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# Energy Policy White Paper for a Least Developing Country (LDC)

Prepared  
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# 1. INTRODUCTION

The current population of the LDC under reference is 57 million people, increased from 45 million in 2011 thus implies the large and rapid growing population within two years. About 70% of the LCD's population is represented by people aged below 30 years, and most depend on agricultural activities as a means to improve their livelihood. In LDC, agriculture supports the livelihoods of two thirds of the population and employs about 80% of the rural workforce. Despite dependence in agriculture, the LDC is one of the countries that are in quick growing economy with an average growth rate of 8-10% per year. The LDC is characterized by the following:

- Few trained human resources (40%).
- Electricity supplies are often interrupted in the major cities, while most of people in rural areas are not connected to national grid.
- The country's growing economy needs a cheap and secure source of energy to ensure that it can create jobs for the expanding workforce.
- The country has unexplored reserves of some fossil fuels, as well as the chance to exploiting geothermal or other sources of renewable energy (solar, wind, biofuels, etc). At present, however, energy is either derived from burning biomass (wood, crop residues, etc) or imported oil and gas.

## 1.1 Challenges of Energy in the LDC

The energy sector in the LDC faces a number of challenges that needs the immediate attention. These are namely;

- i. Dependence on imported fossil fuels as a source of energy (Transport fuel)
- ii. Less number of individuals (1.8%) are connected to national energy grid
- iii. Most of the people in the LDC depend on biomass as the source of energy
- iv. Inadequate institutional and legal frameworks to administer the energy issues
- v. Lack of investment in energy research, technology and development

The dependence in fossil fuel by LDC contribute into greenhouse emission that result to global warming, depletion of the ozone layer and acid rain; and also health impacts such as inflammation and pulmonary injury, and lung cancer that have been reported due to exposure to nitrogen oxides (NO<sub>x</sub>) particulate matter, and lead from fossil fuels. Apart from their environmental problem, fossil fuels are non-renewable resource, thus their availability in future is not guaranteed. Despite the reported problems, the demand for fossil fuels especially petroleum products and their price have been increasing. The organisation for Economic Cooperation and Development (OECD) reported an increase in crude oil prices per barrel from USD 60 in 2009 to 113 in 2011(OECD, 2011).

The United National Framework Convention on Climate Change (UNFCCC) through Kyoto Protocol called upon all parties ( developed and developing countries) to take part in contributing to scientific, research and monitoring of the climate system and greenhouse gases in their countries. Among the issues of concern that were given attention in the protocol is the reduction of six major greenhouse gases (carbon dioxide, methane, nitrous oxide,

hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride) emissions as well as reduced dependency on fossil fuels, which contribute heavily to greenhouse gas emission (Parker and Fletcher, 2007). The intervention calls for alternative energy to replace fossil fuels.

## 2. GOALS OF ENERGY POLICIES

The major goal of this policy is to make sure that by 2050 all individuals (100%) in LDC have access to cheap, clean, sustainable and safe energy. This can be achieved by the energy sub-goals stipulated below:

- i. Energy Provision/Access*  
Energy provision/access is aimed at ensuring that the infrastructure for the provision of energy is available and consumers are connected to these infrastructures. These will include energy grid and off grid infrastructures. The country aims to have 100% of an energy access by 2050.
- ii. Energy Availability / Security*  
In addition to developing the infrastructures, the energy to be conveyed by the infrastructures, must be available all the time and when required. By this, the country must have adequate local generating capacity. The country need to reduce the dependence on energy imports.
- iii. Make Energy Economically Affordable*  
The country shall aim to make energy affordable to consumers. This means measures must be put in place to increase efficiency in the energy value chain. Governance structures in the energy sector must endeavour to aid this policy goal through efficient pricing mechanisms.
- iv. Energy Mix Favouring Renewables*  
In ensuring energy security the country need to diversify the sources of energy. This means investment in the renewable energy sector shall be favoured. The country shall aim to exploit the following renewable energy sources such as solar, wind, hydropower, and biofuels, among others.
- v. Increased Energy Efficiency*  
In providing adequate energy, the country must minimize losses due to consumer behaviour and technology limitations. This would require investment in research and development (R&D) for the development of new efficient technologies as well as implementation of programs to sensitize consumers on efficient use of energy.
- vi. Sustainable Investments in Energy Sector*  
For the ultimate attainment of energy, provision to all the government cannot do it alone. A multi-stakeholders approach that includes government, private sector, community-based organizations, and international development partners are required.

### 3. IMPLEMENTATION ACTIVITIES

In order to fulfil the policy goals, the activities shown in Table 1 should be implemented:

**Table 1: Energy policy goals and their responsible activities**

S/No.	Goal	Activities
1	Energy provision/access	Build new power generation units, extend existing distribution grid, upgrade grid management system.
2	Energy availability / security	Set up a system to manage supply and demand so that installed and operating capacity meet minimum set threshold for national energy security
3	Make energy economically affordable	Put in place tax incentives to lower the energy cost
4	Energy mix favouring renewable	Develop an energy mix matrix with clear quantum targets. Set up energy sub-sectors team responsible for each type of energy sector.
5	Increased energy efficiency	Upgrade infrastructures to latest and more efficient. Research and develop new technologies (implement sensors for energy use control).  Develop and implement a national program on awareness and education on energy use (review curriculum to include issues on energy efficiency at all education level).
6	Sustainable investments in energy sector	Create an enabling environment to attract local and foreign direct investment (FDI) in the energy sector
7	Increased public education & awareness in energy issues	Develop and implement a public awareness program with necessary incentives for energy efficiency

### 4. INSTITUTIONAL FRAMEWORK

A National Energy Commission should be established to coordinate the energy related activities for the country. The activities stipulated in the goals should be done by Ministry of energy in collaboration with other sectors. Table 2 presents activities assigned to institution and Table 3 and figure 1 budget to cover the cost of each activity in different phases.

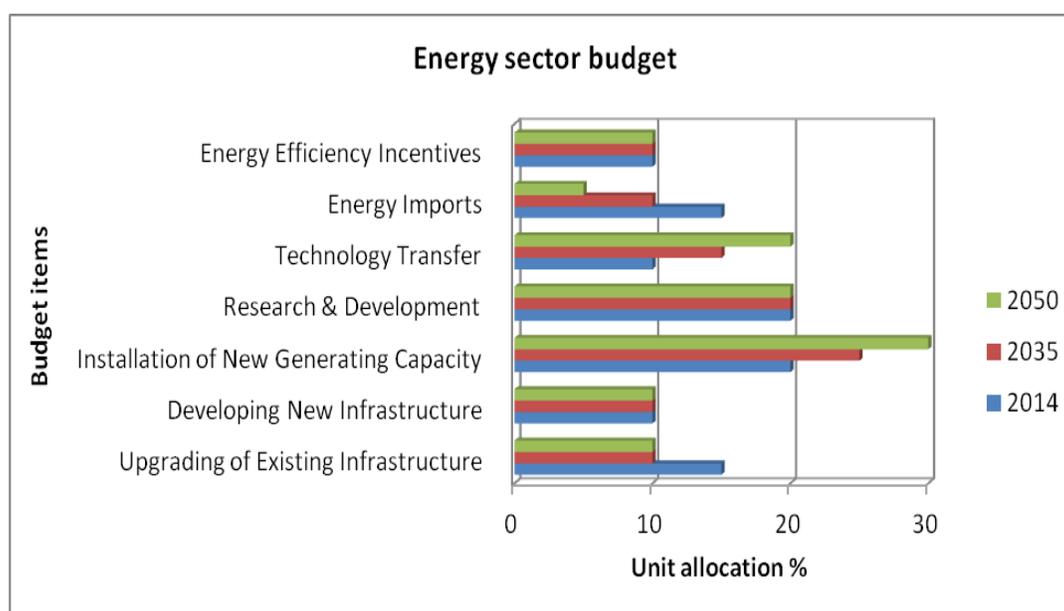
**Table 2: Institutional Responsibilities**

S/No.	Activity	Institution
1	Energy provision/access	Ministry of Energy
2	Energy availability / security	National Energy Commission
3	Make energy economically affordable	Ministry of Finance

4	Energy mix favouring renewable	Ministry of Science & Technology
5	Increased energy efficiency	Ministry of Industry / Energy/Agriculture/Environment
6	Sustainable investments in energy sector	Ministry Finance/Trade & Commerce
7	Increased public education & awareness in energy issues	Ministry of Education/Science & Technology

**Table 3: Energy sector budget**

S/No.	Budget item	Unit allocation (%)		
		2014	2035	2050
1	Upgrading of existing infrastructure	15	10	10
2	Developing new infrastructure	10	10	10
3	Installation of new generating capacity	20	25	30
4	R&D	20	20	20
5	Technology transfer	10	15	20
6	Energy imports	15	10	5
7	Energy efficiency incentives	10	10	10
	<b>TOTAL</b>	<b>100</b>	<b>100</b>	<b>100</b>



**Figure 1: Energy sector budget**

## 5. CONCLUSION

This paper provides a highlight of the important issues that should be undertaken by the government of the LDC to ensure sustainable energy sources and supply schemes for the benefit of the LDC's citizens. The successful implementation of the policy activities requires participation of different stakeholders including, the Government and its public institutions, companies; the private sector, and local communities. The achievement of this policy is the bridge to the LDC's citizens towards reduction of their poverty and maximization of their socio-economic benefits.

## REFERENCES

1. OECD (2011), Future Prospects for Industrial Biotechnology, <Http://Dx.Doi.Org/10.1787/978924126633-En> Retrieved on December, 2013
2. Parker, L and Fletcher, S. R (2007), Climate Change: The Kyoto Protocol and International Actions, Congressional Research Services (CRS) report for congress, <http://fpc.state.gov/documents/organization/80734.pdf> retrieved on December, 2013