

# Energy Management

## News



A newsletter for the SADC region

VOLUME 8 NUMBER 2

<http://www.eri.uct.ac.za>

WINTER 2002

## The safety of paraffin and LPG appliances for domestic use

### Introduction

Paraffin is one of the most widely used fuels for cooking and space heating in South African homes. Table 1 gives the data from the 1996 Census.

**Table 1: South African households using various sources of energy**

	Cooking	Space heating
Electricity	4265305	4030849
Gas	286657	107689
Paraffin	1943862	1294965
Wood	2073219	2417725
Coal	320830	735633
Animal dung	106068	84448
Unspecified	63629	388266

While electricity plays the major role, comparatively few lower income households use this energy source at present. For those households, wood plays a major role in rural areas, and paraffin an equal role in the towns. Coal use, primarily for space

heating, is extensive near to the mines (Free State, Gauteng, Mpumalanga and, to a lesser extent, Kwazulu Natal and North West).

The use of paraffin has severe social consequences. A report to the Paraffin Safety Association of South Africa in 2001 concluded:

1. At least 143 000 children drank paraffin in the last year;
2. At least 55 000 children contracted pneumonia after drinking paraffin in the last year;
3. At least 4 000 children died from paraffin-induced chemical pneumonia in the last year;
4. There were at least 46 000 paraffin-related fires and 50 000 paraffin-related burns in the last year; and
5. 31 000 (63%) of these burns were as the result of paraffin stoves exploding.

It is clear from the fire records that at least 100 000 homes were destroyed as a result of the paraffin-related fires.

The problem of the accidental drinking of paraffin is being addressed by the use of safety caps, which prevent children reaching the paraffin. Over

### In this issue

The safety of paraffin and LPG appliances for domestic use ..... 1

Minister of Minerals and Energy to supply electricity to Tukakgomo Community in the Mpumalanga Province ..... 7

MEETI Certificate course in Environmental Management and Policy in Mining and Minerals ..... 7

Potential impacts of electricity industry restructuring on renewable energy and energy efficiency ..... 9

Sustainable Development Public Survey ..... 15

Three energy regulators to merge ..... 15

Launch of 20/20 Vision for Energy ..... 16

Gauteng High Schools Competition on Sustainable Development ..... 16

NRF Events: Science and Sustainability ..... 17

New report calls for expansion in Wind Energy Research ..... 18

Extracted Budget Vote Speech of the Department of Minerals and Energy ..... 19

Energy Events 2002 ..... 23

half a million households use these caps at present.

A problem that is not being addressed is that of paraffin-related fires. A large proportion of the fires were clearly the result of the appliances exploding. It was necessary to understand how such explosions might originate. It is the purpose of this paper to develop and test a hypothesis of the origin of the problem.

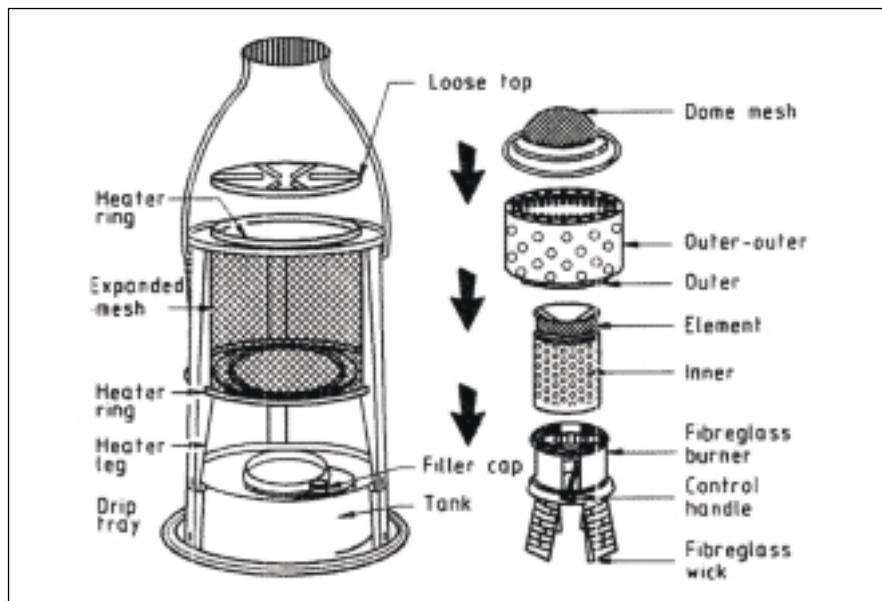
## Paraffin appliances

The majority of paraffin appliances in use today are unpressurized units, which cost a few tens of Rand. Pressurized units of the "Primus" type are much less frequent, partly because they are significantly more expensive. The basic construction of the appliances is illustrated in Figure 1.

Looking at the exploded view on the right, there is a wick, which lifts fuel into the combustion zone. The combustion takes place in the volume between the inner and outer elements. These are perforated to admit air for combustion. In use, these elements become very hot, and the paraffin at the surface of the wick evaporates (which helps to keep the wick cool), and the resultant paraffin vapour then ignites. The radiant heat from combustion heats the elements, which in turn heats the air being drawn in.

When the pieces are assembled, the wick passes through the open hole at the top of the fuel tank, and the burner then locks in place. Importantly, there is no seal where the burner meets the fuel tank. Cookers are made in essentially the same way, except they have no mesh dome or heater ring/loose cover. Instead there is a more robust shield and support for a pot over the burner.

Appliances of this kind are manufactured in Harrismith and Botshabelo.



**Figure 1: Construction of a typical paraffin appliance**

In use they have a life of 6-9 months, in the case of cookers, and 1-2 years in the case of heaters.

## Probable source of the problem

Examination of Figure 1 shows that the inner and outer elements are connected to the burner, which in turn is connected to the fuel tank. In operation, the inner and outer elements reach red heat (Figure 2), and that heat can be conducted downwards to the fuel tank. Granted, the metal of which the parts are made is thin, so the cross-section for conduction



**Figure 2: Top view of a stove in operation. Note red heat of inner element and blue "jets" at 8 o'clock**

of heat is small, but attempts to disassemble the unit soon after use show that heat is indeed lost via this pathway. In addition, the plume of hot gases spreads laterally once it reaches the base of a cooking utensil, and this radiates heat downwards, while the support for the pot also heats up, which creates another conduction path for heat to reach the fuel tank.

Thus there is every reason to suppose that the fuel tank, and thus the fuel in the tank, will get hotter as the appliance is used. According to SABS CKS 78-1972 the flash point of illuminating paraffin is a minimum of 43°C. This means that if the temperature of the fuel exceeds 43°C it is likely to ignite with a minimal source of ignition. The fuel is effectively open to the air, and the opening is within 5cm of the combustion zone. Thus if the fuel temperature exceeds 43°C it is almost inevitable that there will be an ignition outside the appliance.

## Experimental

A "Panda" stove was purchased from a typical retailer (R23.70). It was unpacked and assembled, then filled with 1 litre of illuminating paraffin and

the wick allowed to soak for an hour (the manufacturer recommends a soaking period of at least ten minutes). The filler cap was removed and a glass-mercury thermometer supported in a cork fitted in its place. The appliance was placed on a level surface in a room free of drafts, and lit. Once it was burning steadily, the flame was adjusted close to maximum, so that it was not quite smoking. The temperature was recorded every 20 minutes, after the appliance had been picked up and swirled to mix the fuel. After 2 hours the experiment was stopped. Later it was repeated, but with a pot filled with cold water placed on top of the stove.

After the second measurement, the stove was carried into the open air, still burning, and placed on level ground before being knocked over.

### Results

Figure 3 shows the fuel temperature in the two experiments. In the first, with no pot present, the temperature reached 42°C after 2 hours, at which point the experiment was terminated because the appliance burst into flame at the junction between the fuel tank and the burner when the paraffin was swirled to mix it. It was also observed that the lever for control of the wick became very hot, and was painful to touch when it was desired to shut the stove down

In the second experiment, with a cooking pot on the stove, the fuel temperature reached 43°C in eighty minutes, but it also flamed at the junction between the fuel tank and the burner at all temperatures above 39°C. It was necessary to wear protective gloves to avoid injury.

Figure 4 shows the stove alight in the open air, and Figure 5 is the same, five seconds later. Because the camera was set for automatic exposure,

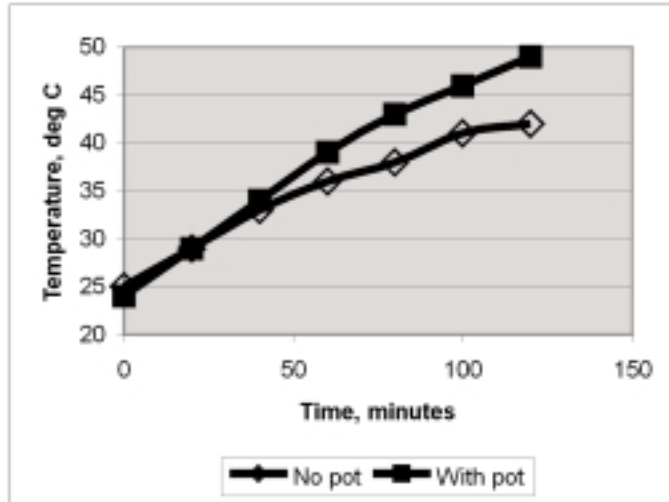


Figure 3: Temperature of fuel in tank with time

the light from the flames dominated the scene and caused massive under-exposure of the background, which is why it appears that the picture was taken at night. An attempt was made to douse the flames, using 25ℓ of water, but this merely had the effect of spreading the blaze. A strong jet of water was needed to contain the flames and finally extinguish them. Figure 6 shows the dying moments of the experiment.

The stove contained less than 1ℓ of paraffin at the time of the test, and most of it was consumed in the first 30 seconds after the appliance was knocked over. That is equivalent to a release approaching 1MW, more than sufficient to trigger a fire in the ordinary home.

A second stove was tested under conditions such that the temperature of the paraffin did not exceed 35°C. Figure 7 shows the stove nearly one minute af-



Figure 4: Stove alight and heated after 2h cooking



Figure 5: Five seconds after knocking stove over



ter being knocked over. Paraffin is burning steadily at the opening in the fuel tank, but a river of unburned paraffin is slowly escaping across the ground. Soon after this photograph was taken, the spilled paraffin ignited and the fire then escalated. Even at its peak, however, it did not attain the ferocity of the blaze shown in Figure 5.

### Discussion and conclusions

It is clear that heating of the fuel in the typical unpressurized paraffin appliance can lead to very strong fires. Gentle agitation is sufficient to produce a small fire where the burner meets the fuel tank. There must be a risk that a user, surprised by that small fire, may knock the appliance over when a massive fire will result. Equally, attempts to control the appliance by adjusting the flame may lead to painful burns, which in turn may cause the gentle agitation needed to cause a small fire and equally lead to a massive fire. When the appliance has been in use for an hour or so, it becomes positively dangerous due to the heating of the fuel. In contrast, when the fuel is cold, there is a low risk of rapid combustion.

The hazard arises from the fact that the fuel flash point is relatively low, and the design of the appliance is such that the fuel can easily exceed the flash point in normal use. There are various potential remedies.

The first would be to increase the flash point of the paraffin. However, this is not as simple as it sounds. The illuminating paraffin of commerce in South Africa is identical to aviation jet fuel. It is partly because jet fuel is a bulk material that the paraffin can be produced so cheaply. The specification cannot be changed without wide ramifications. A specification for a high-flash-point paraffin would probably involve a greater cost.



**Figure 6: Fifty-five seconds later**

Also, if one were to develop a paraffin specification, there are other changes that should be made beside the flash point. As Figure 2 illustrates, the paraffin is not completely burned in these unpressurized appliances. To some extent this is because the paraffin is “illuminating paraffin.” To make a flame luminous, it is necessary to have some relatively high molecular weight species present, which are broken down in the flame to carbon, which then burns incandescently. Illuminating paraffins therefore have a heavy, high-molecular-weight fraction. A cool plate inserted into a flame of illuminating paraffin will be blackened much as a candle will do, due to the unburned carbon precipitating on the plate.

These unburned hydrocarbons leave the combustion zone as tars and soot. We have not found any studies of this phenomenon in unpressurized stoves, but it is clear it is real. First, utensils employed for cooking on paraffin stoves soon build up a tarry layer on their base. This layer has a characteristic “burnt” smell. Paraffin users find the smell spreads to clothing and other goods. Second, after long

use, soot fingers grow on nearby surfaces. It is fairly clear that this soot is very fine and predominantly in the  $<2.5\mu\text{m}$  size range. As such it is in the respirable size range, and likely to play a role in respiratory tract disease. Being the product of pyrolysis, it is likely to be carcinogenic. This is clearly an area where further research is needed.

Respecification of paraffin may resolve these problems by doing away with the heavy fraction needed to provide luminescence in flames, but it is difficult to see how a higher-flash-point, lower heavy end fraction (which, by definition, involves a narrower cut during refining) could be competitive.

A second “fix” might be to redesign the appliances to avoid the problems. To some extent, this was part of the thinking behind Eskom Enterprises’ “Amazing Amanzi”. This is a system for pressurizing paraffin and connecting the pressurized supply to a Primus-style burner head. There is little doubt that preheating the paraffin before combustion improves the efficiency of combustion immeasurably, while the use of a sturdy pressure vessel keeps the liquid well clear of prying hands, and so reduces the incidence of poisoning. However, Amazing Amanzi is not cheap, and



**Figure 7: Stove containing cold paraffin. 50 seconds after knocking stove over.**

so it is unlikely to find widespread use in the poorer households.

Another approach to redesign might be to specify the appliance more carefully. This was foreseen in the White Paper on Energy, and some progress has been made. A draft specification, SABS 1906, has been published for public comment, which must be made before the end of April this year. Some sections are, however, highly flawed in the light of our findings:

**4.2.3 Fuel temperature.** When tested in accordance with 5.7, the maximum temperature of the fuel in the fuel container shall not exceed 54°C

**5.7 Fuel temperature test.** Light and run the appliance for 2h. Measure the temperature of the fuel, and check for compliance with 4.2.3”

Not only is the desired fuel temperature maximum far too high, but also the test method does not reflect the effect of placing a cooking pot on the appliance during the test. This omission is all the more surprising when all other tests of combustion require a pot to be used.

In a similar vein, the draft standard requires:

**4.2.4 Surface temperature.** When tested in accordance with 5.8, the surface temperature of any part of the appliance that it may be necessary to touch during its operation shall not exceed 55°C in the case of parts made of metal and painted metal; and 65°C for enamel metal.”

These temperatures are clearly excessive, and it is not apparent why there should be any difference between painted and enamelled metal. In addition, the Draft Specification has no test of the extent to which an appliance will act as a significant source of fire if, for instance, it is knocked over.

**Table 2: Domestic accident data for LPG, 2001**

Ref	Homes	Injury	Dead	Cause
1	3	0	0	Manifold
2	1	0	1	Cylinder leak
3	1	0	2	Arson
4	1	0	0	Cylinder on stove
5	1	1	0	Cylinder on stove
6	0	1	0	Leak
7	0	0	3	Suicide
8	Henhouse	3	0	Change error
9	Kitchen	1	0	Cylinder on stove
10	0	0	2	Asphyxiation
11	Bedroom	1	0	Leak
12	0	1	0	Purge

(LP Gas Association)

A number of simple design changes to make the appliances safer are apparent. They include such details as:

- Making the connection between the burner and the fuel tank of a low-thermal-conductivity material
- Providing radiation shields to prevent radiant heating of the fuel tank
- Providing a small well for the wick, which was fed with paraffin via a flow-limiting orifice, so limiting the rate of release of fuel if the appliance was knocked over.
- Making the fuel tank spill-proof.

None of these would be very costly or difficult to implement.

There is a third possible solution, and that is to change the fuel altogether. Other societies at our stage of development have faced the problem of meeting the thermal needs of poorer households in a safe and cost effective manner. They too have found that paraffin is not necessarily the optimum solution. Instead, they have turned to LPG.

The reasons for this are several:

- LPG is inherently cleaner burning than paraffin
- LPG is packaged in a way that does not allow users easy access to the fuel, so the possibility of accidental consumption or spillage is remote
- In the event of fire, users recognise the potential hazard of the gas cylinder, and remove it from the vicinity of the fire as a matter of priority
- Failure of the burners or their feed from the cylinder does not lead to a high-energy release.

For these various reasons, LPG is far safer to use than paraffin. Table 2 summarises recent accident data.

Over one year there were only 8 domestic injuries and 8 fatalities, and three of the fatalities arose in a single suicide incident. Comparison with the paraffin safety data makes it clear that LPG is at least two orders of magnitude safer than paraffin as a domestic fuel. Some 90 000t

of LPG is sold annually in the domestic sector, as against some 600 000t of paraffin sold in the same sector. Per 100 000t of fuel sold, therefore, the relative incident rates are as given in Table 3.

**Table 3: Relative incidence rate of paraffin and LPG per 100 000t sold domestically each year**

	Homes	Injuries	Deaths
Paraffin	16700	1700	1000
LPG	9	9	5

LPG can reach the user at a price comparable to that of paraffin, and because the cylinder is sealed, the user is generally assured of the quality of the product received (although unscrupulous operators can give short weight or contaminate the cylinder with a light oil, which effectively reduces the usable fuel sold). However, in South Africa LPG is generally at least twice as costly as paraffin, and LPG appliances are also more expensive.

Comparison with pricing elsewhere soon shows that the South African distribution network is unduly complex and unduly well rewarded. However, a test site in Kwa-Zulu Natal has shown that a whole community can be served with LPG at a delivered cost of less than R5/kg, at which point it becomes the fuel of choice. This has been accomplished by setting up a small bulk filling facility, and training a local operator in safe filling procedures. Cheap appliances – mainly simple gas rings – have been sourced overseas.

The implications of this test are considerable. Elsewhere in the world LPG use has grown at 30% per annum for several years once distribution has

been rationalized to meet the needs of local communities and cheap appliances have become available. Botswana has seen this level of growth in recent years, and China reached this level last year – and growth would have been higher if the logistics of serving that huge market could have been sorted out.

One of the questions that has arisen is whether there is sufficient LPG to meet household needs. About 600 000t of paraffin re consumed annually, and if it were all to be replaced by LPG, there would be a need for about 540 000t of LPG. The domestic market in 2001 was only 90 000t, so another 450 000t would be needed.

It transpires that there is about 200 000t/a of surplus production capacity in South Africa, presently unutilised; that at least 100 000t/a will become available in the near future as industrial users of LPG convert to natural gas; and a further 100 000t/a will be produced from the Temane gas field. It is thus apparent that any reasonable growth in demand could be satisfied from local sources for the foreseeable future.

We may conclude that, while there are reasonable prospects of being able to get safe paraffin-fuelled appliances on to the South African market to meet the needs of lower-income households, there may be real merit in also boosting the offtake of LPG as an alternative fuel. Indeed, Government has seen the merit of this, and took the first steps towards regulating LPG prices in January this year.

## Acknowledgements

I must thank the Paraffin Safety Association of South Africa and the LP Gas Safety Association of SA for

making available the data that brought to light this intriguing problem. Innumerable people in the industries have provided valuable insights, and it would be difficult to list them all, so let me close by saying I remember them warmly, and am only sorry that space does not permit a list as long as the paper itself. A late draft of this paper was presented at the International Conference on the Domestic Use of Energy at the Cape Technikon in March 2002.

■ *Contact: Philip Lloyd  
Senior Research Fellow  
Energy Research Institute  
University of Cape Town  
E-mail: plloyd@ebe.uct.ac.za*

## MINISTER OF MINERALS AND ENERGY TO SUPPLY ELECTRICITY TO TUKAKGOMO COMMUNITY IN THE MPUMALANGA PROVINCE

The Minister of Minerals and Energy, Ms Phumzile Mlambo-Ngcuka, led the entourage of Government officials to conduct the switch-on at Tukakgomo in the Mpumalanga Province. The switch-on took place on Monday, 15 April 2002, forming part of the National Imbizo Focus Week.

The electrification programme is one of the programmes aimed at bringing affordable and sustainable energy to all. For most women in rural areas, life is centred on collecting firewood, fetching water, and walking long hazardous distances, in order to participate in meaningful domestic activities. To date, almost more than half of South Africa's rural population has access to electricity, which is crucial for eradication of

poverty, the fulfilment of basic needs and sustained economic development.

Tukakgomo has about 4000 households, and to date there has been about 1200 electricity connections. Of the four (4) schools in the area two (2) have been electrified and the clinic also electrified as well. Tukakgomo is situated in the Limpopo Province and falls under Sekhukhuneland District Council, the local municipality is Greater Tubatse Municipality.

On 30 October 2001, Deputy Minister, Susan Shabangu, also launched the free basic electricity programme in Mathopestat near Magaliesburg. A basic amount of 50kWh per household per month has been considered as a national standard and this will assist

poor households to access basic electricity for lighting, ironing, water heating, use of radio and black and white television. This will go a long way towards ensuring that poor communities have safer environments, better opportunities for studying, and improved health. A total cost saving of R180-00 per household's connection per year will result from the provision of free electricity of 50kWh per household per month.

■ *Contact: Mr Kanyo Gqulu  
Chief Director Communication/  
Ministerial Spokesperson  
Department of Minerals and Energy  
Tel: 012 317 9537  
Fax: 012 322 7312  
Cell: 083 293 3377  
E-mail: yonelas@mepta.pww.gov.za*

---

## MEETI CERTIFICATE COURSE IN ENVIRONMENTAL MANAGEMENT AND POLICY IN MINING AND MINERALS

The Minerals and Energy Education and Training Institute (MEETI) in association with the Graduate School of Public and Development Management of the University of the Witwatersrand, invites applications for this certificate programme which will cover crucial topics relating to mining and the environment, environmental management systems and best practices, life cycle assessment of minerals, ecological and social aspects of mining, technical aspects of environmental management, key risk areas, impact of mining on water, soil and air (EIA).

This new certificate course has been developed as a result of preparations for the World Sustainable Development Summit. The course will be presented by South African and Canadian experts.

All mid-career and professionals working for government, labour and industry who wish to advance their knowledge of environmental management and policy in minerals and mining policy are encouraged to take part. The course takes place on a block-release basis over three months and participants will be expected to attend lectures in Randburg for one week

The course dates are as follows: 10 - 14 June; and 15 - 19 July 2002. The course offers an opportunity to find more about *sustainable development and multi-stakeholder negotiations* and to exchange opinions with participants from government, trade unions and industry as well as independent experts and community leaders.

■ *Contact: Mike Mangena,  
Training Manager, MEETI  
Tel: +27 11 709 4771  
Fax: +27 11 709 4657  
E-mails: info@meeti.org.za or  
meeti@mepc.org.za*



In association with the Graduate School of Public and Development Management, University of the Witwatersrand

# Certificate in Environmental Management and Policy in Mining and Minerals



Recorded with SAQA

June - July 2002



## Module 1: Interface between the mining and minerals industry and the environment

Minerals in the global and South African economy ♦ international environmental protocols ♦ mining and sustainable development

## Module 2: Environmental policy in mining and minerals

Policy formulation and analysis ♦ minerals and environmental policy and legislation ♦ water legislation ♦ stakeholder participation ♦ public participation ♦ instruments of policy implementation

## Module 3: Life cycle assessment of minerals

Mining sequence ♦ planning and land acquisition ♦ exploration and deposit evaluation ♦ mining operations ♦ planning for closure

## Module 4: Ecological and social aspects of mining

Strategic environmental impact assessment ♦ positive and negative impacts of mining ♦ dispute resolution ♦ community participation ♦ multi-stakeholder negotiations

## Module 5: Introduction to technical aspects of environmental management

Environmental impacts of mining on water, soil and air ♦ key risk areas such as slime dams, waste disposal, acid mine drainage, radioactivity and hazardous chemicals

## Module 6: Environmental management systems and best international practices

Integrated Environmental Management ♦ EMPR ♦ EIA ♦ ISO 14 000 ♦ best international practices

The course offers an opportunity to learn more about Sustainable Development, the Global Mining Initiative, Multi-stakeholder Negotiations and Water Management

### Target group

This programme is aimed at mid-career professionals employed in the South African mining and minerals sector, and in institutions dealing with environment. This includes people from government, labour, industry, non-governmental organisations and the research community.

### Learning outcomes

At the end of the course participants will be able to:

- Demonstrate awareness of different priorities and perspectives of a range of stakeholders in sustainable development and the environment in mining
- Recognise key policy issues in the mining and environment fields and contribute to the policy process

- Identify policy related problems and propose solutions in sustainable development
- Show an understanding of institutional dynamics and governance in the mining and environment fields

### Methodology

The programme will be delivered by Canadian and South African mining and environmental experts. A variety of learning methods including case studies, presentations and panel discussions will be used.

### Dates

The course takes place on a block-release basis over the following two weeks:

- Monday 10 – Friday 14 June 2002
- Monday 15 – Friday 19 July 2002.

Lectures will be delivered from Monday to Friday, 08h30-17h00 daily.

### Cost

The course fee is R10 370 including VAT. The fee includes all course materials, lunches and parking. It does not include accommodation or transport to the venue. A cancellation fee of 50% of the total amount applies to participants who cancel their registration less than 7 days before the course begins and 100% to participants who fail to register on the first day of the course. Cancellations must be confirmed in writing.

### Venue

The course will be held at the MEETI offices:

Level 9 Block 9, Mintek Campus, 200 Hans Strijdom Drive, Randburg, Johannesburg.

### Certificate and Executive Courses Offered by MEETI

- Energy Policy and Management
- Climate Change and Environmental Policy Management in Energy
- Environmental Policy and Management in Mining
- Management of Petroleum Policy and Economics
- Planning and Economics of Refinery Operations
- Management of Mining and Minerals Policy
- Gas Governance and Regulation
- SADC Programme in Rural Energy Planning and Environmental Management

### Contact details

Mike Mangena, MEETI Training Manager

Tel: 011 709 4771

Fax: 011 709 4657

E-mail: [info@meeti.org.za](mailto:info@meeti.org.za)

Postal Address: P.O. Box 599, Randburg, 2125, South Africa



# Potential impacts of electricity industry restructuring on renewable energy and energy efficiency

## Introduction

The South African electricity industry is on the brink of considerable restructuring, implying changes in ownership, structure and regulation, potentially encompassing both the electricity supply and distribution industries. Eskom will shortly become a publicly owned company, and possibly a private company subsequently.

The rationale for restructuring is that it will promote economic and technological efficiency within the electricity sector, delivering notable social benefits. In other countries, however, restructuring has often seen higher prices, particularly for small customers, and loss of public benefits. Although new opportunities may emerge as access to markets is opened up, private companies will not willingly invest in programmes with no commercial return. Change in South Africa renders uncertain the future of electricity-related public benefits, including energy efficiency, renewable energy, environmental protection, public-interest research and development activities, and improved access to energy by the poor.

This article, which is based on a recent EDRC report, focuses on the

effects of restructuring on *environmental* public benefits – particularly renewable energy and energy efficiency; we then make policy recommendations and suggest potential funding sources.

## The restructuring process

Power sector reform is driven strongly by international agencies and concerns. The overall lesson from international experience is that competitive electricity markets significantly narrow the spectrum of financially viable energy-efficiency investment, making the public sector's role in protecting social and environmental benefits critical. Regulation to protect public benefit is one of several new forms of regulation that will be required in a restructured industry; others include competition regulation (e.g. fairness for independent power producers), economic regulation (e.g. avoiding monopoly pricing) and technical regulation (ensuring standards). The literature on power sector reform (restructuring) in developing countries is growing, but has tended to focus more on energy efficiency than renewable energy.

Some of the factors driving restructuring internationally apply in South

Africa: the desire to improve efficiency, potentially widening customer choice; new smaller-scale technologies allowing more participants in the market (gas and renewables); and environmental concerns (including climate change) slowing investment in large power plants. Technical factors are reinforced by a dominant belief in the greater efficiency of private over public capital. Structurally, the local industry could be unbundled both vertically (by separating distribution from generation and transmission) and horizontally (by breaking Eskom's monopoly on generation). On the supply side, restructuring aims to increase competition, by changing industry structure to include more generators (wholesale competition). While competition is more easily achieved in generation, many argue that transmission and distribution remain natural monopolies, as there is only one electricity grid.

Within the supply industry, Eskom, it has been argued elsewhere, is in urgent need of restructuring to improve operational and investment efficiency, to boost economic growth and development and to generate an economic return to shareholders. The utility has already gone through a process of commercialisation, after the

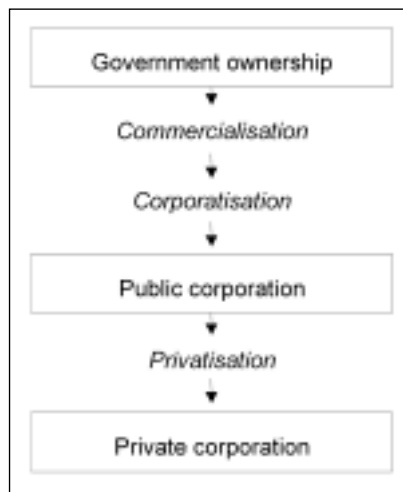
Eskom Conversion Act of 2001 turned it into a company with the state as its only shareholder – a process distinct from privatisation (see Figure 1), as ownership is unchanged.

On the demand side, restructuring will consolidate distributors and at a later stage might lead to retail competition. The reasons for restructuring in the electricity distribution industry are different from those for the ESI. A key issue is the lack of financial viability, with many municipalities close to bankruptcy and not paying Eskom for bulk supplies. Another problem is inequitable treatment of customers, with differential tariffs, quality of service and reliability. EDI restructuring would be intended to remove the inefficiencies arising in an industry that is fragmented between 368 distribution businesses and thus loses any economies of scale. The key steps in EDI restructuring are transferring Eskom distribution and municipalities to an EDI Holdings Company, and the formation of six new regional electricity distributors.

Electricity sector restructuring in South Africa is part of a broader government resolve to restructure the four largest state-owned enterprises: Transnet, Telkom, Denel, as well as Eskom. The 1998 White Paper on Energy Policy states that restructuring is intended to:

- improve social equity by specially addressing the energy requirements of the poor;
- enhance the efficiency and competitiveness of the South African economy by providing low-cost and high-quality energy inputs to industrial, mining and other sectors; and
- achieve environmental sustainability in both the short- and long-term usage of our natural resources.

According to the White Paper, elec-



**Figure 1: Steps from government to full private ownership**

tricity sector reform will be based on introducing competition into the industry by restructuring Eskom generation into competing generation companies, with transmission separate.

### *Context of the electricity industry*

While Eskom appears to have performed well on several fronts (low price of electricity, electrification of 2.5 million households), some of the factors that have made this possible are not, in fact, sustainable. Contributors to the low cost of electricity are access to large resources of cheap coal; the use of generation technologies that maximise economies of scale and exploit the lowest value (and cost) of coal; exemption from taxation and dividends; financing subsidies; over-capacity from power stations which are already fully paid for; and the omission of environmental costs from the price of electricity.

Over-investment in coal-fired power plants in the 1980s led to excess capacity, so that Eskom has not had to invest significantly in new power stations for some years, which reduces overall costs. Three power stations

are, in fact, 'mothballed', and the debt for constructing power plants has largely been paid off. When new investments have to be made, costs and electricity prices will rise. Eskom expects that R100 billion of new investment will be required over the next 25 years, for an estimated capacity of 15 000 - 25 000 MW.

Eskom investments have effectively been subsidised with public money – through, for example, the Reserve Bank providing forward cover and thus protecting Eskom against changes in exchange rates. Not having to pay tax and dividends, even after investments in power plants had been paid off, benefited Eskom by R22 579 million between 1986 and 1998. Even with this subsidy, Eskom's debt burden was high in the 1980s, but over time the loans have been paid off. This is reflected by the high debt-equity ratio of Eskom in 1986 at 2.93, which declined to 0.85 in 1998 and to 0.63 in 2000. A debt-equity ratio of 1.00 means that only half of the liabilities of the company would be financed by borrowing (debt), the rest from other provisions, such as capital development funds, loans redeemed and other capital receipts that reflect the use of retained earnings of the company to support assets. In a commercial firm, lower debt repayments would have been replaced by higher payments of dividends to shareholders, but this did not happen with Eskom as a public company. With the capital costs having been paid off, consumers are currently paying only for energy costs.

The overall effect of all these factors is that the price of electricity does not reflect economic costs (the value of the inputs used to produce electricity): the long-term costs of increasing capacity are not reflected (tariffs are not 'cost-reflective'), nor are externalities priced. External costs are an important category of market failure, in which the social costs of a

good or service are not the same as the private costs. They arise when an individual's welfare is affected, and that impact is not compensated or otherwise represented in the market price. The situation in the South African electricity industry, where externalities are not internalised, favours non-renewable energy sources over renewables, since the environmental benefits of the latter are not priced in the market.

### *Potential impacts on social and environmental benefits*

Social and environmental programmes usually have public benefits, but if private companies are unable to internalise them, they have no incentive to invest in them. Environmental benefits of the current situation include demand-side management and energy efficiency (e.g. the Bonesa Efficient Lighting Initiative). Renewable energy projects have been implemented primarily off-grid, although research and development of large-scale renewables under Eskom's SA Bulk Renewable Energy Generation (SABRE-Gen) programme has begun.

A major social benefit of the current Eskom structure has been its financing of electrification. With plans to restructure, the burden of funding electrification has been shifted to the general treasury; the need for a National Electrification Fund has been accepted, to be resourced from tax and dividend income, and able to receive grants. The proposal for restructuring envisages that electrification will continue at a rate of 300 000 connections per year from 2001 to 2005 and 200 000 connections per year thereafter, requiring an estimated capital subsidy of R840 million per year be given by government to regional electricity distributors for the first five years and R560 million per year thereafter.

The impacts of restructuring on social public benefits have been described in detail elsewhere; in the following section, we focus in greater detail on environmental benefits.

### Renewable energy

The Energy White Paper encourages the entry of multiple players into the generation market. One of the biggest opportunities for renewables under restructuring is the prospect of renewable independent power producers (IPPs) entering the electricity market. Renewable IPPs face a number of barriers, however, as was revealed in a study, commissioned by the Department of Minerals and Energy (DME), of the prospects for bulk renewable IPPs. Key obstacles for renewable IPPs are the present low cost of Eskom's electricity and the lack of non-discriminatory third party access to the grid.

Renewable energy has a different cost structure to traditional power sources, with high initial costs for construction, but low operation and maintenance costs. Coal-fired power plants, by contrast, have high operation and maintenance costs, including the use of fuel. Renewables have clear major environmental benefits, despite high initial costs, however, reducing local air pollution and helping to combat global climate change. If energy tariffs took into account the full external costs of coal production and the life-cycle costs of nuclear power, the costs of renewable power would appear more favourable. Investing in renewables has higher upfront costs, but has major benefits for society in the longer-term.

Furthermore, high initial capital costs could be recovered from future sales, given adequate electricity prices. Eskom's average price for electricity sold in 2000 was 13.23 c/kWh, a price at which it would be impossible to

recover the high initial capital costs of renewables from sales revenues. In the medium term (2005-2010), however, new capacity will be needed and tariffs will increase; if predictions of a future average tariff of 24-40c/kWh by 2010 prove accurate, there will be more scope for renewable IPPs.

Another possibility has positive revenue implications for renewable IPPs, when and if retail competition is introduced in South Africa: that of developing 'green power' markets, amongst customers who want to buy electricity generated only from renewable sources. Demand from customers who are prepared to pay a premium for cleaner energy has been a powerful instrument in retailing renewable energy in industrialised countries. The local equivalent market is probably small, with relatively few environmentally conscious consumers who could afford to pay a premium for 'green power'. In the short-to-medium term, the best opportunities may be in promoting 'green power' for businesses seeking to sell goods on international markets that value products produced with clean energy.

A further measure promoting renewables would be for government to provide production incentives, which would deal with the initial high cost hurdle. Other options include environmental taxation, externality adders, government assisted business development and green marketing. The DME background research paper includes a table comparing advantages and disadvantages of policy tools.

### Energy efficiency

An international review of restructuring in several industrialised and developing countries concluded that the restructuring process has given relatively little serious attention towards ensur-

ing that investment in energy efficiency is maximised. It also found that DSM programmes that existed prior to restructuring had subsequently been reduced in size and scope or sidelined.

DSM options can be divided into two categories: those that improve a utility's financial performance, and those that do not. Utilities typically undertake DSM activities that improve the load profile and thus pay for themselves, such as load shifting (encouraging consumers to use electricity at non-peak times), allowing interruptibility (e.g. switching off geysers remotely at key times), or strategic growth (promoting growth in demand during off-peak periods). Such interventions usually target larger customers, and reflect a concern to delay the need for new supply capacity, or to optimise the load profile. Other kinds of DSM, however, are seen to simply reduce demand, and thus revenue, and are therefore not pursued by utilities. The difference between various kinds of DSM is illustrated in Figure 2. The lower part of the diagram shows a DSM option that is seen to simply reduce demand overall, reduce revenue and is therefore not pursued.

Vertically integrated natural monopolies are more likely to invest in energy efficiency than private companies, given the clear benefit of delaying investment in new power plants. Even in the first steps of restructuring the electricity supply industry (commercialisation), this incentive decreases as IPPs enter the market. DSM programmes under the restructured regime are likely to focus on load management activities rather than on public-interest energy efficiency. The key change relates to change of ownership. As long as ownership is with government, energy efficiency programmes are likely to be implemented, as they contribute to the social and environmental good of the country. When substantial ownership is transferred to the private sector, energy efficiency investment is lost, as it does not contribute

to profit. Where it remains, however, energy efficiency can be used as a way of differentiating a product in a market supplying a homogenous good.

In South Africa, energy efficiency is one of government's goals, as expressed in the 1998 White Paper:

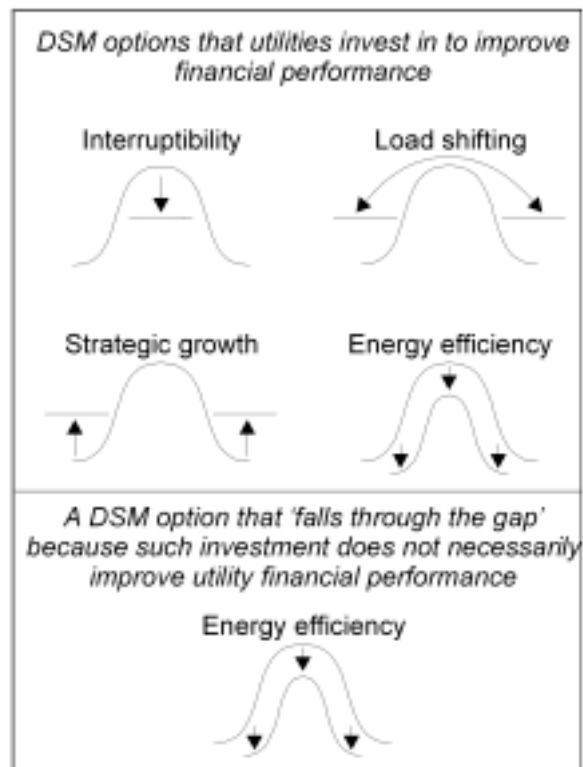
*Since expenditure on energy constitutes a large proportion of the country's GDP (15%) and a particularly large proportion of poor households' expenditure, it is necessary to give attention to the effective and efficient use of energy. Energy efficiency and energy conservation considerations must therefore form part of an overall energy policy.*

Public benefit energy efficiency target the end-user (residential, industrial or commercial). Practical examples include education, training and public awareness campaigns; demonstrations and audits; direct installation

of energy efficiency equipment in (typically small) commerce and industry; installation of efficient appliances in residential houses (e.g. compact fluorescent lights, efficient refrigerators and improved thermal efficiency of low-cost housing); and fuel-switching, e.g. from electricity and paraffin to gas for cooking). The public benefit of such energy efficient interventions has been shown in earlier research. These economic analyses demonstrate the substantial economic and environmental benefits energy efficiency interventions yield for the urban poor.

## Policy recommendations

In the context of restructuring in the South African electricity industry, there are several policy options to promote renewable energy and energy efficiency. Each is addressed below, together with the question of where funding for implementing such policies might be found.



Source: Clark & Mavhungu

Figure 2: Demand side management options



## *Policies to promote renewable energy*

Several policy options could promote renewable power production in a restructured industry:

- One way of removing the barrier of discriminatory third party access to the grid is to offer *power purchase agreements* to small-scale renewable IPPs, giving them a fixed contract and agreed price over a period of years, which would reduce risk and offer certainty that they can sell their power. Some observers suggest that establishing long-term power purchase agreements for IPPs could tie government and consumers into non-competitive prices for years to come. They are, however, essential if renewable IPPs are to have security that they will be able to recoup their high initial investment costs. Indeed, power purchase agreements need to be specifically structured to reflect the cost structure of renewables. To avoid the lock-in to fixed prices, it might be desirable to limit power purchase agreements to small-scale projects, such as renewable energy projects smaller than 50 MW (and energy efficiency equivalent to less than 10 MW). The assumption would be that as renewable IPPs become commercialised and grow, they are able to compete with other technologies, but that while the technologies are still going through learning curves and reducing costs, they need the security of fixed contracts.
- Another policy option is to adopt targets for the percentage of renewable energy to be achieved within a particular time frame. One means of doing this is to set a *renewable electricity portfolio standard*, which requires a fixed percentage of total electricity sales to be derived from renewable energy sources by a certain date. The

DME has recently discussed a target of 5% renewable electricity by 2010. With a single utility, a renewable electricity portfolio standard would amount to the same as the renewable set-aside capacity of renewable power, e.g. 200 MW for five years, just under 0.5% of current capacity. As the industry is restructured into several regional distributors, individual distributors can be required to either achieve this percentage, or buy credits from others who achieve more than their target. In other words, market mechanisms can be used to achieve the target at least cost. Required percentages of renewable energy could also be specified for integrated resource plans to be drawn up by the new REDs.

- *Research, development and demonstration* is a critical activity to promote renewable energy, and its location under restructuring should be clarified.

## *Policies to promote public benefit energy efficiency*

Energy efficiency has clear social and environmental benefits, yet it is not clear that it will survive under restructuring. A key problem is that energy efficiency means forgone revenue for utilities, as it decreases the amount of electricity sold. A number of policies and measures should be used to promote energy efficiency in a restructured industry.

- Under restructuring, the National Electricity Regulator's setting of tariffs will be particularly important for energy efficiency, with a key question being whether the regulator is willing to compensate the utility for such lost revenues. Some agreement will have to be reached on this between the regulator, DME, Eskom and IPPs.

- Apart from the issue of lost revenue, the regulator could also require distributors to *invest a minimum percentage of total annual revenues in energy efficiency*. If so, it could be specified how much of this is spent on end-use efficiency, research and development and supply-side efficiency. While energy efficiency should pay for itself in the long run, some initial funding might be needed through a mechanism for energy efficiency. Some countries, such as Norway and Denmark, have legislated a specified level of energy efficiency investment, and also require utilities to undertake integrated resource planning prior to investment decisions.
- Finding an appropriate *institution to champion energy efficiency* is vital. Under restructuring, utilities may no longer be the best institutions to promote energy efficiency. Especially if Eskom were privatised, many public-benefit functions would likely be lost. On the other hand, the technical capacity and contact with customers that Eskom has should continue to be used where DSM remains in the utility's interest. An institutional home or agency for public-benefit energy efficiency needs to be found.
- *Coordination* between authorities, notably the DME and the National Electricity Regulator, is important for public benefits under restructuring. The DME (particularly through integrated energy planning) should provide overall strategic guidance, develop and enforce codes and standards, promote education and awareness campaigns on renewable energy and energy efficiency, develop policy, and co-ordinate government initiatives. DME work should relate closely to that of the regulator, which issues licences and sets tariffs. The regulator has in the past used a combination of bench-

marking exercises, rate-of-return regulation and performance-based regulation – that is, it has not only looked at the financial viability of projects, but also considered other factors, including social and environmental ones.

- *Codes and standards* should be set for energy efficiency. Such codes could include the South African Energy and Demand Efficiency Standard (approved by the South African Bureau of Standards), standards for energy efficiency in low-cost housing, appliance labelling, standards for energy efficiency in industry and commerce and others.

## Financing environmental benefits

The policies options outlined above require financial resources. Alternative options should be explored for financing renewable energy and energy efficiency.

- A *non-bypassable systems benefit charge* could be levied. Such charges have been introduced in several states in the USA and are usually introduced with retail competition. Essentially, a small charge is added to customers' electricity bills, and the revenue collected is spent on specified items, such as energy efficiency, renewable energy, or research and development. In the current context, where many distributors are not financially viable, additional charges will be politically difficult to motivate. Such charges in other countries are, however, usually very small.
- The funding of a public benefit programmes can be by taxes. Eskom became a taxpayer from the beginning of 2000. Although certain tax allowances mean that no tax is payable for the first few years,

the group was required to provide for deferred tax in the amount of R1.454bn. Renewable energy and energy efficiency would compete with funding for electrification and, possibly, demands from local government.

- Renewable energy should have access to finance at reasonable rates, which traditional power utilities enjoy. Financing from international utilities with green energy targets, or concessionary financing through the Global Environmental Facility, Clean Development Mechanism, development banks or venture funds could reduce the cost of capital for renewables.
- Income to government from the sale of energy sector assets could be used on a once-off basis for funding renewable energy capacity. A trust fund for environmental benefits could be established.
- Finally, funding of research, development and demonstration of renewable energy technologies is important to their development. While Eskom is already undertaking the SABRE-Gen project, research, development and demonstration are only effective if they lead to the commercialisation of renewable energy.

## Conclusion

Strategically, the key question is how to protect social and environmental benefits in a restructured industry. Politically, there is probably now greater support for social benefits, such as access to energy, electrification, services to rural areas and black economic empowerment. It is not always as easy to motivate for environmental goods such as renewable energy and energy efficiency.

In the short term, while South Africa

still has excess generation capacity and regional electricity distributors are being established, the focus should fall on energy efficiency measures, an energy purchase agreements, and non-discriminatory access to the grid for renewable IPPs. In the longer term, the Regulator should set a renewable electricity portfolio standard for electricity generation, and require distributors to invest a minimum percentage in energy efficiency. A systems benefit charge is one possible mechanism to finance such measures. These efforts need support from public interest research capacity.

## Acknowledgement

The paper is based on a report prepared by EDRC for the Sustainable Energy and Climate Change Partnership, a project of Earthlife Africa Johannesburg and WWF Denmark. The immediate goal of the project is to support South African civil society, in co-operation with Northern and Southern NGOs, in advancing policies and measures to address climate change and greenhouse gas emissions while maximising the social benefits that will accompany implementation of sustainable energy.

### ■ Contact:

Harald Winkler  
Principal Scientific Officer  
EDRC,  
University of Cape Town  
Tel: (021) 650 2521  
Fax: (021) 650 2830  
E-mail: harald@energetic.uct.ac.za

Justice Mavhungu  
Deputy Director (Energy Sector),  
Department of Public Enterprises  
Tel: (012) 431 1089  
E-mail: JusticeMavhungu@dpe.gov.za

# SUSTAINABLE DEVELOPMENT PUBLIC SURVEY

A public survey opinion from 23 countries (25000 respondents) undertaken in parallel with a survey of sustainable development experts across the world (300 sustainability experts) found that there has been a lack of progress since the 1992 Rio Earth Summit. The polls were conducted last year and early this year. The research reveals that the majority of citizens in most countries surveyed believe that environmental quality in their countries had *deteriorated* over the past ten years!

Six in ten sustainability experts believe the transition to sustainable development is progressing too slowly to avert major irreversible damage to human, social and ecosystem health! Half of the people across the 23 countries surveyed think the environmental quality in their country has deteriorated over the past ten years since the Rio Summit, compared to four in ten who believed it has improved.

The poll also questioned people on their views on the most important items on the agenda - asked to select from a list of five (poverty, wars and conflict, economic stability and growth, human and worker rights, global environmental and resource issues) - most people thought poverty and war to be most important. Latin Americans and Africa want world leaders to focus on wars and poverty, Americans and Chinese want the focus to be on economic stability and growth - and Europeans

are concerned about wars and conflict.

Sustainability experts were asked to rank different issues for World Summit on Sustainable Development (WSSD) focus - to which they responded that water issues ranked higher than poverty, followed by renewable energy in third place. Food security and public health rank in fourth and fifth places respectively. The participating countries included: Qatar, China, Germany, US, Nigeria, India, Great Britain, South Africa, Australia, Canada, Indonesia, Venezuela, Chile, Mexico, Spain, Brazil, Kazakhstan, Italy, Turkey, France, South Korea, Russia and Argentina.

■ *Contact: Joyce Ferreira*  
*SANEA - Administrative Officer*  
*Suite 121*  
*Postnet RAU*  
*Private Bag X12*  
*2109 Melville*  
*Tel: 489-2547*  
*Fax: 489-2153*  
*E-mail: jmf@na.rau.ac.za*

## Three energy regulators to merge

Three regulating bodies within the energy sector will become a single entity, Minerals and Energy Minister, Phumzile Mlambo-Ngcuka, announced at the end of April 2002.

Opening the new Pretoria offices of the National Electricity Regulator (NER), she said the NER, the gas regulator and the upstream petroleum regulator would merge within the next five years.

Her spokesman, Kanyo Gqulu, said this was part of the department's plans to integrate the energy sector. It was in line with the integrated energy plan for South Africa, which was being drawn up.

The plan would also deal with the effective use of different types of energy. The merger would bring about cost reduction and better-cost efficiency, as well as a sharing of experience and expertise, Gqulu said.

He said the minister also called on the NER to assist in keeping the cost of electricity low. This was especially important in the light of the rising fuel price, which South Africa could not control.

■ *Contact: Mr Kanyo Gqulu*  
*Chief Director Communication/*  
*Ministerial Spokesperson*  
*Department of Minerals and Energy*  
*Tel: 012 317 9537*  
*Fax: 012 322 7312*  
*Cell: 083 293 3377*  
*E-mail: yonelas@mepta.pwv.gov.za*

# Launch of 20/20 Vision for Energy

The South African Civil Society Position Paper on Energy Issues, was released on 15 May 2002 in Johannesburg, intends to inform international considerations of infrastructure development in the energy sector in Africa, and help to align investment with public interest. The outcomes of WSSD must serve to provide affordable access to energy services while reducing the social and environmental impacts of current business practice and fossil fuels technology.

The 20 % 20 Vision for Energy promotes differentiated sustainability targets and pricing strategies for rich and poor, as well as for North and South. Within a realisable time frame, 20 / 20 targets require aggressive promotion of and strategic funding for renewable energy and energy efficiency technologies. This will involve legal provisions such as grid access laws and application of the 'polluter pays' principle, and development of enforceable energy efficiency standards.

The Department of Minerals and Energy has domestically committed to universal access but has not sufficiently engaged international stakeholders on a strategic level. This effectively allows Eskom, with its programme for privatised 'energization' of Africa, to determine spending priorities and keep full life-cycle costs external to their profit stream. If energy access is to support sustainable

development, it must be through localised generation and democratic ownership of resources.

Climate Change and the impacts of carbon accounting, particularly trade-related considerations, will have a profound effect on the national economy. Implementation of the 20 / 20 vision for energy would allow for a just transition from an energy sector monopolised by fossil fuel interests to a sector that serves human needs in a democratised context, where equity is considered a more important indicator and driver than net electricity sales and payments.

The SECCP invited press, government, business and NGO representatives to a media briefing on energy and the WSSD on 15 May in Johannesburg.

■ *Contact: Erika Schultz*  
*Earthlife Africa*  
*E-mail: Erika@earthlife.org.za*



## GAUTENG HIGH SCHOOLS COMPETITION ON SUSTAINABLE DEVELOPMENT

Letters and flyers have been sent to headmasters of state Gauteng high schools, inviting essays on Sustainable Development.

Please check where possible that schools in your area have received the information. If not, kindly contact the SANEA secretariat and flyers will be forwarded to schools at your request.

SANEA members will be contacted shortly with a request to assist in some way in promoting Sustainable Development at high school level and to promote the competition in companies and organisations.

*Closing date for receipt of essays:*  
8 August 2002.

■ *Contact: Joyce Ferreira*  
*SANEA - Administrative Officer*  
*Suite 121*  
*Postnet RAU*  
*Private Bag X12*  
*2109 Melville*  
*Tel: (011) 489-2547*  
*Fax: (011) 489-2153*  
*E-mail: imf@na.rau.ac.za*



# NRF EVENTS: SCIENCE AND SUSTAINABILITY

Sustainable development means development that meets the needs of the present, without compromising the ability of future generations to meet their own needs. South Africa must create a future that caters for all its people and their needs as well as for the environment; the National Research Foundation (NRF) is central to this future. As the government's national agency responsible for advancing research, the NRF upholds excellence in its investments in knowledge, people, and infrastructure.

In preparation for the World Summit on Sustainable Development (WSSD) 2002, the NRF is hosting a series of debates, seminars, presentations, and workshops on science and sustainability. The events will take place between May and September 2002 at venues across the country. Through the events, the NRF seeks to contribute towards the overall global discourse, seeking viable and sustainable solutions to the many social, economic, political and ecological problems plaguing the world's population and its governments.

## Objectives

The key objectives of the NRF's series of events include to:

- raise national awareness on issues of sustainable development and the implications of Agenda 21;
- table key issues on science - social, economic, political and ecological - as these relate to sustain-

able development in South Africa; and

- promote the alignment of scientific research programmes with issues of sustainability and sustainable development.

## Who should participate?

The NRF wishes to involve the research community (researchers and postgraduate students); policy and decision-makers; non-governmental organisations; industry; and civil society.

## Programme of Events

### "DRY MOUTHS AND EMPTY STOMACHS - WHERE WAS SCIENCE?"

*Eradication of poverty*

*Date: 21 June 2002*

*Venue: Alice, Eastern Cape*

*Further information:*

*Moipone Lenyai - Tel: 012 481 4089,*

*E-mail: moipone@nrf.ac.za*

### "THE WIND VERSUS THE ATOM: DARLING OR THE PEBBLE-BED"

*Pebble-bed reactors, nuclear energy and the alternatives*

*Date: 8 August 2002*

*Venue: Johannesburg Zoo, Gauteng*

*Further information:*

*Nicoli Koorbanally - Tel: 012 481 4051,*

*E-mail: nicky@nrf.ac.za*

### "THE LONG WALK TO 'EDEN' "

*Working for local environmental efficiency to gain global competitiveness*

*Date: 13 August 2002*

*Venue: Durban, KwaZulu-Natal*

*Further information:*

*Romi Lutchman - Tel: 012 481-4053,*

*E-mail: romil@nrf.ac.za*

### "SITTING DUCKS OR CHARGING BULLS"

*The impact of South African research, education and tourism on one another - using palaeontology, archaeology and geoscience as examples*

*Date: 21 August 2002*

*Venue: Cape Town, Western Cape*

*Further information:*

*Michael Nxumalo - Tel: 012 481 4011,*

*E-mail: michael@nrf.ac.za*

- *The Project team for the NRF's events in support of the WSSD:*

*Renee le Roux,*

*Project Coordinator*

*E-mail: renee@nrf.ac.za*

*Hilda van Rooyen,*

*Communication Coordinator*

*E-mail: hilda@nrf.ac.za*

*Ntungu Masindi,*

*Information Coordinator*

*E-mail: ntungu@nrf.ac.za*

*Website: www.nrf.ac.za/jhbsummit*

# New Report Calls for Expansion in Wind Energy Research

More longer term research into wind energy is vital if the technology is to become competitive, according to a new report presented at the 2002 Global Windpower Conference in Paris.

"There is an urgent need for stronger publicly supported long-term research to complement the product development already carried out within the industry," says Jorgen Lemming, chairman of the International Energy Agency's R&D Wind Implementing Agreement, which published the report. "This basic research is essential for both industry and society."

The report indicates that, although costs have already fallen dramatically, if wind energy is going to supply 10% of the world's electricity needs by 2020, cost reductions in the technology of 30 to 50% are still necessary. This will enable wind power to compete with conventional energies head to head. Research and development work could contribute up to 40% of those cost reductions.

The study brought together 17 countries, as well as the European Commission, to identify the required wind energy research. The results will need to become available in the mid-term

(5-10 years) and long term (10-20 years).

In the mid-term time frame, R&D areas of major importance for the future deployment of wind energy include forecasting techniques, grid integration, public attitudes and visual impact. The report concludes:

- R&D to develop forecasting techniques will increase the value of wind energy by allowing electricity production to be forecast from 6 to 48 hours in advance.
- R&D to facilitate integration of wind generation into the electrical grid and on demand-side management will be essential when large quantities of electricity from wind will need to be transported.
- R&D to provide information on public attitudes and visual impact of wind developments will be necessary to incorporate such concerns into the deployment process for new locations for wind energy, especially offshore.

For the long-term time frame, the report says that it is vital for R&D to help improve the way in which wind turbines interact with the grid infrastructure. The report concludes:

- Adding intelligence to the complete wind system and allowing it to interact with other energy sources will be essential in areas of large-scale deployment.
- R&D to improve electrical storage techniques for different time scales (minutes to months) will increase the value of wind energy at penetration levels above 15% to 20%.

■ *Contact:*

*Jorgen Lemming +45 4046 3458  
Sven-Erik Thor +46 8555 043 70  
Jaap 't Hooft +431 616 616 157  
Website: [www.afm.dtu.dk/wind/iea/](http://www.afm.dtu.dk/wind/iea/)*

# EXTRACTED BUDGET VOTE SPEECH OF THE DEPARTMENT OF MINERALS AND ENERGY

*delivered by Minister Phumzile Mlambo-Ngcuka, Cape Town, 7 May 2002*

## ENERGY

### *Overview*

Energy comprises approximately 15% of our GDP. The total electricity sales in 2001 grew by 1.8% to 181 511 GWh. Total liquid fuels sales in 2001 grew by 0,3% to 20 934 million litres. These figures demonstrate growth of the South African economy and the importance of energy as a key driver of our economy.

### *The Integrated National Electrification Programme (INEP)*

This programme remains the flagship of the Department of Minerals and Energy (DME) as it constitutes our main vehicle for the delivery of **better life to all**. Accordingly, the total number of connections for 2001 were 336 858, of which 141 707 were installed in rural areas, and 195 191 in urban areas.

The electrification Programme has been delivering above target. In 2001/2002, there were 336 858 connections as against the 300 000 target. Real costs per connection are also coming down at a rate of about two and a half percent per annum. Many thanks to Eskom, our Implementing Agency.

During 2002/2003, a further 300 000 households, 700 schools, and 100 clinics will be electrified. This will be done at a cost of R950 million during 2002/

2003 financial year with more emphasis placed on integration with other infrastructure and service providers.

### *Rural Electrification and Non-Grid Electrification*

The Integrated National Electrification Programme is inclusive of Grid and Non-Grid energy. This ensures that Non-Grid customers, who are generally poor and rural, are secured and catered for. A total of 34 per cent remains un-energized in the whole of South Africa.

Rural areas are particularly costly and difficult to electrify due to large distances from the national grid, low densities and small settlements. We will need, Honourable members, to take a keen interest to ensure public co-operation and understanding.

The NER has been working on regulations that will ensure that non-grid concessionaires are to be regulated in such a way that they provide a comprehensive service, which is linked to the local economic needs of the non-grid communities. Non-grid providers cannot be satisfied with only providing lights and cooking. We need to power economic infrastructure in the first instance.

### *Theft and crime threaten electrification and safety*

Rural electrification efforts are under-

mined by vandalism and theft especially that of solar panels. Parents and Community policing forums, especially in the rural areas, must look to their responsibilities and deal firmly with these mindless vandals. MPs also please stimulate efforts in your constituencies. Such actions are making the cost of Solar Home Systems prohibitively expensive, as theft proof gadgets have to be added. We also need your help to ensure that such vandals will face the full might of the law.

### *Electricity Distribution Industry*

In May 2001 Cabinet approved the establishment of an EDI Holdings Company, which will implement the restructuring of the Electricity Distribution industry and ensure the establishment of the six Regional Electricity Distributors (REDS). EDI reform will lead to a sustainable, well governed, affordable electricity market. It will give a stable industry to large users and cost managed tariffs to the poor. Interviews for the Board and CEO are almost complete.

We have made a lot of progress in reaching our target, which is that by the last quarter of 2003, the 1<sup>st</sup> RED will be established. Government, the South African Local Government Association, National Electricity Regulator, and Eskom now have a shared understanding and have established a framework for co-operation.

In the meantime, the EDI Restructuring Bill will provide the framework through which relevant officers, employees, assets, liabilities, rights and obligations will be transferred to the REDs. We will continue to dialogue with organized labour on matters of difference.

Our study shows that this restructuring will yield a benefit of R5 billion over ten years. At the end of the 10 years we would have created a solid industry that will continue to provide a low input cost to the economy. It will have cost reflective tariffs and subsidies for the poor.

## *The Central Energy Fund (CEF) group of companies*

The controversy of the future of Mossgas is now behind us. This year we will formally launch the new and first national oil company of SA, PetroSA. Cabinet approved the merger of Soekor and Mossgas that form the basis of PetroSA and its business plan. This commercial entity has a new Board of Directors and a new CEO. It will pay dividends to the government without the Government putting money into it.

Our intention is that PetroSA increase its total oil reserves to 100 million barrels by 2014, mainly outside of South Africa.

## *Integrated Energy Plan*

Last year we promised that we would ensure that progress is made on the IEP. That progress has been made. The final IEP will be presented to the Portfolio Committee in July 2002.

Why is the IEP so important? It is a planning tool needed to make critical choices and long range planning about all our energy sources. Energy is a strategic resource. We should be able to plan for 50 years and beyond.

Our IEP projections show that South Africa does not have the luxury of writing off any of our energy sources. For many more years we will be heavily

dependent on coal, nuclear and hydrocarbons. All have controversy, both environmental and safety.

The use of gas and renewables will increase and both are good environmentally but they have real limitations i.e. available size of reserves on the former and technology limitations of the latter.

We are poised to push renewables much higher and even people with grid electricity need to be given the choice. Renewables currently cannot replace or compete with either coal or nuclear. For coal we intend to encourage even greater investments by industry in clean coal technologies through our new renewable energy policy. Intensive coal users and producers will in future contribute towards renewable energy investments.

Investment by both the private and public sector over the past five years in renewables was R255 million and for nuclear, R778 million.

## *Natural Gas*

We are on track as far as the delivery of gas from Mozambique is concerned. The two Presidents of Mozambique and South Africa launched the gas pipeline project last week in Mozambique. Although it is intended mainly for big industry our State gas development company iGas is, investigating how gas can be brought to low income communities for small and micro businesses and to empower communities along the pipeline path.

Along the West Coast, discussions with all gas producers are underway. A Letter of Intent has been signed with Shell. PetroSA is in discussions with Forrest Oil/Mvelaphanda. We are committed to developing the gas infrastructure at the earliest possible time with all players. This project will see the viability of PetroSA, and Coega improved and energy users offered the choice of another energy carrier.

## *FREE BASIC ENERGY*

Free basic energy pilot studies in 16 locations are being implemented to determine what the problems, costs, metering requirements etc. would be to implement such a policy on a national basis.

So far over 9550 households are benefiting from the Free Basic Energy pilots. The second and last phase of EBSST pilot projects will be concluded in September 2002. Based on findings from these pilot studies, policy proposals on EBSST will be made to Cabinet in mid-year.

## *Integrated Energy Centres*

Integrated Energy Centres are designed to provide a one-stop service regarding access to affordable and reliable energy carriers for rural and peri-urban communities.

The Centres are also intended to provide an economic push for community development, linking energy sector provision into local economic development. With the help of corporate sponsors we will open seven this year. We thank Total, Sasol, PASASA for their contribution.

Four are already under construction in Kgalagadi, (Kuruman) Ngwabe, (N. Province) Amajuba (KZN) and Eshane (KZN). Registers for Energy Co-ops have been developed and communities are being trained in the running of the Co-ops.

## *Black Economic Empowerment*

Honourable Members will remember that during 2001 I announced that we had signed an Empowerment Charter with the oil industry. At the time of the signing of the Charter, blacks only owned 5,8 per cent of the industry. At the end of 2001 nearly 14 % of the industry was in the hands of companies owned by historically disadvantaged individuals. We are more than half way!

The share of operating profits accru-



ing to these companies is nearly 11%, up from 3,5% in 1999. This is a substantial achievement and I commend the industry for their efforts but it is not sufficient. In the very near future I want the industry to achieve the 25% target so I will not rest until that is done. A lot more will have to be done to bring women into the industry.

In March this year we launched the Women in Oil and Energy - South Africa (WOESA). This organization is designed to open up opportunities for women in the energy sector and to facilitate their participation in the activities of the oil and energy industry in South Africa.

Since the Charter, Shell and BP have done two major deals. Thus far BP is the only company to meaningfully bring women into the industry. I am very impatient on this score that is regarded as a "make or break" for Government, as is a move towards broad based Empowerment. As long as Government is a facilitator, we will insist on benefiting many more people. If you do not want to empower more people then do not bother about Government's facilitated deals.

I am establishing a monitoring and evaluation mechanism that will monitor progress and evaluate partnerships in consultation with the industry. I will soon appoint a Compliance and Monitoring Advisory Committee to advise me in the application of these mechanisms, which will be a points based system. It will comprise both private and public sector representatives. This will form part of an overall system of recognition, incentives and penalties. This is in line with the announcement of the President at the beginning of the year.

I would like to tell empowerment companies, Government cannot be leant upon forever. They must take responsibility, in particular over the kind of agreements they get themselves into. They must protect the overall empowerment initiative and its integrity.

Government does not like being seen as the "spoiler" because you have not applied yourselves diligently and we have to disapprove pseudo-empowerment. We give a lot of credit to operational BEE and self-made companies such as Excel. We need to see more of these. Excel also won the prize for having the best customer care service in the petrol retail sector.

As an aspect of the rollout of the Charter, we have begun a process of focusing on various aspects of the Charter. Key among these areas is a Supplier Development Strategy. A team comprising government and industry has just returned from a study tour of the USA, to look at best practice, regarding affirmative procurement. As a result we should now see faster progress on this front. Our approach is in line with Government policy, to put in place sector based empowerment strategies and legislation as may be needed.

### *The Energy Industry*

As the country has moved to update and modernize regulation in the energy sector the industries affected have had to endure change, which most do not find comfortable.

## ENERGY EFFICIENCY

I concede that as Government we should and can do much more on energy efficiency. DME now hopes to lead by example – our head office is being made into a highly energy efficient office and we plan to spread this to other Government Departments and institutions. The House will be updated. I commend the mining industry and other bulk users on their cooperation with Eskom on this front.

### *Minerals and Petroleum Resources Development Bill*

The Mineral and Petroleum Resources Development Bill is a very important

piece of legislation that will address fundamental issues in the mining and minerals industry. The Bill will facilitate the transformation of the industry in order to:

- attract new investment
- entrench sustainable development & deal with the legacy of migrant labour
- provide security of tenure
- legitimise mine specific social plan
- Introduce the dedicated use of royalties to communities affected by mining including labour sending areas.

The Bill has been introduced to Parliament, the matter is now in the hands of Parliament where interested parties will be given an opportunity to voice their concerns and provide inputs.

As a department we have listened and incorporated very diverse views as far as we could. We always anticipated that in the Bill we may not reach full consensus, Not everybody got what they wanted. We cannot overrule State Law Advisers to give some stakeholders what they want.

We will not compromise with regard to the fundamental principles of the Bill, and its Key Performance Indicators, which include amongst others, a significant change in ownership profile of the industry.

### *Advisory Board*

In terms of the Bill, an Advisory Board will be established to provide advice on a wide range of mining and mineral related issues. The process of nominating and appointing relevant Board members will be announced through the press this month.

### *World Summit for Sustainable Development: Mining and Energy*

The importance of this conference is not just that South Africa is hosting it but also that important decisions will

be made. Both energy and mining are at the heart of sustainable development.

Our preparations for the WSSD include:

- An African Ambassadors' caucus on Sustainable Development in Mining and Energy.
- A Mining and Energy Minister's meeting

These meetings are aimed at consolidating our position on Mining and Energy issues, identifying key positions and critical issues for Africa, getting consensus on these, and agreeing on a post-WSSD action plan.

The Summit is important for the mining and energy industries as it focuses on issues that affect the well being and future of these industries. It is important that these industries ensure that the exploitation of minerals and energy resources is in a balanced way that addresses all the three pillars of sustainable development, namely; social, economic and environment.

With regards to mining, one of the important social legacies of the past is the migratory labour system, which created single hostel accommodation and a host of associated socio-economic problems. It is important that all stakeholders address this social legacy, which legacy is a factor in the prevalence of HIV/ AIDS.

There is also another challenge facing the industry. This relates to the environmental and health impact caused by coal mining and its usage. We cannot continue with business as usual. The industry has to address these environmental and health issues. Rehabilitation remains critical and has to be taken seriously. It is not fair for the industry to shift its costs to communities and future generations.

With regards to energy, our key focus will be increasing access to affordable and sustainable energy and to ensure security of supply through diverse en-

ergy sources - As part of WSSD and beyond, we also intend to take this up vigorously.

### MANAGEMENT SERVICES

Addressing past imbalances to promote equitable redistribution of benefits

A Workplace Skills Plan was developed and registered with the Public Service and SETA. We also identified a shortage of the required skills in the minerals and energy sectors. During the current financial year, a Skills Master Plan will be developed in partnership with all the SETAs in both industries.

In addition, my Director General, together with our senior Human Resource officials, are developing a programme through which young people will be encouraged to take careers and develop technical skills in the mining and energy fields.

We remain thankful to Petronas for being partners in our skills development programme. Our skills master plan will be launched in June, the Month of youth.

We implemented an internship programme in 2001. Targets were set for each Directorate within the Department to appoint at least two interns, subject to the availability of funds. It is worth noting that thus far, 26 interns have benefited from this programme, and seven of the interns have already been appointed permanently. This has been a very rewarding initiative as some of the interns have simply excelled. For me personally this is probably one of the most gratifying parts of our job.

### RESTRUCTURING PROCESS IN THE DEPARTMENT AND DME BUDGET

Our 2001/2002 budget was R 1, 245 billion and our 2002/2003 budget is

R 1,826 billion. The bulk of our allocation is for Electrification at a total of 52,03 % of the overall current budget. The structure of the Department is currently being revised to be in line with our key strategic objectives and the baseline allocations in terms of our Medium Term Expenditure Framework for 2002/03–2004/05.

DME has a very tight budget; we do much more with much less. With all of the additional responsibilities, especially in mining we can definitely use additional resources, which can bring more revenue to the economy faster. On electrification funding, we will continue our dialogue with National Treasury.

The Mineral Development Branch is in the process of being restructured in line with the implementation of the Mineral and Petroleum Resources Development Bill. Additional personnel will be recruited and all personnel will be trained on the new legislative framework. In addition, a simulation exercise will be conducted to assess the readiness of my department in this regard.

Our International Relations Directorate is doing good work with very limited staff and excellent interns. We can do much to the benefit of South Africa with extra resources. We can also do more for job creation and rural development.

# ENERGY EVENTS 2002

## AUGUST 2002

4 – 8

**THE 8<sup>TH</sup> INTERNATIONAL SYMPOSIUM ON RENEWABLE ENERGY EDUCATION**, Grosvenor Resort, Walt Disney World, Orlando, Florida, USA

*E-mail:* [Sheinkopf@fsec.uct.edu](mailto:Sheinkopf@fsec.uct.edu)  
*Website:* [www.doceconferences.ufl.edu/isree8/](http://www.doceconferences.ufl.edu/isree8/)

18 – 22

**ADVANCES IN HYDROGEN ENERGY**, Boston, Massachusetts, USA

*Contact:* Catherine Gregoire Padro,  
National Renewable Energy  
Laboratory,  
1617 Cole Boulevard,  
Golden, CO 80401, USA  
*Tel:* +1 303 275 2919  
*E-mail:* [cathy\\_padro@nrel.gov](mailto:cathy_padro@nrel.gov)

18 – 22

**ENERGY PRODUCTION IN THE 21<sup>ST</sup> CENTURY**, Boston, Massachusetts, USA

*Contact:* David Berry, National  
Energy Technology Laboratory, U.S.  
Department of Energy,  
P.O. Box 880, Morgantown,  
WV 26507, USA  
*Tel:* + 1 304 285 4430  
*E-mail:* [dberry@netl.doe.gov](mailto:dberry@netl.doe.gov)

19 – 21

**GAS INDUSTRY CONFERENCE FOR THE SADC REGIONS**, Sandton

Crowne Plaza, Johannesburg, South Africa

*Contact:* The Conference  
Administrator,  
Institute for International Research,  
P.O. Box 2353, Parklands, 2121,  
South Africa  
*Tel:* (011) 880 6000 or  
(011) 340 1200  
*Fax:* (011) 880 8620 or  
(011) 880 6789

26 – 4 September

**WORLD SUMMIT ON SUSTAINABLE DEVELOPMENT 2002**, Johannesburg, South Africa

*Website:* <http://www.johannesburgsummit.org>

SEPTEMBER 2002

9 – 11

**EU PROJECT MEETING “POTENTIAL USE OF RENEWABLE SOURCES OF ENERGY IN ASIA AND THEIR COST-EFFECTIVENESS IN AIR POLLUTION ABATEMENT”**

*Contact:* Markus Amann  
*E-mail:* [amann@iiasa.ac.at](mailto:amann@iiasa.ac.at)

23 – 25

**ARCEE 2002 – 1<sup>ST</sup> AFRICAN REGIONAL CONFERENCE ON ENGINEERING EDUCATION**, University of Lagos, Lagos, Nigeria

*Contact:* Dr Funso Falade,  
Department of Civil Engineering,

University of Lagos,  
Akoka, Lagos, Nigeria  
*Tel:/ Fax:* 234 1 48 11184  
*Mobile:* 0802 307 3317  
*E-mails:* [ffalade@arcee.org](mailto:ffalade@arcee.org) or  
[ffalade@unilag.edu](mailto:ffalade@unilag.edu) or  
[fflade@hotmail.com](mailto:fflade@hotmail.com)

OCTOBER 2002

22 – 24

**SUSTAINABLE ENERGY EXPO 2002**, London, United Kingdom

*Website:* [www.sustainable-expo.org](http://www.sustainable-expo.org)

NOVEMBER 2002

11 – 14

**COMPREHENSIVE 5-DAY CERTIFIED ENERGY MANAGEMENT TRAINING COURSE**, South Africa

*Contact:* Prof. L.J. Grobler,  
Potchefstroom University for CHE,  
P.O. Box 19139, Noordbrug,  
Potchefstroom 2522,  
South Africa  
*Tel:* +27 18 299 1328/9  
*Fax:* +27 18 299 1320 or  
+27 18 294 5705  
*E-mail:* [mgiljg@puknet.ac.za](mailto:mgiljg@puknet.ac.za) or  
[cemanager@ananzi.co.za](mailto:cemanager@ananzi.co.za)

ENERGY MANAGEMENT NEWS is published quarterly by the Energy Research Institute of the University of Cape Town and the SADC Industrial Energy Management Project based in Harare, Zimbabwe. The newsletter is available free of charge. The articles reflect the views of the author(s) and not necessarily those of the Editors.

Enquiries, comments, information on energy events, and articles are welcome and should be referred to:

■ Richard Drummond  
 Energy Research Institute  
 University of Cape Town  
 Private Bag  
 Rondebosch 7701  
 South Africa  
 Tel: +27 (21) 650 3894  
 Fax: +27 (21) 686 4838  
 Email: rdrummond@eng.uct.ac.za

■ Geoff Stiles  
 SADC Industrial Energy  
 Management Project  
 PO Box 949  
 Harare  
 Zimbabwe  
 Tel: +263 (4) 33 4247 /  
 33 5479 / 33 4506  
 Fax: +263 (4) 33 4294  
 Email: gstiles@siemp.co.zw

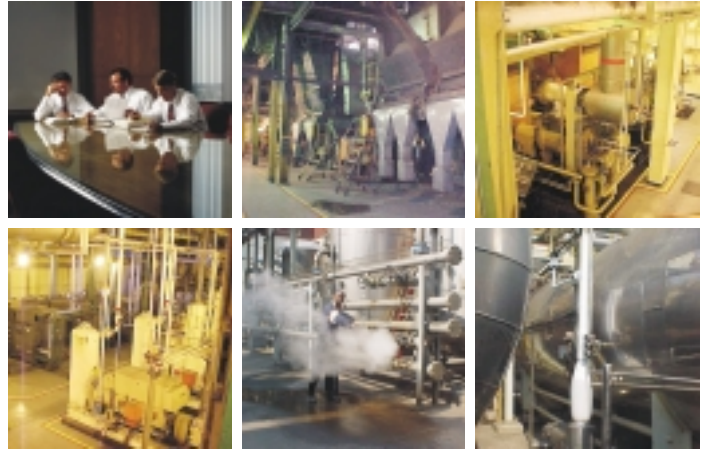
**ERI** Energy Research Institute  
 of the  
 University of Cape Town

Energy Management News is available on the Internet at the web site of the Energy Research Institute:  
<http://www.eri.uct.ac.za/eri.html>

How to save energy and money

## Guide Books 1 to 7

### THE 3E STRATEGY



The Energy Efficiency Earnings (3E) guide books and CD provides information on how to save energy and money when using energy in a factory or plant, as well as an introduction to the principles of the 3E Strategy. Important topics include 'how to' save energy, the formation of an energy management team and effective monitoring and targeting. It opens with a brief summary of the key issues and follows on with comprehensive detail and indepth studies. The emphasis is on reducing costs without compromising production while highlighting the ease with which energy and cost saving can be achieved. The 7 Guide Books and CD in this 'How to save energy and money' series are: The 3E Strategy, Boilers and Furnaces, Compressed Air Systems, Refrigeration, Steam Systems, Insulation and Electricity Use.



ENERGY RESEARCH INSTITUTE  
 UNIVERSITY OF CAPE TOWN  
 PRIVATE BAG  
 RONDEBOSCH 7701  
 SOUTH AFRICA  
 TELEPHONE +27 (0)21 650 3892  
 FAX +27 (0)21 686 4838  
 E-MAIL 3E@eng.uct.ac.za  
 WEBSITE www.3e.uct.ac.za

ORDER YOUR 3E STRATEGY GUIDE BOOKS  
 OR CD (with 7 books) NOW!  
 GUIDEBOOKS: R50 each / CD (with 7 books): R100 each  
 Contact the Energy Research Institute at UCT

ENERGY  
 EFFICIENCY  
 EARNINGS

