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# OPERATIONALIZING THE NEPAD ENERGY INITIATIVE

# ELEMENTS FOR AN ACTION PLAN

for

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**Operationalizing the NEPAD Energy Initiative**

**Elements for an Action Plan**

## Introduction

The critical need to meet Africa's energy requirements is recognized in both the World Summit on Sustainable Development Plan of Implementation (POI) and the New Partnership for Africa's Development (NEPAD). The POI singles out energy for sustainable development as a tool for poverty eradication. NEPAD has set specific objectives, which seeks to secure access to energy for at least 35 per cent of the African population within 20 years, especially in rural areas. Furthermore, NEPAD has identified a number of projects for the short term that are organized into the following categories: power systems, oil and natural gas, studies, capacity building, and facilitation. Building on these, key decisions concerning the national, sub-regional and continental energy policy and development will have to be made. Numerous studies have concluded that despite the abundance of its energy resources, Africa lacks the capacity to effectively exploit them for the welfare of its population and to drive economic development.[1]

The purpose of this document is to suggest some elements for the NEPAD energy initiative. While they cover a broad spectrum of energy topics, these elements do not cover the entire range of energy concerns of NEPAD, nor is it anticipated that they will be adopted exactly as formulated below. They are intended to suggest what could be done and stimulate discussion that could lead to further elaboration of the elements or even wholly new proposals. The main criteria for choosing them is that they be contribute to NEPAD goals and focus areas, concrete actionable ideas, and include a realistic funding mechanism. In looking at these and other elements, it is suggested that the programme to implement them be considered as a set of phased activities, extending from the short term to the medium or long term, when they would naturally conclude. Thus, it is hoped that this set of elements will serve as a jumping-off point for discussion and a framework for action.

Looking over the range of activities suggested by the NEPAD, a basic framework that suggests itself could be as follows:

**Programme areas:**

1. Rural Energy
2. Hydropower
3. Renewable Energy Development
4. Fossil Fuel Development and Trade
5. Electric Power Development and Trade

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[1] See for example: Ogunlade Davidson and Youba Sokona *A new sustainable energy path for African development: Think bigger act faster* (2003), p. 7.; Akin Iwayemi *Energy Sector Development in Africa*, Background Paper prepared for the African Development Report, 1998, p. 10.; Michel Lokolo, *African Regional Energy Programme for Sustainable Development*, unpublished study for UN DESA, pp. 4-5.

**Cross-cutting issues**

1. Technology Transfer
2. Financing and Establishing an Enabling Environment for Investment
3. Capacity Building
4. Energy Sector Reform

The elements proposed below are arranged to reflect this framework.

## Rural Energy and Renewable Energy Development

### Renewable-based Electric Power in Rural Areas of Africa

Rationale

In the effort to develop an energy infrastructure throughout Africa, the rural areas should not be neglected. In an area that has not yet been electrified, there are two options for the provision of electric services: extending the electric grid and establishing a local decentralized grid. Where the latter case is cost effective, the grid can be powered by transported fossil fuel or by locally available renewable energy, generally solar, wind, biomass or geothermal energy. In general, the decision on the approach (grid extension or decentralized grid), the type of decentralized grid (fossil-fuel or renewable based), the source to power the renewable-based grid (solar, wind, biomass, geothermal or hybrid) and the modular size of the decentralized grid is taken on the basis of an economic analysis, including the ability of potential customers to pay for the services.

Focusing on those cases where renewable-based power systems have been determined to be economically viable, we note that the problem is rarely a matter of technology where the resource is available. Numerous power systems, large and small, have been designed and operated reliably. Despite the promise of free or low-cost operating costs, the dissemination and adoption of renewable energy systems is hampered by the substantial initial capital costs. Although there are remote communities in Africa with the means and interest to pay for such energy systems, these remain very few. Moreover, despite the efforts of Governments to allocate funds to provide these communities with access to electric power, the requirements are far greater than the funds available. Therefore, other sources of funding will be needed to meet the capital costs of renewable energy systems where they are deemed to be economically viable.

Approach

The Clean Development Mechanism (CDM) developed under the Kyoto Protocol of the United Nations Framework Convention on Climate Change could provide an effective instrument for attracting investment from industrialized countries, including the private sector, in renewable-based power systems in developing countries, particularly African countries. The CDM, therefore, could provide a significant contribution to financing the capital costs of renewable-based power systems in African countries that would benefit from the installation and operation of such systems in their countries. Moreover, the

reformulated operating rules of the Global Environment Facility (GEF) provide another opportunity for African nations to remove the barriers to extending the utilization, financing and commercialization of renewable-base power systems.

The Small-Scale type of CDM project, in particular, could provide a unique opportunity for developing a renewable-based power in rural and remote areas in Africa. This type of CDM project, with its simplified procedures and rules, envisions renewable energy projects with a maximum output capacity of up to 15 megawatts. These projects include the following 4 categories (under Small-Scale renewable energy project):

1. Electricity generation by the user, which comprises technologies that supply individual households or users with a small amount of electricity, including solar home systems, solar water pumps, and wind battery charges;
2. Mechanical energy for the user, which comprises technologies that supply individual households or users with a small amount of mechanical energy, including wind-powered pumps, solar water pumps, water mills and wind mills;
3. Thermal energy for the user, which comprises technologies that supply individual households or users with thermal energy that displaces fossil fuel or non-renewable sources of biomass, including solar thermal water heaters and dryers, solar cookers, energy derived from biomass for water heating, space heating, or drying; and
4. Generation of grid electricity from renewable sources such as solar, hydro, tidal/wave, wind, geothermal, and biomass that supply electricity that is or would have been supplied by at least one fossil fuel or non-renewable biomass generating unit.

However, the innovative market-based nature of the CDM (and to a lesser extent the GEF) with its broad regulations and special procedures, would require that the nation hosting the project possess certain technical, financial and legal capacities. The requirements for participation in the CDM ranges from the capacities to provide data for determining baselines, to identify and coordinate CDM project proposals, to implement CDM projects and actually manage the power system, and to monitor and report the results. In many countries it might be necessary to strengthen human and institutional capacities, infrastructures, and policy and regulatory frameworks.

Thus, a country interested in attracting a CDM or a GEF project needs to:

(a) Be aware of the procedures and the project cycle in CDM and GEF so as to know how and where to apply for these projects;
(b) Become familiar with the rules, guidelines and requirements for participating in a CDM or a GEF project;
(c) Strengthen its human resources, institutional, financial and legal capacities for effective participation in project development, implementation and monitoring.

The United Nations is available to provide assistance with regard to (a) and (b), but technical expertise, capital financing, and training and capacity building may be required for (c). While the United Nation could also be available to provide assistance for (c), additional support would be required from other entities, for instance via a consortium of corporate entities interested in supporting increased access to energy in a developing country, with an expectation of later involvement in a CDM project with that host country. The e7, a consortium of electric utilities in the G-7 countries has expressed an interest an initiative to support (c).

## Hydropower Development

### Studies for Hydropower Development in Africa

Rationale

Hydropower has recently attracted attention at the highest levels in Africa as an energy source to power development of the continent. Thus, after decades of neglect due to environmental concerns, there is a serious interest in reviving the development of medium- and large-scale hydropower schemes. Africa is endowed with substantial hydropower potential, about 4 million GWh/y, of which one-quarter is considered economically exploitable. Of this exploitable potential, only about 8 per cent has been harnessed. Of the many plans that have been considered, the Inga hydropower scheme has drawn the most attention, because of both its size and its potential for supporting regional development.

However, the problems that have hindered the development of these resources need to be addressed and resolved before significant investment is such new schemes can be expected. Beyond the difficulty of attracting the needed financial investments, the problems faced in Africa are basically of three types: social, environmental and technical.

A major social problem is the need to relocate populations that are usually rural and poor, and often from ethnic minorities, from the area to be flooded behind the dam. The waters of the new lake can also provide a breeding area for disease vectors that have the potential to generate serious health problems. The environmental problems relate to the potential loss of biological diversity and agriculturally fertile land under the lake waters, as well as the effects of a change in microclimate the lake may bring to the region. Finally, the set of possible technical problems normally associated with dam construction and operation include for Africa the problem of silting. The waters of most African rivers have a high sediment content, which can significantly reduce the economical viable life of a dam. These problems need to be addressed.

Approach

In order to advance hydropower development in Africa, studies are needed in two directions. First, a serious effort is needed to address generally the social, environmental and technical problems facing dams in Africa, which would have to include an analysis

of each problem in its various local manifestations, a set of options for effectively, dealing with each, and where necessary recommendations for research and development that may be needed to adequately address these problems. For only when satisfactory solutions to these problems can be demonstrated can significant investment in hydropower schemes from international sources be expected.

Second, a survey of the economic and technical viability of potential hydropower sites would be helpful in identifying the most promising and productive for development. Such a survey must cover the social, environmental and technical issues involved, as well as the commercial viability of each site.

While the likelihood of significant financing for a major hydropower scheme does not currently appear to be great, funding for studies should be much easier to identify. Generally, those donors willing to fund studies are the most likely to have an interest in financing a scheme that the study identifies as viable and provides effective solutions to the various problems the scheme faces. Interest in such studies has been expressed by the e7 group and it is expected that the Canadian members of the group, notably Hydro-Québec, might have the greater interest.

## Fossil Fuel Development and Trade

### Natural Gas Exploration and Development Initiative for the Benefit of Least Developed Countries of Africa

Summary

The least developed countries (LDCs) of Africa desperately need energy to fuel their development and, for those countries, international organizations and donors seriously interested in aiding these countries, assisting them in the development of their own fossil-fuel resources is preferable to increasing their dependence on preferential rates for such fuels form major suppliers. One of the options that could be considered for finding ways of alleviating the serious energy supply problems faced by these countries is to improve their access to cleaner fuels by targeting the development of domestic natural gas resources. As the least greenhouse-gas emitting of the fossil fuels and one that is very flexible for all uses, natural gas could be the focus of an international effort to provide energy security for the poorest countries. The launching of this initiative through the establishment of a revolving fund is an option that could jump-start development efforts in those countries.

Rationale

Of all the non-nuclear fossil fuels, natural gas is the least polluting and emits the least amount of carbon dioxide for the same energy produced, which amounts to only two-thirds of the $CO_2$ emitted by oil. In the near term, natural gas should be the fuel of choice for most non-motive uses and could even become important for vehicles as CNG.

Moreover, given the energy cost of transporting it between continents, it is most efficient to use natural gas locally.

Natural gas occurs both in isolation and in association with oil. The discovery and development of significant non-associated natural gas reserves could provide a least developed country with the domestic fuel it needs. Much of the associated natural gas that is found is flared. However, with the development of the necessary distribution infrastructure, the associated natural gas that is normally flared could be exported from oil-producing nations to neighbouring LDCs.

Sub-Saharan Africa possesses significant quantities of natural gas, but most of it is associated with oil and at present flared. For instance, it is estimated that until recently Nigeria, which possesses the tenth largest natural gas reserves in the world (estimated at 124 trillion cubic feet), flared 75 per cent of the gas it produces in association with oil. The same is true for most other associated natural gas producing countries in Africa, such as Angola, the Democratic Republic of Congo, Gabon, Equatorial Guinea, Sudan and Tanzania. Governments are now developing strategies for reducing gas flaring and increasing commercial usage of natural gas. Cooperation between Nigeria and its neighbours provides an example of what can be done: Nigeria plans to export natural gas to the West through the West African Gas Pipeline that is being developed as far as Ghana. There exist other opportunities to use and even export flared gas in Sub-Saharan Africa.

With support from the Norwegian Government, the World Bank is beginning work to see how associated natural gas could be utilized. Thus far, the work has focussed on collecting information and studying the situation on various continents, but principally in Africa.

Modest quantities of generally non-associated natural gas have been located in Southern Africa, mainly in Mozambique, Namibia and South Africa, in East Africa, primarily in Rwanda, Ethiopia and Somalia, in Central Africa in Cameroon and Congo (Brazzaville), and in West Africa in Cote d'Ivoire, Ghana and Senegal. There has been some experience in the use of indigenous natural gas in Africa, for example for electricity generation in Senegal, Gabon and Côte d'Ivoire. A number of similar projects are in the planning stage in Angola, Cameroon, Equatorial Guinea, Ghana, Nigeria, Mozambique, and Tanzania.

Notwithstanding the work that has already been started, these efforts have not significantly alleviated the serious energy supply problems faced by the least developed countries of Africa. Therefore, it is proposed that a major push in this direction be launched as the Natural Gas Exploration and Development Initiative for the Least Developed Counties of Africa.

Approach

This initiative would be different from previous efforts both in the magnitude and coverage of the activities and in the sustainability of the programme. Thus, this is planned as a large, sustained programme of activities that proposes to promote development of any of the stages of natural gas exploration and development needed for a number of countries at one time and for many countries over an extended period.

In order to attract risk capital and investments from transnational oil and gas corporations, OPEC, the G-8 nations, the World Bank, the regional development banks and foundations could be invited to contribute to a revolving fund as a commitment to helping the poorest nations improve their accessibility to clean energy for development. A political approach to the G-8 nations on one side and OPEC on the other for matching contributions to the fund might prove beneficial. A Government official from Norway has already expressed an interest in such an initiative.

There are precedents in the use of revolving funds to finance technical projects. This approach can make available funds of the magnitude needed to undertake the needed activities and the projects themselves, when successful, can generate the funds needed to keep the fund replenished as a small portion of the proceeds. As the viability of such a financial mechanism relies on the payback of loans when projects are successful, special attention will have to be given to the legal instruments needed to ensure that the loans are paid back in such cases. By starting with development projects where the resource has already been discovered, the risks of project failure at the initial stages of the initiative can be minimized.

The proposal is for an initial fund of US$ 10-20 million to serve as the core of the revolving fund. The revolving fund would be maintained and could even be expanded as recipient countries paying back their loans from a portion of the proceeds of successful projects contribute more than their original loans to cover the cost of failed projects and assist other nations in need of funds for natural gas exploration and development.

A board of advisors would be established for the initiative that would include representatives of substantial donors and experts experienced in the fields of natural gas exploration and development, utility management and operation, financial management, and the relevant legal areas.

The activities can be divided into the following major areas: (a) establishing and managing the revolving fund, (b) identifying promising projects, (c) developing project documents, (d) negotiating agreements with Governments, (e) negotiating with contractors, (f) managing the project, (g) arranging for continuation of next-stage activity and responsibility after completion of the project, and (g) managing the recovery of the funds.

The types of project activity to be financed under the initiative include the following traditional steps in exploration for and development of natural gas reserves. These

include geological exploration, drilling to discovery, estimation and certification of the reserves, establishment of the infrastructure for needed for production, for transmission, for storage, and for distribution of natural gas, as well as development of its use in the industrial, residential and service sectors, and for electricity generation, transportation, and fertilizer production. Other project activities include assisting a Government with negotiations, undertaking feasibility studies and project development, assessing environmental and/or social impacts, arranging for training and other capacity building requirements.

## Electric Power Development and Trade

### Feasibility Studies for Electric Power Grid Interconnection

Rationale

Development of cross-border energy trade is one of the goals for the energy sector of NEPAD. Cross-border interconnections of grids permit trade in energy, which facilitates not only the transfer of electricity from a nation to a neighbouring consumer nation but also the pooling and sharing of power resources and loads to improve overall efficiency, particularly where loads are small.

There are several electric power grid interconnection in Africa, mainly in Southern and West Africa, but many other opportunities exist and more can be expected as more of Africa's natural energy endowment, particularly its hydropower resources, is exploited. Among others, there is currently a request from East African Governments for assistance in a subregional interconnection scheme. However, interconnecting power grids can be complex and should be undertaken only after a thorough study of the project and its effects. Moreover, such a study is one essential requirement for attracting potential investors in an interconnection project.

Approach

It is proposed to establish a Grid Interconnection Feasibility Study for each serious request that has the endorsement of the Governments of all countries concerned. The task of each study would be to examine the feasibility of grid interconnection on a real and practical level, taking full account of the local energy and political situations in the countries involved.

One purpose is to transfer the knowledge of interconnection methodology to the relevant countries. In the process, local institutions will have the task of collecting a significant amount of local energy information and creating databases that describe the energy systems of all the countries involved. This will be used for the next step of assembling and evaluating grid interconnections options.

Thus, another goal of the study is to explore in considerable detail the many practical and implementation-phase aspects of creating the power grid interconnection, including

impacts on the security, environment, trade and political situations in each country, and therefore of the constraints they impose on the interconnection options.

A key element is the development of realistic scenarios for future electricity demand and supply, taking into consideration consumer capacity to pay, seasonality considerations, and the current status and technical parameters of and future plans for the grids in each country. This will entail collaborative and interdisciplinary analysis and modeling studies for pricing of electricity transfers and of the operation of regional grid designs. Each feasibility study should produce one proposal (or more) for interconnecting the grid based on this work that can the basis for seeking financial backing for the implementation of the interconnection project.

Funding is needed to finance each feasibility study. Some of the e7 members have expressed an interest in providing technical assistance and training for feasibility studies, and some countries of the European Union have expressed an interest in supporting such studies. This may involve some expectation of being involved in providing technical and financial assistance in the actual interconnection project on the part of these donors.

## Power Sector Reform

Rationale

Like other parts of the developing world, Africa has felt pressure from the industrialized countries to reform their energy sector, especially the electricity sector, through liberalization and deregulation. However, the experiences of the industrialized countries have not been easy to transfer to developing countries, nor have they all been positive for the industrialized countries themselves.

It is particularly important to note that full liberalization and deregulation require the existence of certain capacities of both the government and the private sector. The government must have the technical, administrative, legislative and regulative capacity to establish the necessary laws, oversee the practices of the privatized utilities and enforce those laws. In addition, the local private sector must have sufficient management, technical and financial resources and experience not only to ensure fair competition for the services, but that the electricity services are delivered competently and reliably. If these conditions are not fulfilled, successful operation of the power sector will require that the government retain some degree of control and ownership, the extent of which will depend on the actual conditions. Opening the market to multinational and foreign corporations will require even more sophistication and more effective regulatory control by the government in order to avoid the risk of turning over the responsibility of the delivery of energy services to corporations that may fail or may act in ways contrary to the needs of the country (increase prices excessively, hold back delivery of services, etc.), as happened in the Enron case.

Of special concern is the issue of poverty, which constrains the ability of consumers to pay for their energy services. Since this is beyond the technical and commercial competencies of the energy suppliers, it falls to the government to address the matter. Providing the people with a capacity to pay requires that they have sufficient income. If properly planned and managed, the energy delivered can drive income-generating activities for the poor population. The government is the only entity with the ability to organize the needed programmes.

Approach

For the African countries that do not meet all the conditions, options to full liberalization and deregulation are needed. As the countries of Africa cover a broad spectrum of capacities for liberalization and deregulation, there is no formula that will work in each country. However, with the right approach and methodology, options can be developed that respond to the local conditions pertaining in each country, and in finding ways for the needed capacities to be acquired so that the country can evolve toward a more liberal and deregulated electricity sector.

Thus, based on this approach, a programme is needed to inform African governments of the types of option available, to undertake an analysis of the national conditions, to advise on specific options for power sector reform, and to assist in capacity strengthening. In order to be executed, (a) the programme requires coherent and coordinated planning, (b) competent assistance in a range of areas, and (c) technical and financial support for capacity strengthening. Although not particularly costly, (a) is essential and could be carried out by the African Energy Commission, the United Nations Economic Commission for Africa, the African Development Bank or some other United Nations entity. The best source of assistance for (b) and (c) is the electricity utilities themselves. DESA has been approached by members of the e7 group of electricity utilities about the possibility of providing training activities and advisory services to assist countries with their plans for power sector reform along these lines. Before, such an effort can begin, however, the methodology will have to be clearly articulated. The requirements for active participation in globalization by Nobel Laureate Stieglitz provide an excellent basis for developing such a methodology.

## Capacity Building and Technology Transfer

### Science and Technology Park on New and Emerging Technologies for Sustainable Development in Africa