

**Institute for Science and Technology Policy Analysis and
Training**

Energy and Environment Training Course

18th – 22nd April 2006

Course Report

1 Course Objectives and Content

Energy plays a crucial role in every society. It is an essential input for social development and economic growth. Not only is energy a provider of basic needs and services for everyday lives – heating, cooling, transportation etc, but it is also a production factor of prime importance in virtually all sectors of industry. At the same time, energy production and use are responsible for considerable environmental degradation at all levels- local, regional and global. Examples of energy-related environmental concerns include indoor and outdoor air pollution by particulates and oxides of sulphur and nitrogen, global climate change associated with the increasing concentration of greenhouse gases in the atmosphere, natural resource depletion, accumulation of wastes (including radioactive wastes), deforestation, water pollution and land disturbance. It is clear that the provision of adequate energy services at affordable costs and in a secure and environmentally friendly benign manner is an essential element of sustainable development. Energy and environmental policies in Africa must adequately address these issues.

This course was designed to introduce participants in policy formulation and/or implementation to the complex issues associated with sustainable energy supply and utilization in Africa. Using carefully selected case studies participants were taken through an in-depth and comprehensive analysis of the problems associated with balancing the risks and benefits of various energy sources. The capacity of participants to formulate strategic intervention and place the same into a policy context was built through simulation exercises and interactive debates.

The course began with an overview of energy, development and environment before going on to address specific issues by way of a series of case studies. These comprised bio-energy from agroforestry; interactions among hydroelectricity generation, distribution/utilization and the environment; and possibilities with regard to solar energy. Finally participants were required to act as a *Policy Commission* dealing with future sustainable energy options. The *Policy Commission* was asked to focus specifically on supplementation of traditional energy sources by renewable resources and to suggest a maximum of four specific policy mechanisms to achieve this. In addition it was asked to itemise these mechanisms, anticipate what institutional changes would be required as a result and suggest also benchmark indicators that could be used as monitoring and evaluation guideposts at all stages of policy execution. It was also asked to specify the most important renewable resources that would be appropriate for a country such as Kenya or Tanzania. Participants were split into four breakout groups. Each group was required to present its findings as a power point presentation (30 minutes maximum duration) and a 3/4 page written document. Final presentations took place on the afternoon of the final day following which certificates were presented and a buffet supper was held.

2. The Programme.

Tuesday 18th April 2006

Time	Activity	Resource/ Facilitation
09.00- 10.30	Welcoming Participants and introductions Course objectives and structure layout for the week Course Evaluation Guide	Prof. Judi Wakhungu – ACTS Executive Director Prof. Lawrence Gumbe- ACTS STPI Director Prof. Norman Clark- ACTS TAED
10.30- 10.45	TEA/ COFFEE BREAK	
10.45- 12.45	Energy, Environment and Development: An overview	Dr Kathryn Stokes, Strathclyde University
12.45- 14.00	LUNCH BREAK	
14.00- 15.15	Case Study on Bio Energy from Agroforestry	Prof. Chin Ong', RELMA-ICRAF
15.15- 15.30	TEA/ COFFEE BREAK	
15.30- 17.00	Working Groups	Participants

Wednesday 19th April 2006

9.00- 10.45	Presentation from working groups and plenary discussions	Participants
10.45- 11.00	TEA/ COFFEE BREAK	
11.00- 12.45	Kenya Tea Factories case Study: Hydroelectricity, Fossil Fuels and the Environment	Eng. Jennifer Gache, Ken Gen
12.45- 14.00	LUNCH BREAK	
14.00- 17.00	Working Groups	Participants

Thursday 20th April		
09.00- 10.45	A case study of the African Energy Programme.	Prof. Lawrence Gumbe
10.45- 11.00	TEA/ COFFEE BREAK	
11.00- 12.45	Policy analysis and preparation of policy briefs Passing on the Final assignment	Prof. Norman Clark/ Prof. Lawrence Gumbe.
12.45- 14.00	LUNCH BREAK	
14.00- 1700	Working groups	Participants

Friday 21st, April 2006

9.00- 10.45	Working Groups	Participants
10.45- 11.00	TEA/ COFFEE BREAK	
11.00- 1250	Working Groups	Participants
12.45- 14.00	LUNCH BREAK	
14.00- 15.15	Presentations	Participants
15.15-15.30	TEA BREAK	
15.30-17.00	Presentations	Participants
17.00- 19.00	Presentation of certificates & reception.	All.

4. Participants

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Resource persons

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Prof. Norman Clark
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Prof. Kathryn Stokes
Prof. Lawrence Gumbe
Mr. Andrew Adwera

5. Final Report of Course Teams

Group A

THE 2006 ENERGY POLICY COMMISSION

1. Introduction and Background

Energy is a vital component that underpins human society and supports economic and social development. The traditional sources of energy are dwindling. Current stocks are getting used up and new finds are less frequent with less spectacular yields. In view of the current fuel crisis facing the world, global warming, environmental degradation, the need to diversify the supply of energy, sustainability of renewable energy sources, interest is shifting to renewable sources of energy which in developing countries is emerging as a source of revenue and job creation. It is therefore imperative to develop sustainable energy policies in promotion of renewable energies in order to create a supplement base for existing traditional sources and increase energy security.

In Kenya, demand is exceeding supply therefore driving fuel prices upwards. The current major types of energy consumed in Kenya are biomass 68%, petroleum 22%, electricity 9% the remaining percentage constitute other sources. There is need to develop policies to enable development of renewable energy alternatives.

Traditional and Renewable energy sources

Traditional Energy Sources

These include fossil fuels (petroleum, natural gas, coal) and hydropower sources of energy

Limitations of Traditional Sources

- High cost on investment
- Frequent price variations

- insecurity of supply
- Adverse impacts on environment and human health

Renewable Energy Sources

These include solar, wind, biomass, hydro, nuclear and Geothermal. In Kenya, the most widely used renewable sources are biomass i.e. animal waste, wood resources, agricultural and crop residues, biogas, liquid bio fuels etc. and hydropower. Solar Home Systems (SHS) as is generally known, consists of a photovoltaic (PV), converting the sun's energy into electrical energy and solar thermal technologies, which use the sun's energy directly for heating, cooking and drying etc. Nuclear energy use in Kenya is limited to research.

Advantages of Renewable Energy Sources

- Readily Available/ Accessible
- Affordable
- Environmentally friendly
- Sustainable and meets energy deficits
- Poverty alleviation, job and enterprise creation
- Independent technology development

1.1. Objective

To develop and promote renewable energy resources to supplement traditional energy sources for energy security and sustainable development

2. Policy Mechanisms

There are various areas of concern; which have been addressed as follows

2.1 Research and Development

There is need to give more priority the following areas

- Increased budgetary Allocation- sufficient public and private funding.
- Training and enhancement of relevant skills as well as retention. Long term energy training programmes designed to develop a critical mass of locally trained manpower with the requisite technical, economic and socio-cultural skills are needed.
- Technology innovation and promotion of renewable energy. There is need for aggressive dissemination of improved renewable energy technologies (IBTs) to mitigate the negative effects of traditional biomass energy use.

2.2 Legal and Institutional Framework

There are several statutes within the energy sector that are scattered. Therefore there is need to undertake the following measures

- Harmonization of existing relevant legislations
- Need for a Regulatory body. A regulatory body should be established to coordinate dissemination of all research findings and information. In addition, this body should be charged with strengthening institutional linkages.

2.3 Investment Policy

There is need to create an enabling environment for foreign and local investment in renewable energy. Investment into renewable energies should be shifted towards technologies and systems that cause minimal impact to the environment and human health. The difference between renewable energy and conventional energy systems and the risk perceptions they imply can become the most significant barrier to investment in RE. This can be overcome through the following measures:

- Tax reduction and subsidies - i.e. custom duty waiver e.g. on bulk purchase of equipment for renewable energy.
- Less bureaucracy e.g. one stop shop for all licensing and issuance of permits for investment on renewable energy.
- Favourable energy tariffs for cost effective investment

This incentive package will accelerate adoption of renewable energy technologies. In order to fast track on this, a commission charged with advising the government on the feasible incentive packages e.g. tax reduction, subsidies etc. to ensure that users benefit from the incentive packages, should be established.

2.4 Policy on Environment and Gender

Development of environmentally friendly programs to ensure that environmental degradation related to use of renewable energies should be minimized. Gender mainstreaming needs to be incorporated at every stage of policy development to ensure that there is enhanced involvement of women.

3. Benchmark Indicators

3.1 Research and Development

- Training needs assessment
- Increased budgetary allocation and private sector funding
- Increased number of people trained on renewable energy technology
- Development of relevant curricula for skills enhancement on renewable energy
- Adoption of emerging technologies in renewables.

Responsibility: Ministry of Science and Technology, Ministry of Finance, Ministry of Energy, Ministry of Education, National Research Institutions,

3.2 Legal and Institutional Framework

- Enactment of relevant laws
- Amendment of existing relevant legislation
- Establishment of a regulatory body
- Strengthening of institutional linkages
- Effective information flow among relevant institutions and stakeholders
- Increased partnerships and collaborations among stakeholders

Responsibility: Attorney General, Ministry of Energy.

3.3 Policy on Investment

- Establishment of regulatory regimes for energy sector
- Provision of incentives

Responsibility: Attorney General, Ministry of Finance, Ministry of Energy, Private Sector, Investment Authority of Kenya, community

3.4 Policy on Environment and Gender

- Adoption of environmentally friendly programs
- Increase participation of women in renewable energy programmes

Responsibility: Ministry of Environment and Natural Resources, Ministry of Energy, Ministry of Culture and Social Services, Private sector, Communities

4. Conclusions

- Renewable energy has great potential to supplement the traditional energy sources being used currently.
- There is a need for deliberate concentration of efforts towards development, promotion and adoption of renewable energy use
- Social, environmental and energy concerns, coupled with improved renewable energy technologies, are increasing the momentum for support for renewable energy.

5. Recommendations

1. These policies should be adopted urgently as a matter of concern as its implementation will boost investment into renewable energy sector. It will also increase accessibility of energy supply for sustainable development.
2. This commission recommends adoption of this policy paper that will ensure development and promotion of renewable energy in supplementing traditional energy sources, thus sustaining the future energy options in line with the government's goal of industrialization by 2020.

3. The development of renewable energy sources should be a matter of national priority to ensure self sufficiency in energy supply for sustainable development.

Group B

RENEWABLE ENERGY SOURCES

Preamble

There are many sources of energy that are easily used in day-to-day activities. Some of these are renewable and others are not. Effective and sustainable energy utilization is a key element to human development, and various options should be sought. However, such energy sources are not effectively utilized due to – among other factors – inappropriate policy and poor infrastructure that hinders exploration.

Overall objective: To develop policy mechanisms for renewable energy options that are economic, sustainable and innovative, to supplement the existing ones

Traditional energy sources

- Electricity (Hydro, geothermal), Petroleum products (LPG, petrol, diesel, kerosene, fuel oil), Biomass (Charcoal, wood fuel), Wind, Animal power (draught power)

Renewable energy sources

- Solar
- Wind
- Water
- Biomass
- Geothermal

Solar (uses less than 1% of total energy requirement)

- Not available always
- Technology not locally available (Cost is high for the common man)
- Lack of awareness/information

Bottlenecks to renewable energy sources

- Low energy output (hence limited power usage)

Wind (uses Less than 1% of total energy requirement)

- Unpredictability of supply
- Awareness/ information

- Technological know-how
- Inadequate research on its use
- Lack of incentives to promote harnessing

Biomass (Fuel wood & Charcoal) (uses about 77% of total energy requirement)

- Exhaustive use of fuel wood
- Cultural hindrance on the use of biomass
- Inadequate technological know how (less expertise and storage/distribution)
- Low energy density
- High capital and maintenance cost
- Inadequate policy addressing production and use
- Environmental conflict - users
- Poor tapping and distribution medium (infrastructure)

Water (Hydro) (uses about 7% of total energy requirement)

- Uneven distribution - unfair transmission policy
- Security of supply - affected by drought
- High cost - generation, distribution and consumption
- Monopoly in distribution e.g. TANESCO, KPLC

Geothermal

- Cost exploration/ extraction
- Limited sources

POLICY MEASURES

1. R&D

- Technology
- Research agenda
- FDI
- IPR
- Encourage private sector involvement
- Legal framework

Indicators

- Budgetary allocation
- Partnerships
- Incentives (Awards and recognition)
- Increased innovations
- Increased stakeholders consultation
- Better co-ordination
- Reliable supply

2. FINANCIAL IMPLICATIONS/COST

- FDI
- Tax incentives/differential taxation
- Subsidies
- Special credit facilities

Indicators

- Budgetary allocation
- More investors in energy sector
- Increase in consumption in RE
- Decreased bureaucracy
- Performance Targets

3. LIBERALISATION ON DISTRIBUTION

Legal framework to address any potential impacts resulting from the liberalized market

Indicator

- More players in the market/competition

4. SOCIAL AND ENVIRONMENTAL CONCERNS

- Conservation
- Conflicts
- Displacements with suitable compensation
- Social acceptance of technology e.g. biomass
- Legal framework
- Poverty reduction
- Environmental sustainability

Indicators

- Increased number of social amenities
- Infrastructural facilities e.g. schools, roads, health facilities
- Community participation
- Awareness creation
- Education

Institutional changes

Set up a National Energy Control Unit (NECU) at the Ministry of Energy to oversee the recommended policy measures, and will co-ordinate the stakeholders:

- Universities
- Research institutions
- Power lighting company
- Electricity regulatory board,
- Relevant ministries – Trade, Energy, Natural resources
- Private sector/investors
- Donors
- Local communities

Summary/Recommendations

In order to realize the benefits of improved/supplementary energy sources, we recommend the following in addition to the policy for institutional reforms above:

- Enactment of the Energy Draft Bill to empower the energy policy and promote investment in the energy sector, while at the same time conserving the environment according to NEMCA of 1999 and enhance socio-economic development
- Political commitment to champion improved and integrated energy production and distribution
- Provision of adequate resources to conduct research and local capacity building on localized and chronological innovations
- Raising awareness and popularization of renewable energy sources to the public

Conclusion

NECU should effectively and specifically co-ordinate all the decision-making processes and implement the policy recommendations

Group C

Policy on Supplementing Traditional Energy with Renewable Sources: The Case of Solar Energy

1.0 Introduction

1.1 Benefits of Promoting Solar

- Abundance but only 10% is using the technology
- Great potential but under-exploited
- It can be decentralized (off-grid)
- Technology is available (components now made locally by a local firm)
- Good supplement during drought
- Individual investors of solar can sell back to the grid for income generation.
- Compared to firewood and charcoal, it is cleaner to use and more efficient.
- It will open up opportunities for small scale businesses e.g. salons, solar dryers

1.2 Scope of Solar Applications

- Crop drying
- Water heating
- Day-lighting (offices)
- Domestic Lighting/TV/Radio etc.
- Cooking
- Communication
- Refrigeration

- Electrification of rural public institutions

2. Fiscal Policy Measures

- Tax subsidies on solar panels, PVCs, inverters etc
- Increase in tax on kerosene
- Increase in water heating tariffs while encouraging use of solar panels.
- Zero rate raw materials for manufacturing solar panels.

Responsibility: Treasury

2.1 Implications on Fiscal measures

- Increase in tax on kerosene
- Increase in price of kerosene and ultimate fiscal impact on users.
- Reduction in the consumption of kerosene, less pollution.
- Cheaper in the long run.

Mitigation: One year grace period to switch to solar.

2.2 Indicators of Fiscal Measures

- Increase in importation and use of solar equipments
- Shift from kerosene.
- Increased number of investors/manufacturers of solar equipment.
- Increase in revenue.
- Credit from Cooperatives Societies.

3.0 Institutional Policy Measures

3.1 Institutional reforms

- Renewable Energy Commission, with a solar section, regional presence.

3.1.1 Its role

- Promote the use of renewable energy (solar panels) through demonstration centres.
- Seek, disseminate and promote new and efficient solar technologies
- Provide technical assistance

3.1.2 Membership

- Formed by an act of parliament
- Independent from government
- Team of permanent employees, regulated by the board.
- Composition of the board: Min of energy, finance, universities, R&D institutions,

NGOs, Kenya Met. Dept.

3.1.3 Funding

- Funded by exchequer.
- Additional taxation on kerosene and electricity tariff on hot water.
- 5% of Rural Electrification Fund to be set aside for solar energy.
- 10% of Constituency Development Fund for setting up solar panels in public institutions

3.2 Indicators of Institutional Reforms

- Establishment and operationalisation of the institution.
- Increase in number of trained people in solar technology.
- Level of adoption of technology.
- Increase in number of demonstration centres.

4.0 Policy Measures on Education

4.1 Education

- Develop curriculum on solar energy for schools & University.
- Develop technical expertise in installation and maintenance in polytechnics and vocational institutions (student funded through school fees).

4.2 Responsibility: Min. Of Education and Energy

4.3 Implication Education

- Money to purchase solar equipments and technology for training.
- Developing and introducing curriculum (Ministry of Education, Commission of Higher Education, Science and Tech)
- Cost of establishing demonstration centres.

4.3.1 Mitigation

- Government funding (exchequer)