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Is there a future without oil?

INTRODUCTION

During May 2005, the South African New Economics Network (SANE) sponsored and arranged a lecture tour by Richard Heinberg. Heinberg is an academic from California, who has studied future oil supplies for the past ten years. In his work, he gives particular attention to the economic, social and political consequences of a decline in the availability of petroleum. He is the author of two books on the subject: 'The Party is over', published in 2003, and 'Powerdown' which appeared a year later. His writings, not surprisingly, are aimed primarily at a readership in the USA, but this does not detract from their applicability elsewhere because the oil industry started in that country, which remains by far the largest energy user in the world. America, therefore, provides an objective lesson for the rest of the globe.

During his tour he addressed audiences, totalling several hundred people, including government officials and some senior business figures in Cape Town and in Gauteng. He was interviewed on both radio and television. A remarkable feature was how sympathetically his views were received in South Africa.

HEINBERG'S MESSAGE

Petroleum, in common with all other minerals, is a finite resource. That the world will, one day, run out of petroleum, is therefore, beyond dispute. When that day will come is, however, the subject of a great deal of controversy.

Heinberg provides a well-constructed case that the subject is an immediate and pressing problem deserving serious attention. He contends that the governments, business leaders and economists of the world deny that any problem exists and that they behave as if it is 'business as usual' and 'market forces' will produce adequate solutions. His own government comes in for particularly severe criticism. Heinberg contends that now is the time for the global community to plan for a totally different economy and life style.

Heinberg makes good use of quotations from others in his presentations and writings. One that encapsulates much of his philosophy is:

> In 1859 the human race discovered a huge treasure chest in its basement. This was oil and gas, a fantastically cheap and easily available source of energy. We did, or at least some of us did, what anybody does who discovers a treasure in the basement – live it up, and we have been spending that treasure with great enjoyment.

Heinberg presents data, which show that, following that first dramatic discovery of petroleum in 1859, a series of huge finds were made within the USA over the next 70 years, reaching a peak in the 1930s. Since then, finds have become fewer and smaller. No significant discoveries have been made in the lower 48 states in the last two decades.

The presence of those large oil

IN THIS ISSUE

resources stimulated the birth of the age of the motorcar and with it, large-scale oil demand. US oil production responded to meet the demand, and by 1970 was nearly 10 million barrels per day. That figure was, however, the peak that US domestic production could achieve and that level proved unsustainable. Following that production peak, which occurred 40 years after the peak in discoveries, production has been in decline. Present day US oil production in the lower 48 is about 4 million barrels per day.

Since 1970, US demand for energy in all forms, including oil products has continued to climb inexorably. To sustain that demand, the US has had to import oil (and gas) on an ever-increasing scale. At first, this came from within the Western hemisphere, from Canada, Mexico and the Caribbean. Now, most of the imports can be sourced only from the Middle East, (Mexico has also now become a net importer of fossil fuel).

What effect has this decline in domestic oil production had on the major characteristics of the US economy? Heinberg points to the following spectacular turn around in just over 50 years.

In 1950 the USA was:

(a) The largest exporter of petroleum products in the world.
(b) The largest lender of finance to foreign countries in the world.
(c) The world's largest exporter of manufactured goods.

In 2005 the USA is:

(a) The world's largest importer of petroleum.
(b) The country with the largest foreign debt in the world.
(c) The world's largest importer of manufactured goods.
(d) Has the largest balance of payments deficit in the world and debts growing by $2 billion per day.

Heinberg believes that, despite the continuing growth of the GDP, it is not possible to sustain such a level of debt indefinitely, and that a major collapse of the US economy will occur.

The USA is, of course, not the only country that has built its prosperity during the last 100 years on fossil fuels and debt. Richard Heinberg points out to us that we have all, to varying degrees, drawn upon that 'treasure in the basement'.

He puts forward evidence that petroleum discovery in all other countries will follow the pattern experienced in the USA; i.e. discoveries reaching a peak and falling off, followed a few decades later, by a peak in production and decline thereafter. In the North Sea and in Indonesia, this has already occurred.

The countries of the Middle East contain by far the majority of the world's declared reserves of petroleum. The reliability of the figures is difficult to verify independently and the source data are, in some countries even state secrets. Heinberg pointed to some surprising jumps in the declared reserves of most of the OPEC countries soon after that organisation agreed upon production quotas for each member proportional to their reserves! He goes on to show evidence that suggests that globally, recent discoveries have become less numerous and smaller than in earlier years, and that they are failing to keep up with the increasing global demand. (This view was supported by a recent press item, which quoted an OPEC official as saying that quotas are no longer meaningful because no spare production capacity exists).

This brings Heinberg to the subject of blossoming demand. Since the Industrial Revolution growth of energy consumption and economic growth have gone hand in hand, some developed countries in the west may now have reached a plateau in fossil fuel energy usage, partly by leaving energy intensive industrial activity to others in the Far East, and partly by internal efforts to economise. Future demand growth is likely to be mainly in the developing world, with the lead being taken by China and India where populations are largest. China is now the fastest growing major economy in the world. It is also the fastest growing energy consumer and the second largest importer of petroleum products, after the USA. This newfound prosperity has made the Chinese wish to live like Americans! The energy for them to do so is just not there. Heinberg says, hopefully and without any conviction, 'someone must tell the Chinese to abandon their dream of owning BMWs'. Obviously nobody is going to do so. Instead China will increasingly challenge the USA for the limited supplies that are available. Prices will inevitably climb under those circumstances.

The least privileged people of the world have every right to demand access to an improved life. Never mind a BMW; a nutritious meal, a decent toilet and a tap would be riches indeed to many. Some governments, including South Africa's, are striving to fulfil these modest demands, but they hope to do it by 'growth', which, Heinberg contends, is based upon energy, which will not be there!

Heinberg puts forward a number of scenarios on the ways in which the global communities and their governments might react to a growing gap between demand and availability. One of these scenarios Heinberg calls 'Waiting for the Magic Elixir'. In this he reviews, dismissively, just about all the alternatives to conventional fossil fuels. In some cases, his arguments are valid, in others, not so. Space does not permit discussion of his criticisms on a case by case basis and readers of 'Energy Management News' will already be familiar with most of the arguments, for example, those regarding oil extraction from tar sands, and for and against nuclear power and wind power. From this, Heinberg concludes that there are no long term alternatives to fossil fuels and he uses that conclusion as the base to build his main message that, do what you like, a radical change in life style is on the horizon for us all. Hence, the title of his first book ' The Party is over'.

He proceeds to describe some possible courses of action by governments and communities. The first of these he calls 'Last Man standing'. In this, powerful nations ride rough shod over everyone else and he is quite explicit in citing the US as the prime player in that league. He quote 'the Carter Doctrine' of 1979 which states that the US would be willing to use military strength in order to maintain access to the oil in the Middle East. Recall that in 1979, the US was not the only super power in the world; the Soviet Union was then available as a restraining influence. How much more feasible is such action by the present US Administration? The outcome to be expected from such a course of action is global tragedy.

Even without global warfare, the picture that he paints is pretty bleak. He draws our attention to evolutionary history during which some species have flourished, become too numerous, and then crashed due to a shortage of the resources that promoted their success. He believes that the huge human population on earth is just too great to be supportable, without the input of a large quantity of energy for the production

and transportation of food. Thus, a population fall must occur; either by famine, disease and war, or by voluntary constraint.

Next he refers to Richard Dawkins book 'The Selfish Gene'. In that book, Dawkin puts forward the idea that individual genes 'use' human bodies only as carriers of themselves in order to replicate themselves at the expense of, and in competition with, other genes. If this is indeed the case, then cooperation to limit human population is unlikely and rape and warfare are to be expected! Heinberg, however, believes that Dawkin's view is too pessimistic and that a 'species wide effort towards self limitation' is possible. The limitation to which he refers has to start with a cultural change to a less competitive, less consuming society and a more localised economy. This concept he develops in a scenario, which he calls: 'Building Lifeboats'. For the benefit of his American readership, he argues that 'Last Man Standing' can only temporarily shift the problem from the strong to the weak. Similarly he contends that to look for the magic elixir can only buy time. So, he surmises, perhaps collapse of the organised industrial, capitalist, city based, transport dependent, society that we now know is inevitable? He asks: does all culture and civilisation have to go with it, leaving us in a primitive state with only vague memories of something better that went before? (Aldous Huxley described that situation in 'Ape and Essence' decades ago.) Heinberg goes on to suggest, in some detail, responses to counter such a possibility. The following quote, which he calls the 'Sermon on the Collapse', is enough to convey the idea.

> Blessed are those who depend less on modern technology, for they have not forgotten how to take care of themselves.
> Blessed are those whose culture is communitarian and not individualistic, for they will share and prosper.
> Blessed are those who have no exploitable natural resources, for no one will bother them.
> Blessed are those who know how to grow food, for they will eat and feed others.

COMMENT ON HEINBERG'S MESSAGE

As stated in the Introduction, there was almost no strongly adverse reaction to Richard Heinberg's presentations in South Africa. There was even guarded support from quite unexpected quarters. This may well be because his lecture presentations skated rather lightly over the more extreme features that appear in the books. This was particularly so with respect to over population and US government policies. The latter omission was deliberate and sensible in a country where his attacks upon the present US Administration have less immediacy. Why he chose to play down the former issue, in Africa of all places, is obscure.

Readers of 'Energy Management News' are far better qualified than this writer to analyse Heinberg's evidence and conclusions regarding supply and demand of petroleum, but the following point seem to stand out for comment.

Heinberg is probably pessimistic in his forecasts of future petroleum discoveries and production. It seems likely that he gives insufficient credit for future technological developments. These will enable us to find and exploit deposits at greater depth and to recover a far larger percentage of the total resource than has been possible hitherto. Furthermore, resources in the ground only become recoverable reserves if they can be worked at a profit. Hence, reserves grow as price increases. An uneconomical deposit at $20 per barrel becomes interesting at $40 per barrel and exciting at $100 per barrel. Furthermore, increasing oil prices increase the viability of all the competing sources of energy, including some that Heinberg dismisses as 'too expensive.'

This writer takes the view that the real need, in South Africa and elsewhere, is for increased funding and encouragement for research into all energy related subjects.

There is an ever-growing belief that global climate change is a real and major threat. Heinberg, surprisingly, makes little use of this aspect in his arguments. In contrast, The Economist of 30th April 2005, in a major survey on oil, suggests that global climate change, rather than price, will be the most effective factor driving constraints on future use of fossil fuels.

Despite these reservations, Heinberg has to be only 'half right' on supply and demand for one to acknowledge that world opinion is focusing attention on all too short a time scale on energy supply and that present policies for restrain on demand are inadequate. Heinberg's more philosophical views on lifestyles are probably outside the scope of this publication.

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What's been discussed in Parliament

This article summarises the Minister of Minerals and Energy Budget Speech, and the Budget Vote Speech, by the Deputy Minister of Minerals and Energy. Both speeches were made to Parliament RSA on 19 May 2005.

DME BUDGET

For the 2004/05 financial years, the Department of Minerals and Energy (DME) received a budget of R1.945 billion. Of the total budget of R1.9 billion, 82% was allocated to transfers and subsidies to public entities and municipalities, leaving the Department with a net budget of R360 million.

The Department also received donor funding of R14.77 million from several foreign donors for the implementation of capacity building and non-grid electrification programmes. The Department was able to utilise 89.3% of donor funding during the 2004/05 financial year. The actual revenue collection for the year under review was R4 million more that the projected revenue of R109 million.

ENERGY

The DME's Energy Policy is based on the following key objectives:

- Attaining universal access to energy by 2014;
- Accessible, affordable and reliable energy, especially for the poor;
- Diversifying sources of primary energy and reducing dependency on coal;
- Good governance, which must also facilitate and encourage private sector investments in the energy sector; and
- Environmentally responsible energy provision.

Progress has been made with regard to each of the above objectives:

- We have continued to progress the electrification programme, although we have slowed down with sparsely populated areas. We now do 635 connections per day, as opposed to 800 per day connections in the past. Access to electricity is now at 71%.
- We have advanced plans for the establishment of the South African National Energy Regulator which will replace the National Electricity Regulator, and it will also regulate gas and petroleum pipelines.
- We are ready to establish the National Energy Research Institute (NERI). The DME and the Department of Science and Technology (DST) will be putting a board in place and recruiting the CEO.
- The Liquid Petroleum Gas (LPG) industry has begun rolling out to poor households on a pilot basis.
- We are ready to hand over Free Basic Electricity policy implementation to the Department of Provincial and Local Government (DPLG), and we have identified barriers and solutions to implementation. Our intervention has added 3.5 million qualifying recipients, and much more needs to be done, to bring in more recipients.
- We have an Energy Efficiency Strategy, which sets targets to be achieved by 2014. The strategy has been embraced by large companies, which will implement energy efficiency in their own companies and adopt our targets, for reduced energy demand of 12% by 2015.
- Progress is being made in the procurement of generation capacity. Eskom will bring to production 3000 MW from mothballed power stations. The DME is busy with a tender process for the procurement of 1000 MW through Independent Power Producers, which should be commissioned in 2008.
- The first Regional Electricity Distributor will be established in July 2005, as announced by the President.
- The Designated National Authority was launched at the end of May, with 7 projects already identified.
- All the oil companies have engaged Black Economic Empowerment (BEE) partners except for Sasol, which has yet to make significant progress on its transformation issues.

Our energy sector is faced with some challenges as well, some of which are driven by external factors such as the escalating oil price. South Africa spends 15% of its total import bill on oil imports. The determination of the price at which we buy crude oil is out of our hands as South Africa is an importing country. The price of oil has a significant impact on the economy. The strong Rand has helped to mitigate the impact of the oil price spikes on the economy.

PetroSA, our State oil company has been busy on three fronts; securing additional oil blocks in Africa, finding additional gas supplies, and developing a new gas-to-liquids technology that may one day challenge the world leaders in this area. This new gas-to-liquids technology and its oil partnerships in Africa give PetroSA strategic and geo-political importance out of all proportion to its size.

FUEL EFFICIENCY

With May being Energy Efficiency Month, it gives us an opportunity to re-revisit the progress made on Energy Efficiency. As far as fuel efficiency is concerned (particularly for motorists) there is huge potential to save money by using the fuel-efficient tips that we

have been publicizing. Some R7.5 billion per annum could be saved by South African motorists, if tips were followed.

ENERGY EFFICIENCY

We have a history of over capacity in electricity, which has made power in South Africa cheap and reliable. Electricity has been a contributor to our economic growth and service delivery to the poor.

During the Energy Efficiency month, the Energy Efficiency Strategy was announced. It aims to reduce energy demand by 12% by 2015. This Strategy includes Eskom's Demand Side Management.

Last year, Eskom exceeded its efficiency targets. Municipalities are also implementing their own Energy Efficiency strategies. 32 large companies have joined forces with the DME and Eskom by signing an Energy Efficiency Accord, committing themselves to targets contained in the DME strategy.

To encourage them, they will be recognised at the annual ETA Awards. This is an important beginning to a changed mindset.

Appliance labelling campaign

To assist households to be more energy efficient, the appliance labelling campaign is being implemented. In future, consumers will know how efficient an appliance is because of the label on it. We have started with refrigerators.

Energy Efficiency Audits

The DME is working with the Department of Public Works and Eskom to retrofit government buildings to make them more energy efficient. We are now saving R600 000 in electricity bills per annum.

GENERATION CAPACITY

To secure our future, South Africa is pursuing a policy of diversifying energy sources and no energy source should be discriminated against. The higher the contribution of an energy source in our energy mix, the greater security of supply and the more that the DME are likely to support and invest in the development of that energy source. In this regard, nuclear energy is here to stay, just as renewable energy, which is mainly important for its contribution to the reduction of greenhouse gas emissions.

NUCLEAR REGULATION

We have continued to focus on improving nuclear safety and governance of the nuclear sector. We have published the nuclear waste management policy through public participation.

In order to enhance awareness on radioactive waste management, capacity building workshops were held in the Northern Cape, Western Cape and Gauteng.

A radioactive waste policy is being submitted to Cabinet for final approval in August 2005.

NUCLEAR ENERGY AND THE PBMR

Uranium and coal are the two raw materials that South Africa has in abundance for its power generation, and can contribute to ensure security of supply. We intend to use our uranium to support our growing nuclear industry. South Africa is at the forefront of developing high temperature reactors in the form of the Pebble Bed Modular Reactor (PBMR) and, we will for that reason, declare Uranium as a protected mineral resource. We will announce a special dispensation for licensing uranium exploration, prospecting and mining.

The National Energy Regulator of South Africa (NERSA)

The need for public education about energy remains a challenge. We need education on energy efficiency, cleaner energy, and the dangers of paraffin and coal use in households.

The health expenses associated with domestic coal combustion are about R1.2 billion per annum. We are continuing to educate households about the basa njengo magogo technique, 16 000 households are now using this method in Orange Farm. This winter we hope to reach 40 000 more households.

HUMAN RESOURCES DEVELOPMENT

The Department of Minerals and Energy developed and endorsed the mentorship policy, so as to implement the Skills Development Act and to support the principle of equal opportunities for all (EEA).

Mentorship programmes will complement other initiatives like the internship, learnership programmes, scarce skills and retention programmes.

HRD Master Plan

The Department developed an Human Resource Development (HRD) Master Plan, which is aimed at providing short, medium and long term solutions to the skills shortage and gaps that exist in the Minerals and Energy sectors in order to ensure an adequate and sustainable human resource supply for the entire industry.

This process was a consultative one, which involved all stakeholders that are responsible for skills development in the sectors. An implementation plan has been developed, and it highlights all strategies that would be put into place to ensure that the minerals and energy sectors implement GDS agreements, as well as ensuring that targets as contained in the Charters are met.

ELECTRICITY DISTRIBUTION INDUSTRY

The progress made towards the establishment of RED 1, which will be in Cape Town, is another milestone for the DME. This is the biggest industry restructuring South Africa has ever seen. The Electricity Distribution Industry (EDI) is valued at R50 billion. The path for RED 1 has been developed with the greatest detail, with 1 July 2005 as the RED 1 day. There are overarching policy challenges, which Cabinet still need to resolve.

INTEGRATED NATIONAL ELECTRIFICATION PROGRAMME

A lot of progress has been made towards universal access to electricity. The Integrated National Electrification Programme has delivered 232 287 household connections at R582 million, 2233 schools at R100 million and 50 clinics at R118 million. The programme is focussing on the creation of bulk infrastructure especially in areas where it has become impossible to connect new households to the network without reinforcement. The erection of bulk infrastructure has enabled local development in the nodal zones like OR Tambo district and Maluti a Phofung in the Free State. Backlogs have been completely eliminated in the Kgalagadi Node and Western Cape schools.

New jobs and small, medium and micro enterprise (SMME) opportunities in KwaZulu- Natal, Eastern Cape and Limpopo have been created as a result of the non-grid electrification of the schools program. The maintenance of the schools will result in permanent jobs defined in terms of the non-grid learnerships that have been started.

About 1 100 schools have been

completed under the non-grid electrification program to fast track school universal access. This represents more than 50% of the total number of schools electrified in the past five years, and this was achieved in one year. School electrification is done parallel with installation of e-leaning facilities i.e. satellite dish and educational content and computer installation, to ensure that children become computer literate sooner, rather than later.

Three co-operatives, with over 10 permanent employees each, have been started in the Eastern Cape to maintain 8000 solar home systems installed under the previous electrification program. Forty thousand households in the Eastern Cape, Limpopo and KwaZulu-Natal were electrified using the same technology to provide lighting using the facility for electronic communication.

HYDROCARBONS AND RENEWABLES

Renewable energy

The Renewable Energy Act will be passed this year. A number of projects and initiatives are underway at the Central Energy Fund (CEF), including a low smoke fuel project, hydropower, and bio-diesel.

Later this year, we will begin subsidizing renewable energy investments.

A renewable energy strategy to detail implementation plans for each of the technology options to be introduced during the ten year period of the target, will be released in the third quarter. The key elements are:

- Development of market rules, which provides preferential access to the grid and customers for renewable energy power producers;
- Introduction of incentives to facilitate the development of viable business cases for generators. We are in the process of developing a framework for the generation of power from sugar cane bagasse and landfill gas; and
- A roll out programme for solar water heaters has commenced, with the focus on middle to high-income households in Gauteng, Western Cape and KwaZulu-Natal. This initiative is spearheaded by the CEF.

A positive record of decision for the Environmental Impact Analysis for the Darling Wind Farm was obtained. This has paved the way for the establishment of the Independent Power Producers (IPPs) and construction of wind turbines.

Liquid Petroleum Gas (LPG)

Government wants to see both rich and poor using LPG for cooking and heating, so as to reduce the need for big investments in power generation.

The LPG Association members had promised that they would 'connect' 250 000 low income households by March 2005, and a further 3 million by 2008. The targets have not been met because of many obstacles, which have to be addressed.

Only 23 000 households have been 'connected'. The price of LPG and the cost of the cylinders need to be looked at. Lowering the price of cylinders, particularly the steel costs, and the price of the gas itself, is a must for us to make progress. Once we have affordable prices, then a large market will open up. Constructive discussions with the steel producers and the LPG Association are taking place.

Eskom is supportive, and can only justify their support for the initiative if there are clear electricity Demand Side Management (DSM) benefits. The industry is donating 120 LPG cylinders and stoves to Members of Parliament for use in their constituencies and homes to educate themselves and the public. In addition, two workshops will be hosted in Cape Town (at Parliament), where Members will get vouchers, which they can use to redeem the stoves in different parts of the country.

The liquid fuels industry will, for the first time, be licensed this year. The objectives of the licensing framework as detailed in the Petroleum Products Amendment Act, 2003, include: promotion of an efficient manufacturing, wholesaling and retailing petroleum industry; facilitation of an environment conducive to an efficient and commercially justifiable investment; promotion and advancement of historically disadvantaged South Africans; and the creation of employment opportunities and the development of small businesses in the petroleum sector.

Gas Trade Agreement – Mozambique

The private sector and the Mozambique government have expressed an interest in building a petroleum pipeline from Maputo to Witbank. The Gas Trade Commission will facilitate this initiative, until a Petroleum Products Trade Commission has been put in place.

LNG Project – Coega

A feasibility study by Eskom, Shell and iGas on the possibility of a gas-fired power station at Coega is underway. Gas for the project, if it goes ahead, will be supplied by Shell in the form of Liquefied Natural Gas (LNG) thus creating significant employment opportunities during the construction of a regasification terminal. An engineering study is in progress and the agreement between participating members is to be finalised shortly.

INTEGRATED ENERGY CENTRES (IEC)

The DME plans to launch IECs in the following local municipalities between now and March 2006: Moshaweng (Northern Cape), Ratlou (North West), Mutale (Limpopo), Greater Tubatse (Limpopo), Newcastle (KwaZulu-Natal) and King Sabata Dalidyebo (Qunu, Eastern Cape). Sasol and Total are to be commended for their continued commitment to the rollout of IECs.

The IECs are a beacon of hope to communities that Government is beginning to deliver on its promise of giving them a wider variety of energy choices.

WOMEN IN ENERGY IN SOUTH AFRICA (WOESA)

The DME, together with its associated institutions and industry, continue to support the women organisations in energy.

The CEF's Energy Development Corporation has taken a 49% stake in a R72 million hydroelectric plant near Bethlehem in the Free State. A shareholders agreement was signed with HydroSA, an affiliate of Woesa.

WOMEN IN NUCLEAR SOUTH AFRICA

The Department of Minerals and Energy hosted the Annual General Meeting of Women in Nuclear South Africa (WINSA), which continues to enjoy increased membership and support.

An outreach programme to institutions of higher learning is planned.

PARAFFIN SAFETY

The hazards associated with paraffin, is a concern to the Department. The consequences of accidents can be devastating on individual consumers and their families.

To address this, we have completed the new National Standard for Non-Pressure Paraffin stoves and heaters and are currently awaiting final

approval from the Standards Approval Committee at the South African National Standards. This is anticipated to be ready during the course of June.

SUPPLIER DEVELOPMENT AGENCY

The charter has resulted in the transfer of over 18% equity to black hands. All oil companies have complied, with the exception of Sasol.

The industry has now shown further leadership by not only opening up their procurement but by also developing the suppliers. The oil industry has come together and contributed to the creation of the Supplier Development Agency (SASDA). SASDA was launched in Port Elizabeth in December 2004. Potential suppliers can now log into its database and view the opportunities for the supply of goods and services. The opportunities listed range from civil engineering, through supplying of valves to protective clothing.

THE WESTERN POWER CORRIDOR PROJECT

The Intergovernmental Memorandum of Understanding on the Western Power Corridor Project (WESTCO) was signed in October 2004. WESTCO is a New Partnership for Africa's Development (NEPAD) flagship programme intended to pilot hydroelectric energy of the Inga rapids site in the Democratic Republic of the Congo (DRC), and will ensure security of supply in the Southern African Development Community (SADC).

The participating utilities are those of Namibia, South Africa, the DRC, Botswana and Angola. A joint venture company has been formed to initiate studies determining the viability of the project, to build, own, and operate the infrastructure.

AFRICAN PETROLEUM PRODUCERS ASSOCIATION

PetroSA is increasingly active in African counties exploring and developing oil fields. The time is now right for South Africa to apply for membership of the African Petroleum Producers Association. This will provide us with a forum for dialogue and cooperation on oil matters as well as strengthening the NEPAD programme.

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Beyond the baseline – large scale climate friendly development

In many countries of the world, economic development is proceeding along a path that is comparatively less 'climate-friendly' than is possible or perhaps even ideal. Our research investigates the climate benefits from and some barriers to a more climate-friendly development path in China and South Africa. We show that there are significant quantities of emissions to be saved and that these do little harm to, and can even encourage, economic development. For these developing countries, we show that it is impossible to achieve these savings under current emissions mitigation mechanisms, and as such, they may not be realized until it is too late.

In the case of China, we consider the accelerated implementation of a gas network to power electricity generation, that would 'lock in' greenhouse gas emissions savings. The results are striking: under a scenario whereby in 2020, China has an installed capacity of 167GW of natural gas-fired generation (and where there is no change in the utilization rate implicit in the IEA baseline), the emissions savings for that year amount to 130 million tonnes of carbon dioxide. This 'high gas' scenario is no fantasy—the only difference from the IEA forecast is that 100GW of capacity has changed from coal to gas. As a comparison, 110GW of CCGT capacity was constructed in the U.S. between 2000 and 2003.

In the case of South Africa, we consider the effects of implementing an aggressive energy efficiency program in industry (with electricity analysed in detail). Over a fifteen year period, there is a reduction of approximately 230 million tons of carbon dioxide at a negative cost per ton of CO_2, with 50 000 extra jobs created as the economy becomes more economically efficient. Were all sectors and all energy carriers to be considered, the total saving would be close to a billion tons of CO_2 – and this done at a net benefit to society. This represents a change in the CO_2 development trajectory of the country that could not be achieved by project specific activities (CDM). At present, a total 21million tons of CO_2 are expected to be mitigated in South Africa under climate-motivated mechanisms such as the Clean Development Mechanism (CDM), and these at net positive costs.

Under the Kyoto Protocol, the international community adopted the Clean Development Mechanism (CDM), which allows developed countries to invest in greenhouse gas mitigating projects in developing countries that would not have otherwise gone ahead – in other words, the projects must be 'additional.' This requirement precludes investments and policies, which may significantly reduce emissions but could have gone ahead under different circumstances for other reasons. Under the CDM, there is therefore no incentive for developed countries to push China towards policies that lock-in natural gas for electricity generation, or to persuade South Africa to implement an aggressive yet development friendly energy efficiency policy. This is because it is impossible to determine the 'additionality' of emissions reductions created through these policies. Both polices are sensible and could, but may not, go ahead on their own merits.

There are incentives that could encourage the GHG mitigation we describe. These incentives are currently outside of the CDM. We conclude that it is necessary to urgently review the CDM, or develop new mechanisms to accommodate such non-additional, large scale, development friendly mitigation.

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An energy efficient house at Mudge Point

HISTORY

Some 23 years ago, the Raimondo family was fortunate enough to be able to acquire the farm, Hoek van de Berg, which is about 450 hectares. It runs from the Onrust Mountains down to the sea between the village of Hawston and Vermont, and is about 10 kilometres from Hermanus, Western Cape.

The R43 road to Hermanus runs through the property, which has a coastline of some 5 kilometres. About midway along this coastline is situated the promontory of Mudge Point.

It was decided to build a family holiday home at Mudge Point, sufficiently large to accommodate the various family members of the different families, who would get together for holidays. As a result, the house exceeds 1000 square metres.

Despite its large size, the house was to blend in as much as possible into its surroundings. Due to its isolation on the coast, there was no supply of water or electricity.

It was decided to make this house as independent as possible and to be self sufficient in fuel, water and power. There is an abundant supply of rooikrans on the farm, which is suitable for fuel.

CONSTRUCTION

The house was built of bricks, which were made to blend in with the surrounding rocks as much as possible. These bricks, of different sizes, similar to the cobblestones used in England, were made by Smart Stone in Cape Town, who were provided with rock samples. The roof tiles were made of cement, but likewise, made to blend in with their surroundings. All the windows were made of wood. There was thus the minimum of external maintenance.

The internal walls were made of normal plastered stock bricks but a five-centimetre gap was left between the outer and inner walls, in order to allow for good insulation and waterproofing. The roof was given a low pitch so as not to be too prominent and both the roof and the ceiling were very well insulated.

Since there was no fresh water available, seawater was used for all construction purposes, and this necessitated using stainless steel and plastic for reinforcing and brick tie bars. Sea sand was used for the cement mix and also for plastering purposes. This worked very well - apart from some leeching of the salt in the plaster through the paintwork at a later stage.

WATER SUPPLY

Very large tanks were constructed under the house and under the ground next to the house. All rainwater falling onto the roof was channelled into the tanks, which flowed from one into the other.

Additional tanks were built underground to collect all the grey and brown water from the house, which is used for irrigating the garden by means of a submersible sump pump lowered into the tanks.

A pump located under the front stoep of the house pumps fresh water up into head tanks located on the hill behind the house. Originally a pressure pump system was installed but this was found to use too much power and to be too troublesome.

Where heated water is needed, it is first passed through the wetback of an Aga type wood stove, which is used for cooking in the kitchen. Thereafter, it is passed through two water solar heaters on the roof and into an insulated water geyser tank inside the roof (the electrical element is switched off). From the geysers, the water flows through a gas boiler, which only functions if the temperature drops below a set level. In practice, the gas boiler is very seldom used.

COOKING

As already mentioned, cooking is done on a wood stove. There is also a gas stove on stand-bye.

REFRIGERATION

Fridges and freezers are both electrical and gas operated.

POWER SUPPLY

Power is supplied by means of two marine type wind turbines and 12 solar panels on a section of the roof, which is facing north. These feed directly into 12 Willard DC storage batteries. These in turn feed into a 2000 W Trace inverter, which supplies 220 volts AC to the network in the house.

There is also a 10 KVA Hats Silent pack diesel generator, with a Meccalte alternator which can feed 220 volts to the house and, at the same time, charge the batteries if need be.

This set up has worked without major problems since the outset.

CONCLUSION

The set up outlined above has worked well since the house was constructed over 20 years ago. There is very little that would be changed if one had to rebuild it again.

Possibly inside walls would be built of face brick as well, so as to minimize maintenance and avoid the problems caused with salt leeching from the plaster.

The water collection and supply systems would remain the same, as well as the sun and the wind electrical power supplies.

An energy efficient house should be built along the lines of 'keeping it simple' and avoiding complications.

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Third Sustainable Energy Symposium held

Over 150 people attended the third Sustainable Energy Symposium of the Sustainable Energy and Climate Change Project (SECCP) on the 13th April 2005 at the Development Bank of Southern Africa (DBSA) to launch its latest research into the potential contribution of renewable energy (RE) in South Africa.

After opening and key note addresses by Joanne Yawich, the Deputy Director General at the Department of Environmental Affairs and Tourism and Manny Singh, the General Manager of the Energy Development Corporation a division of the Central Energy Fund; the researchers, Douglas Banks from RAPS Consulting and Jason Schaffler from Nano Energy, presented their research through three case scenarios:

1. BUSINESS AS USUAL

If South Africa continues along the current path, it will still need a lot of money and resources to meet the demand for energy e.g. it would need to build an Eskom 6-pack every 18 months to meet demand.

2. PROGRESSIVE RENEWABLE SCENARIO

In this scenario, the researchers tried to grow renewable energy (RE) as realistically as possible, though the growth rate is still quite fast (20% per annum). Despite this accelerated RE growth, fossil fuel-generated energy would still play the major role in meeting energy demand. This has environmental and social implications - e.g. by contributing to climate change. In addition, the researchers predict that by 2025, the rising cost of fossil fuels and diminishing cost of RE options will make many of the latter costs competitive with the former.

3. HIGH RENEWABLE SCENARIO

In this scenario, the researchers modelled significant growths of RE - thereby showing that it would be possible for up to 90% of South Africa's electricity and 60% of South Africa's total energy mix to be generated from RE sources. The researchers noted the importance of energy efficiency in contributing to reducing demand.

Douglas Banks then made three important concluding remarks:

- That South Africa needs to reduce its dependence on fossil fuels - particularly because of their contribution to climate change.
- Current energy planning does not look far enough ahead - stopping at 2020 to 2025. As such, South Africa has not anticipated the magnitude of the problem looming around the corner.
- Time is short – South Africa's RE industry has a small base at the moment, and needs very large investments to deal with the looming energy crisis. Developing the graphs has been an 'eye opener' showing that meeting growing energy demand with any technology mix will be a significant challenge. Current resource allocations are not adequate to tackle the issue.

The rest of the day was spent looking at integrated energy planning and ways to finance renewable energy projects.

When discussing ways to finance renewable energy, speakers made a number of important points. Kevin Nassiep, the Chief Director of Energy Planning at the Department of Minerals and Energy (DME) responded to a comment that Eskom is the only institution that can absorb the costs of investing in RE by noting first, that it makes sense for Eskom to absorb the costs; and secondly, that the DME is in tentative discussions with other government departments and Eskom around future commitments. He said, 'In the coming year, we will see the outcome of these discussions. Full cost accounting is the DME's intention, but before rolling this out, government needs to know what the macro economic impacts will be and how consumers will manage the increased costs.'

Responding to the question, 'is government considering internalising the costs associated with pollution to emitters? If so, what impact will this have on RE technology?' Joanne Yawitch reported that the Department of Environmental Affairs and Tourism (DEAT) is working with Treasury to develop a Money Bill, which aims at internalising these costs. She noted that this issue is complicated as it affects many sectors, including transport and energy and it also has to grapple with how to factor in domestic fuel burning, as this is a significant polluter. She wasn't sure what impact this Bill would have on RE, but noted that it would provide an incentive for cleaner production technology.

Richard Worthington the co-ordinator of SECCP concluded the day's proceedings by noting first, that the research presented at the Symposium gave lie to the claim by conventional energy proponents that RE is only suitable for niche applications. Secondly, he highlighted two exciting points made during the day's events, namely that pollution charges are being developed and that some people working for the DME do want to include externalities in energy pricing. However, apparently management have not yet mandated this. As such, South Africa needs a strong civil society to push for achieving the RE potential outlined in the research.

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Certified Energy Manager course

How to become a CEM

The Southern African Association for Energy Efficiency (SAEE), in conjunction with the Association for Energy Engineers (AEE) in the USA, locally presents the 5-day comprehensive Certified Energy Manager (CEM) course. An optional examination, which is mandatory for certification, can be taken during the afternoon of the last day of the course. This special in-depth course is ideal for professionals who seek a more detailed programme of instruction covering the technical, economic and regulatory aspects of effective energy management. The programme offers a comprehensive learning and problem-solving forum for those who want a broader understanding of the latest energy cost reduction techniques and strategies.

Three steps to becoming a CEM:

- Attend the comprehensive 5-day training course on energy management;
- Pass the CEM exam that is written on the last day of the training course; and
- Assessment and approval of your professional profile by the CEM Board.

The purpose of the CEM programme is to build capacity in the energy industry by:

- Recognising expertise in specialised areas of the energy industry;
- Establishing a standard of professional competence which is recognized throughout the industry;
- Fostering professional development through encouragement of long term career goals; and
- Promoting quality through continuing education to ensure a high level of competence in constantly changing fields.

What some previous CEM delegates had to say:

'This was an intensive 5-day CEM course providing knowledge regarding Energy Management. It was enjoyable and exciting. I expect to be able to use much of this knowledge in the future and reduce the total energy bill at Toyota.' – *Graham Whittle, Toyota SA.*

'Very comprehensive and well paced. I would recommend all energy advisors to attend the CEM course since it covers all related topics.' – *Lodine Redelinghuys, Eskom.*

CEM awards 2005

It was that time of the year again, when professionals were awarded with the prestigious Certified Energy Manager (CEM) qualification. This event was held on 11 May 2005 at 1886 in Sandton, Johannesburg.

The first CEM course was presented in 2001. A total of 195 professionals have attended the CEM course in South Africa over the last four years, and 84 professionals have been certified since then in Southern Africa. Delegates from South Africa, Botswana, Lesotho, Nigeria, Namibia, Zimbabwe, Zambia and Kenya have attended the local CEM course.

The CEM qualification allows these professionals to be recognised for their expertise and experience in the duel field of Energy and Engineering in countries around the world such as the United States, India, Africa and numerous others. This event is the highlight of the year and allows for synergy between major role-players in the field of energy.

CERTIFIED ENERGY MANAGER COURSE 17 - 21 OCTOBER 2005

The pressure is increasing on South African companies and industry to increase their levels of energy efficiency. This is clear for the ever-increasing need for energy specialists in industry.

Four of the major driving forces behind this need are:

- The rising cost of electricity;
- The targets set by the Department of Minerals and Energy (DME) to reduce the energy demand of the industrial sector,
- The commercial and public building sector, with 15% by 2014, and the demand reduction target of 180 MW per year set by the National Electricity Regulator; and
- Lastly, the Kyoto Protocol, which was signed by the South African government to reduce the national greenhouse gas emissions.

It is thus critical that all sectors of our economy increase their knowledge and focus outlook towards energy as a resource that must and can be managed to the benefit of their bottom-line.

The first of two Certified Energy Management (CEM) courses for 2005 was hosted from 9 -13 May 2005 at The Emperor's Palace (Caesar's) Gauteng. The course was attended by 30 delegates from a wide range of professional backgrounds and companies, ranging from engineers, consultants, industrial plant operators and managers, property owners and building managers. Companies represented during this course were, amongst others, Eskom, Dowding, Reynard and Associates, Delta T, North-West University, Extrata Alloys, Autocon Powertech, TFMC, Sasol Gas, Iyanda Power Technologies, Iscor Ispat, Anglo Technical, Department of Minerals and Energy, Palace Consulting Engineers, Van Zyl & de Villiers Consulting Engineers and the Broll Property Group.

The internationally recognized CEM course offers a substantial range of topics relevant to the field of energy management and assists specialists to identify opportunities for energy management at their plants or in their buildings, and helps to develop viable business cases.

For all matters relating to the Certified Energy Manager courses:

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Testing the mitigation manual on trainers

INTRODUCTION

The Energy Research Centre (ERC), together with the Munasinghe Institute for Development (MIND) in Sri Lanka and the Environment and Development Action (ENDA) in Senegal, are developing training manuals to train trainers under UNITAR's Climate Change Capacity Development Programme (C3D). The rationale for this is clear. The UNFCCC seeks to strengthen non-Annex 1 countries' effective participation in the Kyoto Protocol process, and to strengthen existing and/or establish new training and research institutions to ensure sustainability of capacity building programmes. These capacity building initiatives should be country driven, involve stakeholder participation, and address specific needs and conditions of the country. For this reason, the ERC is developing training modules on climate change mitigation. ENDA is developing modules on climate change on vulnerability and adaptation; and MIND on sustainable development.

The UNITAR training is an experiment in training of trainers, which emphasises the skills element, as well as refreshing the content elements. With the focus on skills, the ERC adopted the approach that the best way to develop these without doing generic training skills courses, is to do 'learning by doing' with strong peer review. This should generate a fair degree of confidence and training skills in participants, especially if tools are well put together and supplied with detailed instructions.

Although the training manual on mitigation is prepared in South Africa, it is designed in a flexible form and can be modified for use by other countries. Consistent with C3D objectives, some of expected long-term results of the training endeavour can be listed as:

- Reducing dependence on overseas institutions for skills building and capacity development;
- Increasing and sustaining abilities to develop and deliver training programme activities;
- Increasing capacity of country officials to effectively integrate into the intergovernmental climate policy debate; and;
- Integrate climate change policies into the overall national sustainable development strategy.

The ERC recently held its 'Training of Trainers' Workshop from 5 – 7 April 2005. This report reviews this workshop as well assess the mitigation manual used to conduct the training. The rest of this report is divided into the following sections. The first section discusses the methodology adopted. After briefly describing the resource material for the workshop and how it works, we explain how the participants were assigned into groups to play different training roles for the duration of the workshop. The second section is on the presentation of the modules used to test the training manual. Section three presents results of the various methods used to test and get feedback on the training manual. Specifically, we want to determine the response by reviewers, what was learned, and whether the expectations of the participants were met. We attempt to solicit further feedback through evaluation forms, with results reported in the fourth section, making an overall conclusion in the last section.

OBJECTIVE

The main objective of the mitigation manual is to impart skills development in the field of training, while at the same time, repeating and topping up knowledge in the content of the following mitigation courses: greenhouse gas inventories, mitigation and the clean development mechanism (CDM). Being a 'Training of Trainers Workshop', selection and invitation for attendance, apart from project partners, was based on the assumption that one is already familiar with the topics covered, or had knowledge, but did not have the skill to train or impart this knowledge. The focus was on testing whether the instructions in the training manual were clear and the training manual suitable, and to give skills to future trainers. In doing so, the goal was to familiarise the participants with a range of tasks required to conduct a 'Training of Trainers' workshop, the technical requirements necessary, and the expertise demanded.

At the start of the workshop, participants received a welcome file, which contained a welcoming letter, a CD on climate change mitigation, a list of participants, and the workshop agenda. The agenda allocated sufficient time for lunch and tea breaks, so that participants would make new contacts and follow up on issues raised in the sessions. Indeed there had to be a social event! Before the training workshop began, participants were asked to write at least one expectation they had from the course. These expectations were recorded on a flipchart page and were revisited daily as well as reviewed at the end of the workshop.

The final session gave room for participants to reflect on their learning experiences of the workshop, and to fill out evaluation forms for the entire proceedings. The importance of the evaluation is to obtain feedback on the effectiveness of the training manual, its clarity, how the training material is presented and received, and to identify areas for improvement.

METHODOLOGY

Training resource material

The training manual was designed to be used by three different groups of people: the facilitator of a course where trainers are trained; the trainers once they are trained; and the learners who are trained by the trainers. All the pages in the manual are coded at the bottom right corner of each page. Because of the highly interactive nature of the workshop, the number of participants was limited to a manageable size.

Workshop participants were given a file at the commencement of a particular course, with three training files handed out at the completion of the workshop. Each training file contained detailed instructions as well as basic material needed to conduct training, but did not include the material to be used for testing the manual or for the workshop. This material was kept in a concertina file by the Facilitator or trainer, and was handed out to participants at appropriate times. The facilitator or trainer following training instructions, is given a time indication on sections to be covered, and also follows keys and captions that help make the manuals user friendly. Although the use of concertina files for training can be disruptive, if well organised, this proves better than having pages provided in a stack up front. The material to be handed out in the concertina file was marked T, L, or G. Pages marked L (for learner) were handed out as instructed during the course. Pages marked T (for trainer) contain training instructions, are only handed out on completion of a particular section, and should be placed in the files at the appropriate page numbers. The handing out of the G (for general) pages is optional as these are, in essence, file dividers and give participants and idea of what the module is offering. The file held by a participant is complete once all these marked pages are handed out.

The training manual assumes that all adults have some knowledge on the topic, and works on the premise that adults should first explore their inherent knowledge, then apply that knowledge to 'doing' exercises. The trainer facilitates the process, and 'tops up' the learner's knowledge, thus closing off that particular learning.

Training groups

To make the workshop interesting and successful, and at the same time, maintaining its intellectual appeal, the training was organised to take the form of a rotation, so that each participant would get the opportunity to train, be trained, and observe and evaluate the trainers. As soon as the workshop preliminaries were over, and an explanation made on how to use the resource material, the course Moderator divided participants into five groups so that they would work in pairs, with participants remaining in their assigned groups for the duration of the workshop. The groups consisted of those who would attend all the sessions of the workshop. Participants not attending the full session were given the status of observer and/or evaluator. Distinct groups of participants were the Facilitator (trainer), the Learner, and the Reviewer/Evaluator. Division into these groups was done arbitrarily by the Moderator. Ten caps with five different colours were handed out arbitrarily, and once with a particular colour cap, a participant had to look for another with the same colour cap thus forming a pair for the group. The system of rotation made it possible for participants to assume different roles (to train, to be a learner and to review) with different training modules. Thus groups could be distinguished from others by the colour of their caps. The intention was for the three groups learning to always work in pairs, but as one in the context of role-plays. A necessary check was to ensure that people from the same organisation/centre were not in the same group.

Division of responsibilities to participants were as follows:

- *The Moderator.* The Moderator is ideally the focal person for the workshop, with responsibilities that include the following functions: organising the workshop itself, ensuring that the training materials and equipment are available to the Facilitators/ Trainers beforehand, to enable them to prepare for the workshop, and controlling group rotations and dealing with overall workshop facilitation.
- *The Facilitators/Trainers.* The main responsibility of the Facilitators is to facilitate the ability of the participants to train the material and their understanding of the content. Thus, Facilitators were expected to take over the training material from the previous group and commence training the next set of groups.
- *The Learners.* Learners had to know and understand the content so as to be able to apply it.
- *The Reviewers/Evaluator.* The role of the Reviewers/Evaluators was to observe the Facilitators, to make notes of their observations, and at the end of each rotation, to do a verbal critique of the methods, approach and evident skills of the Facilitator.

PRESENTATIONS

Following the workshop agenda programme and a guide to the roles of various groups (see Appendix A), each group knew in advance the training role it would play. The design was such that each group would provide training of a module as indicated by the colour of their cap (see Appendix A), would be a reviewer for one of the modules, and for periods in between, a learner. Hence, it was vital for groups to consist of people with enough skill on the content issues to be in a position to present them fairly thoroughly. The only exception was with the exercises on Greenhouse Gas Inventories, where a specialist in the area trained the group, and also where a short-term participant was a reviewer. At the end of the training for the day, reviewers gave a report followed by a group discussion on lessons learnt.

Table 1 shows the training modules for the mitigation course, with the highlighted modules used in the workshop.

Other workshop highlights were presentations by the Munasinghe Institute for Development (MIND) on sustainable development, and ENDA on vulnerability and adaptation. These presentations came on different days, where all groups were learners and active participants in ensuring discussions. The purpose of both the MIND and ENDA presentations was to give an overview of the work being done by other project partners.

RESULTS

Reviewer's results

Reviewers' reports to a large extent, failed to capture problems in the module. This could be because focus was largely on the delivery of the content and the style of those training, rather than on clarity of training instructions as well as the content in manuals. The comments are, however, useful hints to Facilitators and organisers in future workshops. A sample of the comments is:

Table 1: ERC course outlines for the C3D project

Modules	Courses		
	GHG Inventories	Mitigation	CDM
Module1	Introduction	Framework for mitigation	CDM and CC
Module 2	GHG computation	Technologies and mitigation policy	CDM and SD
Module 3	Exercises	Mitigation in different sectors	CDM projects
Module 4	GHG reporting	Cross-cutting policies	Finance and risk markets
Module 5		Economic analysis	DNA
Module 6		Mitigation and sustainable development	
Sections of the highlighted modules are those used for presentation in the training of trainers			

- Give an overview at the beginning of each session to make it clear where we are coming from and going to
- Lack of coordination between the Facilitators in their presentations
- Encourage interaction between Facilitators and participants. There was no rapport, and with few questions to determine understanding of the presentation
- Avoid the dreadful tendency of being stationary with presentations. Rather, move around to assist participants
- Add pictures to slides to explain some of the technical concepts
- Do not talk with your back to participants. Talk to the screen and keep eye contact with participants
- Avoid reading slides to participants
- Go round and help with questions and with role plays

WHAT WAS LEARNT?

Workshop participants expressed the following on what they learnt:

- Trainers should prepare thoroughly and go through the material beforehand
- Adult training methodology works well
- Modular approach is good, and materials can be adapted
- It is hard to write material with a step-by-step instruction
- Trainers need to target their audience
- It is important to pace the training
- Trainers should use different techniques at different times
- It is hard to use a Power Point presentation prepared by others
- Use Power Point as a 'tool' rather than as a way of presenting

WERE EXPECTATIONS MET?

Participants were asked if their expectations they had at the beginning of the course were met. Responses were:

- More than met
- Some material was at too high a level
- Learnt a lot
- All my expectations met, but there is still a lot of work to do
- The approach is innovative, even if not comfortable with the material
- I now have better understanding and confidence
- Yes, although the time was short for the three courses
- Yes, the training manual gives more effective training
- Yes, the training tool can be used effectively

WORKSHOP EVALUATION

At the end of the training session before closure, the Moderator handed out evaluation forms to be filled in by all participants. The evaluation results are shown in Table 2.

THE CHALLENGE

Due to financial constraints, the UNITAR delegation could not attend. There had been interest in attending, expressed by the Caribbean Community Climate Change Centre, but again budgetary constraints came in the way. These were not seen as serious impediments because our original plan was to focus on people in the Southern African region. This, however, would have required targeting specialists who needed training in areas covered and allowing their organisations to cover expenses related to workshop attendance.

A major problem is that one cannot expect meaningful training three courses to be done effectively in three days. Originally, training per partner was to be for two weeks. We did not encounter language barriers with the participants from the Francophone country. A good suggestion is to try to customise our courses, so that they are not only applicable to South Africa.

The main problems pointed out in discussions for the ERC to act on are:

- GHG I should have ready exercises easy enough to follow so as to facilitate exposition;
- An example in the CDM module has inaccuracies to be attended to;
- Mitigation course could be made more interesting;
- The G pages should be used as dividers, or for overview or be removed; and
- Other modules should also be tested.

Overall, very positive comments were received about the training manual. The ERC will now incorporate the comments received during the Training of Trainers, as well as comments received in writing from ENDA, MIND and UNITAR on specific modules, in producing the final version of the training manual.

Table 2: Workshop evaluation results

Evaluation	Results/comments (N = 10)
Your understanding about the intention of the course?	The intention of the course was well understood by all participants, although their responses varied as follows: • To train trainers • To give skills to future trainers • To test the course material
How well did the course achieve this? (well, very well, brilliantly)	One participant expressed that this was achieved brilliantly, while six others reported very well.
What was your intention in attending?	Responses to this question were largely consistent with the first one above. For three participants, the objective was to become a trainer, two wanted to get feedback on the manual and five wanted to learn more.
Did you enjoy the course?	Six enjoyed the course very well, and two enormously.
Did you understand the course?	Except for two who felt the course was not easy enough, the course was understood very easily by most (six), and easily by two.
Was the course too easy, easy, and not easy enough?	Almost all (eight) participants found the course easy; two did not.
Did you struggle with the language with which the course was presented?	Only two cases reported that they struggled with the language.
Which section/s did you find not useful?	Five felt that the section on GHG computation was not useful, and three pointed out that all sections were useful.
Which section/s did you find useful?	Two participants found all sections useful, three thought the CDM most useful, and another two felt the mitigation section was useful.
Do you feel competent to go ahead?	Yes, from eight participants. Two felt competent but need a lot more training in other sections/modules.
What are you missing to go ahead?	There were interesting responses to this question. Six participants reported that they miss nothing to go ahead, three lack technical knowledge for some sections, and one lacks confidence.
What I liked about the course was ...	Being called upon to play different roles was very popular (seven), the course was fun and people great (1), its interactive nature (2).
What I did not like about the course was ...	There was a 30% response to this question, with two (20%) complaining about the long texts to read, and one about using a Power Point presentation without much preparation.
What lacked for me was ...	No response.
What the course could have left out was ...	Only one responded to this, pointing out the GHG modules should have been left out given they demand time to absorb, and being of a technical nature.
Suggestions	Varied suggestions were received. These were: the modules should be rearranged; give more time for reading; make the G pages an overview; and that the workshop should have spanned over a longer period, at least five days.
Comment on the course methodology	All comments received were positive, with the bulk believing the course methodology is good (six), two pointing out innovative, and one saying it was excellent.
Rating	Average out of 10
Logistics and planning:	
Course material	8
Support during the course	8
Office facilities	No office facilities provided.
Food	7
Hotel and accommodation	Two participants in the hotel for the duration of workshop.
Planning and logistics	8
Other logistics (please specify)	(Two responses) 7

Evaluation	Results/comments (N = 10)
General:	8
Interaction with other participants	8
Creating a network	
Becoming equipped for the tasks ahead	7
Were your expectations met?	This question received a yes from most participants (nine). Only one participant felt the technical material could have been presented in a more user-friendly manner.
What further needs do you have after the course?	Three feel the material has to be reviewed, six see no further needs, and one urges that what is left is to practise using the material
Any other comments?	Comments ranged from OK, thanks to: the material is sufficient to improve knowledge; and that Power Point presentations need to be supplemented with audio-visual material.

Appendix A: Roles for groups

Day	*Module*	*Trainer*	*Learner*	*Critique*
Day 1, April 5 Tuesday	GHGI	White Cap (Group 1)	Blue Cap (Group 2) Black Cap (Group 3)	Cream Cap (Group 5)
	GHGI Exercises	GHGI specialist	Khaki Cap (Group 4)	
Day 2, April 6 Wednesday	CDM 1	Blue Cap (Group 2)	White Cap (Group 1) Khaki Cap (Group 4) Cream Cap (Group 5)	Black Cap (Group 3)
	CDM 2	Black Cap (Group 3)	White Cap (Group 1) Blue Cap (Group 2) Cream Cap (Group 5)	Khaki Cap (Group 4)
Day 3, April 7 Thursday	Mitigation 1	Khaki Cap (Group 4)	White Cap (Group 1) Black Cap (Group 3) Cream Cap (Group 5)	Blue Cap (Group 2)
	Mitigation 2	Cream Cap (Group 5)	Blue Cap (Group 2) Black Cap (Group 3) Khaki Cap (Group 4)	White Cap (Group 1)

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Renewable Energy Seminar at the Polytechnic of Namibia

The Polytechnic of Namibia's School of Engineering and Information Technology, currently offers a block seminar on renewable energy. The seminar is divided into three different 1-day modules and is held on 13, 16 and 20 June at the Engineering Building.

The introductory module held on 13 June encompassed information about the nature of energy in general and a history of renewable energy technologies. The use of renewable energy stretches back several thousand years, with technologies using wind and water energy. Solar energy technologies were already effectively demonstrated in the 18th Century and encompassed solar thermal applications such as solar cooking and steam generation using solar energy. Henry Ford's Model T, the first motor vehicle to be mass-produced in the early 20th Century, was also designed to be driven on ethanol obtained from fermenting plant matter. In 1925 Ford maintained that: 'There is fuel in every bit of vegetable matter that can be fermented. There's enough alcohol in one year's yield of an acre of potatoes to drive the machinery necessary to cultivate the fields for a hundred years.'

The introductory seminar offered remarkable insight into the world's current consumption of fossil fuels and the projections when oil reserves are anticipated to be depleted. A number of calculation models exist that can estimate the time frame by when oil reserves will have run out or where any additional resources would be uneconomical to exploit. Although the estimated time frames differ, all of the models indicate that oil will be unavailable to the bulk of mankind within the next 40 years at the latest.

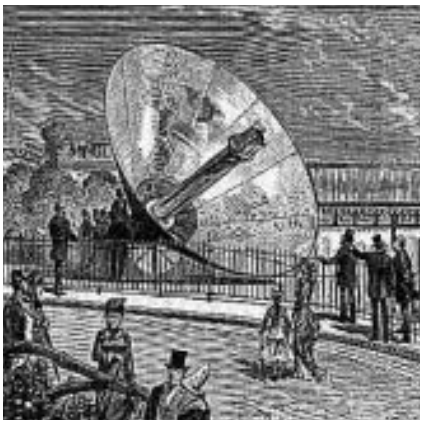
The rapid depletion of oil reserves was punctuated with recent media releases such as:

- Financial Times, February 16 2005: 'The Organization of Petroleum Exporting Countries signalled a significant tightening of oil markets towards the end of this year, warning on Wednesday it would have to pump close to its maximum capacity next winter to meet rising demand from China against the backdrop of slowing Russian production.'
- The International Energy Agency: 'Oil exporters (Iran, Indonesia, Venezuela) will become net importers in 2010.'
- The International Panel on Climate Change expects until 2050, a 2.7 to 9.4 times increase of kerosene consumption for air traffic compared to 1990. Gasoline consumption will be 2.5 times higher in 2030. If these scenarios become real, the worldwide traffic will require the overall oil production alone.

The seminar is presented by Prof. Thomas Eickhoff, from the University of Applied Sciences in Bingen, Germany. Prof. Eickhoff is currently a guest lecturer at the Polytechnic and offers the seminar as a supplement to existing engineering studies. Seminar modules will focus on the various solar energy and related energy technologies such as wind and water.

It is apparent that renewable energy technologies need to provide a vital contribution towards the world's energy mix, if we wish to prepare for the pending energy crisis. The energy crisis is not a problem that will go away if we continue to ignore it.

Prof Thomas Eickhoff, University of Applied Sciences in Bingen, Germany
(photo: Prof Eickhoff)



Solar steam engine driving a printing machine at the Paris World Exhibition in 1878 (picture: archive Prof Eickhoff)

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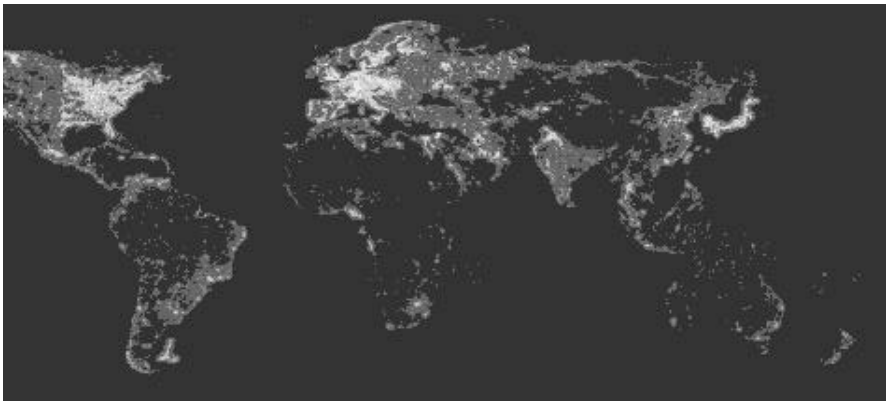

The world's artificial nighttime brightness
(picture: Royal Astronomical Society)

Business and government demonstrate commitment to energy efficiency

Energy Efficiency Month was launched on 4 May 2005, when the then Minister of Minerals and Energy, Ms Phumzile Mlambo-Ngcuka, together with leading South African business organisations and industry associations, signed a voluntary Energy Efficiency Accord. The event was also attended by the Ministers of Environmental Affairs and Tourism (DEAT) and Public Enterprises.

The National Business Initiative (NBI), a coalition of 140 leading South African and international corporations dedicated to sustainable development, facilitated the participation of a group of major corporations in this vital initiative. Andre Fourie, Chief Executive of the NBI said: 'The private sector recognises the advantages of energy efficiency as an imperative for sustainable growth and development. It makes business sense and has direct environmental benefits. With this as a basis, the NBI, with the active support of Business Unity South Africa (BUSA), has facilitated the signing of a voluntary Energy Efficiency Accord between the Minster of Minerals and Energy and leading South African corporations and industry associations'.

The group of industries and associations that signed the voluntary accord last night included: ABB Holdings (Pty) Ltd; Aluminium Federation of Southern Africa (AFSA); Anglo American Corporation of SA Limited; Anglo American Platinum Corporation Limited; AngloGold Ashanti; Association of Cementitious Material Producers (ACMP); Barloworld Limited; BP Southern Africa (Pty) Ltd; British American Tobacco South Africa; Business Unity South Africa (BUSA); Chamber of Mines; Chemical and Allied Industries' Association (CAIA); Engen Petroleum Limited; Eskom Holdings Limited; Holcim (South Africa) (Pty) Ltd; Impala Platinum Limited; Kumba Resources Limited; Mondi Business Paper; National Association of Automobile Manufacturers of South Africa (NAAMSA); Nedcor Limited; the South African Breweries Limited; Sanlam Limited; Sasol Limited; Siemens Limited; South African Petroleum Industry Association (SAPIA); Gold Fields Limited, ABSA Group and Total SA.

'We are extremely pleased with the take-up within industry. Added to this, several other companies and associations have expressed interest and we envisage this group growing significantly in the coming months,' explained Fourie.

This voluntary accord demonstrates commitment to the department's National Energy Efficiency Strategy. Within a framework of eight strategic goals based on the three cornerstones of sustainability, the strategy targets a 15% reduction in 'final energy demand' for the industrial sector by 2015, and a 12% improvement in energy efficiency for the nation as a whole by the same date. This target is expressed as a percentage reduction against the projected national energy usage in 2015. The forecast usage takes into account-projected increases in economic development, without any additional efficiency interventions. This ensures that energy efficiency does not impact negatively on South Africa's commitment to economic growth, investment and job creation.

'The accord gives individual companies and industry associations an opportunity to play a leadership role through a voluntary commitment,' says Fourie. 'It acknowledges and reflects government's recognition of the willingness of industry to participate and engage. It also provides scope for further dialogue between government and business on the Energy Efficiency Strategy and the draft bill. The accord makes the need for closer cooperation between DEAT and DME more explicit'.

The accord promotes the concept of collaboration to achieve national objectives and the development of more detailed commitments, in terms of industry setting a strategy and putting reporting mechanisms in place. This allows sectors and enterprises the freedom to work at their own pace and deal with their own issues, without having to reach the lowest common denominator.

The NBI believes that this Accord offers industry a window of opportunity to engage with energy efficiency and all the business benefits and mitigation of risk this can bring.

Both South African business and government recognise that improvements in energy efficiency are necessary if the country is to remain competitive internationally, as are dealing effectively with potential electricity capacity shortages, environmental concerns and the steadily rising costs of all energy sources.

The business sector in South Africa is committed to energy efficiency as it makes both environmental and business sense. Many companies and industries are doing significant work in the area. Some industrial sectors have demonstrated their commitment through focused programmes, e.g. the Chemical and Allied Industries Association's Responsible Care programme and the textile sector's continued involvement in 'cleaner production' activities. Furthermore, several industries have made progress towards agreeing to government commitments.

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The application of energy models in developing countries

The Energy Research Centre (ERC), University of Cape Town, has for a number of years, applied models in their work for Government and other clients. This article gives some pointers, based on the ERC's experience, for analysts in developing countries who are considering applying energy models in their work.

When analysing energy, or other social and economic systems, a seemingly infinite number of factors need to be taken into account. It is not uncommon for an energy model to have thousands of data entries. As humans are unable to deal with all this information themselves, they use computer-based models to assist them. These models are abstractions. They are simplified mathematical representations of some real world system or problem. It is this simplification that makes them so useful, as it puts the problem into a form that it is possible to comprehend. As a tool, computer models are comprehensive and able to interrelate a great number of factors simultaneously. Moreover, they do not make computational or logical errors.

Models are not constructed for the sake of modelling itself, rather they are tools designed to help with the analysis of some real life situation. That is, a model is created for a distinct purpose and is meant to be applied to a particular problem. It follows that the modelling approach should be determined by this purpose.

There is a wide range of options and techniques available to energy analysts who wish to use such models. Here, we will focus on two widely used modelling frameworks, with different areas of application, namely LEAP and MARKAL. They are both pre-developed, ready-to-use model-building tools that save the user the trouble of programming themselves. The ERC has used them both extensively and found them to be particularly useful.

LEAP

LEAP is an accounting tool that balances production and consumption of energy in an energy system model. Just as assets have to equal liabilities in a financial balance sheet, supply has to equal demand in an energy balance. LEAP is deterministic, in the sense that all outcomes are specified by the user. As such, it is a 'what if' tool in that it calculates the implications of a set of assumptions and tells the user what would happen if these were true. In mathematical terms, it would be described as having zero degrees of freedom. This implies that there is one equation for every variable and thus there is only one feasible solution.

Based on the assumptions provided by the user, LEAP balances the energy flow equations, thereby identifying the energy transformation and primary energy supply requirements. The requirements are back-calculated from a set of final energy demands, which form the 'fixed' side of the first set of the equations of the accounting process.

The entire energy system is (can be) included in the model and the level of detail is really decided by the user, although making the models immensely detailed will usually not be appropriate. This means that the data requirements are mainly determined by the user's preferences and can be made to fit the information that is available. Analysts in developing countries will find this particularly useful, as good data tends to be a scarce commodity in these countries. LEAP is also flexible in terms of the format of input data, which makes it easy to reconcile and compare data from various sources. Cost of fuels and capacity can also be included at the users' discretion, as can environmental effects such as GHG-emissions and pollution.

LEAP results are generated in annual increments and presented as time series data. Time horizons will vary but LEAP is most commonly used for long term (more than 20 years) analysis. The results can easily be viewed as graphs, charts or tables.

The analysis is scenario based, meaning that assumptions for a set of potential futures are compiled. Results are calculated by LEAP and then compared. The user can thus, gain insight into how different decisions or events may affect the future.

Getting started is relatively easy. LEAP demands very little from the user as only basic computer skills are required. Training material is available and a new user should be conversant in the use of LEAP after a couple of days. The software is provided free of charge to users in developing countries.

The main benefit of LEAP is that it is a tool that helps the user to combine and assess data in a consistent framework. This makes it easier to organise the data in an intuitive and accessible manner, and to get a grasp on the infor-

mation. Creating scenarios allows the user to evaluate the implications of various decisions, and to identify the significance of different assumptions. The fact that it is easy to use and provided free of charge, makes it particularly beneficial for users in developing countries, who are frequently strapped for resources.

LEAP is a convenient tool as far as gaining basic insights into the workings of an energy system is concerned. Furthermore, it is a useful and appropriate introduction to energy modelling.

MARKAL

MARKAL on the other hand, is an optimisation tool. Optimisation models are prescriptive rather than descriptive and tell the user how to make the best of a given situation in relation to a predefined goal. As opposed to accounting models, optimisation models have several degrees of freedom and therefore there is not only one feasible solution to these problems, but many in fact. The objective is to identify the best, from all these solutions.

For MARKAL users, the goal will usually be to minimise costs under the condition of a partial equilibrium, which is equivalent to maximising consumer and producer surpluses. MARKAL models are demand driven, in the sense that meeting demand is a requirement for all feasible solutions. The optimal solution to a MARKAL modelling problem is thus the solution that meets these demands, satisfies all other constraints, while having the lowest total cost. Perfect markets conditions are assumed and all actors in the market possess perfect foresight.

Humans, however, rarely make decisions based purely on economic considerations, and even when they do, they are unfortunately not as infallible as computers in establishing what is best for them. In terms of forecasting and predicting actual behaviour, one should therefore be very careful when applying optimisation models like MARKAL. The output of an optimisation model should be seen as the best way of accomplishing a goal, rather than a prediction. So instead of being a 'what if' tool, MARKAL is a 'how to' tool. 'If you want to minimise costs, then this is what you should do'.

MARKAL is most useful in situations where the problem is to choose the best from a set of well-defined alternatives. This applies in particular when the problem relates to technology choice. In fact, identifying an optimal technology mix is the main application of MARKAL. Technologies are specified by their technical, economic and environmental properties. It follows that MARKAL is relatively data intensive.

Becoming familiar with MARKAL is a little more demanding than LEAP and requires more from the user. To be able to fully understand and utilise MARKAL, the user should have good computer skills, be conversant in equilibrium economics and preferably have a basic understanding of linear programming. With that said, it is important to note that MARKAL is a more powerful tool than LEAP, and has a range of prescriptive capabilities that LEAP does not support.

THE USE OF LEAP AND MARKAL AT THE ERC

The ERC has used both LEAP and MARKAL for numerous studies, most notably the National Integrated Energy Plan that was developed for the South African Department of Minerals and Energy in 2002.

LEAP was used in the first phase of the project. An extensive data collection exercise was conducted, and stakeholders were invited to participate with their information and views. The resulting LEAP dataset served as a platform for the first fully integrated description of the national energy system. Through model runs in LEAP, it was possible to identify gaps and weaknesses in the dataset, which could subsequently be attended to. Based on this input, a business as usual scenario was developed to act as a general forecast and a reference. A set of scenarios was then developed to investigate various options and futures.

The second phase focused more on specific issues, and MARKAL was used to find least cost supply alternatives. The analysis was done by comparing different fuel and technology alternatives for each economic sector to find an optimal mix. This provided input to the final analysis, which sought to provide specific policy recommendations, as well as advice on energy infrastructure investments.

In addition to the national LEAP and MARKAL energy models, the ERC maintains and develops energy system models for rural African communities, multi criteria decision analysis tools and models for other African countries.

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Biodiesel in South Africa reviewed

A report titled: 'A Review of Biodiesel Related Activities in South Africa' is now available. Very briefly, the report reviews the status of activities relating to biodiesel in South Africa, focusing particularly on the Western Cape, in order to fill information gaps preventing effective planning of biodiesel projects. Having identified one of the benefits of biodiesel use as its potential to stimulate agricultural production in marginal areas and to generate employment opportunities in the associated collection of feedstock, processing, manufacture, distribution and retailing sectors, the report then looks at how current policies and measures facilitate the production of energy crops in South Africa.

The report then covers the activities and objectives of NGOs, information networks, and national actors in the public and private sectors within South Africa as they relate to biodiesel. Finally, a map describing a project to implement a project to introduce biodiesel at a Provincial level is given, which could be applied to other Provinces in South Africa.

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The launch of Energy Efficiency Month and the announcement of the South African Energy Efficiency Accord

A summary of the speech made by the then Minister of Minerals & Energy, Ms Phumzile Mlambo-Ngcuka on 4 May 2005

ENERGY EFFICIENCY GLOBALLY

Worldwide, nations are beginning to face up to the challenge of sustainable energy – in other words, to alter the way that energy is utilized so that social, environmental and economic aims of sustainable development are supported.

The existing energy policy of South Africa is captured within the White Paper on Energy Policy (1998). The policy aims to provide the nation with wider access to energy services, by various means, whilst ensuring that the environmental impacts of energy conversion and use are minimized as far as possible. This is of relevance to Africa as a whole, as South Africa uses some 40% of the total electricity consumed within the continent.

The Minister was therefore happy to announce that she had approved the Energy Efficiency Strategy for South Africa, and made South Africa one of a few countries in the world with such a strategy. The Strategy sets out energy efficiency targets to be achieved by 2015 for the different sectors as follows:

- A total final energy demand reduction of 12% (all sectors combined)
- Industry and Mining – 15% reduction in energy demand
- Power Generation – 15% reduction in parasitic electrical usage
- Commercial and Public Building sector – 15%
- Residential sector – 10%
- Transport sector – 9%

Other role players are very important in this process.

Central Energy Fund

The Central Energy Fund (CEF) (Pty) Ltd, the state-owned energy company, has established, under a Ministerial Directive, a division called the Energy Development Corporation (EDC). The EDC has a mandate to support the development and commercialisation of projects that promote sustainable development. In particular, renewable energy and energy efficient projects have been identified and are being developed for implementation. Already, the Darling Wind Farm, of which CEF is Ta major shareholder, has received a positive Record of Decision for its Environmental Impact Assessment.

This paves the way for the construction of the 5MW first phase of the project, with possible construction in the second half of the year. Other projects that the EDC is participating in include; the Bethlehem Mini-hydro scheme, the Torbanite low-smoke fuels project, domestic solar water heaters, solar cookers and hybrid power supply to rural communities. The EDC is also evaluating the possibility of partnering the lighting company, OSRAM, in a 5 million-lamp energy efficiency project in South Africa.

Municipalities

Every municipality will draw up an Environmental Management Plan, as per the NEMA Act, and as part of that plan how energy efficiency should play a major role.

NER

The NER has already released its Energy Efficiency Document for all power producers to become energy efficient and how energy efficiency will be dealt with in the pricing of electricity.

Eskom

Eskom has a significant Demand Side Management Programme, which is ongoing.

OBLIGATIONS

The Kyoto Protocol was adopted at the 3rd Conference of Parties in 1997. The Protocol provides that developed nations accept commitments to limit, or reduce, the emission of green house gases according to different targets. South Africa ratified the United Nations Framework on Climate Change in August 1997, and acceded to the Kyoto Protocol in March 2002 as a non-Annex 1 signatory. Annex 1 countries are committed to a 5% overall reduction in the period 2008 –2012.

Achieving such goals will result in significant costs to the economies of each Annex 1 country, and a number of mechanisms were developed to assist these countries to comply with their respective targets. One of these mechanisms is the Clean Development Mechanism (CDM). The basic principle of the CDM is simple: developed countries can invest in low-cost abatement opportunities in developing countries and receive credits for the resulting emission reduction. Such credits would then count towards their own abatement targets.

To this end, the DME has established the Designated National Authority (DNA) office. The DNA office has received 7 project proposals for review to date. These projects are in the following areas: landfill gas, hydroelectric power, fuel switching and industrial energy efficiency. These projects, if implemented, will reduce 21 million tonnes of CO_2 emissions by the year 2012, and will generate revenue of R618 million by year 2012 from sales of Certified Emission Reductions (CERS).

WORLD SUMMIT ON SUSTAINABLE DEVELOPMENT APRIL 2002 GOALS

The following World Summit on Sustainable Development (WSSD) goals are addressed by the energy efficiency strategy of the DME:

- Develop public-private partnerships for technology development, transfer, adaptation, application and commercialisation;
- Support accelerated technology development and dissemination for both renewable energy and energy efficiency – mainly through market development of technologies in the *North* and collaborative Research Development & Demonstration;
- Provide incentives for private sector companies to set specific targets to improve their energy mix / emissions profile by 2012; and
- Developed countries to demonstrate their commitment to use the Clean Development Mechanism and to delivering increased climate change funding (e.g. through contributions to GEF, Special Climate Change Fund, LDCs Fund and Kyoto Protocol Adaptation Fund).

ENERGY EFFICIENCY INITIATIVES IN GOVERNMENT

In its drive to become more energy efficient, the Department has retrofitted 4 buildings namely, the DME building, 120 Plein Street, the NER Building and the Union Buildings, and the expected cost savings per annum amounts to approximately R640 000. The CO_2 savings in tones per annum amounts to R734.

KUYASA LOW COST ENERGY EFFICIENT HOUSING PROJECT

The first potential CDM project in South Africa is the Kuyasa Low-Cost Energy Efficient Housing Upgrade project located in Khayelitsha, Cape Town. The project activity aims to improve the thermal performance, lighting and water heating efficiency of existing and future housing units in this area by installing insulated ceilings, solar water heaters and energy efficient lighting in each household.

Implementation of the Kuyasa Low-Cost Energy Efficient Housing Upgrade Project will generate the following benefits to the community:

- Emission reduction of 6 558 tonnes of Carbon dioxide equivalent per annum, which may be tradable as Certified Emission Reduction Credits (CERs) in the carbon market;
- The Net Present Value of the income from the emission reductions (carbon finance) will cover 20% to 30% of the capital costs of the installation of these technologies;
- Households will save approximately R626 per year in the cost of energy;
- Contribution to employment creation of approximately 100 jobs per year for installation of technologies and associated infrastructure;
- Health cost benefits due to reduced reliance on heat sources holding fire-related dangers and negative respiratory health impacts.

THE IMPORTANCE OF NUCLEAR POWER

Nuclear power remains very important to the South Africa government as there are no greenhouse gases emitted from nuclear sources of energy, and alternatives to nuclear are very expensive. The DME will therefore continue to focus its attention on nuclear research and development, as it will also contribute to the diversifying of energy resources.

NEW GENERATION CAPACITY

An amount of approximately R60 billion will be spent on new generation capacity in the period up to 2015. If there is a reduction on energy demand as a result of our energy efficiency drive of 15% as proposed, it could amount to a R9 billion saving.

SAVINGS IN HOUSEHOLDS

This sector used 360 Petajoules in 2000 in the form of coal (11%), petroleum products (7%), biomass (53%) and electricity (29%). The transition towards the use of higher calorific value fuels and a reduction in use of thermal energy consumption will be driven by energy efficiency standards in housing, generally higher standards of living accompanying economic growth of 2.8% per annum, and the electrification programme. The following measures and interventions will be used for the residential sector:

- Mandatory standards
- Appliance Labelling
- Efficient lighting
- Energy efficient coal stoves, wood stoves and liquid fuel stoves.

An ongoing public awareness drive namely the Energy Efficiency Month, which was officially launched on 4 May 2005, will have to continue and should continue throughout the year in future in order to achieve the 10% target for households by 2015, taking into consideration that changing people's lifestyle is by no means straightforward.

Water is also conserved by being energy efficient – for every kilowatt-hour saved, approximately 1 litre of water is saved as well.

LIQUID FUELS

Transport is the second largest sectoral consumer of energy, and it is expected to grow considerably in the medium-term. A target of 9% has therefore been established as a realistic but challenging objective for 2015. This target has assumed the introduction of the following:

- A labelling system for vehicle energy consumption accompanied by other measures (legislative and otherwise) to promote vehicle efficiency;
- Technology upgrades; and
- Longer-term impacts would include public transport systems, moving road to rail and spatial planning.

A study done by the DME found that the biggest opportunity to improve vehicle efficiency is to switch to diesel. New technology diesel engines will become available when South Africa's new low sulphur grade diesel specifications come into effect in January 2006, and this will help the introduction of cheaper more efficient diesel engines.

The indications are that this would result in improved diesel fuel efficiencies between 30% and 40%, which translates into a saving of approximately a quarter of a billion Rands per annum, for every 2% increase in diesel over petrol usage by motorists.

ILLUMINATING PARAFFIN

The new National Standard for Non-Pressure Paraffin Stoves and heaters has been completed and is currently awaiting final approval from the Standards Approval Committee at the SABS. The new Standard will improve the safety of these stoves a lot.

Currently stoves have to be replaced every 3 to 4 months, while the new stove may last for 1 year. The cooking time can be reduced as the stove is efficient and paraffin consumption will also improve giving savings to users.

LPG

The LPG Association and its members including BP, Shell, Afrox and Total, gave Government a commitment to "connect" low-income households to LP Gas. So far 23 000 consumers have been connected.

BIODIESEL AND BIO-ETHANOL GEL

As an incentive to biodiesel producers, negotiations are underway with the oil industry for them to market biodiesel. A bio-diesel standard has been published.

Efforts are also being made to facilitate the manufacture and marketing of bio-ethanol gel as a substitute for paraffin, as it is much less dangerous to use.

DARLING WIND FARM

The introduction of wind energy in South Africa is an important step forward in realizing our goals for renewable energy and sustainable development. It is also a powerful instrument in ensuring diversification of our energy resources. To this end, the Minister has supported the Darling Wind Farm Demonstration project, proclaiming it a National Demonstration Project and ensuring that with CEF's shareholding in the project, has received the appro-

priate government support. The project has received the green light from an environmental perspective, and construction is to commence later this year. This is an important step forward for independent power producers, who wish to generate and trade renewable energy in our country.

SANERI

During the latter part of 2005, the South African National Energy Research Institute (SANERI) will be launched. This is a joint project with the Department of Science and Technology (DST), and places energy research firmly on the Government's agenda for Research & Development (R&D). SANERI will be a subsidiary of the CEF (Pty) Ltd and will be funded through the Science Council Vote.

An allocation of R20 million has been secured for the 2005/6 financial year through the Medium Term Expenditure Framework, with R40 million available in 2006/7. Energy efficiency has been included in the Research Strategy, which will govern SANERI's operations in the first few years.

The focus is on the development of innovative products and strategies that promote energy efficiency. All innovation, whether in the formal sector or not, receives the due attention which innovation deserves. Those part-time inventors and innovators in the townships are to be welcomed and supported – it is important that we stimulate a culture of innovation among all our people. The Minister intends hosting a competition as part of this year's activities in Energy Efficiency Month, whereby all manner of innovation supporting energy efficiency is identified and appropriately recognized and supported. Watch the press for details on this exciting opportunity.

ENERGY EFFICIENCY MONTH

The Energy Efficiency "Month" will continue from May 2005 until August 2005 this year, and longer next year. The following are the highlights of the month:

- 75% of the population will be reached with radio messages and tips on being more energy wise, with specific emphasis on community radio stations;
- Taxi rank promotions in all 9 provinces on the busiest routes;
- Street Theatre and other promotions at selected stores;
- A number of municipalities have agreed to print energy efficiency messages on their electricity accounts during this time;
- A number of magazine, newspaper and television articles and advertisements will be done;
- A schools competition focusing on 10 year olds, as energy forms part of their curriculum; and
- A poster competition in Worcester.

BP also indicated that they would like to launch their new, very energy efficient building, and this will also take place during this period.

APPLIANCE LABELLING

The appliance label for fridges was launched in May.

The Label

Energy efficiency *labels* are informative labels affixed to manufactured products indicating products' energy performance and efficiency in a way that allows for comparison between similar products, or endorses the products' use. Energy efficiency *standards* are a set of procedures and regulations that prescribe the minimum energy performance of manufactured products. Together, energy efficiency standards and labelling can be the most cost-effective means to help South Africa reduce energy demand, while stimulating economic growth.

The label is identical to the informative label used in EU member states, with the only difference being that the EU flag is replaced by our unique South African symbol. This symbol is the DME symbol for our Energy Efficiency Initiative.

In real life, the product will be graded either A or down to G – with G being the poorest performing product in electricity terms. The grading A – G will be found as part of the instruction manual inside the box of the appliance. Obviously the retailers can display the grading on the appliances in their shop for those appliances that have been unpacked.

Where will I find the label and when?

The DME in close collaboration with all the sector players – in particular the manufacturers, have decided to start the labelling initiative with labelling of refrigerators. Why? Mainly because all electrified households typically purchase a refrigerator as the first electrical kitchen appliance. The label should have been in some stores as from late May 2005, and from next year, we should be able to find labelled refrigerators all over South Africa. Parallel to household refrigerators, we will also ensure and support the labelling of household freezers. Hereafter follows products such as front-loading washing machines, tumble driers, electrical stoves etc.

When will it become mandatory?

The South African Bureau of Standards (SABS) has agreed, and the process to make the label and standard mandatory had commenced in April 2005. This will take approximately 18 months.

The Minister was very happy to see all the manufacturers of fridges at the launch, and also to have them sign their commitment to this process.

ENERGY EFFICIENCY ACCORD

The business sector in South Africa is committed to energy efficiency because energy efficiency makes both environmental and business sense. Many companies and industries are already committed to the principle of energy efficiency and are doing significant work in the area.

It is against this background that the National Business Initiative, with the active support of Business Unity South Africa, has facilitated the process for a voluntary Energy Efficiency Accord, which was signed in May by the Minister of Minerals and Energy and leading South African corporations and industry associations. These are:

- Clive Govender (ABB)
- Israel Skosana (ABSA)
- David Hughes (Aluminium Federation of Southern Africa)
- Lazarus Zim (Anglo American)
- Ralph Havenstein (Anglo American Platinum Corporation Limited)
- Bobby Godsell (AngloGold Ashanti / BUSA)
- Naude Klopper (Association of Cementitious Material Producers)
- Mark Drewell (Barloworld)
- Rams Ramashia (BP Southern Africa)
- Niel de Waal (British American Tobacco)
- Bobby Godsell (Business Unity South Africa / AngloGold Ashanti)
- James Seutloadi (Caltex Oil SA)
- Dr. Con Fauconier (Chamber of Mines / Kumba Resources)
- Neville Crosse (Chemical and Allied Industries' Association)
- Vukani Magubane (De Beers)
- Saied Solomons (Engen Petroleum Limited)

- Thulani Gcabashe (Eskom)
- Chris van Heeswijk (Gold Fields Limited)
- Karl Meissner-Roloff (Holcim)
- Keith Rumble (Impala Platinum)
- Dr CJ Fauconnier (Kumba Resources / Chamber of Mines)
- John Barton (Mondi)
- Brian Kennedy (Nedcor)
- Sipho Mkhize (PetroSA)
- Maurice Egan (SAB)
- Temba Mvusi (Sanlam)
- Pieter Cox (Sasol)
- Motukuane Mokoena (Shell South Africa Energy (Pty) Ltd)
- Klaus Döring (Siemens)
- Colin McClelland (South African Petroleum Industry Association)
- Philip Jordan (Total South Africa

ACKNOWLEDGEMENTS

The Minister then took the opportunity to thank the Danish Government for their continued support in promoting energy efficiency and renewable energy and, in particular, for their support in the development of the Energy Efficiency Strategy.

She commended the National Business Initiative (NBI) for their tireless efforts and negotiations with large industry and big business to raise awareness on energy efficiency and for the development of the Energy Efficiency Accord.

Lastly but not least, she thanked our co-hosts, the National Electricity Regulator and Eskom, for their dedicated commitment to energy efficiency.

CONCLUSION

As you can see, the DME is undertaking a number of activities to ensure energy efficiency in the country, and the Minister took this opportunity to urge every single person there, to become energy wise and help to create an energy efficiency culture in South Africa.

Energy Efficiency is in everyone's power!

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Uncertainty in the saving – quantifying the 'rebound effect'

Greenhouse gas (GHG) mitigation measures may reduce emissions directly. However, due to knock on effects through the economy, total emissions reductions (direct and indirect) may be different to the direct reductions, introducing uncertainty. Our research computes the relationship between direct emissions savings and indirect emissions and compares the difference – or the 'rebound effect'. To do so, we employ a case study and use a straightforward input-output model to track the effect of energy-efficiency measures through the economy of South Africa. We conclude that although the positive 'rebound' effects can be significant, the contribution ranges from being limited to encouraging more climate friendly economic development.

Following a short literature review, we examine the effect of the role-out of proposed energy efficiency policy in South African industry. The methodology has been used previously to determine the (positive) economy wide effects of profitable energy efficiency measures in industry, its limitations are noted and extensions suggested. As the measures proposed are profitable, typically with 'paybacks' of less than two years, industrial profitability increases, and so in turn does the activity of sectors that transact with industry, as well as those sectors with other sectors etc. Estimating the compounded change in activities of all sectors, the energy consumption increases, or the "rebound" economy is calculated. Figure 1 shows the economy wide effect of saving a unit of electricity in terms of increased electricity demand as a percentage of that saved.

Knowing the quantity of energy saved, coupled with the rebound in energy demand, we calculate both the emissions saved directly through energy efficiency measures, and then emissions gained as a function of this rebound effect. In our framework, the rebound effect does not drown out the savings estimated by the application of profitable industrial energy efficiency, but it is significant. It is also a function of the local content and profitability of the measure implemented, as well as other parameters.

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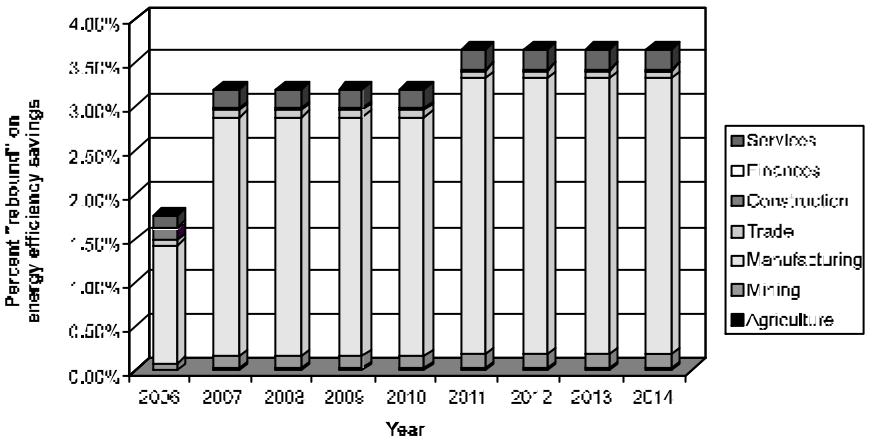

Figure 1:Rebound effect per unit of electricity saved

Energy events 2005/2006

SEPTEMBER 2005
19 – 21

EASTERN AND SOUTHERN AFRICA POWER & MINING INDUSTRY CONVENTION
Maputo, Mozambique
Contact: Lello Sekesseke
Tel: +27 21 700 3500
Fax: +27 21 700 3501
E-mail: lello@spintelligent.com
Website: www.spintelligent.com

21 – 23

ENERGY 2020: THE AUSTRIAN ENERGY CONFERENCE
Fuschl, Austria
Contact: Brainbows - the information company
Tel: +43 1 796 54 44 15
Fax: +43 1 796 54 44 85
E-mail: office@energy2020.at or birgit.rys@brainbows.com
Website: http://www.energy2020.at or www.brainbows.com

OCTOBER 2005
12

OPTIMISATION OF INDUSTRIAL BOLIERS
Pretoria, South Africa
Contact: Aquaorange
Tel: +27 83 278 5886
Fax: +27 11 880 1237
E-mail: heather@aquaorange.co.za

MARCH 2006
10 – 12

ERNEUERBARE ENERGIEN 2006 - INTERNATIONAL FAIR AND CONGRESS FOR RENEWABLE ENERGY AND ENERGY-EFFICIENT BUILDING AND RECONSTRUCTION
Boblingen, Germany
Tel: +49 71 21 30 1600
Fax: +49 71 21 30 1610
E-mail: redaktion@energie-server.de
Website: www.erneuerbareenergien.com

MAY 2006
30 – 1 June

WORLD BIOENERGY 2006: CONFERENCE & EXHIBITION & BIOMASS FOR ENERGY
Jönköping, Sweden
Contact: SVEBIO
Tel: +46 8 441 7080
Fax: +46 8 441 7089
E-mail: info@svebio.se
Website: www.svebio.se

JUNE 2006
18 – 21

EUROSUN 2006
Glasgow, UK
Contact: UK Solar Energy Society
Tel: +44 1865 484 367
Fax: +44 1865 484 263
E-mail: ukises@brookes.ac.za
Website: www.thesolarline.co.uk

AUGUST 2006
19 – 25

THE NINTH WORLD RENEWABLE ENERGY CONGRESS
Florence, Italy
Contact: Prof. Ali Sayigh
Tel: +44 1273 625 643
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Website: www.wrenuk.co.uk

Visit www.erc.uct.ac.za for further events and details

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