DRAFT CONCEPT PAPER

JOHANNESBURG LEGACY: MILLENNIUM PARTNERSHIPS

BY

REUEL KHOZA: CHAIRMAN ESKOM, VICE CHAIRMAN BUSINESS COORDINATING FORUM OF SOUTH AFRICA

Klaus Töpfer, Executive Director of UNEP, has called for the goal of the Summit to promote co-operation around the world to overcome poverty in a responsible way. He has also suggested that if the Summit is to be successful then it should lead to a new "global deal" that meets the needs of developing countries.

This paper seeks to address the call for a "new global deal". The New African Initiative is a call for a new relationship of partnership between Africa and the international community, especially the highly industrialised countries, to overcome the development chasm that has widened over centuries of unequal relations.

A historic opportunity presents itself to end the scourge of underdevelopment that afflicts Africa. The resources, including capital, technology and human skills, that are required to launch a global war on poverty and underdevelopment exist in abundance, and are within our grasp. What is required to mobilise these resources and to use them properly, is bold and imaginative leadership that is genuinely committed to a sustained effort of human upliftment and poverty eradication, as well as a new global partnership based on shared responsibility and mutual interest. Improvements in the living standards of the marginalised offer massive potential for growth in the entire international economy, through the creation of new markets and by harnessing increased economic capacity. This will bring with it greater stability on a global scale, accompanied by the social well being and cultural exuberance that thrive in conditions of certainty. The imperative of development, therefore, not only poses a challenge to moral conscience; it is in fact fundamental to the sustainability of the globalisation process. We readily admit that globalisation is a product of scientific and technological advances many of, which have been market-driven. Yet, governments particularly those in the developed world have, in partnership with the private sector, played an important role in shaping its form, content and course.

The case for the role of national authorities and private institutions in guiding the globalisation agenda along a sustainable path and, therefore, one in which its benefits are more equally spread, remains strong. Experience shows that, despite the unparalleled opportunities that globalisation has offered to some previously poor countries, there is nothing inherent in the process that automatically reduces poverty and inequality. What is needed is a commitment on the part of governments, the private sector and other institutions of civil society, to the genuine integration of all nations into the global economy and body politic. This requires the recognition of global interdependence in respect of production and demand, the environmental base that sustains the planet, cross-border migration, a global financial architecture that rewards good socio-economic management, and global governance that recognises partnership among all peoples. We hold that it is within the capacity of the international community to create fair and just conditions in which Africa can participate effectively in the global economy and body politic. [A New African Initiative [NAI], 2000 African Renaissance].

The World Summit on Sustainable Development presents a unique opportunity for reinventing the way we do business. This should not be seen as just another avenue to

showcase us. We need a collective effort to bring to the debate concrete proposals, which will underpin the sustainability goal.

The legacy of partnerships is the foundation for promoting the sustainability goal. Our leaders in business are called upon to partner with Africa.

This document details several specific pojects which can be used to launch the NAI and place Africa on a sustainable path.

A. CASE STUDY ON PARTNERSHIPS IN ACTION

1.ELECTRIFICATION

Part of strategic priority to provide access to basic services.

Eskom is South Africa's electricity utility and has a nominal capacity of 40 585 megawatts. Eskom supplies approximately 95% of the country's electricity and is one of the lowest cost producers of electricity in the world. Before 1994 only 12% of the rural population in South Africa had access to electricity. Electrification is a priority in the region as a whole. In South Africa the South African government, the electricity distribution industry and Eskom committed to electrifying 2.5 million households by the year 2000.

Targets

Eskom committed itself to connect 1 750 000 homes between 1994 and the year 2000. The implications of this were as follows:

Connection every 30 sec, pole every 10secs, 200m cable/minute, payment and invoice of R6000/minute.
Every year 1000 projects with 200 running simultaneously had to be managed.

Activities

Since the start of the electrification initiative, Eskom has invested more than 7.5 billion Rand (approximately 1 billion US dollars) in electrification projects and electrified 1,000 homes per day.

This required a substantial and co-ordinated effort on the part of Eskom. Some of the problems encountered were as follows:

Cost per connection
Lack of community interaction
Non-payment

As a result a comprehensive programme into how to overcome these difficulties was undertaken, including more comprehensive community interaction programmes and the

development of the pre-payment meter. To counter the problem of costs associated with greater distances from the established grid, there are new initiatives to promote the use of non-grid energy such as solar power.
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Results

A committed electrification programme has resulted in the electrification of approximately 1,000 homes per day, with 2,135,661 homes been electrified since the beginning of the electrification programme in 1991. This has significant environmental implications from both a natural and social perspective. The provision of electricity leads to job creation, and a subsequent rise in disposable income in a community.

Electrification of schools and houses is highly likely to lead to increased education and productivity levels. The supply of electricity can lead to a decrease in the harvesting of firewood with resultant biodiversity implications, and a decrease in respiratory disease due to the reduction of biomass burning. The relative efficiency of using electricity will reduce the overall emission of pollutants caused and lead to an improved quality of life. Studies have shown that electrification reduces the level of ambient air pollution and a reduction in related respiratory diseases.

Thus some of the more specific socio-economic benefits of electrification are:

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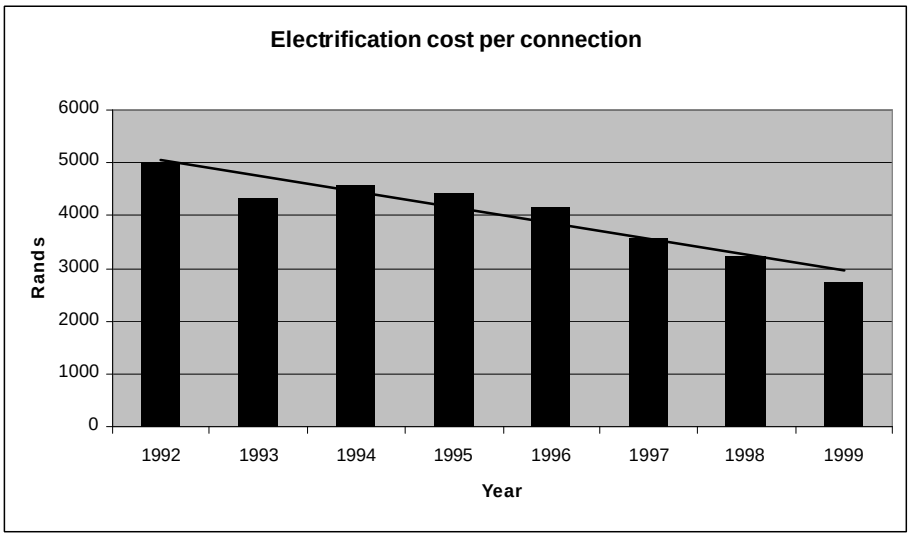
Job creation through FDI in energy intensive manufacturing
New employment opportunities
Small business development
Appliances
Shops
Welding
Hair salons
Change of life style
Refrigeration
Extended hours
Access to communications
Improved security
Improved education levels
Rural development
GDP increases
Knock-on impacts
Improved quality of life
Access to modern technology
Reduced local air pollution levels
Major health benefits through fewer paraffin burns and poisoning, as well as vaccine refrigeration, water pasteurisation and a decrease in respiratory disease

Electrification may not bring about immediate results in as improvements take place over a number of years.

Another achievement was the reduction in the cost per connection. The graph below details the reduction in cost, thereby assisting in bringing affordable electricity to communities.



Some of the lessons learnt are as follows:

- The projects need to undertaken in a holistic manner.
- It is not possible to separate planning and project management. Continual re-planning is required as well as defined targets and a technology plan.
- A centralised approach is required for planning.
- Customer knowledge essential.
- Standards must be based on proven pilots. Innovation is done during the pilot phase.
- Standards provide building blocks, and allow the matching of tariffs and technology to customer requirements.
- Tariffs and revenue collection are critical and must tie in to technology and culture.
- Non grid options need to be integrated in a controlled manner. (grid utility greater)

Over 90% of urban areas are now electrified and more than 40% of rural areas. Eskom has committed itself to an addition three year target of a further 600 000 connections, giving more attention to rural areas.

A joint venture between Eskom and Shell International Renewables LTD is targeting electrification for about 50 000 homes in isolated South African rural communities. The project involves the installation of a pre-paid solar system with battery storage. The solar system utilised features four high-efficiency fluorescent lights and an outlet for direct current black and white television and a radio. Local shops are used as the outlets for the purchase of pre-payment cards and local people are trained to do the system installation and maintenance, thus promoting job creation in the communities. To date 6,000 systems

have been installed and customer satisfaction is high. The success of the project was due to the combined efforts of the private sector, a public utility, Transitional Local Government and the local rural communities. The Eskom Shell Solar Home System LTD South Africa was selected as a winner of the International Climate Technology Initiative (CTI) Leadership Award during 2000.

2.WEST AFRICAN GAS PIPELINE

Part of strategic priority: develop new infrastructure to benefit more than one country.

Introduction

In 1982, The Economic Community of West African States (ECOWAS) as one of its key regional economic policies proposed the development of a natural gas pipelines throughout West Africa. ECOWAS's regional energy distribution plan (1991) and a feasibility study on the supplying of Nigerian gas to Ghanaian markets (1992) further enhanced the practicality and need of developing a regional pipeline. A feasibility report, prepared for the World Bank in the early 1990's, deemed that a pipeline to transport Nigerian natural gas to Benin, Togo and Ghana was commercially viable. The report's conclusion was based on the U.S. firm Chevron's associated gas reserves in Nigeria's Escravos region. In September 1995, the governments of the four nations signed a Heads of Agreement (HOA) pertaining to the pipeline project. The HOA broadly outlined the principles of the pipeline development.

An energy shortage experienced by Ghana, Togo, and Benin in 1997 to 1998 renewed interest in the pipeline project. In August 1998, a consortium of Chevron, Shell, Nigerian National Petroleum Corporation (NNPC), Ghana National Petroleum Corp. (GNPC), Societe Beninoise de Gaz (SoBeGaz), and Societe Togolaise de Gaz (SoToGaz) signed an agreement commissioning a feasibility study on the West Africa Gas Pipeline (WAGP). The study, which was completed in March 1999, concluded the commercial and technical viability of the WAGP, and projected that it could be operational as early as 2002. On August 11, 1999, in Cotonou, Benin, a Memorandum of Understanding was signed by the four countries and the consortium establishing the legal framework for the WAGP. The Joint Venture Agreement naming Chevron as the WAGP project manager was signed on August 16, 1999 in Abuja, Nigeria. In February 2000, the four nations signed an Inter-Governmental Agreement (IGA) which established the framework for realizing the pipeline venture. The IGA includes the governments commitments to the pipeline owners and gas distributors on the conditions for the development, construction and operation of the WAGP, as well as fiscal and customs policies for the venture. The project has received administrative support from the ECOWAS Secretariat and technical assistance ($1.55 million) from the United States Agency for International Development (USAID).

Project Details

The WA GP will traverse 620 miles (1,033 kilometers) both on and offshore to its final planned terminus at Effasu in Ghana. The first portion of the pipeline, which will deliver gas to the greater Lagos area (Alagbado), is already in existence. The Escravos-Lagos

pipeline (ELP) was commissioned in 1989, supplying natural gas to Nigeria's Egbin power plant and other industrial consumers in Lagos and Ogun States. ELP has a capacity to handle nearly 900 million cubic feet per day (Mmcf/d) of natural gas, but currently the majority of this capacity is not utilized. A 34-mile (57- kilometer) onshore portion of the WAGP will run from Alagbado to Seme beach in Lagos State. The WAGP will continue offshore, with proposed landfall spurs at Cotonou (Benin), Lome (Togo), Tema (Ghana), Takoradi (Ghana) and Effasu (Ghana). The initial capacity of the WAGP will be 200 Mmcf/d, with the capability to expand to 600 Mmcf/d as demand grows.

The $400-million WAGP will initially transport 120 Mmcf/d of gas to Ghana, Benin and Togo beginning in 2003. Gas deliveries are expected to increase to 150 Mmcf/d in 2005, 210 MMcf/d in 2010 and be 400 Mmcf/d by the end of 2020. It is estimated that $600 million will be spent on the development of new and renovated power facilities in the four states to utilize the gas. It is also possible that the WAGP will be extended to markets in Cote d'Ivoire. Speculation has the WAGP eventually terminating in Senegal, but the current regional stability problems of several countries (Liberia, Sierra Leone, Guinea, and Guinea-Bissau) that lie on the way to Senegal, will hinder any further extension of the WAGP.

Project Benefits

A study commissioned by Chevron, estimates that 10,000 to 20,000 primary sector jobs will be created in the region by WAGP. New power supplies, fueled by gas from the project, will stimulate the growth of new industry. The industrial growth has the potential to spawn additional 30,000-60,000 secondary jobs. In addition to the $1 billion in investment (WAGP and power facilities) already projected, the study sees approximately $800 million in new industrial investment occurring in the region. The World Bank estimates that Benin, Togo and Ghana can save nearly $500 million in energy costs over a 20-year period as WAGP-supplied gas is substituted for more expensive fuels in power generation. Ghana estimates that it will save between 15,000 to 20,000 barrels per day of crude oil by taking gas from the WAGP to run its power plants. Chevron has signed a 20-year agreement to supply natural gas, via the WAGP, to a 220-MW power plant proposed in Tema, Ghana. Under terms of the contract, the plant will receive 40 Mmcf/d of natural gas.

Environmental Impact

The major positive environmental impact of WAGP will be the development and use of gas currently flared in Nigeria. Research by ecologists suggests that routine flaring of gas at Niger Delta facilities has stunted plant growth and reduced crop yields in the region. Cleaner-burning gas supplied by the WAGP will replace petroleum products used in the generation of electricity.

Several local environmental groups in Ghana, Nigeria, and Togo oppose the WAGP project. Friends of the Earth Ghana argue that environmental impact assessments of the project were not given sufficient priority in feasibility studies. Nigerian environmentalists

estimate that a total of 50,000 families in Nigeria, Ghana, Benin, and Togo could be displaced as a result of the WAGP project.

B. OPPORTUNITIES FOR PARTNERSHIPS

1. CLIMATE CHANGE PROJECT

BACKGROUND

Much of Southern Africa experience drought conditions caused by the absence of rain in both time and space. According to available records, drought conditions have occurred between 10 and 20 year cycles; in the 1960s, 1980s and again in 1991-1992.

As part of an integrated analysis of electricity plans conducted by the South African Power Pool (SAPP) utilities, drought was identified as a major constraint for hydro-producing countries. The impact was evaluated for the plan deemed most sensitive to drought (worst case scenario). The solution, in terms of meeting customer needs in drought impacted, hydro-producing countries, was to strengthen Transmission infrastructure to allow power to be routed from thermal producing countries to those impacted.

This work can be augmented by further research. There has already been drought-related research conducted for Eskom and this information should be reviewed and factored in as part of the above assessment. In addition there are other parties active in this field of research, eg the Zimbabwe Environment Research Organisation (ZERO) has an existing programme to identify long term strategies to cope with recurrent drought in the region.

The severity, probability of occurrence, frequency and duration of drought episodes need to be further determined. These need to be investigated against the compounding effect of climate change. From a technical perspective, the associated costs and benefits need to be determined relating to the infrastrucutural strengthening.

PROJECT STATEMENT / HYPOTHESIS / OBJECTIVE / PROBLEM STATEMENT
Droughts in the Southern African region will severely constrain hydro-producing countries from meeting their electricity supply commitments. This will be exacerbated by the impacts of climate change. A solution is for appropriate interconnection expansion to allow power to go from thermal producing countries to hydro-producing countries.

KEY RESEARCH QUESTION TO BE ANSWERED
What are the probabilities of droughts occurring and how would this frequency be affected by climate change impacts?
What would be the technical requirements and costs associated with strengthening the SAPP transmission grid (interconnection expansion)?
What related regional work could contribute to the study?

What climate change mechanisms could be utilised to fund this work?

ULTIMATE DELIVERABLES OBJECTIVE
Feasibility study on interconnection expansion as a solution to drought impacts on hydro-producing countries to meet supply commitments. In addition, recommendations on future work and implementation of such a plan would be included.

TIME FRAME
It is envisaged that the study would take a phased approach. For the review and feasibility study, it is envisaged that this phase would take approximately one year. More detailed techno-economic studies could then be undertaken during Phase 2 with the view to putting together an investment proposal.

BUDGET: (South African Rand)

ACTIVITY	COST
Project management	100,000
Techno-economic analyses	200,000
Modelling	200,000
Workshop	100,000

MAJOR OUTPUTS PER YEAR
2002 Review of Drought related research
2003 Techno-economic analyses, modelling and definition of an investment strategy

EXPECTED BENEFITS
Mitigation of inability of hydro-producing countries to supply in the case of droughts. Quantification of and development of strategies to address drought related risks in terms of climate change. A return on investment will be based on the avoided costs of realising these benefits.

ACTIONS NEEDED
The initial study on the integrated analysis of electricity plans has been conducted by the South African Power Pool (SAPP) utilities, and drought was identified as a major constraint for hydro-producing countries. The impact was evaluated for the plan deemed most sensitive to drought (worst case scenario). The solution, in terms of meeting customer needs in drought impacted, hydro-producing countries, was to strengthen Transmission infrastructure to allow power to be routed from thermal producing countries to those impacted. Thus the recommended actions are to:

To initiate the study detailed above (to be tabled at SAPP)
To prepare an investment strategy on the way forward to reduce the risks to the region

PARTICIPANTS
As this is a proposed SAPP project, SAPP members will be participants as well as regional centres of excellence for climate change related issues, as well as techno-economic modellers.

It is anticipated that throughout the study, opportunities will arise for capacity building and technology transfer in various areas such as modelling around the impacts of climate change for the region and drought prediction. Thus opportunities will exist for partners, both regional and internationally and will actively be sought as part of the project.

Once the investment strategy has been defined, opportunities will arise for international participation and partnerships.

2. THE ZAMBIA-TANZANYA-KENYA INTERCONNECTION

Strategic priority Enable power trading between excess capacity regions and power shortage regions:

Background
Of the 12 Southern African Development Community (SADC) countries, Tanzania, Malawi and Angola, are the only three not yet connected to the Southern African Power Pool (SAPP), of which they are members. Tanzania and Kenya experience a shortage of supply due to their dependency on hydro resources; Uganda, Malawi, Ruanda and Burundi are likely to require additional capacity in the short to medium term. All the above could benefit from interconnection to the SAPP. The proposed 700 km 330-400 kV line costing US$160-200m, and the proposed 200 km, 330 kV Arusha Nairobi interconnection costing about US$ 40 to 60m will require the strengthening of the Tanzanian grid between Mbeya and Arusha. In addition it is proposed to connect Malawi to Mozambique via the Songo – Blatyre 220 Kv transmission line. These projects will allow excess power from Zambia, the DRC Mozambique and South Africa to reach East Africa at a competitive price level. In the long run, interconnection could be part of an important link to Egypt, the Middle East and eventually Europe. Further these interconnecting lines could provide the platform for telecommunication infrastructure identified as a priority for the Millennium Africa Programme (MAP). The project could be developed on a JV basis similar to the Motraco IPT between Eskom, SEB and EDM described in the main report or could be developed on a BOOT (Build Own, Operate, and Transfer)

Actions Needed
It is considered that power import and export by potential participants will be governed by the well developed SAPP rules. For a private sector investment or a public-private sector participation it is required to obtain agreement and commitment from at least two governments Zambia and Tanzania, but preferably from Kenya to import power through these lines at an agreed price level and quantities. A pricing level study is required prior to such commitment. Further a commitment must be made to support the development and licensing of an Independent JV entity to build and transmit power. A full bankable

feasibility study needs to be undertaken for various capacity options and potential extensions to other countries in the region (e.g. Malawi).

Participants
Obvious participant in such a development are the three governments Zambia, Kenya, Tanzania. Further national utilities and private producers are regarded as the potential exporters of power.

Timeframe
Based on previous studies is it considered feasible to construct the line within 24 months following an agreement on a suitable commercial basis.

3. NATURAL GAS PROJECT
SUPPLY OF LIQUEFIED NATURAL GAS (LNG) TO LOW INCOME HOUSING PILOT PROJECT

Background
Natural Gas is abundantly available in Africa but is in most cases remote from the demand markets. Capital requirements to provide the infrastructure to get this gas to the user are very high, and economic payback for such a project can only be achieved at high gas rates. This implies that domestic consumption of gas to poor households would have to be coupled to a large base local industrial usage before the price of the domestic gas would become affordable. Alternatively, a low cost infrastructure should be developed to allow the cost effective distribution of the gas to the individual consumers.

Goal
The goals of this project are:
To provide a low cost alternative infrastructure to the conventional pipeline gas supply systems, in order to increase the affordability of the Natural Gas as an energy source.
To build up a market demand for gas ahead of putting in a conventional infrastructure, such as long distance overland pipelines. This leads to higher utilisation of this expensive infrastructure from the start, which improves the economic viability of creating the long term gas reticulation infrastructure.
The objective was to develop a pilot case of supplying LNG during the development of a new low cost housing estate. Browns farm in Cape Town was the area selected.

Specific Objectives
Develop the technical specification for a low cost gas supply and distribution infrastructure to supply and distribute LNG to individual households in the Browns farm housing development in Cape Town.
Develop a low cost road transport option to move the LNG from Mossgas to Cape Town.
Note: above, actual working examples used in Poland were referenced.

Define the pricing of the gas to the consumers such that it would be affordable when compared to the alternate energy sources (electricity, kerosene, and coal).
Develop capital cost requirements and evaluate economics to gas supplier. Mossgas in this case.

Deliverables (Targets, performance indicators, assumptions)
The following deliverables were set:
Confirm the technical viability of this lower cost alternative to provide LNG to low income consumers.
Confirm the economic parameters required ensuring that this would be a realistic option for promoting the use of LNG for a low income population.
Propose methods of control to ensure billing and collection of monies.
Develop scenarios of supply that include domestic consumer's only and also domestic and industrial users.
Consider financing plans.

Activities - Milestones
The design of the gas reticulation system to individual households in a housing estate has been completed. The design of the transport and storage of the liquefied gas has been fully evaluated. The affordable gas price has been estimated in the area of application, namely Cape Town.

An economic evaluation has indicated that the economic return would initially be below the commercially acceptable minimum hurdle rate, even taking into account the lower cost infrastructure. However, one can use South Africa's electricity project as an example, of projects, which can eventually achieve commercial scale.

Overall capital cost:
The overall capital required to supply natural gas to the 4000 household pilot area will be of the order of R30 million.

Financing requirements:
Financing would not easily be accessible due to the poor economic returns that are expected. Expected economic payback periods on infrastructure projects are normally less stringent than for pure commercial ventures, but a degree of grant financing would assist the implementation of such a project

Refinery Sector
In many countries in Africa refinery plant problems (under capacity, availability, fires, etc) often lead to acute fuel shortages. Some of the known projects for refurbishment, upgrade or greenfield plant are given below:

4. EFFICIENT LIGHTING INITIATIVE (ELI)

CASE STUDY BACKGROUND/CONTEXT
Introduction

A programme funded by Eskom and the Global Environment Facility has led to the establishment of the South African Efficient Lighting Initiative (ELI), a three-year, R63 million programme aimed at transforming the local market to make use of energy-efficient lighting technologies. The Efficient Lighting Initiative, aimed at reducing electricity demand, increasing efficiency and reducing emissions through the promotion of compact fluorescent light bulbs throughout South Africa, was officially set in motion in Guguletu in the Western Cape, South Africa, at the end of July 2000. It is proposed that the next phase of the project look at rolling out the ELI throughout the SADC region. The details below set out the South African experience in order to demonstrate the potential for the SADC. It is anticipated that s project proposal will be prepared for submission to the GEF. Partners for the project will be sought on the basis of the South African model.

Key Issues
How to address technical, marketing and institutional issues that have to be resolved to create a cost-effective, robust market for energy efficient lighting?
The barriers to more efficient lighting in South Africa are informational, financial, and institutional. The ELI will overcome these barriers by addressing customer education, market co-ordination, product distribution and sales volumes.
A national development priority for South Africa is to raise the living standard of the previously-disadvantaged population through black economic empowerment.

Stakeholders
Key stakeholders include:
Employees
Government
Customers
Investors

OBJECTIVES
The objective of the ELI is to promote the penetration of efficient lamps and luminaires into the South African market. A joint venture company, Bonesa, was set up to implement the ELI programme. The project's objectives include:
Lowering household energy costs, making more disposable income available, particularly to South Africa's previously-disadvantaged population.
To reduce the energy or maximum demand by changing the configuration or magnitude of the load shape. Eskom will thus be able to accommodate the system demand growth using existing capacity.
Creating employment and economic benefits arising from a robust, energy efficient lighting market.
Improving the indoor air quality, health, safety and quality of life for South Africa's most needy citizens.

ACTIVITIES
The ELI programme comprises of the following programme themes:

Public education - The primary objective of this programme is to increase awareness about efficient lighting. The programme includes a broad range of marketing and public relations activities, and feeds directly in to programmes in different income segments as well as commercial, industrial and institutional programme activities.
New bonded homes - The main objective of this programme is to educate financial institutions about “green” mortgages and to make energy efficient lighting a popular option on new bonded housing produced in South Africa.
Reconstruction and Development Programme (RDP) housing and new electrification - Bonesa will make Compact Fluorescent Lights (CFL’s) available to newly-electrified consumers, and new RDP homeowners.
Low-income subsidies/prepayment vendors - This programme activity will develop consumer finance that allows low-income customers to “lease” energy efficient lamps.
Schools programme - The objective of this programme is to highlight the benefits and importance of using efficient lighting to school pupils.
Tertiary schools programme - Bonesa will seek to increase awareness of students and faculties on efficient lighting through providing participating institutions with technical information on lighting, and teaching and study aid materials to lecturers and students.
Commercial, industrial and institutional programmes - The main objective of this programme is to transform the commercial, industrial and institutional lighting market into efficient technologies.

Problems and Difficulties
The following issues became clear during the planning of the pilot project:
The tender price for luminaires was considerably higher than anticipated (South African Rand of 71.60) per unit.
Due to the disparity between the subsidised selling price (South African Rand 10.00) and the actual value of the fitting, the luminaire is a commodity that may lend itself to the establishment of a black market. Strict stock and financial control is required. The will be expensive and difficult to achieve.
The size of the luminaires are such that the space required for storage at Eskom is inadequate. This implies additional expense, not previously anticipated, for storage, transport and insurance.
Whilst Eskom management in the regions were very supportive, staff was hesitant to get involved and it was a problem to arrange meetings and to get commitment to participate in the project. Eskom staff resisted the project on the following grounds:
It implied extra work which was not part of their job descriptions and they insisted on the reclassification of jobs and consequently better remuneration
If the project were successful it would lead to a reduction in electricity sales and consequently income to Eskom which could lead to retrenchments.
Contrary to our initial understanding, houses in the rural areas tend to have more than one room. According to Eskom field staff, houses have an average of four rooms.
Political problems will be experienced with villages that have been electrified if neighbours get a subsidised energy efficient light, and they do not. Villages that have been electrified some time ago cannot be excluded from the programme if their newly electrified neighbours benefit from it. The focus can therefore not only be on newly electrified homes.

Word-of-mouth would be an important motivator to purchase efficient lights. It may be better to supply lights to households that are already consuming electricity, and could see the difference that energy efficient lights make to their electricity consumption patterns. The willingness of people in the low-income sector to purchase integrated CFLs should not be underestimated. Observations at mall promotions have shown that they are currently purchasing a substantial portion of the CFLs sold via the current subsidy programme.

These issues are now being addressed.

RESULTS

Significant milestones achieved by the ELI team in the first six month development phase of the programme include:

Execution of a joint advertising campaign with Osram to promote the sale of CFLs;
Continued networking with all manufacturers, retailers, government officials, academics, marketing organisations, etc, to keep up motivation and interest in potential involvement in the future;
Regular articles, features and advertisements in trade and consumer media;
Purchase of a mini-database including registered building developers, contractors and architects in South Africa;
Input into the Minister of Minerals and Energy's budget vote speech;
Support and sponsorship of the 8th International Domestic Use of Energy (DUE) conference in Cape Town;
Launch of the 8-meter giant CFL at the Johannesburg Stadium;
Continued participation in the South Africa National Defence Force Awards for Environmental Sustainability, culminating in the presentation of the Elektro-Wise Award for Energy Efficiency;
Contribution to the Eskom/702 Winter Schools Programme Initiative;
Production of the ELI brochure;
Representation at the ELI 7-country conference in the Czech Republic;
Production of a Corporate Brand Identity Manual for Bonesa.

LESSONS LEARNED

Various important lessons have been learnt during the course of the above activities. These include:

Future planning is essential, as are realistic lead times when organising promotional (and other) events.
Pre- and post research is necessary for continuous feedback to the programme.
It is important to keep the web-site current and dynamic, as well as offer a toll-free telephonic service. It has been found that after promotional events and advertising campaign roll-out, Bonesa phones are inundated with calls.
Interaction with stakeholders is critical. In the case of the Festive season events, increased awareness was attained, but very few lamps were sold. This was mainly due to the fact that there had been insufficient interaction with stakeholders.
A key lesson to Bonesa is that careful scrutiny of contractors is vital if the programmes are to be successful.

A key barrier inhibiting investment in energy efficiency in commercial, industrial and institutional sectors is that the price of electricity is too low, and therefore payback periods are too long. Essentially, customers do not have adequate incentive to invest in technologies and practices of this nature. The team intends to open up communication with the National Electricity Regulator in this regard.
Another barrier is that efficient technologies are expensive – or rather, that there is little incentive to invest in them given that existing equipment is "paid off and working well." It is Bonesa's view that one way of addressing this barrier is through aggregating the sales of energy efficient products, thus creating economies of scale that could potentially reduce the high cost of Energy Efficient products.
It has become clear to Bonesa staff that its projects are highly reliant on the response of the respective companies that have been approached. This makes longer term planning more difficult for Bonesa. Furthermore, Bonesa must await response from companies, once approached. Attainment of this response can take many months.
It has also become evident that in the light of the barriers currently inhibiting investment in energy efficiency in the commercial, industrial and institutional sectors, showcasing examples of how these barriers can be successfully reduced are becoming more and more necessary.
One of the findings of this review is that Bonesa's ELI programme has been slow to start. The exception to this finding is the Public Education programme which appears to be rolling out very successfully.
Most importantly, Bonesa is attempting to roll out a programme entailing a concept, which is fundamentally new to many South Africans. Most of the programmes do not have South Africa (or other developing country) experience to draw from, and international experience has tended not to be that useful. The learning curve has been very steep for all Bonesa staff, in particular staff of the RDP and Electrification & Low-income subsidies programme. There are clear signs, however, that this learning curve is flattening out – that Bonesa is learning how to deal address prevailing barriers, and to apply past experiences.

5. REFURBISHMENT PROJECTS

Project Refurbishment of refineries (Nigeria) - on going
Project Refurbishment of refineries (Kenya) – under study
Project Upgrade/Capacity increase of Natref (RSA) on going
Project Green field Development Lobito (Angola)

6. PROJECTS IN AFRICA USING NUCLEAR TECHNOLOGY

BACKGROUND

AFRA
An inter-governmental agreement called AFRA was established in 1990 to promote the development of nuclear science and technology in Africa.

AFRA is an acronym for **"**African Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology. Currently 26 African countries are members: Algeria, Burkina Faso, Cameroon, DRC, Cote D'Ivoire, Egypt, Ethiopia, Ghana, Kenya, Libya, Madagascar, Mali, Mauritius, Morocco, Namibia, Niger, Nigeria, Sierra Leone, South Africa, Senegal, Sudan, Tanzania, Tunisia, Uganda, Zambia and Zimbabwe.

Although AFRA receives funding from the International Atomic Energy Agency for many of its projects, additional funding has to be sought from other donor organizations, or Governments.

IAEA TECHNICAL COOPERATION

Many IAEA member States, for example South Africa, also receive funds directly from the IAEA for approved projects so-called Technical Cooperation funding. Some countries have performed a needs analysis and developed a "Country Programme Framework (CPF) " that helps to identify and prioritise projects. Dr. Steve Lennon chaired and facilitated the workshop held in August 1998 to develop the South African CPF.

AFRA AND SOUTH AFRICAN CPF PROJECT THEMES

The following are some key themes of AFRA and South Africa's IAEA-TC activities. The projects indicated are those which have a direct connection to South Africa, either because they are being undertaken in SA or because expertise from SA is utilised.

A review would be required of the status of the projects to determine if they could be accelerated (for example through additional funding) or if they could be extended to other countries.

Not all African countries are members of AFRA and/or the IAEA, for example of our neighbouring countries, Mozambique is not a member, and Botswana only became a member this year. A possible opportunity would thus be to extend some of the projects to these African non-IAEA States or those that have only recently joined.

1. HUMAN HEALTH

In one form or another, most hospitals in Africa use radiation and radionuclides for medical and biological purposes, primarily for the treatment of cancer and for medical diagnosis.

An area of special interest is radiotherapy. Costly radiotherapy facilities for curative and palliative treatment of cancer have been established in many African countries. However, most of these facilities are not providing optimal services owing to several factors. These factors include the inadequate supply of indigenous specialists, such as radiotherapists, medical physicists, and radiographers, which is limited by the high cost of overseas

training (and the attractive job opportunities offered by foreign clinics to graduates). A related problem affecting the quality of treatment appears to be the various standards of quality for radiotherapy, which results from the fact that the practice covers a wide range of techniques and approaches. Several AFRA States are now working to introduce a regional quality assurance programme to improve their national capabilities for radiotherapy practice, to optimize the utilization of existing radiotherapy facilities by introducing new clinical techniques in teletherapy and brachytherapy, and to upgrade and support existing regional training centres to enable them to answer the most pressing needs of the region for trained personnel. These activities should also contribute to increased awareness in countries about rational and comprehensive programmes for early detection of cancer.

A regional external quality scheme is being set up to pave the way for gradual introduction of early screening of neonatal hypothyroidism.

Projects which can be extended into other developing countries:
Auditing of Radiotherapy facilities: South African experts from State Hospitals have been requested to audit facilities in Libya and Nigeria. Tunisia has been completed.
Auditing of Nuclear Medicine facilities: Experts from South African State Hospitals have undertaken missions to Ethiopia, Zambia, Zimbabwe and Namibia.
Technology to **upgrade gamma cameras** has been tested in South Africa. About ten gamma cameras in South Africa can be converted to digital machines at a tremendous cost saving.
Molecular techniques are being used to diagnose **drug resistance in Tuberculosis**. This work, with IAEA assistance, has established new technology to bring down diagnosis times from two months to two days.
The project in **neonatal screening at the Johannesburg Hospital** has been extended to include about twenty hospitals in the Northern Province.

2. FOOD AND AGRICULTURE

The agriculture sector is the mainstay of the economy of many African countries and sustains the lives of more than 80% of the population. Many adverse factors affect development unfavorable climatic conditions, recurrent droughts, insufficient water resources in the Sahel, North, Eastern and Austral Africa, and accelerating environmental degradation, notably desertification, deforestation, declining soil fertility, and erosion. Analysis of current trends reveals that in order to meet the needs of the continent's population, a 70% increase in crop production up to the year 2010 will have to be attained through yield increases and intensified farming. This will require an agricultural development strategy that combines the imperative of food security with the rational management of natural resources and protection of the environment.

Within the agricultural sector, the rearing of livestock is a key component. On average, when both their direct and indirect contributions are taken into account, livestock account for half of the agricultural output and may represent up to 25% of the gross domestic product of African countries as a whole. The productivity of livestock greatly affects the

livelihood of smallholdings that constitute the majority of farming systems in sub-Saharan Africa. Besides being a source of draught power, they produce meat, milk, and wool for local populations and, in some countries, for export.

The AFRA programme in food and agriculture supports collaborative efforts to use appropriate technologies to consolidate and improve research capabilities for crop and livestock production. Current projects deal with food preservation using irradiation technology, animal reproduction and nutrition, and crop improvement by mutation breeding and biotechnology.

Food preservation

Post-harvest losses of foodstuffs in Africa sometimes run as high as 50%, and the technology of food irradiation is seen as playing a potentially valuable role in reducing these losses, especially for grain, vegetables, root plants and fruits. Several African countries have shown keen interest in the use of this technology for food preservation and some have already established pilot food irradiation facilities to pave the way for the introduction of the technology on a commercial scale. This common interest has prompted Algeria, Egypt, Ethiopia, Ghana, Kenya, Libya, Madagascar, Mauritius, Morocco, Nigeria, South Africa, Sudan, Tanzania, Tunisia, and Zaire to initiate an AFRA programme based on mutual co-operation and sharing of experience. Activities were initiated in 1991 and since then 55 scientists from these countries have been trained in basic aspects of food irradiation technology.

Animal reproduction and nutrition

Although many African countries have established national laboratories, mainly through IAEA assistance, for studies on animal reproduction and nutrition, many of them realized the need to enhance their facilities. As a result, they initiated an AFRA programme to use standardized services for Radioimmunoassay (RIA) and for blood nutrient analysis, and to facilitate co-ordination and promote the exchange of information and experience. Eleven countries now are participating in this endeavor, and their present emphasis is on conducting intensive training courses for scientists. Areas covered include milk production and reproductive performance of indigenous and crossbred dairy cattle; supplementary feeding strategies using locally available feed resources; an investigation into the effect of trypanosomiasis on the reproductive performance of goats; a field study to investigate the influence of mineral deficiency on fertility of dairy cattle and camels and its impact on productivity; and a project to develop facilities and sustainable systems for agriculture and animal production in desert conditions.

Plant breeding and genetics

Africa's future food production depends to a significant extent on the ability of crops to tolerate difficult soil and water conditions. The application of radiation-induced mutation techniques combined with selected biotechnologies can play an important role, and most AFRA States have established national capabilities in mutation breeding. Some of them are already using their irradiation facilities for routine irradiation of seeds and plantlets in efforts to breed crops that are more resistant to disease or which require little water. In-vitro culture laboratories are now established in at least five countries.

IAEA-supported activities have led to some achievements; in particular the development of improved varieties of cassava, plantain, and wild African rice. In general, however the results have not yet been transferred to the end users. The need to consolidate experience and to bridge the gap between research laboratories and farmers prompted 12 AFRA countries to establish a regional programme for this purpose. So far, the activities have concentrated on training, and plant breeders from 11 AFRA countries have been trained.

Projects which can be extended to other developing countries:
A project aimed at **emerging cattle farmers** is being established in South Africa. The use of radioimmunoassay techniques to increase the success rate of artificial insemination and to diagnose pregnancy will increase the income of this important group in our agricultural sector.
South Africa continues to play an important role in the development of **improved crops using mutation breeding.** The Vegetable and Ornamental Plant Institute has been pre-selected as an AFRA Regional Designated Centre.
The programme **to eradicate fruit fly in the Western Cape using the Sterile Insect Technique** has achieved remarkable success in its pilot project in the Hex River Valley.
A programme to determine the feasibility and desirability of **tsetse fly eradication** (including the use of SIT) in N-E KwaZulu Natal has begun.
In the veterinary field, we are attempting to breed pigs resistant to **African Swine Fever** as well as establishing a **national reference laboratory** to determine residues of **veterinary drugs in animal products**. The latter will be crucial to protecting our export markets.

3. WATER
Access to sufficient quantities of quality water is a problem in many African countries.

Projects which can be extended to other developing countries:
Work in an impoverished area of the Northern Province to investigate the **sustainability of underground water resources using isotope hydrology** has been undertaken since 1999 and preliminary results seem to indicate that the Taaibosch aquifer can sustain 60 000 people and not 600 000 as estimated previously. This result was achieved in a short period of time and will save this precious resource from over-exploitation.
Isotope hydrology is being used to ascertain the sustainability of aquifers in Gauteng and the Western Cape.
Dam leakage detection: A team consisting of South Africans has been established and members have participated in a number of missions.

4. OTHER POSSIBLE PROJECTS
The detection of land mines using nuclear techniques is something that has recently being receiving attention. It could be of huge importance in countries such as Mozambique and Angola.