

# ASPECTS OF ENERGY POLICY : PROTECTION OF THE ENVIRONMENT AND OPTIMISATION OF COAL RESERVES. STRATEGIES IN CONFLICT?

by

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## SUMMARY:

The aims of policies (a) to reduce air pollution and (b) to increase the economic development of a country are liable to clash. The nature of the clash is discussed and guide lines are given for minimising the clash.

## OPSOMMING:

Die hoofdoelwitte om (a) lugbesoedeling te verminder en (b) die ekonomiese ontwikkeling van 'n land te verhoog is onderhewig aan botsing. Die aard van botsing word bespreek en riglyne vir verkleining van die botsing gegee.

## THE ROLE OF THE STATE IN ENERGY/COAL MANAGEMENT

The cornerstone of South Africa's energy strategy which, of necessity, encompasses several interrelated objectives as detailed in Annexure I, is the optimization of the country's coal resources.<sup>1,2</sup> The involvement of the Department of Mineral and Energy Affairs (DMEA) in affairs of coal *per se*, covers the entire spectrum of mineral and energy economics: Exploration and resource assessment (Geological Survey); safety and environmental aspects of coal mining (Government Mining Engineer); health (Medical Bureau); assessment and forecasting of coal supply and demand (Minerals Bureau) in collaboration with the Energy Branch); international coal intelligence (overseas representatives of the Department based at eight South African Missions abroad); local coal pricing and distribution and administration of the coal export programme, as well as longer term planning related to optimal utilization of coal as an energy resource and for synfuels production (Energy Branch).

All coal-related research sponsored by the State is done under the aegis of the Council for Scientific and Industrial Research (CSIR) mainly at its Fuel Research Institute, and at various universities. Allocation of research funding and identification of priorities is done by the National Committee for Energy Research of the CSIR which acts in close liaison with the Energy Policy Committee which advises the Minister of Mineral and Energy Affairs on energy policy matters. The private sector is represented on both these committees.

As far as guidelines for the coal/energy strategies of the State are concerned these take full cognisance of the fact that: coal is the primary and most important fuel for the generation of electrical energy, South Africa's most important energy

carrier; coal is the primary raw material for conversion into synthetic liquid fuels; coal is the primary indigenous source material for the chemical industry in the place of imported crude oils and coal is the most important reductant in the steel and metallurgical industries. Furthermore coal mining is a very important socio-economic generator of work opportunities and satellite industrial activity, a stimulator of regional development and, in addition, a very important earner of foreign exchange, second only to gold.<sup>2</sup>

It is however appreciated, at the same time, that coal mining activity, particularly opencast strip mining, could have a negative impact on land use and the environment. Embodied therefore in coal/energy policy guidelines is the principle that, even though optimal recovery of all saleable coal reserves is the primary objective, this should not be achieved at all costs, but within a framework of balanced mining and environmental priorities.

In order to appreciate the magnitude of the problems which face the successful achievement of objectives of mutual concern it is considered appropriate to briefly review the present state of the South African coal mining industry, in world, and in local context.

## THE SOUTH AFRICAN COAL INDUSTRY

### World Ranking

The basic features of the South African coal industry, in a world context, is that it ranks as the 5th largest producer in the world based on a 1981 output of 130,4 Mt (i.e. million saleable tons).<sup>2</sup> In 1980, it was estimated that South Africa had 51 000 Mt of economically recoverable coal, the fourth largest reserve in the World.<sup>4</sup> More importantly though is the fact that South Africa is presently the second largest thermal

coal exporter in the world which, taken together with the fact that it is also one of the leading exporters of uranium, places South Africa in the forefront of world non-oil energy suppliers. It is appropriate in this regard to indicate, indeed to emphasize, that *an increase of merely 1 per cent of the in situ mineable reserves means an additional more than 1 000 million tons of extractable coal*. Optimal extraction of our coal reserves is therefore of critical importance.

#### *The Domestic Coal Supply Situation*

During 1981, some 152,7 million tons of coal was mined in South Africa of which nearly 30 per cent came from opencast operations. The first large scale opencast coal mine came into production during late 1971, today some 10 years later, more than 30 of a total of 96 operating or planned collieries, are strip or partly opencast operations. The larger part of opencast coal output is consumed locally by the electricity generating, steel and metallurgical industries. An increasingly larger percentage of export coal, which amounted to some 29,8 Mt, in 1981, will in future be produced from opencast operations.<sup>2</sup>

It has been estimated by DMEA that domestic demand for coal will increase from some 130 Mt in 1981 (about 100 million tons for local use and some 30 million tons for export) to more than 220 million tons by 1990 (about 160 million tons for local use and some 60 million tons for export). It is important to appreciate that the amount of coal discards generated in 1981 amounted to more than 22 million tons for that year alone (152 million tons of run of mine coal yielded 130 million saleable tons).

With the massive expansion planned by the South African coal mining industry increasingly larger quantities of discards and unsaleable fine coal will therefore be produced each year. One of the various reasons for this being so is that increased mechanisation, as is being planned, will increase the waste content of the coal mined, another reason being an increased need to upgrade or to prepare the coal for different consumer requirements, particularly for the export and local steel markets.

#### *THE ROLE OF THE DEPARTMENT OF MINERAL AND ENERGY AFFAIRS IN THE PROTECTION OF THE ENVIRONMENT.*

The basic premise on which the strategy of the Department of Mineral and Energy Affairs is based is that optimisation of coal resources and protection of the environment need not be in conflict if goodwill, mutual understanding and appreciation of each others responsibilities and duties, are demonstrated by all involved.

As far as environmental aspects of mining in general are concerned, various acts of Parliament together with regulations and Notices issued in terms thereof, have a bearing thereon. It is the Mines and Works Act (Act 27 of 1956) and its atten-

dant Regulations which has a bearing on environmental impact of total coal extraction methods.

It is appropriate to record at this stage of the discussion that South Africa is not only in the very fortunate position of having a mining industry which is one of the world's largest most advanced and technically efficient mining industries but that it is also a very responsible mining industry as far as protection of the environment is concerned. With particular reference to opencast coal mining which is obviously the most efficient way of extracting coal reserves, the Industry had accepted that rehabilitation of the surface would be an essential and integral part of strip mining operations right from the start. Indeed the Chamber of Mines, as far back as 1974, initiated a background study to define those factors which could influence rehabilitation and those factors that would be necessary to be detailed in a Code of Practice. Since total extraction mining methods such as the opencast mining and longwall and pillar methods, by their very nature, have an impact on land use, surface and underground water and atmospheric environments, the aim of the Mines Works Act is to reconcile the interests of mining and of environmental protection, and to ensure that such environmental damage, as would or might occur, be of temporary nature and that rehabilitation of, in particular, the surface is effectively done.

#### *THE EFFECTS OF TOTAL EXTRACTION MINING METHODS ON THE ENVIRONMENT*

##### *Opencast Mining*

This method of mining can only be employed in areas where fairly thick coal seams occur at relatively shallow depths of less than 30 to 40 metres below the surface. The overburden is stripped to reach the coal seams. Under such conditions it is obvious that the environment will be affected as a result of mining operations.

Ideal conditions for opencast coal mining exist in the South Eastern Transvaal in an area where the highest potential agricultural land in the country occurs. The commissioning of a number of the larger coal mines in this area has highlighted the conflicting interests of mining and agriculture, both of which are of great importance to the country.

In an effort to reconcile the interests of the two sectors, the then Minister of Mines appointed the Opencast Advisory Committee in 1976. The terms of reference of the Committee are: to advise on the measures which must be taken to minimise the influence of opencast mining of agricultural land and to handle complaints and submissions which may be received in connection with either general or specific aspects of opencast mining.

The Committee, therefore, functions principally in an advisory capacity on a continuous basis. A Deputy Government Mining Engineer is Chairman of the Committee which

is representative of the mining industry, the private agricultural sector and the Departments of Mineral and Energy Affairs, Agriculture and Fisheries and Environment Affairs.

Control and supervision of the physical aspects of mining activities, irrespective of type or extent, is the responsibility of the Government Mining Engineer (GME) in terms of the Mines and Works Act. In 1977 an amendment to this Act was promulgated and an additional section was included in terms of which the State President may make regulations regarding the conservation of the environment at or near any mine or works, including the restoration of land on which activities in connection with mines and works are performed, or have been performed.

One of the first tasks performed by the Advisory Committee on Opencast Mining was to assist in the drafting of such regulations in terms of these increased statutory powers. These regulations were promulgated on 21 March 1980. In broad terms they require that rehabilitation of the surface at any opencast mine shall form an integral part of prospecting and mining operations and that such operations shall be performed to the satisfaction of the authorities. Executive and supervisory powers are vested in the GME who can also prescribe rehabilitation programmes. The GME in turn is largely dependent on the assistance and advice of the Committee in the performance of these duties. The Committee realised at its inception that conditions at the various types of opencast mines differed to such an extent that an overall, uniform rehabilitation programme could not be instituted and it accordingly decided to investigate and submit recommendations on an *ad-hoc* basis in respect of individual mines.

The Committee is in the process of conducting a country-wide survey of opencast activities in order to assess the extent of its task ahead and to plan its activities systematically.

A detailed survey was conducted by the Committee during 1981 and it was revealed that rehabilitation costs at collieries varied from R10 000 to R18 000 per hectare. Of the some 645 ha which is at present affected by opencast mining, 614 ha or 95 per cent is restored during the same year. It is conceded that opencast coal mining results in the temporary interruption of the normal use of the surface and therefore it has a temporary effect on the environment in the vicinity of such mining operations. It must, however, be emphasised that the rehabilitation programmes prescribed by the authorities have been successfully carried out by the mine owners and after a short period the surface can again be usefully employed.

#### *Underground Mining*

By means of the longwalling and pillar extraction methods of mining the support of the superincumbent strata is removed and caving to the surface may occur, resulting in the subsidence of the surface.

The institution which is responsible for performing, co-ordinating and implementing safety research in regard to collieries is the Coal Mining Research Controlling Council. The GME is the Chairman of the Council which is representative of both the mining industry and the State.

The Controlling Council is served by two main committees: the Strata Control Advisory Committee and the Explosions Hazards Advisory Committee. For the purpose of this paper the former Committee is of importance in that this Committee has kept itself busy with the quantification of the effects of mining on surface behaviour, more particularly in regard to its influence on the integrity of surface structures, but indirectly the work being done by the Committee also contributes to the knowledge of the degree of influence of mining on the environment. A data bank of knowledge is being built up and it can be accepted that the increased knowledge thus obtained will lead to improved environmental protection measures. It is, however, obvious that close collaboration of all parties involved is a prerequisite.

#### *IMPACT OF COAL MINING AND RELATED ACTIVITIES ON AIR POLLUTION*

##### *Low-level air pollution*

Air pollution associated in particular with opencast mining operations ranges from localized dust pollution resulting from vehicle and equipment movements as well as dust blown from spoil and discard, to low level atmospheric pollution resulting from burning dumps. Of these, the latter is cause for particular concern particularly in areas where older dumps prevail. Discussions between the appropriate authorities on how to deal with this very difficult situation, since burning coal dumps are notoriously difficult to put out, are presently in progress. Another related problem which needs urgent attention is how to utilise the millions of tons of waste, (unsaleable fine coals and coals of poor quality) which will be produced annually, at an ever increasing rate, particularly by the more mechanized opencast operations. Controls exist, in the Mines and Works Act and the regulations for issuing export permits, to ensure that coal and its discards are stacked so as to prevent spontaneous combustion. It is still important to find methods of using the discards for energy production by gasification or liquefaction. Proposals to do this have been made e.g. by raising steam for electricity generation or industrial purposes by means of fluidized bed combustion of these discards enabling reduction of atmospheric pollutants at the same time too.<sup>4</sup> To ensure economic utilization of all colliery discard material it has also been proposed that colliery groups should co-operate to develop an integrated industry plan to achieve this.<sup>5</sup> This is presently being investigated by industry in collaboration with ESCOM. The utilization of fine unsaleable coal presently discarded e.g. new processes of gasification for the production of synthetic fuels, are also being investigated.<sup>6</sup>

### *High-level air pollution*

The extent of high-level atmospheric pollution resulting from the combustion of coal for electricity generation, has resulted in the Department of Health withdrawing permission for the use of a large part of the Highveld-Witbank coal field as a fuel supply for the further development of power stations in that region. Even though it is accepted that the withdrawal may only be of a temporary nature, until such time as air pollution levels can be made acceptable again, this reservation has sterilized a substantial part of a recoverable coal reserve of about 12 000 Mt of the best coal in the Country which is ideally suited for the establishment of multi-product collieries i.e. power station/local market/export mines.<sup>8</sup>

### *Restoration of mined-out areas*

In and around the town of Witbank large tracts of shallow mined-out areas exist. This has led to subsidence of the surface, underground fires and acid pollution of ground and surface waters on a large scale. Significant tonnages of good quality coal still exist underground, mainly in the form of pillars. The intention is to opencast these old mined-out areas and to restore the surface to such an extent that it will once

again be useable for township development and agricultural purposes and at the same time will restrict water pollution. The only way that this can be done commercially is to export the coal. Several proposals from industry to do this is presently being considered by DMEA. This is a admirable example of how the export of coal can be used to assist in the rehabilitation of previously mined areas while at the same time, contributing to foreign exchange, increased land use and the combating of air and water pollution.

### CONCLUSIONS

The aim of the Department of Mineral and Energy Affairs is to stimulate the optimization and utilization of coal reserves in order to conserve the nation's primary source of energy. This can be achieved with the least possible permanent impact on the environment. Ample legal powers exist to do so and the willingness of the mining industry to co-operate in this regard is an established fact. Should mutual trust, and frank and open exchange of views continue to prevail between mining industry, agriculture, and pollution control authorities there is no need for energy and environmental strategies to be in conflict, in fact they should be mutually reinforcing.

### REFERENCES

1. MINING SURVEY, No. 1/2, 1981 (Coal Survey). *Chamber of Mines of South Afrika, Johannesburg.*
2. ANNUAL REPORT OF THE DEPARTMENT OF MINERAL AND ENERGY AFFAIRS 1980 and 1981. *Government Printer, Pretoria.*
3. MEHLISS, A H (1982). Operating and planned coal mines in South Africa. *S A Minerals Bureau, Directory No. 1182, Johannesburg.*
4. HUGO, P J (1982). The South African Coal Industry. *Coal outlook Conference, Arlington, U S A.*
5. NAUDE, D P and DUTKIEWITZ, R K (1979). Fluidized bed combustion for pollution control. *Air Pollution Conference, Cape Town.*
6. MacGILLIVRAY, R B (1979). Potential value of colliery discard material. *S A Institute of Mining and Metallurgy and S A Coal Processing Society Conference, Witbank.*
7. ANNUAL REPORT (1982). *Sasol, Johannesburg.*
8. DE JAGER, F S J and PREVOST, X M (1982). *Geological Survey, Pretoria (Personal Communication).*