; dependency on government subventions <p>c) Environmental Challenges</p> <ul style="list-style-type: none"> siltation of dams from environmental degradation weed colonisation of the Shire River frequent drought resulting in low lake levels and river flows

	<p>d) Legislation Challenges</p> <ul style="list-style-type: none"> • costly regulatory system • 1998 legislation inadequate for liberalisation <p>e) Institutional Challenges</p> <ul style="list-style-type: none"> • high level of government interference; • board members with questionable qualifications; • unclear reporting structures
--	--

Source: DOE (2000) *Proceedings of National, Regional and Principal Secretaries Workshops*

GoM recognises that poor performance of the ESI may be attributed to both internal and external factors, many emanating from the general down-turn, in the past five years, in Malawi's economy and the general fall in the value of the Malawi Kwacha against major trading currencies, most notably the USA Dollar. Whatever the reasons for this dismal performance, it is clear that ESI has, in recent years, failed to provide the quality of service demanded by consumers. Power outages are frequent and impose severe costs on consumers and on the economy. Industrial and other consumers have increasingly been installing their own generators, a response which, from the national point of view, is unlikely to have been least-cost. The proposals set out in this MEP address these and other issues.

In the short to medium term, it is the desire of GoM that it further reforms its ESI by restructuring the market and promoting private sector participation. Reforms will aim to change the market structure shown in Figure 7 to that elaborated in Figure 8. The time-scale for achieving this target is six years.

5.2.2 GoM's Goals and Objectives for the ESI

GoM has three goals for ESI:

- a) to expand and revitalise the ESI and make it more efficient, effective and financially viable;
- b) to enable the ESI to provide an adequate, affordable and reliable power supply which will assist in industrialisation, rural transformation, sustainable economic development and reducing poverty;
- c) to enable the ESI effectively to participate in the emerging regional electricity trading market through the SAPP.

Figure 7: ESI: Current Market Structure

Figure 8: ESI: New Market Structure

In order to realise its goals in this sector, GoM has set the following objectives for reforming the ESI:

- a) increase the sector's technical and economic efficiency;
- b) make the sector financially viable and, in the short term, minimise the subsidies required from GoM's budget and, in the longer term, make ESI a net contributor to that budget;
- c) improve the sector's commercial performance;
- d) improve the reliability and quality of electricity supply;
- e) meet the growing demand for electricity at least cost;
- f) increase the number of households with access to electricity from 4% to 10% of the population by 2010 and to 30% by 2020; and 40% by 2050;
- g) increase area coverage;
- h) increase capacity to meet growing demand;
- i) attract private capital and participation;
- j) take advantage of power trading opportunities, particularly via SAPP;
- k) promote the use of solar and other renewable energy sources; and
- l) protect the environment.

In addition to these objectives, GoM considers it important that proposed reforms should be practical and implementable in Malawi, they should also be politically and socially acceptable and environmentally sound. GoM sees enhancing efficiency and effectiveness to be of key importance for the future development of the ESI.

Efficiency has three dimensions:

- a) operating the power system at minimum cost;
- b) expanding the system at minimum cost; and
- c) pricing electricity to reflect the LRMC of supply.

Effectiveness, on the other hand, also has three main dimensions:

- a) providing electricity on demand;
- b) providing reliable power and keeping the frequency and duration of outages to a minimum; and
- c) connecting new customers speedily and without impediments.

GoM's policies for the ESI are set out below and are aimed at achieving all three dimensions of efficiency and effectiveness.

5.2.3 ESI Policy Framework and Process

To address the challenges noted in Box 2, *GoM undertakes to reform the ESI through market restructuring and promoting private sector participation*. GoM sees competition and the private sector as key components in enhancing the ESI's efficiency and effectiveness and ensuring that its investment requirements are met within the industry without recourse to GoM's budget.

A basic condition for the success of any reform programme for the ESI is that guidelines are laid down ensuring that revenues are collected as quickly as possible. This will allow timely payments to be made to upstream operators, like those in

generation and transmission and will ensure that the industry is not a burden on the Government's budget. Unless consumers pay their bills, there is no guarantee that generating companies will be paid, in which case government guarantees become essential. GoM believes that should they be required, a fundamental objective of the reform programme would not be met. This risk is unacceptable to GoM. It is imperative that appropriate actions are taken to address these technical, economic, environmental and legislative issues and that a market structure and transaction arrangements that adequately address some of the bottlenecks contributing to the economic and technical inefficiency of the industry and to its inability to finance itself be devised.

5.2.4 Promoting Private Sector Participation and Competition

GoM sees private sector participation as being of paramount importance in its efforts to bring about improvements in the ESI's efficiency and effectiveness, in promoting competition and mobilising the much needed finance capital for investment. It clearly understands that, to improve efficiency, the private sector needs different incentives from the public sector. This position is in line with GoM's overall economic liberalisation policies as articulated in the Private Enterprise (privatisation) Act (1996) which calls for the retreat of the state in the day-to-day management of the economy through, *inter alia*, privatising some of its public enterprises, giving long-term concessions or by other measures. To this effect, the Privatisation Commission (PC) was established in 1996 with the remit of ensuring that privatisation programmes would be advanced and carried out in accordance with agreed principles. The proposed restructuring of the ESI would be undertaken through the same channels.

GoM has reviewed the different options for introducing competition into the various parts of the ESI. These include:

- a) competition in the generating market through a power pool;
- b) competition for the provision of new capacity such as independent power producers (IPPs);
- c) competition for the provision of certain retail services, such as billing and revenue collection based on letting short term franchises.

GoM's position on the way forward is discussed below.

5.2.5 ESI Market Reforms

As shown in Figure 8, the main thrust of restructuring is the division of the ESI into generators, transmitters and distributors. This is central to attaining efficiency and effectiveness through competition and private sector participation. It will also allow Malawi to benefit from the evolving regional power pool market through SAPP. The following are elements of the restructured ESI.

5.2.5.1 *Elements of the ESI Reform Programme*

The ESI will begin by building on the reforms introduced under the Electricity Act, 1998 and the corporatisation of ESCOM which led to its registration as a limited liability company with 99% of its shares held by GoM and 1% by the Malawi Development Corporation (MDC). The Act liberalised the ESI by introducing separate licensing for generation, transmission and distribution and permitting private sector participation in all parts of the industry under an independent regulator. It also allowed ESCOM to operate business units (BUs) in generation, transmission and distribution. A total of six BUs were established: 1 in generation, 1 in transmission, 3 in distribution (that is, North, Centre and South) and 1 in construction. The present policy lays down the framework for consolidating these changes and introducing

further reforms necessary for promoting competition and effective private sector participation.

The proposed reforms are founded on two positions. First, that the reforms of 1998 did not go far enough to trigger the necessary results, since no single IPP or independent power distributor (IPD) has yet registered. Second, GoM takes the position that a vertically integrated ESI is not conducive to competition and would not encourage private sector participation. This makes it imperative that the sector is vertically separated and, in the medium term, that agreements are made for implementing horizontal separations where necessary.

1. Power Generation

GoM is committed to increasing the scope of competition in generating capacity. The use of competitive bidding by the private sector should increase efficiency and effectiveness and provide much-needed investment. In turn, this should minimise prices for consumers and assist in promoting the economic and social development of Malawi. Under GoM's reform programme, the following actions will be instituted in the generation segment of ESI:

- a) in the short term, the existing generation assets will be held and operated by a publicly owned company, the National Generation Company (NAGEC). At a later date an Adviser will be engaged to review the operations and ownership of the company and offer advice on the next stages of reform;*
- b) IPPs shall be allowed to develop their own generating capacity, including build, own, operate, and transfer (BOOTs), and to operate in the same way as private concerns in a competitive but regulated market;*

c) the development of new capacity, including co-generation, by major industrial plants, will be encouraged and a tariff will be developed to encourage sales of energy and capacity to the transmitting operator.

2. Interconnection

GoM recognises that the security of supply may be enhanced by purchase from other countries. It also recognises that new energy trading opportunities are now available through SAPP and Malawi can export its excess power. As a consequence:

a) GoM considers its participation in SAPP a matter of strategic importance in exploiting trading opportunities.

b) In the interests of national security, the extent of supply met through imports will be subject to prudent limits depending on the number of interconnections and the risks associated with each.

3. Transmission

The present transmission network is simple and extends only to the more developed parts of the country. As with generation, GoM has considered various options for its restructuring and ownership. Based on its review, *GoM is convinced that transmission (66kV and above) is a natural monopoly and should therefore be maintained as a public asset operated by a National Transmission/Dispatch Company. To avoid any conflict of interest, the Transmission/Dispatch Company shall not be permitted to engage in generation or distribution.* The functions of the Transmission/Dispatch Company will be:

- a) operating and maintaining the transmission system safely and efficiently;
- b) planning the expansion of the system, including international connectors, to meet forecast demand for electricity at least cost;
- c) giving contracts to the private sector for construction of new transmission lines;
- d) regional power trading and wheeling (transmitting electricity for a fee) in SAPP; and
- e) managing Power Purchase Agreements (PPAs).

4. Third Party Access

Reforms are expected to attract new IPPs who will participate in the ESI as competitors. In order to encourage competition and ensure that demand is met at least cost, ***GoM will permit third party access to the grid.*** A cost reflecting and non-discriminatory tariff will be developed to encourage IPPs, private generators and others to sell energy to the Transmission/Dispatch Company. This tariff will be subject to review and approval by the Energy Regulator. In the short-term, direct sales by generators to specified large consumers will not be permitted but, in the long-term, when the market has grown adequately, the adviser will examine the possibility of such contracts.

5. Distribution

In recent years, countries facing similar problems to those in Malawi have focused ESI reforms on distribution. This was thought to be necessary to underpin the whole reform programme. Success throughout the industry rests critically on the strong commercial performance of distribution, in particular its ability to collect revenue. GoM is convinced that this is the appropriate way forward.

GoM has considered various options in the distribution network such as service contracts, leasing, concessioning and asset transfer. For the reasons elaborated earlier, GoM is convinced that the private sector must play a major role in distributing and selling electricity if the objectives set for the new ESI are to be met. Consequently:

- a) *Given the smallness of the distribution network and taking cognisance of political sensitivities around ESI, GoM has decided to retain distribution as a single entity, but to transfer management to a private operator under a long-term concession of up to 20 years. The concessionaire will operate under specific investment obligations and targets for new connections throughout the country's three geographical regions.*
- b) *The distribution company will buy electricity from the transmission operator under a bulk supply tariff, which will be reviewed and approved by the Energy Regulator.*
- c) *In the long-run, multiple distribution companies will be allowed. However, common ownership of these distribution companies will be limited in order to spur effective competition.*

5.2.5.2 Market Structure and Commercial Arrangements

1. Generation

In the short to medium-term, the Transmission/Dispatch Company will make PPAs with the publicly owned NAGEC for the existing capacity in Nkula, Tedzani, Kapichira and Wovwe. The operations and ownership of NAGEC will, in due course, be subject to review. The Transmission/Dispatch Company

shall also make PPAs with any IPPs that will develop new generating capacity. Preference for this market structure is motivated by the need to promote new, private sector generating capacity and the need for the least-cost expansion of generating capacity.

In the long-term, GoM plans to enhance competition in the generation market by promoting a structure in which distribution companies and large consumers will contract for generating capacity directly with generating companies, a process overseen by the Energy Regulator. In this case, the Transmission/Dispatch Company will confine its operations to transmission and dispatch and in return impose a wheeling charge. Under these arrangements, the size and timing of new capacity will be determined by the generators and distributors and the risk will be borne by generators when they build new capacity.

2. Transmission

In addition to the transmission functions, the Transmission/Dispatch Company will also be involved in the bulk purchase and supply of generating capacity from competing providers under a framework of PPAs.

The function of bulk purchase and supply will be undertaken by a ring-fenced entity, with separate accounts and its own personnel within the Transmission/Dispatch Company. In the short to medium term, it will be the sole purchaser of output and will make the first PPAs; it will also manage invoicing and settlement. Robust and reliable settlement procedures will be put in place to ensure that revenues are collected from distributors and paid promptly to generators. This will build the confidence necessary to encourage active private sector participation. In

order to carry out the role of bulk purchase and supply the Transmission/Dispatch Company will:

- a) assess potential generating projects against a least-cost expansion plan which takes into account the costs of associated transmission developments;
- b) suggest to potential generators the location and magnitude of likely generating shortfalls;
- c) consider both solicited and un-solicited proposals to construct new generating capacity;
- d) carry out demand forecasting and publish the results;
- e) arrange for least cost dispatch;
- f) formulate a fair and cost reflecting bulk supply tariff for sales to distributors;
- g) be responsible for cash flow and settlement; and
- h) arrange for revenue to be collected on an equitable basis to pay for generation and transmission.

The Transmission/Dispatch Company will be subject to the Energy Regulator who, among other things, will review and approve the bulk supply tariff and contracts for generation and transmission.

3. *Distribution*

In the short-term, the IPD-concessionaire will purchase power in bulk from the transmission operator and sell it to retail consumers. The IPD-concessionaire will be responsible for:

- a) ensuring that revenue is collected and defaulters disconnected;
- b) expanding the distribution network; and
- c) increasing the customer base.

The Energy Regulator will regulate and approve the retail tariff of the IPD-Concessionaire.

5.2.6 Rural Electrification

5.2.6.1 Objectives and Implementation

A key objective of GoM is to improve access to electricity for people in peri-urban and rural areas as part of its effort to reduce poverty, transform rural economies and improve productivity. GoM will pursue a number of options, which will include grid and non-grid electrification. The policy for rural electrification shall be based on:

- a) minimising costs and tariffs by implementation arrangements that are based on local participation and initiatives.*
- b) plans administered through MAREP Secretariat of DoE. Its functions will be to:*
 - i) develop and periodically update a rural electrification master plan;*
 - ii) set criteria for selecting sites;*
 - iii) set operational modalities;*
 - iv) act as a source of technical, commercial and institutional advice;*
 - v) administer the Rural Electrification Fund;*
 - vi) access donor funding and soft loans for rural electrification;*
 - vii) oversee construction and management of the rural electrification projects; and*
 - viii) undertake a publicity campaign on the new approach to rural electrification and the opportunities it provides.*

The overall rural electrification policy will involve the following:

- a) ensuring that rural electrification schemes are appropriately engineered and costs are minimised;*
- b) establishing an institutional framework to enable plant and equipment to be made available to projects at low cost;*
- c) establishing a dedicated and sustainable funding mechanism, to be known as Rural Electrification Fund, based on financial resources from the following sources:*
 - ✓ levy on electricity sales;*
 - ✓ levy on liquid fuels and gas sales;*
 - ✓ proceeds from privatization;*
 - ✓ proceeds from HIPC programme; and*
 - ✓ donations from local and international cooperating partners*
- d) enactment of a Rural Electrification Bill to support the new arrangements for rural electrification.*
- e) application of simple contracting/licensing procedures, e.g. using a model licence, the removal of bureaucratic obstacles to private investment and defining the role of the Energy Regulator so that it is appropriate for off-*

grid rural electrification. The legal basis for this will be through the Rural Electrification Act.

5.2.6.2 Subsidies for Rural Electrification

GoM recognises that rural electrification has low returns on investment and provides very little incentive for private investors. It is imperative that GoM arranges some level of subsidy and adopts rural electrification as a deliberate social policy in support of poverty reduction, rural transformation and productivity enhancement. In this regard:

- a) GoM will subsidise plant and equipment for rural electrification. This subsidy will offer the best prospect of developing local projects, minimising tariffs and promoting growth.*
- b) GoM will, on case by case basis, consider extending an appropriate level of subsidy to an operator for overhead and maintenance (O&M) costs for rural electrification facilities where these are deemed unviable. Determination of this subsidy will be made by DoE via its MAREP Secretariat in conjunction with the Energy Regulator.*
- c) GoM will pursue a policy of national uniform pricing for electricity services, including rural electrification.*
- d) GoM will get funding in support of its Rural Electrification subsidies through the Rural Electrification Fund.*

5.2.6.3 Grid Options

The grid options for MAREP shall involve the extension of low voltage power distribution lines (up to 66 kV) to target areas to be established under the Master Plan and selected in accordance with the approved site selection criteria. GoM policy shall be:

- a) Expanding the distribution network to rural growth centres and trading centres where beneficiaries shall include: public institutions (e.g. health centres, schools, police units, immigration and customs border posts) and other related institutions for the common good (for example, orphanages).*
- b) Distribution assets developed with public funds under MAREP shall be owned by the public but managed by a concessionaire.*

5.2.6.4 Off-Grid Options

GoM recognises that there are a number of sites, which will be difficult and expensive to reach because they are remote or because demand is low. This makes it imperative that a complementary strategy be deployed to expedite their electrification. GoM will support both public and private sector driven programmes that will:

- a) Electrify areas not on the grid using a number of off-grid options including thermal power, PVs, and mini or micro-hydros.*
- b) Promote private ownership of off-grid facilities developed with private funds. GoM will assist such initiatives through capacity building and market priming.*

In the case of off-grid supply options, GoM takes cognisance of problems associated with the development of renewable energy markets, which according to recent assessments include few and scattered consumers, lack of a known delivery mechanism and a lack of dedicated financing. *GoM undertakes to experiment with a number of institutional delivery modes. These include, among others, delivery by utilities, NGOs and industry.*

Lessons learnt from this process will be developed into a coherent renewable energy commercialisation master plan as a market priming initiative aimed at removing technical, political, economic and market risks and barriers.

5.2.7 Regulation and Role of Government

5.2.7.1 Regulation

While the regulatory provisions of the Electricity Act, 1998 are in general adequate, they must be amended to introduce clarity and relevance to the present policy. This will give private sector participants and consumers confidence that the new policy will function under an agreed and transparent set of rules and procedures.

GoM recognises that effective regulation is the key to the ESI reforms and undertakes to amend the Electricity Act, 1998 and to enhance the role and functions of the Energy Regulator.

GoM has reviewed international experience in regulation and is determined to put in place an independent, transparent, lean and effective regulatory system consistent with the reforms. *GoM recognises the need to anchor the Energy Regulator on*

all the three aspects of regulation: economic, technical and legal, for it to be effective.

Economic regulation is focused on price of supply etc. and is basically a substitute for competition. It is required since, following a reformed ESI, some parts will continue to be monopolistic, particularly in transmission and distribution. If regulated companies are to be efficient and if efficiency gains are to be fairly distributed between the companies (shareholders) and consumers, then economic regulation must focus on providing appropriate incentives. Economic regulation covers four main areas: prices or tariffs, investments, service standards and competition. Its objectives are:

- a) protecting the interests of consumers, particularly those with low-incomes;
- b) ensuring the financial viability of efficient companies within the industry;
- c) promoting competition; and
- d) collecting and disseminating information.

Price (Tariff) regulation will be *incentive based* by way of ceilings on average prices. Changes between major reviews, to be undertaken every four (4) years, will be tied to changes in the Consumer Price Index (CPI), other unavoidable cost increases and expected efficiency gains in the sector. Expected efficiency gains shall include:

- a) technical and non-technical losses to be set at 12%;
- b) accounts receivable set at 60 days;
- c) connection rates set at a minimum of 20,000 customers per annum; and
- d) a customer to employee ratio of 130 customers per employee.

Technical Regulation is concerned with the inspection of various installations to ensure that they abide by set standards and specifications. It also continuously monitors safety, quality and reliability of supply.

Legal Regulation will focus on enforcing laws, contracts and codes of conduct. The Electricity Act 1998 will be amended to ensure that:

- a) regulation is transparent, effective and independent from GoM;
- b) regulation is delivered as cost effectively as possible;
- c) the size and composition of the Energy Regulator's staff is appropriate;
- d) the level of fees that the Energy Regulator may charge is reasonable;
- e) that the Energy Regulator is adequately equipped, technically and otherwise, to undertake all three forms of regulation set out in this Policy;
- f) that the service provider pays for regulation, but on a fixed levy basis to be reflected in the tariff.

5.2.7.2. Role of Government

Following the passing of the Electricity Act, 1998, the role of the Government has been reduced to policy and governance, but is still extensively involved in the ESI and thus not consistent with the proposed reforms. For instance, GoM still undertakes a number of roles, some of which are not well defined:

1. in regulation: under the terms of the Electricity Act, 1998, the Minister for Energy Affairs retains important responsibilities and powers;
2. in ownership: GoM owns the majority of the assets of the ESI through ESCOM Ltd and has been involved in day-to-day decision-making;

3. in finance: GoM is still the primary financier of all new investments, both directly and as a conduit for multi-lateral and bilateral donor finance.

Under the new policy, GoM will:

- a) end its involvement in day-to-day management. Instead, it will set the policy framework and commercial environment under which the ESI operates. To ensure accountability and transparency, a performance bond will be signed between GoM and undertakers setting targets;*
- b) ensure that all new hydro generation projects comply with international agreements on water riparian rights and that all projects in generation, transmission and distribution meet its environmental standards and approval procedures.*

5.3 Liquid Fuels and Gas Supply Industry

GoM recognises that any LF&GSI has two principal parts, one upstream, the other downstream. Upstream covers exploration for oil and gas, the production and refining of crude, ethanol and other fuels. Supply logistics and marketing liquid fuel products and gas are downstream.

Malawi imports 97% of its refined petroleum, the balance is contributed by locally-produced ethanol, sold directly to the oil companies for blending with petrol on a maximum 20:80 ratio of ethanol-petrol. This ratio is not being met (it is usually 12:88) because production is limited and because of the lack of legislation to make

the blend mandatory. If ethanol production ran at its current full capacity, it could produce 18 million litres, nearly 7% of the total liquid fuels market.

Malawi is obliged to import refined products since it lacks domestic refining capacity and recent GoM studies have confirmed that domestic capacity and the construction of pipelines from the coasts of Mozambique or Tanzania would not be financially viable in the short to medium term given the relatively low demand for liquid fuels. Before 1999 PCC was the sole importer of petroleum products on behalf of the oil industry. In 1999, the LF&GSI downstream market was liberalised with the aim of allowing individual oil companies to import their own oil supplies, thus confining the role of PCC to that of Regulator. On their part, the oil industries formed a consortium, called the Petroleum Importers Limited (PIL), which imports petroleum products on behalf of all existing oil supply companies. While GoM finds this arrangement economically sound for economies of scale and administratively convenient for ease of tax collection and other regulatory functions, it would still encourage competition at this level by permitting oil companies to make own separate import arrangements, provided these are price competitive and approved by the Energy Regulator.

An automatic price adjustment mechanism which links pump prices to procurement costs and exchange rate movements was introduced in 2000 with a 5% trigger band. The formula is managed under a multi-sector Petroleum Pricing Committee (PPC), which meets once every month to assess changes in the agreed parameters that constitute the in-bond landed cost (IBLC) and the value of the Malawi Kwacha against the US Dollar. It is chaired by the Malawi Confederation of Chambers of Commerce and Industry (MCCCI) and includes representatives from PIL, GoM (Treasury, Department of Economic Planning and Development , DoE, Ministry of

Commerce and Industry, Department of Statutory Corporations), NGOs [Consumers' Association of Malawi (CAMA), Road Transport Operators Association (RTOA), Passengers' Welfare Association (PWA), Malawi Council of Churches (MCC) and the Society of Accountants of Malawi (SOCAM)], Reserve Bank of Malawi (RBM) and the PCC as Secretariat. Under the current market arrangements (see Figure 9), the role of GoM is confined to appointing PCC Board and PPC members, providing policy guidance and undertaking strategic planning in support of its LF&GSI policy and legislative reviews.

5.3.1 Opportunities and Challenges

The full extent of the opportunities for and challenges to the LF&GSI are outlined in Box 3, and as can be noted therein, some emerged after liberalisation, while others are perennial. GoM recognises that some of these challenges, including the consequences of being landlocked, are structural and that there is little that can effectively be done, by short to medium term interventions, to change the picture.

Box 3: Opportunities and Challenges in the LF & GSI

OPPORTUNITIES	CHALLENGES
<p>a) Economic Opportunities</p> <ul style="list-style-type: none"> ▪ No of cars increased: 7,131 in 1990 to 13,165 in 2000; ▪ No. of oil companies increased to five in 2000 ▪ New oil company applications in hand ▪ Joint venture opportunities through SADC <p>b) Legislation and Enabling Environment</p> <ul style="list-style-type: none"> ▪ Decentralisation Policy and Act, 1999, ▪ Relative peace and geo-political stability in the region; ▪ Regional cooperation and integration through SADC ▪ Diplomatic mix includes oil producing countries. ▪ Fair Trading and Competitions Act, 2000 ▪ Investment Promotion Act, 1991 ▪ Private Enterprise (privatisation) Act (1996) 	<p>a). Technical Challenges</p> <ul style="list-style-type: none"> ▪ lack of internal oil refining capacity; ▪ inadequate inland storage capacity; ▪ insufficient distribution network, particularly for rural areas; ▪ limited ethanol production capacity to meet blend ratios; ▪ limited R&D into new ethanol applications. <p>b) Economic Challenges</p> <ul style="list-style-type: none"> ▪ high international oil prices; ▪ lack of investment in exploration for oil and gas; ▪ inadequate investment in retail outlets; ▪ high transportation costs; ▪ lack of effective competition; ▪ pricing based on RoR which raises potential for

<p>c) Natural Resource Base</p> <ul style="list-style-type: none"> ▪ hydrocarbon bearing rocks on Lake Malawi bed ▪ large biomass for liquid fuels and gas production ▪ coal resources for gas (coal-bed methane) production <p>d) Technical</p> <ul style="list-style-type: none"> ▪ 18 million litre ethanol production capacity ▪ 18 years of experience in ethanol production ▪ private sector ethanol expansion plans in place 	<p>undesired investments;</p> <ul style="list-style-type: none"> ▪ limited indigenous involvement in the LF&GSI. <p>c) Environmental, Health and Safety Challenges</p> <ul style="list-style-type: none"> ▪ growth of off-street illegal markets; ▪ high incidence of household fires and burns; ▪ air pollution. <p>d) Geo-political Challenges</p> <ul style="list-style-type: none"> ▪ landlocked country; ▪ complex international relations; ▪ long haulage routes. <p>e) Legal and Institutional Challenges</p> <ul style="list-style-type: none"> ▪ inappropriate legal framework for LF&GSI governance; ▪ fragmented institutional framework; ▪ lack of adequate investment guidelines; ▪ vertically integrated industry.
---	--

Source: DoE(2000) National, Regional and Principal Secretaries Workshops

GoM notes that the current market structures and trading arrangements shown in Figure 9 do not fully reflect the reform plans initiated in 1999 and must be changed. GoM has, for instance, noted the tendency by oil companies to operate through a consortium for sourcing oil imports, which reduce competition. GoM recognises the strategic role liquid fuels play in the national economy and the impact international oil prices have on its balance of payments (BOP), local prices and the general welfare of its people. GoM also recognises that liquid fuel is a protected commodity under the Control of Goods Act, a position it intends to retain for strategic reasons. GoM notes that the industry is still vertically integrated in the sense that a few oil marketing companies control not only supply, but also distribution, wholesaling and retailing. This limits the involvement of Malawian operators that GoM considers critical for the reduction of poverty. This also makes it difficult for the country to fully realise both efficiency and equity gains associated with a vertically separated LF&GSI market.

In the short to medium term, it is the desire of GoM to:

- a) further reform its LF&GSI downstream market by restructuring it, encouraging greater private sector participation and the localisation of retail outlets through affirmative action. The reform process will aim at changing the current market structure shown in Figure 9 to the one elaborated in Figure 10. The time scale for achieving this target is three years.*
- b) establish structures and financing mechanisms for the active promotion of upstream activities*

5.3.2 Objectives of LF&GSI Reforms

GoM has set five key objectives for the LF&GSI: competition, security of supply, localisation, improved governance and the improved management of environmental, health and safety hazards. These are elaborated in the following specific objectives:

- a) empowering Malawians by encouraging their participation in LF&GSI retail outlets;
- b) ensuring continuous and reliable liquid fuels and gas supplies;
- c) ensuring the security of fuel supply by expanding fuel storage capacity to 90 days cover (i.e. 30 days maintained by commercial operators and 60 days maintained by GoM by acquiring, owning and managing coastal fuel storage and handling facilities as part of the country's strategic fuel supply chain) and by maintaining a trade route and transport mode diversification policy.

- d) promoting effective competition through appropriate regulatory instruments and innovative pricing mechanisms;
- e) promoting hydrocarbon exploration ;
- f) promoting R&D into new uses for ethanol;
- g) encouraging import substitution by developing local agro-based alcohol-fuels and gases;
- h) minimising health, safety and environmental hazards arising from liquid fuels and gas utilisation;
- i) expanding the liquid fuel and gas retail network into rural areas;
- j) improving and strengthening LF&GSI governance structures and instruments;
- k) developing human skills for improved LF&GSI management and governance;
- l) encouraging greater private sector participation and investment; and
- m) promoting the efficient use of liquid fuels and gas.

Figure 9: Liquid Fuels and Gas Supply Industry: Current Market Structure

Figure 10: Liquid Fuels & Gas Supply Industry: New Market Structure

5.3.3 Outline of the LF&GSI Reform Programme

To fulfil these objectives, GoM undertakes to reform the LF&GSI by restructuring upstream and downstream markets, promoting private participation and the localisation of the retail market. The reform programme shall include:

- a) establishing NOCMA;
- b) encouraging competition in liquid fuels and gas importation;
- c) rationalising the location of internal commercial storage facilities and retail outlets;
- d) legislating for the regulation of the LF&GSI.

GoM strongly believes that although private sector participation is critical for the efficient and effective operation of the LF&GSI, some level of public involvement is required in this area for security, strategic and commercial reasons. As a landlocked, non-oil producing country, Malawi needs a secure fuel supply chain calling for long lead times for coping with emergencies (e.g. flooding, route disruption and civil strife). Experience has shown that commercial oil companies have neither the incentive nor the desire to hold large stocks of fuel because they tie down capital.

It is also in the country's strategic interest to explore its potential for hydrocarbons, hence the need to take a lead in promoting hydrocarbon exploration and other R&D initiatives. Commercial motivation for public involvement is founded on the understanding that although GoM has liberalised the market, there is still a tendency for oil companies to collude on margins and to form import consortia. This not only stifles competition, but also acts as a barrier to entry for new applicants. The role of NOCMA in this case would be to leverage the entry of new players and to promote

competition through its ownership of strategic fuel storage facilities, which it would let to new players on a chargeable hospitality arrangement.

For GoM's long-term view of the LF&GSI market structure see Figure 10, and it includes the following:

- a) NOCMA shall be established under an Act of Parliament and empowered to undertake the following functions:
 - promote upstream oil and gas exploration;
 - manage a strategic fuel reserve facility in accordance with a GoM approved Strategic Fuel Reserve Management Plan; and
 - provide at a fee hospitality to new entrants as one way of promoting competition; .
- b) Ethanol supply to be maintained at levels that sustain a 20:80 ethanol-petrol blend ratio.
- c) Regulation of the LF&GSI shall be undertaken by the Energy Regulator.

5.3.3.1. Upstream Activities

a) Exploration for Oil and Gas

Recent studies have shown that unsuspected and thick sedimentary rocks, which may have hydrocarbon accumulations, are present beneath the northern part of Lake Malawi and in the Lower Shire Valley. Further exploration has not been undertaken because of its high capital costs. GoM is aware that prospective investors are increasingly looking at oil and gas exploration ventures in SADC as a whole, so that

the Southern African region is seen as one exploration block as opposed to separate national targets. The inclusion of the SADC Oil and Gas Exploration Programme in the *SADC Energy Activity Plan (2000)* is evidence of this development. It is GoM's intention to encourage this approach. To realize this:

- i) GoM, in collaboration with SADC and international investment agencies, will encourage and promote exploration for oil and gas in the Lake Malawi basin.*
- ii) NOCMA will be charged with responsibility for promoting this exploration.*

b) Ethanol Production Capacity

Malawi has an eighteen year history of ethanol production with an installed capacity of 18 million litres, 95% of which is dedicated to fuel-ethanol and the remaining 5% to industrial alcohol. Sixty-seven percent of the locally available biomass in the form of sugar molasses is used in its production. The programme of expansion in production, based on smallholder sugarcane farming, means that the output of molasses will far surpass the current levels of 90,000 – 100,000 metric tonnes. This will make possible the expansion of ethanol production. Technological changes will allow the use of cane-juice in ethanol production, so that capacity for further expansion is enhanced.

GoM notes that although the maximum limit set for ethanol-petrol blend is 20:80, it cannot be met because of underproduction and a general reluctance by some oil companies to blend because the price differentials between imported petrol and ethanol are insignificant and because of the absence of legislation requiring blending.

Research is underway to determine other uses for ethanol including blending it with other petroleum products, like diesel-ethanol and gelfuel. Success in the research will allow the expansion of ethanol production with consequent savings in foreign exchange. GoM, by encouraging public-private sector partnerships under CDM, will enable the expansion of ethanol production in order to achieve the 20:80 ethanol-petrol blend ratio. Therefore:

GoM will ensure an appropriate return on investment by pricing ethanol on the basis of full cost recovery.

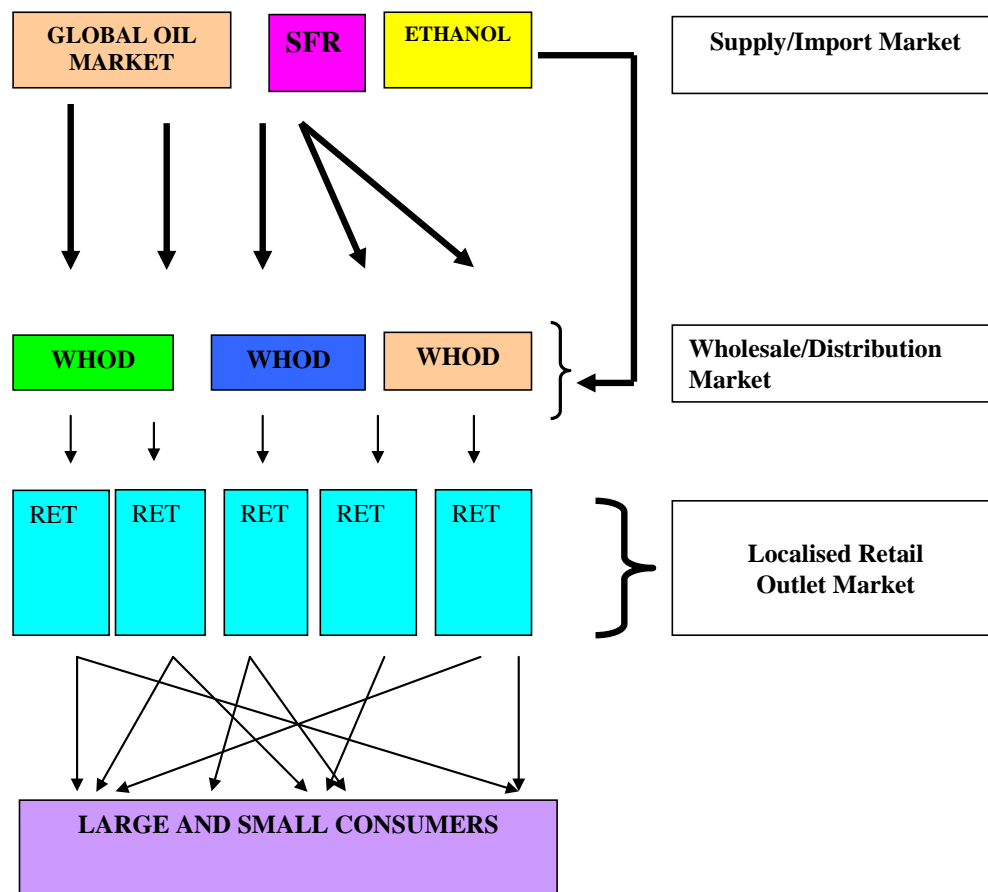
5.3.3.2 Downstream Activities

Like the ESI market reforms, LF&GSI reforms involve interventions along four axes: market structure, commercial arrangements, ownership and regulation. Downstream reforms will involve the vertical separation of the LF&GSI into the following market segments: supply/import, wholesale, retail, storage, and haulage/distribution. This segmentation is deemed essential to improve efficiency, curtail collusion, enhance competition and to promote equity and local empowerment for poverty reduction. Policy pathways in the other three axes are illustrated in Fig 11 and set out below.

a). Supply and Importation: Commercial Arrangements and Ownership

Oil companies are at liberty to import directly at least cost, at a margin approved by the Energy Regulator. Ethanol shall be purchased by each Wholesaler from local ethanol manufacturers in volumes adequate to cover the mandatory 20:80 ethanol-petrol blend ratio and at a price approved by the Energy Regulator.

Figure 11: LF&GSI: Market Arrangements Under New Market Structure



Source: Department of Energy Affairs (2002)

Fuel haulage shall be guided by GoM's policy of diversifying routes and modes of transport, with the following annual weightings: 20% Dar Corridor, 50% Nacala Corridor and 30% Beira Corridor, subject to national reviews by the Energy Regulator. Short term variations to these weightings shall only be allowed under situations of *force majeure* and when approved by the Energy Regulator.

Specifications for all liquid fuels (jet-fuel, av-gas, petrol, diesel, paraffin and ethanol), gas, and lubricants shall be established by the Malawi Bureau of Standards (MBS) and conform to international standards. These shall be reviewed regularly by the Energy Regulator to ensure that they are in line with trends in the SADC Region.

b). Wholesale and Distribution Markets

Oil companies will be allowed to own internal storage depots and retail outlets. They will be allowed to sell wholesale to retail and other outlets. In order to expedite the implementation of GoM's retail outlet localisation policy, own operation of retail outlets by any oil market company shall be restricted to a maximum of two (2).

Ethanol shall be sold to all wholesalers through their storage depots where mandatory blending shall take place. This will be enforced and monitored by the Energy Regulator. Wholesale margin and inland distribution margin shall be approved by the Energy Regulator.

c). Retail Market

Except for own-operated retail outlets, where applicable, all retail outlets shall be operated and managed by Malawians, through franchise arrangements with retail outlet owners, as part of GoM's poverty reduction strategy. In addition, any Malawian is at liberty to construct, own and operate a retail outlet to sell franchised products from wholesale companies. Retail outlet franchise arrangements shall be subject to approval by the Energy Regulator to ensure transparency and equity. The Energy Regulator shall put in place a Retail Outlet Rationalisation Plan to ensure their proper geographical distribution.

d). Internal Storage Capacity

Malawi's geographical location means that the country must have a reasonable internal storage capacity to avert supply disruptions by natural or man-made emergencies. A reasonable capacity for a landlocked country is at least 90 days supply [see studies by GoM and SADC and the recommendation of the International Energy Agency (IEA)]. GoM will endeavour to maintain this level of storage through the following arrangements:

- i) Rationalising commercial storage capacity. The Energy Regulator shall prepare and enforce a Commercial Storage Rationalisation Plan which shall require:
 - o each Wholesaler licensee to hold fuel supplies that cover 30 days consumption;
 - o each Wholesaler licensee to allow third party hospitality access to its storage in cases where there is idle capacity;
 - o each Wholesaler licensee to establish a regional presence in the geographical distribution of its storage capacity.
- ii) Establishing a strategic fuel storage facility with a holding capacity of 60 days cover. This facility shall be owned by GOM and operated by NOCMA. It will be used in part to provide hospitality to new entrants into the market who may otherwise be constrained by lack of own storage.

5.3.3.3 LF&GSI Regulation

Malawi does not have LF&GSI regulatory legislation, although a number of separate Acts exist that deal with specific aspects of the industry. For instance, the *Petroleum Act (1951)* is concerned with regulating the storage of petroleum products defined as

petroleum spirits, diesel oil, paraffin, aviation fuel and any other motor fuel or other substance or matter declared under Section 2 of that Act. The fuel crisis of 1970s led to the enactment of a *Preservation of Public Security Act (1979)* which extended the powers of the Minister stipulated in the 1951 Act to include, among other things, restricting the hours of opening for retail outlets and restricting the purchase or sale of certain products to ensure a supply of fuel at all times. The realisation of a hydrocarbon potential in 1983 led to the enactment of yet another set of laws to govern exploration and production. With this Act the Minister promulgated the following regulations:

- for Applications to deal with applications for grants of petroleum exploration licences and production licences;
- for the Constitution of Blocks to divide Malawi into geographical blocks for purposes of exploration;
- for General Provisions dealing with investigations and studies and survey of oil/gas wells;
- for Prescribed Fees and Annual Charges;
- for Records, Reports and Accounts; and
- for Registration and Transfer of Licences.

In 1986 a further Act was passed which established the PCC as a regulatory body, but restricted its powers to ensuring that there is, at all times, a steady, continuous and adequate supply of petroleum products. GoM considers these instruments to be far too inadequate to ensure that PCC functions as an effective regulator in the reformed LF&GSI market.

GoM will therefore review all existing laws affecting liquid fuels and gas with the intent of creating appropriate legislation to govern a liberalised LF&GSI.

Under the new legislation, provision shall be made to place the regulation of LF&GSI under the jurisdiction of the Energy Regulator, which shall be mandated to carry out all technical, economic and legal aspects of regulating this industry. Such regulations are consistent with those defined in section 5.2.7.1 of the ESI but made specific to liquid fuels and gas.

5.3.3.4 Role of Government

Under existing legislation the Minister responsible for energy has, in an emergency, the power to limit hours of operation and the quantities that may be sold by any operator. He has licensing and regulating powers over any operator in the upstream market, but his powers in the downstream market are not adequately defined. As a result, GoM has made a number of provisional arrangements for the regulation of the industry, which include the establishment of an autonomous multidisciplinary Petroleum Pricing Committee for price regulation, and a Licensing Committee supported by a set of new licensing guidelines. In the 1999 reforms, GoM relinquished its role as importer through the PCC and earlier plans to form a public oil supply company did not materialise.

GOM plans to reconstitute existing regulatory instruments to make them consistent with the proposed reforms. Under the restructured market, the role of Government shall cover policy and strategy, the promotion of upstream activities and strategic fuel reserve management.

5.3.3.5 Environment, Health and Safety

GoM is aware that hydrocarbon exploration and production have significant adverse environmental consequences and this is particularly so wherever oil production takes

place. Lake Malawi, which is a source of fresh water and home to nearly a thousand rare tropical high value fish species, is particularly vulnerable. In this regard:

GoM shall subject all hydrocarbon exploration, oil and gas production and storage schemes to rigorous EIAs as required by the Environmental Management Act of 1996.

GoM is also concerned that the combustion of petroleum products produces carbon monoxide, carbon dioxide, nitrous oxides, lead and particulate matter. Some of these substances are health hazards, lead to atmospheric pollution and contribute to global warming. Downstream activities such as spillage and leakages from trucks, train cargoes, storage facilities and filling stations may lead to the pollution of ground water and rivers and fires. Therefore:

GoM will enforce strict fuel product, fuel storage and fuel haulage equipment specification codes, and siting guidelines in order to safeguard peoples' health, ensure safety and protect the environment.

5.4 Coal Supply Industry

Malawi has 1 billion metric tonnes of probable coal reserves, of which 22 million tonnes are proven reserves of a bituminous type. These resources occur in various parts of the north (Karonga and Rumphi) and the south (Lengwe and Mwabvi game reserves in the Lower Shire Valley). Although coal deposits occur at several locations in Malawi, coal mining started only in 1985 - one mine is currently in operation at Mchenga in Rumphi District in the north of the country and accessible only by road. Production in 2000 was approximately 55,000 tonnes and nearly 15% of this was

exported to Tanzania leaving a balance of 46,404 tonnes adequate only for 20% of the country's total requirements. The remaining 80% is imported.

The coal produced from Mchenga has a calorific value of 7,000 kcal/kg (that is, 28 - 30 MJ/kg) and compares favourably in quality with imported coal, with ash and moisture contents of 14% and 3%, respectively. This makes it suitable for a wide range of applications including power and steam generation.

Five main challenges face the CSI: a lack of price competitiveness for northern Malawian coal compared to imported coal (particularly from Zambia, Zimbabwe and Mozambique), a lack of competition within the industry (eight years after the liberalisation of 1995, there is only one company), low productivity and high production costs owing to the use of obsolete technologies, a general lack of information on firm coal reserves because exploration is limited and an absence of an appropriate regulatory framework to govern downstream marketing, transportation and utilisation. Uncompetitive prices are also partly attributable to the high cost of transporting coal by road from mines located in northern Malawi to coal-using industries mainly concentrated in Lilongwe and Blantyre, respectively some 500 km and 800 km away. This should be compared with Moatzie coal mines which are only 90 km from Blantyre.

Between 1985 and 1995 the industry consisted of a single public monopoly producer (the Mining Investment Development Corporation - MIDCOR) and one private monopoly wholesaler (i.e. AMI), the latter handled all retailing and transportation. MIDCOR was a parastatal agency established by an Act of Parliament in 1985 and charged with two principal functions: to promote mineral ventures through

exploration, mapping and data management and to cultivate a mining culture by undertaking mining, mineral processing and marketing activities.

The liberalisation of the CSI in 1995 took two forms: the closure of MIDCOR and the privatisation of its assets, including the sale of its Mchenga Coal Mine. This was followed by a short lived investment in mine modernisation which led to a rise in monthly production levels from an average 800 tonnes/month to 7,500 tonnes/month, an improvement in productivity from 1 tonne/worker/month to 22 tonnes/worker/month. This was possible because of a change in methods from purely manual labour, taking approximately 800 employees to produce 800–1000 tonnes per month, to semi-automatic processes which involved the introduction of crushing, screening and other machinery. The improved figures are still lower than regional averages and have not been sustained. Production has varied significantly from one year to another and the number of employees has steadily increased to pre-1995 levels, thus reducing the amount of coal per worker per month. One consequence of limited exploration has been to force Mchenga Coal Mine to change from open-cast to deep mining, which has contributed to a rise in production costs.

Coal is mostly used by industry, principally in the manufacture of textiles and cement, the processing of tobacco and the production of ethanol. Large public institutions, such as hospitals and prisons, are also substantial consumers. Most households do not use coal because there are no effective coal stoves and its use produces problems in health and safety.

5.4.1 Opportunities and Challenges

GoM has identified a number of opportunities and challenges arising from the current CSI market structure. These are summarised in Box 4 and elaborated below.

Governmental portfolios put all upstream activities in the CSI under the jurisdiction of the Geological Surveys Department, which deals with mineral exploration and mapping, and the Mines Department, which promotes and supervises mining activities, including mining regulation and licensing. These activities are governed by the *Mines and Minerals Act (1981)*. Therefore, the present policy will focus its interventions on those challenges that relate only to the downstream activities of coal marketing, transportation and utilisation. DoE will collaborate with relevant authorities to facilitate the efficiency and effectiveness of coal supply.

GoM finds the monopoly in the CSI market and transport arrangements unsatisfactory. It inhibits GoM's ability to improve the efficiency, competition and reliability of coal supply.

Box 4: Opportunities and Challenges for the Coal Supply Industry

OPPORTUNITIES	CHALLENGES
<p>a) Natural Resource Base</p> <ul style="list-style-type: none"> 1 billion tonnes probable reserves 22 million tonnes proven bituminous coal reserves <p>b) Economic Opportunities</p> <ul style="list-style-type: none"> 80% of local requirements currently imported; export opportunities in regional and global markets; large potential for new local applications (e.g. power generation, household, tobacco curing, etc); <p>c) Human Resource & Institutions Opportunities</p> <ul style="list-style-type: none"> large pool of qualified mining engineers; local mining expertise; Geological Surveys Department supports exploration Mines Department supports mining development activities <p>d) Governance Opportunities</p> <ul style="list-style-type: none"> Mines and Minerals Act (1981). 	<p>a) Technical Challenges</p> <ul style="list-style-type: none"> lack of appropriate end-use technologies to use coal in new market niches, e.g. household and tobacco curing; limited exploration and information on existing reserves Difficulties in starting coal fires <p>b) Economic Challenges</p> <ul style="list-style-type: none"> inadequate investment in exploration and mining; low production capacity to meet local demand; low labour productivity; uncompetitive prices due to high transport costs, use of obsolete technologies, inappropriate pricing, inherent inefficiency in mining methods; monopoly arrangements in production and distribution <p>c) Governance Challenges</p>

<ul style="list-style-type: none"> ▪ GoM policy for power generation diversification ▪ Electricity Act, 1998 based on liberal market structure ▪ Fair Trading and Competitions Act, 2000 ▪ Investment Promotion Act, 1991 ▪ Private Enterprise (privatisation) Act (1996) 	<ul style="list-style-type: none"> ▪ lack of policy on mining generally and coal particularly ▪ lack of a coal downstream regulatory framework <p>d) Environmental and Health Challenge</p> <ul style="list-style-type: none"> ▪ water and air pollution via accumulated coal dust dumping; ▪ GHG emissions during coal combustion; ▪ health hazards for miners – respiratory and chest infections.
--	---

Source: DoE (2000) National, Regional and Principal Secretaries Workshops

GoM also sees the removal of MIDCOR, without providing an alternative, as having a negative impact on the efficiency, effectiveness, reliability and transparency of the market. It also has the effect of entrenching the quasi-monopolistic tendencies, the only difference being that the mine is now controlled by a private operator. GoM notes that by using coal to generate power Malawi could greatly expand coal applications, thus improving the security of power supply. Coal could also be an alternative fuel for household and agro-industries. To address these issues:

GoM will undertake further reforms to improve efficiency and competition in coal supply systems and to promote it as a fuel for on-site power generation and as an alternative for household, tobacco curing and other applications.

This will involve extending the CSI reform programme of 1995 by restructuring the market and promoting competition through private sector participation in the wholesale and retail marketing as well as in transportation by changing the market structure in Figure 12 to the one in Figure 13.

5.4.2 CSI Market Structure

The CSI market structure shall consist of ex-mine suppliers, coal wholesale operators (CWOs) and coal retail operators (CROs) all of whom will be required to register and obtain a licence with the Energy Regulator. The Energy Regulator shall solicit investment from ex-mine suppliers. It shall also advertise for wholesale and retail operators and the former shall be required to establish wholesale depots under a demand driven Coal Distribution Rationalisation Plan. With environmental considerations in mind they will keep stocks at these depots. This is necessary to facilitate retail marketing and penetrate new markets. CWOs shall wholesale their products to any registered CRO and/or directly to any large consumer.

5.4.3 Trucking

Trucking arrangements are currently monopolised by the producer who also serves as a monopoly wholesaler. This excludes other truck operators and introduces inefficiency and arbitrariness in delivery arrangements. Therefore:

GoM will break the trucking monopoly by allowing other players to participate in coal haulage under brokerage contract arrangements with wholesalers under the supervision of the Energy Regulator.

Figure 12: CSI: Current Market Structure

Figure 13: CSI: New Market Structure

5.4.4 Regulation

Upstream activities are currently regulated by GoM through the *Mines and Minerals Act (1981)*. Under it, the Minister is empowered to regulate all reconnaissance, exclusive prospecting and the issue of large mining licences. GoM is considering a review of these regulations to accommodate new developments in the sector under a new mining policy. While the present Energy Policy will not institute any changes to this regulatory framework, it is noted that there are no regulatory provisions for CSI downstream activities and these are essential for realising the efficiency gains expected in the proposed reforms. Consequently,

A Coal Marketing, Stockpiling and Utilisation Bill shall be passed to serve as a regulatory instrument for the CSI downstream market. Provisions shall be made in this Act for the role of a regulatory agency to guide downstream activities.

The functions of the Energy Regulator with regard to CSI downstream activities shall include, but not be restricted to, the following:

- a) issuing licences to wholesalers,retailers, and hauliers;
- b) approving and overseeing trucking brokerage agreements;
- c) approving coal price structures;
- d) promoting coal marketing;
- e) maintaining a coal data base;
- f) introducing and enforcing measures to mitigate the impact of coal stockpiling and use on the environment, health and safety;
- g) preparing coal marketing, trucking and utilisation regulations;
- h) setting and enforcing minimum standards of coal combustion systems .

5.4.5 Role of Government

The role of GoM in CSI downstream activities shall be confined to setting policies and strategies, maintaining a coal databank for planning purposes, monitoring the performance of the reform process, supporting market priming initiatives, including R&D in coal utilization, particularly in new markets, and undertaking promotional work and civic education.

5.4.6 Coal, Environment, Health and Safety

Coal produces gaseous by-products when burning, including carbon monoxide, carbon dioxide and sulphur dioxide, which are hazardous to life and to the environment. Carbon monoxide can be avoided by ensuring the complete combustion of coal while a washing process can deal with sulphur dioxide. Another by-product is dust, which can cause problems in the environment. It is anticipated that the CSI reform process will lead to a significant increase in the use of coal. To address environmental, health and safety problems associated with this increased utilization:

GoM will *draw up regulations that will ameliorate the impact of coal storage, haulage and utilization on the environment, and on the health and safety of its handlers and users.*

5.4.7 Clean Coal Technologies

The impact of coal utilisation on the environment can be reduced by introducing clean coal technologies, including coal washing, gasification, liquification, fume-capturing etc. Therefore:

GoM will, through market priming activities and fiscal incentives, promote the application of these technologies.

5.4.8 Combustion Efficiency

Since the utilisation of coal contributes to GHG emissions, it is important that efficient combustion technologies are used. Consequently:

- a) The Energy Regulator will implement a systematic programme of inspection of coal combustion installations to ensure that they abide by set minimum standards.*
- b) GoM will also support research into, and the development of, more efficient coal-combustion technologies.*

5.4.9 Coal Dust Management

The existence of a growing regional market for coal-dust has meant that its accumulation is not yet a problem in Malawi. Almost all coal dust generated from Mchenga Coal Mine is sold to local cement plants or exported to neighbouring countries. However, *should it become a problem:*

GoM will, through market priming and fiscal incentives, promote coal-dust briquetting programmes.

5.4.10 Coal Bed Methane

GoM is aware that during coal mining operations, some quantities of coal-bed methane escape into the atmosphere and contribute to GHGs. GoM is also aware of

regional initiatives, under the auspices of SADC, to develop a market for this product. Therefore:

- a) *GoM will monitor regional developments and assess the potential for tapping coal-bed methane as a commercial product.*
- b) *Where found feasible, GoM will, working in partnership with the private sector, promote the commercial production and marketing of coal-bed-methane.*

5.5 Nuclear Energy

Malawi has proven reserves of about 63,000 tonnes of uranium at Kayerekera in Chitipa District in the northern part of the country. Another deposit has been identified at Illomba, also in Chitipa. In this regard:

- a) *Because of the country's limited economic strength and wary of environmental consequences of nuclear development, GoM has no plans, in the short to medium term, for generating nuclear power.*
- b) *In the long term, when the economy is strong enough to venture into nuclear generation, this policy will be reviewed.*

5.6 Biomass Supply Industry

The BSI also has upstream and downstream elements. Upstream activities deal with the production of wood resources in man-made plantations, woodlots and natural woodlands. BSI downstream activities are harvesting, marketing and utilizing wood. This Energy Policy will confine itself to downstream matters since upstream activities

are adequately dealt with in the *Land Policy (2002)* as well as in the *Forestry Policy (1996)* and its supporting *Forest Act, 1997*.

Malawi's energy balance is dominated by biomass (firewood, charcoal, agricultural and industrial wastes), which account for 97% of the total primary energy supply. Table 3 shows general patterns in the regional distribution of biomass resources by source, indicating flows and stocks, where flows refer to sustainable yields obtained from stocks. A number of important conclusions can be drawn.

More than a third (34%) of biomass resources are obtained from agricultural and industrial residues. Although the use of residues for energy has a large opportunity cost for agriculture, its impact on deforestation is virtually non-existent. The energy sector's contribution to deforestation is related to the wood obtained from unsustainable sources on customary lands for charcoal production and firewood. But even here customary land contributes only 37% of all biomass used. The remainder is obtained from sustainable yields on government plantations (10%), forest reserves (15%) and private plantations (3%). The real challenge for biomass is the existence of isolated deficits, concentrated mainly in the South, where population densities are high and the demand for wood is greatest, and some tobacco growing areas in the Central and Northern Regions. Related to this are the problems of getting woody biomass from areas with a surplus because of the high cost of transport and the difficult terrain.

Table 3: Distribution of Biomass Resources by Administrative Region

REGION SOURCE	North		Central		South		Total	
	Flows (toe/a)	Stocks (toe/a)	Flows (toe/a)	Stocks (toe/a)	Flows (toe/a)	Stocks (toe/a)	Flows (toe/a)	Stocks (toe/a)
Government Forest Plantations	104916	2364909	37756	307079	31318	394081	173990 (10.4%)	3065868 (4.0%)
Forest Reserves	93828	4563000	97024	6130800	60314	5358600	251166 (15.0%)	16052400 (20.7%)
Private Forest Plantations	n.a	n.a	22838	102292	33402	167010	56240 (3.3%)	269302 (0.3%)
Indigenous Wood (Customary Land)	383700	46000000	170800	8500000	58500	3500000	613000 (36.5%)	58000000 (75.0%)
Wastes from Wood Industry	n.a	n.a	n.a	n.a	9672	n.a	9672 (0.5%)	n.a
Agricultural Residues (Customary Land)	40134	n.a	202051	n.a	103041	n.a	345226 (20.5%)	n.a
Agricultural Residues (Tobacco Estates)	2637	n.a	13526	n.a	5044	n.a	21207 (1.3%)	n.a

Agro- Industry Residues	1116	n.a	258	n.a	209155	n.a	210529 (12.5%)	n.a
TOTAL	626331	52927708	544253	15040171	510446	9419691	1681030	77387570
%	(37.3%)	(68.4%)	(32.4%)	(19.4%)	(30.4%)	(12.2%)	(100.0%)	(100.0%)

Source: DoE (1988, 1993) *National Energy Master Plan: Biomass Sector Position Paper* (IPC, Lilongwe),

Another issue relates to the conversion technologies used in charcoal production. For the comparative yields of various charcoal carbonisation technologies see section 4.2.1 and for a comparison of the efficiencies of end use combustion appliances (cookstoves), see Table 2. The problem of low biomass end-use efficiency also applies in flue and fire curing of tobacco, brick burning, fish smoking and other cottage industries.

Biomass presents a number of special challenges in marketing: laws governing land tenure have allocated 80% of land to customary holding in which the private ownership of land and resources is prohibited, although Malawians have usufruct rights and wood resources are available free of charge. A small stumpage fee is imposed when wood is harvested for commercial purposes under the *Forest Act, 1997*. Enforcement of this law has been weak and in many instances wood is illegally harvested free of charge. The biomass market lacks any formal structures with a large

number of individual vendors involved in harvesting, transportation and marketing. It is estimated that it employs nearly 55,000 individuals jointly generating MK880 million per annum. Because biomass is traded through informal structures, revenue is neither recorded in national accounts nor taxed.

5.6.1 Deforestation: Causes and Effects

Malawi's dependence on woodfuel has always been thought to contribute significantly to the country's rampant deforestation. But available statistics point to a slightly different conclusion. Deforestation and environmental degradation are now linked to land clearance, mainly for agriculture, urbanisation and other infrastructural developments. The contribution of energy to deforestation is largely in the form of uncontrolled tree felling for curing tobacco and the rise in opportunistic trade in firewood and charcoal, particularly since the dawn of multi-party democracy.

The Forestry Department estimates that the country's deforestation rate is 2.8% per annum. The effects of agricultural expansion and ways to slow it down would need to be addressed. This could be done by raising farm productivity and slowing the rate of population growth. Agricultural productivity, a problem for the Agriculture Policy, should be given adequate attention not only to improve and diversify farm yields, but also to ensure a sustainable supply of wood products and to protect the environment. These interventions will run into various structural problems. Most forest products, firewood, charcoal, fruits and bamboos, are grossly undervalued at roadside markets. If the true market value for these products was used, communities would want to protect and manage trees and at the same time reduce the demand for firewood and charcoal. Price incentives would encourage tree planting by communities and thus reduce the pressure on natural woodlands. Studies have shown that the only people who can protect and replant trees cost-effectively are local communities. Planting by

authorities is expensive and difficult to manage on the required scale. As long as wood prices remain low and levels of responsibility remain unclear, local people will have little interest in planting or protecting trees and consequently, sustainable wood production is virtually impossible.

GoM realises that deforestation is not an energy issue *per se*. It is linked to the whole question of poverty and people's survival. Consequently, GoM takes the view that deforestation cannot be resolved by energy interventions alone. It will only be resolved in a development path that alleviates poverty and increases economic productivity. Energy is obviously an infrastructural investment and service that contributes to development and poverty reduction. The widening of access to efficient, effective and sustainable energy resources and technologies will accelerate development, but energy interventions by themselves will not address deforestation.

Since deforestation is a multi-sectoral poverty issue, GoM realises that earlier direct interventions in the energy and forestry sectors focusing on deforestation were mis-targeted. One consequence of this has been little investment in rural electrification, which provides the greatest potential for poverty reduction and rural transformation. To prioritise rural energy interventions, especially those that tackle poverty, the focus must be on supporting public and private investment that increases human capability and transforms rural economies. To that end:

GoM will provide fiscal incentives and where necessary direct support to public and private initiatives aimed at enhancing access to alternative modern energy services and promoting IGAs for biomass vendors.

5.6.2 Opportunities and Challenges

GoM has identified a number of opportunities and challenges arising from the current BSI market structure. These are summarised in Box 5 and elaborated below.

Box 5: Opportunities and Challenges for the BSI

OPPORTUNITIES	CHALLENGES
<p>a) Resource Potential</p> <ul style="list-style-type: none"> ▪ biomass is still readily available free of charge ▪ excess wood in some parts of the country (North); ▪ flows from agriculture and industrial residues plentiful <p>b) Economic Potential</p> <ul style="list-style-type: none"> ▪ emerging cash biomass markets ▪ availability of alternatives to firewood and charcoal <p>c) Governance and Institutional Arrangements</p> <ul style="list-style-type: none"> ▪ enabling environment exists which includes: <ul style="list-style-type: none"> ➢ Environmental Policy, 1996 ➢ Environment Management Act, 1996 ➢ Forestry Policy, 1997 ➢ Forestry Act, 1997 ➢ Land Policy, 2002 ➢ Decentralisation Policy, 1999; ➢ Private Enterprise (Privatisation) Act, 1996 ▪ availability of efficient charcoal carbonisation technologies; ▪ availability of efficient biomass end use technologies; ▪ willingness of donor community to support improved environmental management initiatives; ▪ Malawi signatory to UN Conventions on Desertification, Biodiversity, Climate Change; ▪ access to CDM and GEF financing; ▪ forests identified as sinks for GHG emission under UN Conventions; ▪ existence of a functioning Forestry Department. 	<p>a) Technical Challenges</p> <ul style="list-style-type: none"> ▪ dependence on inefficient traditional charcoal carbonisation technologies; ▪ dependence on inefficient biomass end-use technologies ▪ increased pockets of woody biomass scarcity in parts of the country, (e.g. South and major tobacco growing areas). <p>b) Economic challenges</p> <ul style="list-style-type: none"> ▪ biomass is a free resource under customary law which makes market regulation impossible; ▪ greater use of residues which could be used for agricultural purposes. ▪ multiplicity of end-uses for biomass (e.g. cooking, heating, socialisation, insect repellent, food preservative, etc) <p>c) Environmental, health and safety challenges</p> <ul style="list-style-type: none"> ▪ deforestation and environmental degradation; ▪ air pollution; ▪ health and safety hazards from smoke, carbon monoxide, other fumes and open fires; ▪ GHG emissions from carbonisation and use of charcoal and firewood, which contribute to climate change. <p>d) Governance and Institutional challenges</p> <ul style="list-style-type: none"> ▪ fragmented and informal market structures; ▪ absence of linkage with national accounting system; ▪ politically incorrect messages sent in support of charcoal production and trading; ▪ land use conflicts in agriculture, forestry and energy; ▪ problems in enforcing existing Forest &

	<p>Environment Laws .</p> <p>d) Social and Cultural challenges</p> <ul style="list-style-type: none"> ▪ Engrained mindsets in support of biomass as a special fuel for preparing specialised dishes for its aromatic properties
--	---

Source: DoE (2000) National, Regional and Principal Secretaries Workshops

GoM recognises that because of the fragmented and informal nature of the BSI market and given that woody biomass is virtually a free resource, formalisation of the market would have to start from changes in land tenure policies. GoM will closely monitor the implementation of Land Policy in order to draw synergies for the BSI and thus develop appropriate interventions. The present Energy Policy will confine interventions to those areas directly related to the utilisation of biomass for energy. In this regard:

a) GoM will ensure the efficient utilisation of biomass in an environmentally sound and sustainable manner by promoting, through market priming activities:

- i. the use of efficient charcoal carbonisation technologies ;*
- ii the use of non-indigenous wood for charcoal production from sustainable sources;*
- ii. the use of efficient biomass end-use technologies through civic education;*
- iii. training and research in production, use and marketing of biomass technologies;*

iv. stakeholder participation, including local communities, in producing and marketing biomass technologies.

b) GoM will promote alternatives to firewood and charcoal, including gelfuel, biomass briquettes, biogas and other renewables through market priming initiatives and fiscal incentives.

GoM will embark on a concerted long-term programme of rural energisation for rural transformation.

5.7 Other Renewable Energy Sources Supply Industry

Malawi is well endowed with other renewable energy sources (ORES) including good sunshine throughout the year for photo-voltaic and photo-thermal applications, reasonable wind speeds for water pumping, a number of perennial rivers with hydro power potential, a reasonably large population of domesticated animals for biogas applications and hot springs for geothermal power generation. Although technologies for ORES conversions are now widely commercially available and their prices are increasingly competitive, Malawi has not been able to fully utilize them. As a consequence, the role of ORES in the total energy balance has remained insignificant (0.2%). This is attributed to the prevalence of a number of technical, economic, skills, institutional and socio-cultural barriers.

Technical barriers include a lack of capacity in manufacturing, distributing, installing and maintaining RETs. Financial barriers include high first cost, a large proportion (45%) of which emanates from import duties and surtaxes. Other important financial barriers are a lack of dedicated and affordable financing mechanism, a lack of financiers and suppliers knowledgeable about establishing dedicated financing

mechanisms and appraising applications for credit, a lack of skills to develop business plans, a lack of knowledge about local, regional and international financial facilities for RETs, a lack of confidence in RETs and low returns on investment (for financiers) and the non-availability of loans (for end users).

Institutional barriers include a lack of standards and regulatory framework, limited delivery modes, a small number of RET companies, a latent market and a small number of qualified technicians to undertake installations. A lack of a deliberate policy and strategy and a lack of information about the efficacy of RETs among policy makers, NGOs and the public, have further contributed to the entrenchment of institutional barriers.

Socio-cultural barriers include gender insensitivity in the design and operation of some RETs and the acceptability of those technologies, which touch on cultural issues, such as the promotion of biogas using human wastes.

Malawi has no codes of practice and system standards for RETs. This has meant a proliferation of systems of questionable quality, often poorly installed and with no maintenance. GoM realises that if RETs are to be used sustainably, then regulatory mechanisms have to be in place to reverse negative perceptions and to instill confidence in the RETs market. Codes of practice and standards must be developed in close collaboration with industry and potential users. These regulations should cover performance, system installation, system commissioning, system guarantees, system maintenance, theft avoidance and a code of RET business ethics. In addition, compliance monitoring needs to be designed and undertaken. In order to address these barriers, GoM, in September 1999, launched the NSREP. The main objective of the programme is to promote RETs as alternative sources for lighting and cooking, using delivery modalities and financing mechanisms that have proved

workable elsewhere in the world. GoM is working with a number of financing agencies to prime the RETs market.

In addition to the potential provided by a large ORES resource base and the availability of mature RETs, Malawi's commitment to the promotion of RETs is further motivated by its commitment to various UN conventions on the conservation of the environment, UNFCCC for example, which have identified the use of RETs as the most potent GHG mitigating measure. Therefore:

GoM will put in place measures that will consolidate market priming activities under NSREP, as a prelude to establishing a vibrant, reliable and sustainable private sector driven RETs industry

5.7.1 Opportunities and Challenges for ORESSI

GoM has identified a number of opportunities and challenges arising from the current ORESSI market structure. These are summarised in Box 6 and elaborated below.

Box 6: Opportunities and Challenges for ORESSI

OPPORTUNITIES	CHALLENGES
a) Resource Potential <ul style="list-style-type: none"> ▪ wind speeds of 2 – 7 m/s adequate for water pumping ▪ solar radiation 21.1 MJ/m²/day for PV, PT applications ▪ perennial rivers with hydropower potential of 900MW ▪ hot springs for geothermal power generation ▪ large biomass stocks and flows for biogas, power generation ▪ large animal population for biogas generation b) Technical <ul style="list-style-type: none"> ▪ existence of technically mature & commercially viable RETs 	a) Technical Challenges <ul style="list-style-type: none"> ▪ lack of local capacity in manufacturing, distribution, installation and maintenance of RETs; ▪ lack of information on the efficacy of RETs. b) Economic Challenges <ul style="list-style-type: none"> ▪ high first costs (largely from taxes); ▪ lack of dedicated financing mechanisms; ▪ very small industry ▪ small niche market ▪ limited delivery modes.

<p>c) Economic</p> <ul style="list-style-type: none"> ▪ fiscal measures (e.g. waiver of duty/surtax on RET); ▪ donor willingness to promote RETs ▪ CDM and GEF resource availability for RETs ▪ 96% population without access to modern energy services <p>d) Governance and Institutional Arrangements</p> <ul style="list-style-type: none"> • NSREP as focal point for RETs activities ▪ enabling environment exists which includes: <ul style="list-style-type: none"> ➢ Environmental Policy, 1996 ➢ Environment Management Act, 1996 ➢ Forestry Policy, 1997 ➢ Forestry Act, 1997 ➢ Private Enterprises (Privatisation) Act, 1996 ▪ Malawi signatory to UN Conventions on Desertification, Biodiversity, Climate Change; 	<p>c) Governance and Institutional Challenges</p> <ul style="list-style-type: none"> ▪ lack of clear government policy on RETs; ▪ lack of system standards and industry code of practice; ▪ lack of regulatory framework <p>d) Social and Cultural Challenges</p> <ul style="list-style-type: none"> ▪ gender insensitivity; ▪ unacceptability of systems using human waste.
---	---

Source: DoE (2000) National, Regional and Principal Secretaries

The ORESSI is a small private industry comprising seven registered private companies and a few individual vendors. National power utilities in other members of SADC, for example, South Africa, Namibia, Botswana and Zimbabwe, have included RETs in their services to cater for remote locations, but this has not been the case in Malawi which limits the number of delivery modalities. All components are imported as Malawi lacks a local manufacturing capacity. About 5,000 RET systems including PV, photo-thermal and other systems have been installed, but more than 50% of them are malfunctioning or have completely stopped working due to poor artisanship and lack of after-sales support. Marketing has been based on the sale of gadgets, absence of warranties, up-front cash payments and no formal links between buyer and seller for post-sale maintenance. Companies lack rigorous marketing strategies and have simply waited for orders, principally from donor-funded projects. Entrepreneurship has declined and little information has been provided for prospective customers since most of these projects have been confined

to public institutions. The market has no regulatory framework and competition is limited. To address these challenges:

GoM is determined to change the practice of merely selling RETs as gadgets to the provision of energy services. GoM will also change the market structure from the present loose, informal arrangement (Figure 14) to an organised formal market governed by appropriate regulatory instruments as shown in Figure 15.

5.7.2 Nature of the ORESSI Market Reform

The reformed ORESSI market will have a number of elements described below.

5.7.2.1 Supply and Warehousing

The Energy Regulator will register operators in supply and warehousing and will certify each approved supplier. Equipment will be subject to quality certification by the Energy Regulator. For an operator to be registered he must prove that he is a member of the Renewable Energy Industry Association of Malawi (REIAMA) or any other government approved renewable energy association. Membership of an approved renewable energy association is needed to provide a framework for peer pressure to enforce and entrench a code of practice that will be developed as part of the regulatory mechanism. The certified supplier shall be permitted to run a bonded warehouse for RETs equipment and spare parts.

The certified supplier can also participate in the ORESSI retail market as a certified installer under a separate installer's licence to be issued by the Energy Regulator. Only certified suppliers shall be allowed to access duty free incentives and credit facilities for equipment warehousing.

5.7.2.2 Retail Market (Installation and Maintenance)

Any registered RET company wishing to participate in the ORESSI retail market and to undertake installation and maintenance of specified RETs, must obtain a retailer's licence from the Energy Regulator. Like the supplier, the retail operator is required to be a member of REIAMA or any other government approved renewable energy association. Other conditions include a willingness to issue a warranty, a willingness to enter into service agreements with end users, the ownership of a maintenance workshop and the accreditation of its technicians with the Energy Regulator. Only certified retail operators shall participate in GoM sponsored RETs installation programmes.

Figure 14: ORESSI: Current Market Structure

Figure 15: ORESSI: New Market Structure

5.7.3 Financing Mechanisms

GoM will establish a dedicated financing mechanism in support of market priming. The mechanisms shall have three main features:

- a) A loan guarantee fund to be managed by a private fund manager;*
- b) Commercial credit facilities provided by commercial banks for RET suppliers and for end-users;*
- c) Fiscal Incentives in the form of exemption from import duty and import surtaxes for all RET's systems.*

5.7.4 Regulatory Framework

During the market priming stage, DoE shall act as Regulator for ORESSI. GoM will initially be involved in regulation because this is a fairly new market area and highly vulnerable to dislocations and abuse if not carefully introduced and nurtured. In the long term, this function will be relinquished to the Energy Regulator. In both cases, ORESSI regulation will be undertaken in conjunction with the MBS for purposes of developing, reviewing, and enforcing systems standards and industry codes of practice. The functions of the Regulator shall include but not limited to:

- a) licensing RET suppliers ,retailers, and installers;
- b) preparing and enforcing regulations and bylaws;
- c) developing standards and a code of conduct;
- d) testing and certifying equipment;
- e) training and accrediting technicians in collaboration with other agencies;

- f) approving prices;
- g) inspecting and commissioning installations.

5.7.5 Role of Government

GoM involvement in ORESSI shall be confined to providing policy guidelines, developing strategies, providing institutional and capacity building support for market priming and, initially, regulating. Institutional strengthening and capacity building in the ORESSI reform programme will have six key priorities:

- a) GoM will establish a NSREP Agency as a semi-autonomous body under the overall supervision of DoE to serve as a focal point for the implementation of the ORESSI reform programme, particularly in market priming.*
- b) Strengthening research institutions to include ORESSI upstream development work initiating manufacturing and assembling capacity.*
- c) Establishing a testing and training centre for RETs (TECRET) which will be affiliated to Mzuzu University and twinned with an overseas university with experience in RET training, testing and accreditation. TECRET shall be responsible for training and accrediting technicians, offering RETs testing and certification services in collaboration with the Energy Regulator and MBS.*
- d) Strengthening MBS to enable it to develop appropriate RET standards and a code of conduct. MBS shall be twinned with overseas RETs testing centres with experience in this area.*

e) GoM shall undertake public awareness campaigns to explain the efficacy of RETs and to inform the public of the new market arrangements. Use will be made of print, electronic and motion picture media for the delivery of these messages.

GoM shall introduce courses in sustainable and renewable energy and environment into school curricula at primary, secondary and tertiary levels.

PART VI

6.0 CROSS-CUTTING ISSUES

6.1 Introduction

This section analyses cross-cutting issues affecting the entire energy sector without considering the peculiar features of individual supply and demand sub-sectors. They are:

- a) energy pricing;
- b) energy planning;
- c) governance and institutional framework;
- d) research and development;
- e) energy and gender;
- f) energy and climate change;
- g) regional and international co-operation;
- h) energy efficiency.

These issues are discussed below and GoM policy position on each of them is specified.

6.2 Energy Pricing

Due to the strategic nature of the LF&GSI and the peculiar character of the ESI, which accommodates natural monopolies in its market structure, general price regulation will be required in order to foster competition and promote efficiency. Different market structures apply different pricing principles. In this section we present general principles to guide energy pricing regulation. As a general guide:

a) GoM will ensure that the pricing of energy services is based on principles that allow the investor to fully recover costs, earn an appropriate return on investment and encourage technical and economic efficiency.

b) GoM will pursue a policy of uniform energy pricing countrywide.

To achieve this objective, GoM will apply the following guidelines in pricing energy services:

1. Electricity pricing will be based on a price cap system of tariff setting. Ceilings for average prices will be set. Changes between major reviews will be tied to the Consumer Price Index (CPI), currency exchange rate movements and expected efficiency gains. In addition, an intermediate automatic tariff adjustment mechanism, with a 5% trigger band either way, will be used to address major changes in applicable macroeconomic fundamentals occurring between major reviews and approved by the Energy Regulator.
2. The average price of liquid fuels and gas will reflect full cost recovery of supplying the product plus appropriate duties and levies. An automatic pricing review will be encouraged whereby price adjustments shall respond to changes in the in-bond landed cost (IBLC) beyond a threshold (plus or minus 5%) approved by the Energy Regulator. The IBLC shall be derived from the following elements: Free On Board (FOB); transport costs; insurance and handling costs; in-transit, distribution and storage losses set at a maximum of 0.05% of FOB. To this we add changes in the exchange rate in the Malawi Kwacha against the US Dollar.

3. The average price of coal will reflect full cost recovery of supplying the product plus appropriate margins, duties, royalties and levies. Prices will principally depend on the costs of extraction, transport to users and any royalties required by the *Mines and Minerals Act (1981)*.
4. The biomass business is informal with thousands of individual operators. This makes it difficult to regulate its prices. Biomass energy prices depend on supply and demand, but the Government will ensure that the woodfuel stumpage prices stipulated in the *Forestry Act (1997)* are at a level that guarantees production costs recovery. They will give producers an incentive to grow trees and users an incentive to conserve.
5. The prices of ORES will reflect full financial cost recovery of supplying the services, but an attempt will be made to link these to trends on the international RETs market. GoM will remove all import duties and surtaxes as its contribution to reducing first costs.

6.3 Energy Planning

GoM will follow principles of integrated energy planning to guide its activities.

Its objective is to design a sustainable energy economy taking into account socio-economic, technical and environmental considerations.

To achieve this objective, GoM will promote the use of the following guidelines in energy planning:

- a) The energy sector should aim at poverty reduction by providing more sustainable and affordable energy services.

- b) Energy service prices should generally be based on full cost recovery and on principles that encourage technical and economic efficiency.
- c) Private sector participation should be promoted through the creation of a conducive environment with sound and clear policies, strategies and regulatory mechanisms.
- d) The role of government should be clearly defined, particularly in areas of social responsibility such as electrification for rural transformation and poverty reduction.
- e) Gender must always be considered in energy programmes and activities.
- f) Capacity building at all levels is required to ensure that skills are developed and to improve stakeholder and public awareness of technologies.
- g) R&Dis required for generating information and developing technology.
- h) Community based management of natural resources on customary and public lands should be encouraged to promote sustainable utilisation of the biomass resource base.
- i) An effective institutional framework is necessary to facilitate the implementation of the Energy Policy and M&E.
- j) Timely and constant data from surveys, the energy industry and other quarters is imperative in the integrated planning process.

- k) A legislative framework is needed to make the Energy Policy operational.
- l) To carry out its activities effectively, the Energy Regulator should be independent.
- m) Regional and international conventions should be recognised.

6.4 Governance, Institutional Framework and Capacity Building

6.4.1 Instruments of Governance

A major impediment to effective governance in the energy sector is the lack of a sound legal basis and regulatory instruments for fair competition, coordination, reporting and liaison. In order to improve this situation and adequately support the proposed reforms, GoM is determined to:

put in place a sound legal framework for the effective implementation of the proposed reforms, improved governance of the energy sector and coordination of its activities. This is set out in Figures 16 and 17.

To achieve this objective, GoM will:

- a) Review all legal instruments that impinge on energy and prepare an Energy Framework Law (i.e. Energy Regulation Act) as an overall regulatory instrument for the development and governance of the sector. Through this instrument, GoM will establish an independent Energy Sector-wide Regulator to undertake economic, technical and legal regulatory functions for the ESI, CSI, LF&GSI, and ORESSI.

- b) Empowering DoE to oversee, co-ordinate and facilitate implementation, monitoring and evaluation of the Energy Policy through the Energy Regulation Act.
- c) Provide a legal structure for establishing and managing a dedicated Rural Electrification Fund.
- d) Provide a legal structure for empowering the DoE to plan, mobilise resources, implement, supervise, monitor and evaluate all rural electrification activities.
- e) Ensure that environmental, health and safety issues are adequately incorporated in the legal framework.
- f) Provide a legal structure for recognising riparian rights of other countries and support the participation of Malawi in regional and international treaties and conventions.

6.4.2 Institutional Framework

An effective institution for energy affairs is needed to guide and facilitate the development of a robust and efficient sector that adequately supports national economic and social development in a manner that ensures sustainable management of, and equitable access to, energy resources. Therefore:

GoM will establish an effective institutional framework that facilitates efficient and transparent implementation, monitoring and evaluation of the Energy Policy.

To achieve this, GoM will:

- a) strengthen the DoE's ability to provide effective leadership in formulating policy and strategy, effective governance, M&E and R&D through training and related capacity building initiatives;
- b) provide the DOE with the necessary human and financial resources to carry out its mandate and facilitate the implementation of the Energy Policy;
- c) rationalize energy regulation by establishing the Energy Regulator. Existing Single Industry Regulators for the different energy sub-sectors will be dissolved..

Figure 16: Legal Framework for the Energy Sector

Figure 17: Institutional Framework for Energy Sector Governance

- d) establish inter-sectoral and inter-ministerial mechanisms to ensure that energy needs and concerns, for both rural and urban areas, are integrated into policies and practices of other sectors and ministries as need arises. develop institutional linkages necessary to co-ordinate and liaise with other institutions, NGOs and international bodies on energy matters.
- e) ensure that energy matters are adequately represented and eventually addressed at district level, in line with GoM's decentralisation policy.
- f) establish a MAREP Secretariat within the DoE to plan, mobilise resources, implement and monitor and evaluate rural electrification activities.
- g) establish a NSREP agency as a semi-autonomous body under the supervision of DoE to serve as a focal point for the implementation of ORESSI reform programme, particularly the market priming activities.
- h) strengthen research institutions to include ORESSI upstream market development to initiate a manufacturing, fabrication and assembly capacity for RETs.
- i) establish TECTRET to undertake training and accreditation of RETs technicians offering RETs testing and certification services in collaboration with MBS and the Energy Regulator.
- j) strengthen MBS to enable it develop appropriate RETs systems standards and industry code of conduct. MBS shall be twinned with overseas RETs testing centres with experience in this area.

- k) establish NOCMA to undertake oil and gas exploration and the management of the country's strategic fuel reserve facility.

6.4.3 Capacity Building

GoM recognises that improvements in institutions without matching improvements in the people entrusted with the institutions will not achieve the expected results. It is imperative that efforts are made to develop human resources by training and other measures. GoM will pursue a policy that will:

Develop the skills and knowledge of human resources at all levels for sustained and efficient energy supply, distribution and utilisation.

To achieve this objective, GoM will:

- a) Introduce courses related to the various energy sub-sectors into educational curricula at primary, secondary and tertiary levels.
- b) Develop the capacity of private sector suppliers of energy services and technologies.
- c) Strengthen the capacities of relevant institutions (government, private, learning, research and development and communities).
- d) Exploit regional and international training opportunities.
- e) Develop energy extension and training materials for rural, peri-urban and urban users.

- f) Engage in civic education (public awareness) on issues related to the different energy sub-sectors including the available technologies.
- g) Facilitate access to information by various stakeholders and the public.

6.5 Research and Development

There are a number of institutions in the country, which are conducting R&D activities on energy and related topics but without proper central coordinating mechanism to ensure consistency and cost effectiveness and effective dissemination of research results. Networking mechanisms among researchers are also weak and so are institutional frameworks for reference material and data retrieval. GoM finds this state of affairs unacceptable because it makes policy, planning and energy investment appraisal work problematic. To address this constraint GoM will:

- a) Facilitate the exchange of energy research findings and experience through effective publication and dissemination.
- b) Initiate joint and collaborative energy research projects on matters of common interest at national and international levels.
- c) Facilitate donor support in establishing and assisting centres of excellence in energy research in Malawi.
- d) Facilitate networking among energy researchers.

6.5.1 Research and Development in LF&GSI

Research into the utilisation, conservation and development of liquid fuels and gas in Malawi is limited by the lack of funding, well-trained human resources, focus and

direction. Research is required to develop substitutes for imported petroleum products, the fabrication of cooking appliances and to ensure acceptable standards and specifications. In this regard:

GoM will support R&D in the fabrication of low-cost cooking, refrigeration and other appliances and ethanol based fuel blends.

6.5.2 Research and Development in CSI

There does not exist, in Malawi, a suitable coal-burning stove for use at the household level. The stoves currently available on the market lack the features that would enhance combustion and minimise the emission of smoke and other gaseous by-products. Research into coal briquetting recommends making them from coal duff with sugar molasses as a binder; full-scale production is now called for. A coal-burning furnace has been developed and recommended for curing tobacco and research continues to improve their efficiency by using a forced draft supplied by solar powered fans. To address this situation:

GoM will strengthen local skills for research, development, dissemination and utilisation of coal technologies at all levels through training and resource support.

6.6. Energy Statistics and Information

Lack of data and information systems is a major weakness in energy sector planning. Data are necessary for policy review and planning purposes. An information system must, among other issues, take into account the following:

- a) national energy resources;
- b) domestic energy utilisation by sectors;
- c) domestic energy production;
- d) domestic energy trade;
- e) domestic energy transformation and transportation;
- f) domestic energy storage and distribution;
- g) energy efficiency;
- h) domestic energy prices;
- i) regional and international energy resources, trade and energy prices.

To facilitate the exchange and comparability of information, regionally and nationally, it is necessary that data should follow international standards in collection, storage and reporting. The data should periodically be updated and reviewed. In this regard:

- a) GoM will facilitate the creation of an energy information system by making available the necessary resources for the purpose.*
- b) GoM will further put in place legislation to facilitate energy data collection, review, preservation and dissemination while ensuring that commercial interests are not compromised.*

6.7 Energy and Gender

The overall goal of the National Gender Policy is to mainstream gender in the development process to enhance the participation of both men and women, boys and girls, in sustainable and equitable development for poverty reduction. Gender has become a central consideration in development policy and programming because of the recognition that men and women play different roles in society and have different

needs, perspectives and responsibilities. All sectors should address gender issues in their sectoral policies, planning and programming. Gender is a cross cutting issue affecting everyone in society.

The importance of the issue arises from gender inequality - a contributing factor in underdevelopment and an obstacle to progress. Women, who constitute 51% of the population, experience extensive socio-economic problems including gender imbalances and inequalities in all sectors. The imbalances and inequalities are manifested in low levels of education, large households, negative attitudes and practices, limited access to and control of the means of production and limited rights and control over their reproductive health. The main challenge is to redress these inequalities including traditional, cultural and social attitudes that hinder the equal participation of women and men in development and which put women in subordinate positions. Therefore:

GoM will ensure that gender issues are mainstreamed in the planning and implementation of energy programmes and projects .

To achieve this objective, GoM will:

- a) Ensure that the heavy work burdens of men and women are lightened by modernising household fuel supply systems for the kitchen and for agriculture.
- b) Identify ways in which men and women become equally independently involved in using energy as a source of income.

- c) Involvement and women in decision-making in energy technology design, development and dissemination.
- d) Offer equal employment opportunities to both men and women to work in the energy sector.

6.8 Energy and Climate Change

International co-operation on climate change and the environment culminated into the United Nations Convention on Environment and Development (UNCED), held in Rio de Janeiro in June 1992. At the conference two important documents were approved: The Rio Declaration on Sustainable Development and Protection of the Environment and Agenda 21, a plan of action for international co-operation. Agenda 21, *inter alia*, emphasises the need to control atmospheric emissions, gases and substances through efficiency in energy production, transmission, distribution and consumption and through growing reliance on environmentally benign energy systems, particularly renewable sources of energy.

UNFCCC entered into force in 1994. Parties to the Agreement committed themselves to stabilise GHG concentrations in the atmosphere at a level that would prevent dangerous man-made interference with the climate. At the third Conference of Parties held in Kyoto, December 1997, a Protocol was formulated to reduce carbon dioxide and sulphur emissions to prevent the depletion of the O-zone layer. The Protocol also broadens the commitments of all parties to formulate, implement, publish and update national and regional programmes, which should include energy programmes. Malawi has ratified the Kyoto Protocol.

The protocol further established CDM to assist developing countries to achieve the aims of sustainable development and developed countries to meet their commitment to reduce emissions. The EAD is taking the lead in the negotiations of the climate change conventions. Therefore:

GoM will promote the efficient use of energy resources with minimal adverse effects on the environment and climate change.

To achieve this objective, GoM will:

- a) Formulate environmentally benign energy projects that will take advantage of GEF and CDM funding windows.
- b) Encourage and promote the use of more efficient energy systems to reduce emissions through concerted extension services and support of various market priming activities including provision of fiscal incentives.
- c) Promote the use of unleaded petrol through legislation and provision of fiscal incentives wherever necessary.
- d) Encourage the use of RETs through support of market priming activities and fiscal incentives and legislation.

6.9 Regional Integration and International Co-operation

Energy development and use transcends national and regional boundaries. Malawi is a signatory to several agreements in the development and use of energy at both regional and international level. The country must take cognisance of its obligations

under these agreements in developing its energy sector. Internationally, Malawi is a signatory to the Rio Declaration and Agenda 21 and to the Kyoto Protocol. Regionally, Malawi ratified the SADC Energy Protocol on 17 March 1998. The objectives of the protocol include harmonising national and regional energy policies, strategies and programmes based on equity, balance and mutual benefit and co-operation in the development and efficient utilisation of energy, energy pooling, institutional capacity building, R&D and quality control. The protocol, among other things, requires (as general principles) member states to:

- a) use energy to support economic growth and development, reduce poverty and improve the standard and quality of life;
- b) ensure that the development and use of energy takes cognisance of gender realities;
- c) promote research and development and the use of comparable methods and standards;
- d) promote and encourage the direct participation of citizens and communities in the development and use of energy;
- e) ensure that the development and use of energy is environmentally sound;
- f) create a conducive climate for the private sector to participate fully in energy development;

- g) ensure that sectoral and sub-sectoral energy policies and programmes are in harmony with the overall policies and programmes of SADC and with the strategies and programmes of SADC sectors.

In view of these realities:

GoM shall take cognisance of its obligations in the respective regional and international agreements to which Malawi is a signatory.

6.9.1 Electricity Trade

Malawi is currently a non-operating member of SAPP because it is not yet connected to the regional grid. SAPP was formally established in December 1995, essentially to provide a transparent mechanism for electricity utilities to trade in the region. It is SADC's main strategic trading vehicle in the electricity sub-sector. It gives Malawi the option of importing and exporting electricity and so improve the reliability and security of its own supply and earn some foreign exchange. Government wishes its ESI effectively to participate in the emerging regional electricity market through SAPP and to enjoy the benefits that accrue to an operating member. Interconnection will also support Malawi's industrialisation process and help her achieve sustainable economic growth and the social improvement of the people. Therefore:

- a) GoM will expedite dialogue with private investors and financiers with a view to economically facilitating viable and competitive investment for interconnection with neighbouring countries to improve the security of supply and enhance trade opportunities under the auspices of SAPP.*

b) GoM will also encourage cross-border electricity trading where it is economically viable.

6.9.2 Petroleum Trade

Malawi does not have the capacity to import crude oil for processing. Refineries in the region have proved not to be economically viable due to the small national markets and high maintenance costs. Malawi and the SADC partners resolved to develop regional refineries to process their petroleum requirements and exploit natural gas in the region. Consequently:

GoM will explore the possibility of joint procurement, refining, and transmission where economically viable.

6.10 Energy Efficiency

Energy efficiency is a measure of energy savings made while maintaining the desired benefits. Resources are not inexhaustible, hence the need to encourage and promote judicious and efficient use of the energy. Expenditure on it constitutes a large portion of the country's GDP (15%) and a large proportion of poor households' expenditure, again making it necessary to give attention to the effective and efficient use of energy. Efficiency must form part of the overall Energy Policy and should also be considered within the conceptual framework known as Integrated Resource Planning (IRP). This framework considers both supply and demand side options for meeting requirements.

Significant scope for improved efficiency exists within industry and commerce, households and institutions and in transport. The efficient use of energy is best achieved through awareness of the benefits of efficiency measures, both

environmental and economic, and the deployment of incentives to encourage them. Therefore:

GoM will ensure the efficient and sustainable production, distribution and utilisation of energy resources and services through legislation.

6.10.1 Energy Efficiency in Industry and Commerce

To improve energy efficiency in Industry and Commerce, GoM, in collaboration with other stakeholders, will:

- a) Promote energy efficiency awareness among industrial and commercial energy consumers and encourage the use of energy efficient practices.*
- b) Establish energy efficiency norms and standards for commercial buildings and equipment.*
- c) Promote the performance of energy audits, demonstrations, information dissemination, sectoral analysis and training programs.*
- d) Implement energy efficiency programs to reduce consumption by the general public and government institutions.*

6.10.2 Energy Efficiency in Households and Institutions

Over the years, various improved stove designs for charcoal and firewood have been introduced, but some of them have not been sustainable due to cost and other

factors. To improve energy efficiency in households and institutions, such as schools and hospitals, GoM will:

- a) Promote energy efficiency awareness in households and institutions, which will include intensifying civic education on DSM, the use and pricing of the different services, particularly electricity.*
- b) Promote the introduction of a domestic appliance efficiency labeling through legislation.*
- c) Promote the use of energy efficient appliances and fuel efficient cooking technologies in rural areas through support of market priming activities.*

6.10.3 Energy Efficiency in Transport

Transportation of people and goods is an essential social and economic service and accounts for 3.8% of total energy consumption. More than 90% of transport energy is derived from liquid fuels. Since supply is largely dependent on oil imports, transport energy is unusual in that its pricing is heavily influenced by trends in international supply and demand.

To improve energy efficiency in the transport sector, GoM will:

- a) Discourage the importation of inefficient large capacity luxury engines in vehicles and machinery through taxation.*
- b) Provide advice, through DoE, to other stakeholders on the efficiency of alternative modes of transport and provide assistance in the formulation of*

fiscal and transportation policies to promote energy conservation and efficiency.

PART VII

7.0 THE WAY FORWARD

7.1 Sub-Sector Reform Strategies

The focus of this policy is the need to undertake major institutional and market reforms of the energy industry with a view to improving quality of service, service delivery and governance. The manner in which reforms will be undertaken, schedules, and implementation structures will therefore need to be elaborated. Consequently, a set of Sub-Sector Reform Strategy Documents will be prepared amplifying on these issues. The following strategy documents are envisaged:

- a) Electricity Supply Industry Reform Strategy
- b) Coal Supply Industry Reform Strategy
- c) Liquid Fuels and Gas Supply Industry Reform Strategy
- d) ORES Supply Industry Reform Strategy
- e) Biomass Supply Reform Strategy

7.2 National Energy Sector Implementation Plan

NESIP will be prepared to guide the implementation of the Energy Policy. The Plan will, among other things, provide details on the performance indicators, targets, financial and human resources required for executing individual tasks identified in the Policy and on the time frames and stakeholders responsible for specific tasks.

7.3 Energy Framework Law

For a liberalised private-sector-driven industry to operate effectively, it is essential that strong checks and balances are established and operating efficiently. The role of the independent Energy Regulator and legal instruments put in place to regulate the industry are a critical component of such structures. This makes it imperative that an Energy Framework Law should be established as a matter of urgency in the form of an Energy Regulation Bill. This will provide the necessary synergies among all individual energy related legislation. The legal review will advise on how best to link the Energy Framework Law and the following industry specific legislation envisioned under this Policy:

- a) Energy Regulation Act
- b) Electricity Act
- c) Rural Electrification Act
- d) Liquid Fuels and Gas Supply Act
- e) Coal Supply Act
- f) Other Renewable Energy Sources Act

7.4 Monitoring and Evaluation Structures and Instruments

The implementation of this Energy Policy requires careful M&E. Prioritised interventions will be monitored against set targets after the first two years and, thereafter, annually. Overall monitoring responsibility lies with the DoE and support will be required from NGOs and civil society for transparency and accountability. When monitoring shows that a target has been met, it is expected that new priorities will already have been defined for implementation. Evaluation will be undertaken in a three-year cycle by agencies external to DoE.

While it is understood that DoE will take a leading role in monitoring implementation, the Energy Policy demands that each of the individual players mentioned in the Implementation Plan elaborate their own internal mechanisms for monitoring agreed targets so as to ensure compliance and its smooth implementation.

REFERENCES

1. Government of Namibia (May 1998) Namibia Energy Policy White Paper, Windhoek, Namibia.
2. Government of the Republic of South Africa (December 1998) Energy Policy White Paper, Pretoria, South Africa
3. Government of Zimbabwe (1999) Zimbabwe Energy Policy White Paper, Harare, Zimbabwe
4. Government of United Republic of (1992) Tanzania Energy Policy, Dar-es-Salaam, Tanzania.
5. Malawi Government, Environment Policy, 1996 Lilongwe, Malawi.
6. Malawi Government, Forest Policy, 1997 Lilongwe, Malawi.
7. Malawi Government, Competition and Fair Act, 2000 Lilongwe, Malawi.
8. Malawi Government, Investment Promotion Act, 1991 Lilongwe, Malawi
9. Malawi Government, Poverty Alleviation Policy, 1995 Lilongwe, Malawi
10. Malawi Government, Decentralization Policy, 1999 Lilongwe, Malawi
11. Malawi Government, Electricity Act, 1998 Ministry of Justice, Lilongwe, Malawi
12. Malawi Government, Petroleum Storage Act, 1956 Ministry of Justice, Lilongwe, Malawi
13. Malawi Government, Gender Policy, 2000; Lilongwe, Malawi
14. Malawi Government, Land Policy 2002; Lilongwe, Malawi.
15. Malawi Government, Petroleum Control Commission (PCC) Act, 1986; Ministry of Justice, Lilongwe Malawi.
16. Malawi Government, Charcoal Production and Marketing Study, 1997; Lilongwe Malawi.
17. Malawi Government, Coal Transportation Study, 1997; Lilongwe Malawi
18. Malawi Government, Biomass Energy Strategy Study, 1986; Lilongwe Malawi

19. Malawi Government, Rural Energy Study, Department of Energy, 1984, 1986, and 1992, Lilongwe Malawi.
20. The World Bank/Malawi Government, Rural Energy and Institutional Development Study, ESMAP, 1998, Lilongwe Malawi
21. Malawi Government, Petroleum Supply Study, PCC, 1998; Lilongwe Malawi.
22. Malawi Government, Petroleum Exploration in Malawi, 1983; Lilongwe Malawi.
23. Malawi Government, Brief Historical Perspective of Hydrocarbons Exploration in Malawi, Department of Energy, 1983, Lilongwe Malawi
24. Malawi Government, Urban Biomass Fuels: Production, Transportation and Trading Study, 1997, Lilongwe Malawi.
25. Malawi Government, Urban Biomass Fuel: Non-Household Demand Survey, Department of Energy, 1996, Lilongwe Malawi
26. Malawi Government, Urban Household Energy Demand Side Strategy, Department of Energy, 1996, Lilongwe, Malawi
27. Malawi Government, Ethanol: Applications and Utilisation in Developing Countries, 1987, Lilongwe, Malawi
28. Malawi Government, The Status of Renewable Energy Technologies in Malawi, 1994, Lilongwe, Malawi.
29. Malawi Government, The National Sustainable Renewable Energy Programme, Department of Energy, 1997, Lilongwe Malawi
30. Malawi Government, The Tobacco Industry Efficiency Project Report, 1986, Lilongwe, Malawi
31. Malawi Government/Southern Africa Development Community (SADC) FINESSE Malawi Country Study, SADC, 1998 Lilongwe, Malawi.

ANNEX A

MALAWI'S SOCIAL INDICATORS 2000

- Infant mortality - 135 per 1000 live births;
- Under-five mortality - 234 per 1000 live births;
- Maternal mortality - 620 per 100,000 births;
- Life expectancy, the lowest in Africa, is 49 years;
- Food insecurity affects nearly 60% of households;
- About 49% of children under the age of five are stunted and half of these are severely malnourished;
- High illiteracy - 40% (69% among women);
- High population growth - 1.9% per annum;
- High rate of deforestation (2.8% per annum) and environmental degradation;
- High HIV/AIDS prevalence affecting about 13% of the population, resulting in death of the economically active and an increased number of orphans, estimated at 700,000 in 2001;
- High gender imbalance - women, who constitute 51% of the population, experience extensive socio-economic problems including gender imbalances and inequalities in all sectors.

ANNEX B

ENERGY POLICY PRIORITY ACTIONS

Objective 1: IMPROVE EFFICIENCY AND EFFECTIVENESS OF THE COMMERCIAL ENERGY SUPPLY INDUSTRIES

Coal Supply Industry

- ❖ Improve commercial performance
 - Devise an appropriate pricing system for indigenous coal
 - Improve labour productivity
- ❖ Undertake CSI Reforms
 - Prepare a CSI Market Reform Implementation Strategy
 - Change CSI Market Structure
 - Change CSI Commercial Arrangements
 - Alter ownership patterns
 - Improve CSI regulatory framework and mechanisms

Electricity Supply Industry

- ❖ Improve Commercial Performance
 - Adopt an appropriate tariff mechanism
 - Strengthen revenue collection systems and efforts
 - Improve labour productivity through enhanced customer connection rates
 - Improve corporate image to the public
 - Improve accounting system
- ❖ Improve Technical Performance
 - Reduce technical and non-technical (pilferage) losses
 - Reduce frequency and duration of outages
 - Improve system availability and quality
 - Improve maintenance practices
- ❖ Improve Management Systems and Performance
 - Hire people to manage change
 - Introduce new management systems in line with corporatisation process
- ❖ Undertake Power Sector Reforms
 - Prepare an ESI market reform implementation strategy document
 - Change market structure
 - Change commercial market transaction arrangements
 - Alter ownership patterns
 - Improve regulatory framework and mechanisms

Liquid Fuels and Gas Supply Industry

- ❖ Improve Commercial Performance
 - Adopt an appropriate pricing mechanism for imported petroleum products
 - Adopt an appropriate pricing mechanism for locally produced fuel-ethanol
 - Consolidate automatic pricing review mechanisms for liquid fuels
- ❖ Improve Technical Performance
 - Reduce technical and non-technical (pilferage) losses
 - Improve quality of service stations
 - Match product and regional standards and enforce a system of standards

- ❖ Undertake LF&GSI Reforms
 - Prepare an LF&GSI market reform implementation strategy
 - Change market structure
 - Change commercial arrangements
 - Alter ownership patterns
 - Improve regulatory framework and mechanisms

Other Renewable Energy Sources Supply Industry

Objective 2: IMPROVE THE SECURITY AND RELIABILITY OF ENERGY SUPPLY SYSTEMS

Coal Supply Industry

- ❖ Increase Indigenous Coal Production Capability
 - Improve labour productivity
 - Encourage exploration of more coal fields
 - Encourage investment in coal mining
 - Maintain appropriate balance between coal imports and exports

Electricity Supply Industry

- ❖ Take Advantage of Emerging Electricity Trading Opportunities through SAPP
 - Interconnection of the Malawian grid with that of Mozambique
- ❖ Rehabilitate Existing Transmission and Distribution Power Systems
 - Prepare a transmission and distribution maintenance strategic plan
 - Mobilise resources and implement projects for rehabilitation and reinforcement of the industry
- ❖ Expand Generating Capacity
 - Implement Kapichira Phase II
- ❖ Diversify Power Generation Sources
 - Diversify hydro power generation from Shire River to other hydro sites in Malawi
 - Diversify the power generation mix to include coal and biomass based thermal plants

Liquid Fuels and Gas Supply Industry

- ❖ Transport Route Diversification
 - Maintain multiple transport routes
 - Maintain appropriate balance between rail and road haulage
 - Explore the viability of developing a pipeline
- ❖ Encourage the Establishment of Fuel Import Substitution Industries
 - Promote hydrocarbon (oil and gas) exploration
 - Prepare an ethanol expansion and utilisation plan
 - R&D into new fuel-ethanol blend applications (for example, ethanol-diesel)
 - Promote production of Gelfuel and other biomass-based products
 - Expand fuel-ethanol production capacity to meet current and future demands
- ❖ Rationalise Internal Fuel Storage Capacity
 - Establish a strategic fuel reserve facility to spur competition and maintain minimum internal storage requirements
 - Prepare a management plan for a strategic fuel reserve which will ensure its sustainability
 - Open commercial storage capacity to third party access
 - Set minimum commercial storage capacity
 - Establish an appropriate regional balance in storage capacity
- ❖ Develop a Fuel Processing Capability
 - Explore the viability of developing a refinery or participating in a regional refinery programme

Other Renewable Energy Sources Supply Industry

Objective 3: INCREASE ACCESS TO AFFORDABLE AND MODERN ENERGY SERVICES

Coal Supply Industry

- ❖ Provide Incentives for the Establishment of Coal Distribution Depots
 - Rationalise coal distribution margins to provide incentives for private participation

Electricity Supply Industry

- ❖ Restructure Electricity Pricing Policies
 - Remove indirect taxes on RETs
 - Introduce (cross) subsidies where appropriate
 - Lower first cost barriers e.g. capital contribution for electricity connections and RETs
 - Base electricity pricing on LRMC
 - Provide capital subsidy and leverage O&M, where necessary, for rural electrification
 - Provide life line tariff for low income consumers for poverty reduction
 - Base industrial tariff on actual energy consumption
- ❖ Review Fiscal Policies on Electricity End-use Appliances
 - DoE to present justification for tax waiver on electric appliances to Treasury and Cabinet Committee on the Economy
- ❖ Promote Use of Low Cost Electrification Technologies
 - Review electrification regulations covering technology range and standards
- ❖ Promote and Consolidate Innovative Electricity Marketing Strategies
 - Review electricity marketing strategies to encompass end-use appliances
- ❖ Expand Electricity Supply Options
 - Develop institutional delivery modes and establish a dedicated financing mechanism for photo-voltaic (PV) systems
 - Establish dedicated financing vehicle for PVs
 - Rehabilitate non-working PVs

Liquid Fuels and Gas Supply Industry

- ❖ Rationalise the Geographical Distribution of Retail Outlets
 - Prepare a plan to rationalise the geographical distribution of fuel retail outlets
- ❖ Provide Incentives for the Development of Fuel Retail Outlets in Rural Areas

- Rationalise distribution margins to provide incentive to rural distributors
- Review existing fiscal policies for the development of fuel outlets

Other Renewable Energy Sources Supply Industry

Objective 4: STIMULATE ECONOMIC DEVELOPMENT AND RURAL TRANSFORMATION FOR POVERTY REDUCTION

Coal Supply Industry

- ❖ Economic Empowerment of Local Entrepreneurs
 - Rationalise coal trucking to permit competition
 - Encourage local participation in coal wholesaling
- ❖ Expand Coal Utilisation Options
 - Encourage development of coal-based thermal power stations at coal mines

Electricity Supply Industry

- ❖ Provide Price Incentives to Encourage the Industrialisation, Modernisation and Diversification of Agriculture, Targeting Irrigation
 - Review maximum demand tariff provisions and practices
 - Review time-of-use tariff provisions and practices
- ❖ Embark on a Nation-wide Rural Electrification Programme for the Transformation of the Rural Economy and Communities
 - Review Class II tariff to provide incentives for the growth of rural/peri-urban based SMEs
 - Expand distribution network to centres with the potential to spur economic activities

Liquid Fuels and Gas Supply Industry

- ❖ Economic Empowerment of Local Entrepreneurs
 - Localisation of retail outlets market
 - Encourage local participation in the inland distribution of fuel

Other Renewable Energy Sources Supply Industry

Objective 5: IMPROVE ENERGY SECTOR GOVERNANCE

Coal Supply Industry

- ❖ Institutional Strengthening and Capacity Building for DoE, and Energy Regulator
 - Implement new institutional structure for DoE
 - Endow DOE with adequate resources to implement CSI Reforms and policies
 - Undertake staff development and skills training for personnel in CSI institutions
 - Develop a computerised CSI information system
 - Establish M&E instruments and structures for CSI policy implementation compliance
- ❖ Establish Legal Frameworks for CSI Governance
 - Rationalise CSI regulation by establishing an energy sector-wide regulator
 - Prepare an energy sector framework law (legislation)
 - Prepare a CSI reform strategy
 - Review Mining Act and related legislation

Electricity Supply Industry

- ❖ Institutional Strengthening and Capacity Building for DoE, ESI and the Energy Regulator
 - Establish a NSREP Agency under DoE
 - Implement new institutional structure for DoE
 - Endow DoE with adequate resources to implement energy policy
 - Undertake staff development and skills training for the personnel of energy institutions
 - Develop a computerized ESI information system
 - Establish policy implementation performance M&E instruments and structures
- ❖ Establish a Legal Framework for Improved ESI Governance
 - Rationalise ESI regulation by establishing an energy sector-wide regulator
 - Prepare an energy sector framework law (legislation)
 - Prepare a power sector reform strategy
 - Repeal the Electricity Act, 1998 and prepare a successor electricity bill
 - Prepare rural electrification legislation
 - Prepare a rural electrification master plan

Liquid Fuels and Gas Supply Industry

- ❖ Institutional Strengthening and Capacity Building for DoE and Energy Regulator
 - Implement a new institutional structure for DoE
 - Endow DoE with adequate resources to implement LF&GSI Reforms and policies
 - Undertake staff development and skills training for LF&GSI institutions personnel
 - Develop a computerised LF&GSI information system
 - Establish M&E instruments and structures for LF&GSI policy implementation
 - Establish NOCMA to coordinate upstream and strategic storage activities
- ❖ Establish Legal Framework for Improved LF&GSI Governance
 - Rationalise LF&GSI regulation by establishing an energy sector-wide regulator
 - Prepare an energy sector framework law (legislation)
 - Prepare an LF&GSI Reform Strategy
 - Review Petroleum Act, PCC Act, and related laws

Other Renewable Energy Sources Supply Industry

Objective 6: MITIGATE ENVIRONMENTAL SAFETY, AND HEALTH IMPACTS OF ENERGY PRODUCTION AND UTILIZATION

Coal Supply Industry

- ❖ Mitigate the Environmental Impacts of CSI Projects
 - Subject CSI developments to EIA in line with the Environmental Management Act
- ❖ Improve Coal Handling Safety Standards
 - Make mandatory the use of protective gowns by coal handlers
 - Undertake high profile campaigns to increase public awareness of the dangers of exposure to coal
- ❖ Reduce GHG Emissions

- Promote the use of clean coal
- Make briquettes of the accumulated coal dust

Electricity Supply Industry

- ❖ Mitigate the Environmental Impacts of ESI Projects
 - Subject ESI projects to EIA in line with the Environmental Management Act
- ❖ Control Siltation of Dams
 - Support afforestation of river banks and around power generation plants
 - Dredge silted dams
- ❖ Rationalise Management of Water Systems for Hydropower Generation
 - Prepare a Water Management Plan in collaboration with the Water Department
- ❖ Reduce the Incidence of Electricity Accidents
 - Undertake maintenance of transmission and distribution lines
 - Undertake high profile public awareness campaigns on the dangers of electricity installations
- ❖ Promote Energy Conservation
 - Promote the use of more efficient electric lighting systems
 - Undertake DSM activities at power stations
 - Undertake energy audits in industries and large commercial entities and plants
- ❖ Reduce GHG Emissions
 - Promote the use of clean fuels to replace high GHG emitting fuels
 - Develop programmes for carbon trading under the CDM for example, mini/micro hydros,

Liquid Fuels and Gas Supply Industry

- ❖ Mitigate the Environmental Impacts of LF&GSI Projects
 - Subject LF&GSI developments to EIAs in line with the Environmental Management Act
- ❖ Reduce the Incidence of Liquid Fuels and Gas Accidents

- Outlaw the operation of household based fuel retail outlets
- Require mandatory fire fighting facilities at all fuel storage depots, wholesale and retail outlets
- Enforce laws against refueling of public passenger vehicles while loaded
- Undertake high profile public awareness campaigns of the dangers of operating and buying fuel from illegal sources

- ❖ Reduce GHG Emissions
 - Promote the use of more small, fuel efficient vehicles
 - Promote use of unleaded fuel
 - Develop programmes for carbon trading under the CDM, for example, Gelfuel

Other Renewable Energy Sources Supply Industry