
Coal Industry Advisory Board



**A Survey of CIAB Members on
Coal and Sustainable Development**

Volume 2

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Descriptions of Sustainable Development Initiatives

1. Description of Coal Producers' Activities

Arch Coal Inc

Arch is creating unique and sustainable economic development opportunities on reclaimed lands.

Arch is using reclaimed lands to create unique opportunities for recreation and economic development in the steep terrain of southern West Virginia. Although comprising less than 1% of the state's surface area, former mine lands provide West Virginia with a valuable and rare resource: developable land. In 2001, Arch's Mingo Logan mine captured West Virginia's top award for land reclamation for transforming former mine lands into an 18-hole championship golf course. In addition, the only arctic char fish hatchery east of the Mississippi River was established at that same mining complex to capitalize on the cold, pure waters of its deep mining operations. At another Arch site, a new wood products firm is fast becoming a cornerstone of the regional economy. These projects demonstrate how careful planning, creativity and high reclamation standards can lead to new and sustainable opportunities for economic growth on reclaimed lands. Arch is enthusiastic about the potential to use its reclaimed lands to bring additional growth and diversity to the regions in which it operates.

During the past 10 years, Arch has shifted its focus to cleaner-burning, low-sulfur coal.

Over the course of the past 10 years, Arch Coal has transformed itself from a predominantly high-sulfur coal producer to one that today mines low-sulfur coal exclusively. Of the company's roughly 3 billion tons of reserves, approximately 90% would be characterized as low sulfur and fully two thirds meet the most stringent requirements of the Clean Air Act without the application of scrubbing technology. Arch's low-sulfur coal production has played an important role in helping the utility industry reduce sulfur dioxide emissions and comply with Phase II of the Clean Air Act. Even in scrubbed generating units, the use of low-sulfur coal increases plant efficiency and reduces waste disposal costs. In the past 30 years, the utility industry has increased its coal consumption for electricity generation threefold, while achieving a one-third reduction in emissions. The shift to lower sulfur coals played a significant role in this remarkable achievement.

Arch pursues excellence in its lands reclamation practices, and continuously seeks to advance the science of land reclamation.

Arch Coal is committed to advancing the science of land reclamation and promoting nature's swift return at its reclaimed mine sites. In the past five years, Arch has replanted more than 1 million trees on its reclaimed mine lands in southern West Virginia. Through ongoing research and a commitment to continuous improvement, Arch has increased the survivability ratio for new tree plantings to more than 80%. Arch is also supporting research into commercial forestry applications on some of its former mine lands. Wildlife thrives on the company's former mine sites, where soil quality, vegetative cover and water availability are generally superior to that found prior to mining. Herds of pronghorn antelope, elk and mule deer roam the company's reclaimed lands in Wyoming, which in just a few growing seasons are virtually indistinguishable from the surrounding terrain. New water sources in West Virginia – where ponds and wetlands are scarce – are a boon to waterfowl, aquatic species and other wildlife. Arch has created more than 200 acres of new wetlands on its reclaimed lands in Central Appalachia. A recent university study found that Arch's reclaimed lands in West Virginia provide a more diverse habitat, with higher wildlife value, than adjacent, unmined lands.

Arch is a founding member of ZECA Corporation, successor to the Zero Emission Coal Alliance.

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BHP Billiton

In concert with other major coal producers, BHPB has taken a prominent and proactive role within national and international coal industry bodies aimed at helping to ensure the industry takes on a new, more sustainable direction. The key elements are:

All mineral production sites are progressively implementing health, safety, environment and community (HSEC) management standards that were developed following the merger in 2001 of BHP and Billiton to form BHPB. The standards and related performance requirements will be factored into all business planning and all phases of projects, mergers, acquisitions and divestments, and will apply to all BHPB owned/operated facilities and major contractors on BHPB sites. The standards are to be operationalised by a hierarchy of documents - (i) company-wide HSEC guidelines and procedures, (ii) business-based management systems and (iii) operational procedures.

Australia: - The Australian Coal Association Sustainable Development Program (ACASDP) was established in late 2000 to, amongst other things, raise the level of appreciation amongst policy-makers of the contribution of coal to development and raise the standard of energy and environmental policy formulation. Key messages are that Coal will continue to be an essential part of the Australian and world energy mix for the foreseeable future, and that new and emerging technologies will enhance coal's contribution to sustainable development by substantially reducing or even eliminating emissions from its use. The program is funded by a voluntary levy on Australian coal producers.

The work of the ACASDP has been greatly informed by life cycle analysis (LCA) conducted by the Coal in Sustainable Society (CISS) project, a research initiative of the industry aimed at improving the understanding of the role of coal in sustainable development. As with the ACASDP, CISS is funded for three years by a voluntary levy on the coal companies. In its first stage CISS undertook full comparative life cycle analyses of different energy technologies, while its second and final stage, which is nearing completion, involves further targeted investigations in a number of discrete areas, including alternative coke making technologies, brown coal-fired power generation, energy scenarios in Australia, electricity generation in developing countries, and synergies between coal and renewables.

From mid-2002, the work of CISS will be picked up and continued under the auspices of the new CRC for Coal in Sustainable Development, within which BHPB also takes an active role.

Internationally, BHPB has been instrumental within the World Coal Institute in helping to simultaneously broaden and re-focus that organisation's agenda to emphasize sustainable development issues. The WCI has established sustainable development principles for the coal industry, and is building on these by developing position statements on the key sustainability issues facing coal and, in concert with other coal consumers and industry stakeholders, exploring ways in which coal's contribution to sustainable development can be enhanced. In April the WCI held a workshop on coal and sustainable development for South East Asian stakeholders (mainly power utilities) that is intended to be the first of series of such events to be conducted around the world under the organization's new direction.

BHPB has a number of social responsibility programs in the countries and regions in which it operates coal mines. Following are three such programs in South Africa that address issues specific to that country's special circumstances:

HIV/AIDS prevention and remediation: - BHPB (together with Anglo American and other industry partners) formed the Powerbelt HIV/AIDS project, aimed at reducing the spread of HIV/AIDS and improving the condition of people suffering from the disease. The programme is multifaceted, including community-based prevention strategies and education, counselling for sufferers and their families, and research into the effectiveness of programmes. All measures have been conducted with extensive co-operation among the participating companies and between companies and local community groups.

Black economic empowerment: BHPB subsidiary Ingwe Coal (in concert with Anglo Coal and with the support of Eskom) has established a black economic empowerment coal mining company. This empowerment initiative was concluded in February 2001, and the company - Eyesizwe Mining - now produces some 18 million tonnes per annum, making it the fourth largest coal producer in the country.

Post-mining community support:- Ingwe Coal is seeking to minimize the impact on the local community of the closure of the Rietspruit mine after 24 years of operation. The effect of the mine's downsizing over the last four years has been ameliorated by re-employing redundant employees in place of contractors or at other Ingwe mines – more than two-thirds of the 800 workers that left during this time did so voluntarily or were re-employed.

For the remaining employees, an alternative employment program has been established, involving four essential elements:

- A social fund, to use the proceeds of sales of company houses to employees at below-market value to fund employment-generating business projects;
- A development corporation to develop and manage the community's portfolio of job-creating investments;
- A community trust and village bank to enable the community to participate in and benefit from the commercial and financial management of the investment projects;
- A community forum to allow community leaders to consult with stakeholders in the program and to act as steering body.
- The aim of the program is to ensure that life within the community that has built up around the Rietspruit mine will continue as normal in its absence.

Central Queensland Community Support: - The BHP Billiton Mitsubishi Alliance (BMA) currently contributes about 10 million AUD per annum directly to the local communities surrounding its mines in Central Queensland. Of this amount, about one-quarter (\$2.4m) is spent on community relations programs (eg. donations and sponsorships for local groups/events, school scholarships and youth programs, apprenticeships and support for personal counselling services) and the balance (\$7.3m) on rate payments to the towns and the provision of social services and infrastructure (eg. water, roads and housing). BMA is currently carrying out a comprehensive review of these contributions to ensure their maximum effectiveness within BHPB's commitment to spend one percent of pre-tax profits from its central Queensland operations on local communities.

Illawarra Coal waste mine gas utilisation: - Approximately 200,000 tonnes per annum of methane is drained from the Tower, Appin and West Cliff underground coal mines in NSW, and used in the on-site generation of power for supply to the state electricity grid. While the primary purpose of capturing the gas is to provide a safe working environment for the mines' employees, its use for power generation has substantial greenhouse benefits in terms of both the methane emissions avoided (3mt CO₂e net of emissions from the gas-fired generation) and the displacement of coal-fired generation (about 800,000t CO₂e).

In addition, the West Cliff colliery, with funding assistance from the Australian government, is trialling specialised combustion units capable of running off the very low concentrations of methane in the mine's ventilation air. The heat from the units is being used in the generation of power for internal use at the mine. About 200,000t CO₂e of greenhouse emissions are currently abated by the trial, while the possibility of larger scale application of the technology, in concert with the utilisation of drained methane, holds out the prospect of Illawarra Coal becoming a zero GHG emitter in the future.

Consol Energy

Greenhouse Gas Management

CONSOL Energy Inc. (CONSOL) believes it is prudent to explore technologies that can mitigate or offset greenhouse gas emissions, and, in particular, to develop options for which there are potential near-term economic and environmental benefits.

Coal mining is a source of anthropogenic emissions of methane, a greenhouse gas. CONSOL was one of the first coal companies to drain methane in advance of mining to improve safety, and has been an industry leader in producing commercial-quality coal bed methane for sale. The company produces 130 million cubic feet of gas daily, from operations in southwestern Virginia, southwestern Pennsylvania and northern West Virginia. Citing the company's achievements in reducing methane emissions to the atmosphere, the U.S. Environmental Protection Agency recognized CONSOL as a winner of its 2002 Climate Protection Award for work in recovering and using coal bed methane. According to the EPA citation, CONSOL's coal bed methane recovery efforts "resulted in avoided emissions of 12.5 million tons of CO₂ equivalent in 2000. This was two-thirds of the U.S. coal industry's avoided emissions that year."

In a related project, CONSOL, in a joint venture with Allegheny Energy, constructed an 88-megawatt power plant in Virginia that will be fuelled by its coal bed methane. The company plans to expand its gas operations to other Appalachian locations.

While CONSOL has led in the capture and utilization of pipeline quality methane, the majority of coal mine methane is emitted at very low concentrations in the mine ventilation air, making its use or abatement difficult. CONSOL is now undertaking the commercial-scale demonstration of a technology to utilize the methane in mine ventilation air, with the potential for simultaneous energy recovery.

Methane is the most significant direct greenhouse gas emission from coal mining, but CONSOL recognizes that carbon dioxide from coal combustion represents the largest greenhouse gas impact from the coal utilization cycle. One potential option to reduce or offset greenhouse gas emissions from coal use is to capture and sequester CO₂ in geologic formations. Coal seams represent a potential CO₂ sink. CONSOL and the U.S. Department of Energy are conducting a program to evaluate the potential for CO₂ sequestration in coal seams that are not suitable for mining. In this program, coal bed methane would be produced from the coal seams using slant-hole horizontal drilling technology, followed by CO₂ injection into the seam. Injection of CO₂ is expected to stimulate methane production, providing an economic benefit to help offset the cost of CO₂ sequestration. This project includes long-term monitoring of the test site to evaluate the ability of the coal seam to retain the sequestered CO₂.

Pollutant Control for Electricity Generation

Achieving the economic, social and environmental benefits of coal use requires that pollutants be controlled at a cost that does not obviate coal's advantage as a low-cost fuel. CONSOL is a leader in the development and deployment of technologies to reduce emissions of the criteria pollutants: sulfur oxides, nitrogen oxides and mercury. Our emphasis has been on low-cost technologies that can be retrofitted to existing power plants or incorporated into the design of new plants.

For example, under the U.S. Department of Energy's Power Plant Improvement Initiative program, CONSOL and other private partners are installing a single bed SCR unit (for NO_x control), a carbon injection system (for mercury control), and circulating dry scrubber, flue-gas desulfurization system at the AES Greenidge Station. The program objectives are to reduce emissions of SO₂, NO_x, mercury and other acid gases (HCl, HF, and SO₃) to levels well below current regulatory requirements.

The environmental and health impacts of coal use are important for sustainable development. This requires timely, scientifically valid information and analysis. CONSOL is conducting extensive research to help resolve the scientific uncertainties associated with coal use and the environment. For example, CONSOL has measured mercury removed by flue gas

desulfurization systems at eight coal-fired power plants, and is conducting a companion program to evaluate the environmental impact, if any, of mercury in coal combustion by-products such as fly ash, FGD sludge, bottom ash, gypsum, and manufactured aggregates.

CONSOL R&D, along with the Harvard School of Public Health, is conducting a study to determine the composition of fine particles in residences and in ambient air, and the personal exposure of children and older adults to these particles. The data from the program will be used in health effects research, and to evaluate sources and control options. Funding is provided by the Ohio Coal Development Office, U.S. Department of Energy, the National Mining Association, the Electric Power Research Institute, the American Iron and Steel Institute, the American Petroleum Institute, and the Edison Electric Institute.

Useful Products from Coal Utilization "Wastes"

Coal contains mineral matter that remains after combustion as a solid by-product. Environmental control processes, such as flue-gas desulfurization, also produce a solid by-product. Although these by-products are chemically non-hazardous, their disposal has both cost and land-use implications. In recognition of this, CONSOL has been conducting research for more than a decade to develop technology for the utilization of high-volume coal combustion by-products. In January 2000, a CONSOL joint venture company was formed to commercialise patented CONSOL technology to produce high-quality aggregate from flue-gas desulfurization wastes and other coal combustion products, such as fly ash. These aggregates can be used in applications such as road construction and masonry. Manufacturing aggregates from coal combustion wastes confers a dual benefit. First, it reduces the land-use impact and cost of coal utilization waste disposal. Second, it reduces the need for producing aggregate from conventional sources by quarrying or river dredging, reducing these environmental impacts. CONSOL has worked with the U.S. Department of Energy, the states of Ohio and Illinois, a number of electricity generators, and aggregate users to develop the technology and to ensure the engineering and environmental acceptability of the products. The first commercial plant is in the detailed engineering design phase, with initial operation planned to occur in 2003.

In a related project, CONSOL, in cooperation with the state of Ohio and other private partners, is creating a computer model to estimate landfill costs for the range of solid coal combustion products (CCPs), e.g., fly ash, scrubber sludge. The model will promote the development of alternative utilization technologies for CCPs by reducing the economic uncertainty of these options. The model will be made widely available to the public and developers of CCP utilization technologies.

Mining Industry of the Future

CONSOL has been a champion for the U.S. Department of Energy's Mining Industry of the Future program since its inception, providing leadership and technical expertise in all aspects of its implementation. CONSOL is contributing its R&D expertise to improve energy efficiency and competitiveness in U.S. mining. This includes R&D on advanced sensors to perform real-time stress measurement as well as technologies to perform imaging ahead of mining. These technologies will reduce excavation requirements in mining, resulting in significant improvements in mine safety as well as reduced energy requirements.

Fording Coal

Education of Employees on the Balance between Economic/Social/Environment well-being

Fording's management believes that one of the pillars of corporate sustainability is the successful engagement of employees in understanding and acting on key issues for the coal industry such as sustainability. The company provides information to our employees and their families/communities through a variety of initiatives including corporate communication vehicles (brochures, newsletters, advertising, etc.), community relations programs (engaging local governments and service organizations) and direct educational and training initiatives. For example, Fording, along with other local mining companies, holds a mining week celebration every year, which engages the community, schools and politicians through mine tours, special events, school contests, and other activities. The concept is to promote

understanding about all aspects of coal mining, including the environment, and to demonstrate to the public and employees how coal mining seeks to remain a sustainable activity. Fording has also worked with other mining companies within the local community to promote mining's approach to safety through mine rescue competitions which attract teams from the US and Canada.

Applied Research and Development to Improve Efficiency/Productivity

Sustainability requires the constant seeking for better and more efficient ways to conduct our business with the goal of improving competitiveness and reducing environmental impacts. The spin-off from this activity will be to enhance the economic benefits gained from coal mining and to provide a more secure and stable work environment for employees. Local communities also benefit by having a more stable, secure local economy and tax base. Fording has invested strongly in a variety of improvements, which have led to increased coal recoveries from the mining operations. The effect of this improvement is to increase the amount of products, which can be produced from existing raw resources while also reducing the inputs needed to provide final products. Another example would be recent programs to upgrade haul truck engines to reduce fuel consumption, lower emissions and improve truck productivities. This example provides a combination of economic and environmental gains.

Integrating Sustainable Development Practices into all aspects of our business activity

Fording is strongly committed to integrating sustainability practices into all aspects of our business. An emphasis is placed on defining long term resources at our mining operations which provides a strong base for long term capital investments, provides our employees and local communities with increased assurances that the mines will be active for long periods of time, and provides a clear demonstration that the company is interested in sustaining long-term relationships with customers, governments, local communities, employees and investors.

Clean Air Strategic Alliance

Fording actively participated in the government led process from which emerged an agreement to create a new type of organization in Alberta, which would be made up of Governments (3 levels), Industry (broad range including agriculture and forestry and energy), and NGO organizations. The mandate of this organization is to undertake air quality planning activities with a view to making recommendations to governments about taking action. This organization has developed a CAMS (Clean Air Management System) process, which is used to screen air quality issues and define where there are actual problems, which need to be acted upon and then develop consensus-based solutions, which can be implemented by all parties to CASA. This organization has been successful at addressing a wide range of issues and incorporates into its basic philosophy the need to combine the elements of sustainability – environment, economic and social aspects. (see www.casahome.org) Fording has been a strong supporter of consensus processes, which focus on identifying and solving real problems. Fording continues to strongly support the activities of CASA.

Organisation B

Internal research and publication of papers relating to coal utilization and environmental issues. Recording, monitoring and auditing greenhouse gas emissions to identify potential reductions. Active member of the CRC Coal in sustainable development and ACA research activities relating to coal's use in society.

Preparing first public environmental report, which examines the environmental performance of the company and outlines actions we are taking to address and manage our environmental and community challenges to continually improve our performance. The report reflects our commitment to sustainable development and to the principles contained within the Australian Minerals Industry Code for Environmental Management.

One site has trialed the use of mine water for crop irrigation and is planning to establish a large irrigation scheme to further expand crop irrigation activities. The Scheme involves the

use of mine water for the irrigation 250 hectares of pastures at approximately 7 megalitres per hectare per year.

During 2001, we commenced the development of a Sustainable and Integrated Land Management Strategy (SILMS), which aims to provide a vision and objectives for the way in which we manage and use our land. The SILMS considers ecological, social and commercial benefits to the environment, local communities and the company retrospectively, and provides a framework for the development of an action plan for holistic land management.

Organisation F

We established our own coal research laboratory in early 1980's and have been involved in technology development and support in the areas from research on coal science to practical use of coal including coal handling and combustion performance assessment. We have been involved in CCT development and also creation of new coal demand by conducting joint research programs with power companies on development of coal quality evaluation systems, research contracts with industrial coal users on development of coal combustion simulation systems and R &D on environment-friendly technology utilizing subsidies from the government.

At one of our opencut coal mines in Australia, we have commenced a test forest plantation program with an aim of CO₂ sequestration as part of effective use of a disturbed land such as mined out area at an opencut coal mine. At another opencut coal mine in Australia, we also have been conducting a demonstration research project using the government subsidies as a core member of a consortium to establish a fast-growing plantation forest at mined out areas utilizing microbial technology.

We have been implementing a technical cooperation project in China with an aim of development of a Chinese version of coal quality evaluation system utilizing our own coal quality evaluation system. The objective of this project is to improve combustion efficiency of small-scale stoker boilers of which technologies can be applied to the numerous existing stoker boilers for improvement of the environment in China.

Our company is one of the core member companies of the two respective non-profit organizations actively involved with many projects in the area of technology development, international cooperation including technology transfer and research & survey in the respective upstream and downstream areas in coal. Through the activities by these organizations, we have been indirectly contributing to and supporting sustainable development on coal.

Organisation K

- Issuing an annual environment report
- Adopting and endorsing an environment charter
- Research and development with biological soil treatment

Organisation L

Mining coal with minimum losses of reserve is considered the most appropriate approach in mining practice, though this practice may not prove to be the most economical solution.

Safety standards in regards to mining practice are increasing. That may indicate the more critical approach in senior management towards safety issues.

More attention is being exercised to customer services.

Comparatively more time is consumed in discussions related to environmental issues, which may indicate the growing importance of sustainability concept.

Peabody Energy

Peabody Co-Chairs the Coal Utilization Research Council, which works on a “Technology Roadmap” for research on coal combustion technology and carbon capture and sequestration. The Roadmap is used to guide research expenditures to ensure that the monies are spent in an effective manner. The goal of the research program is to develop coal combustion technology that would produce near-zero emissions from coal fuelled generating plants deployed after 2025.

Peabody strives to set a good example and provide a strong foundation for public policy advocacy. We are the only coal company supporting the development of advanced coal-based gasification systems and syn-gas cleanup technology at the DOE Power Systems Development facility. We have won the largest number of reclamation excellence awards granted to a single company by the U.S. Department of Interior over the last two years.

Peabody has developed and promoted public policy that provides tax incentives for the early commercial deployment of advanced coal-fuelled generating technologies that result in low emissions. The financial incentives have been incorporated into both versions of the energy bills being considered in the U.S. Congress.

Peabody strives to be the employer of choice in each region in which it operates.

Our mission is to have each employee return home safely, every day. That commitment has resulted in continuous improvement in the area of safety and one of the best safety records in America’s coal mining industry.

RAG

RAG’s implementation of power plant projects outside of Germany contributes to a sustainable energy supply for the countries that commission the projects

RAG’s subsidiary STEAG used its expertise for a relatively recent entry into the IPP market

STEAG’s IPP-projects are a good example of successful technology transfer

STEAG, which is Germany’s second largest converter of hard coal into electricity, operates a highly efficient and clean (compared to international standards) group of power plants with a capacity of nearly 5,300 megawatts. STEAG’s expertise formed the basis for its relatively recent entry into the independent power producer (IPP) market.

STEAG’s 165 MW Termopaipa power plant began supplying the Bogota region in Colombia with electrical power in 1999, and the company is now building a second international power generating facility: the Iskenderun power plant project on the Mediterranean coast of Turkey. This project, whose investment volume is approximately US\$1.5 billion, constitutes the largest such commitment ever made within the RAG Group. The power plant, which will go into operation in 2003, will generate 1,210 MW of electrical power.

There is an enormous potential that is represented by the concept of an Independent Power Producer. Today, RAG is contributing to a secure and sustainable energy supply in parts of Turkey and Colombia through the transfer of our environmentally safe power plant technology and our expertise in the areas of marketing and distribution. Without this expertise and technology transfer, the conversion of coal into electrical power at these sites would be much less proficient, and the level of emissions of harmful substances would be much higher. The application of this concept to other countries and regions could make a significant difference in terms of achieving a sustainable energy supply.

Energy derived from mine gas protects the world’s climate.

RAG has founded two companies that will use mine gas.

Gas from both active and inactive mines will be recycled.

In the future, RAG Aktiengesellschaft will be increasingly involved in the recycling of mine gas for the electrical power and thermal energy markets that is produced by underground mining. The gas that is produced is a naturally occurring mixture of methane and air that is found within hard coal. Through the Act on Renewable Energy Sources, the German government has now created suitable conditions for cost-effective and ecologically safe recycling of mine gas. The Government is also supporting power generation from mine gas. The reason for this is that methane, on the one hand, is an exploitable energy resource. On the other hand, the uncontrolled release of methane into the atmosphere can be detrimental to the climate.

Against this backdrop, RAG recently founded Minegas GmbH with G.A.S. Energietechnik GmbH (Krefeld) and LAMBDA Gesellschaft für Deponiegastechnik mbH (Wuppertal) as partners. In the future, mine gas from coal mines that have been closed will be used to generate electrical and thermal energy. A second company, Minegas Power GmbH, will be involved in the recycling of mine gas from active coal mines in the Ruhr region and in Ibbenbüren. RAG will have the majority share in both companies.

In the past, mine gas from active Deutsche Steinkohle AG coal mines was extracted from underground mines, where it was used to a limited extent to generate energy.

In the future, the two new companies will have the capacity to generate a combined total of approximately 450 million kWh of electricity annually. At the same time, emissions will be reduced by the equivalent of approximately 2.5 million tonnes of carbon dioxide. In addition, plans call for the waste heat that is generated to be used for ambient heating.

RAG expertise is being utilized to extinguish coal fires in China

RAG is making a significant contribution to climate protection in the People's Republic of China

Geographic information systems are making it easier to localize the sources of fires

For decades now, the People's Republic of China has been plagued by the natural phenomenon of coal fires. Coal deposits have ignited spontaneously in many parts of the country. RAG Aktiengesellschaft is involved in two projects that are designed to help the Chinese to localize these fires with a view to extinguishing them more quickly and at a lower cost. Smouldering fires cause considerable damage to the immediate environment. They also destroy energy deposits and damage the world's climate owing to the large amounts of carbon dioxide they emit. German expertise - particularly in the realm of the earth sciences - is making a significant contribution to the protection of our global climate.

Coal can ignite spontaneously due to climatic conditions and the properties of the coal itself, but in such cases it does not burn completely. As a result, chemical substances as well as the products of smouldering fires are released and sometimes remain in the ground water or surface water. In China as a whole, approximately 20 million tonnes of coal are incinerated annually in this manner, and an additional 200 million tonnes are rendered unsuitable for economic purposes. Emissions from all coal fire-related emissions produce the equivalent of 100 million tonnes of carbon dioxide annually.

In July 2000 RAG Aktiengesellschaft signed a cooperative agreement with the Chinese coal industry (State Administration of Coal Industry/SACI). The purpose of the agreement is to obtain detailed, computer-supported information about the fire zones, so as to increase the chances of extinguishing the fires more efficiently in the future. The cooperative agreement is restricted for the time being to two pilot projects in the autonomous province of Xinjiang in north-western China. The two pilot projects will be realized on the basis of a feasibility study that was carried out by DMT (Deutsche Montan Technologie GmbH).

Rio Tinto Energy

Rio Tinto Company wide SD program

Rio Tinto has made a strategic commitment to contribute to society's transition to more sustainable forms of development. In this regard, the business has identified sustainable development as a means of raising performance standards generally, including financial results and additional shareholder value. In order to realise this commitment, Rio Tinto has taken a leadership role in the Global Mining Initiative (see below) as well as initiating an internal company wide sustainable development programme.

The internal sustainable development programme has involved the development of a company wide sustainable development policy, which is:

“To ensure that Rio Tinto businesses, operations and products contribute to the global transition to sustainable development”.

In implementing this policy, each Rio Tinto business (including the Rio Tinto Energy Group) has been asked to assess the risks and opportunities presented by the drive to contribute to sustainable forms of development and, in this context, make an effective sustainable development case for its activities. In order to facilitate the programme, Rio Tinto has re-examined its operational codes, and is updating its statement of business practice, “The Way We Work”

It is acknowledged that there can be no ‘template’ solution applied across a diverse company like Rio Tinto, and accordingly the sustainable development case for each business will be dependant upon the particular circumstances of its host communities, environment, products, markets, and the nature and scale of its operations. Within this context, all Group businesses are being asked to:

- Determine what sustainable development means to them: what are the implications, risks and opportunities;
- Engage with stakeholders and examine what measures, targets and reporting requirements are best;
- Find ways to include sustainable development principles in business plans and decision making; and
- Investigate how social, environmental, economic and governance issues can be integrated.

In supporting the implementation of these activities, a Group Coordinator for Sustainable Development has been appointed and a small corporate, cross-functional support team formed. Similarly, Rio Tinto Energy has appointed a full-time co-ordinator, and each of the Energy businesses have appointed a Sustainable Development Champion and are forming cross-functional teams to progress their specific sustainable development programmes.

Rio Tinto Social, Community and Environmental programs including reporting.

Policy

The way we work is Rio Tinto's statement of business practice. It was published in January 1998 after extensive internal and external consultation. The document sets out the Group's policies on health, safety and environment, communities, human rights, access to land, employees, business integrity and political involvement. It commits the Group to transparency consistent with normal commercial confidentiality, corporate accountability, and the application of appropriate accounting standards and internal financial controls.

To give direction to employees and managers on the practical application of business principles in the way we work, each business has developed a code of conduct. Rio Tinto also produced health, safety and environment standards and a guidance document on applying the human rights policy. A business integrity guidance document on the issues of bribery, corruption and political contributions is being prepared in 2002.

Communities Programmes

Rio Tinto implements its community policy through programmes that include:

- The development of five year community plans at each business;

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- Baseline surveys of the social, economic and cultural characteristics of local communities are relevant at each stage of mine development, from pre-exploration, to post closure;
 - Protecting cultural heritage;
 - Recognising the need for appropriate skills for our managers and employees to engage with our neighbours;
 - Undertaking community consultations at our operations; and
 - Reaching agreements with Indigenous people on use of land.

Environmental programmes

Rio Tinto implements its environment policy through programmes that include:

- Reducing our disturbance of the environment to as low a level as possible. In order to do this, we seek to understand the environmental consequences of what we do, build what we learn into systems to manage those consequences, and provide information on our activities to those who are interested;
- Understanding the impacts on the resources we use in our activities. This includes, how we use energy; how we manage water resources; and minimising our footprint on the land; and
- Reducing the outputs of our activities that have potential environmental impacts. Programmes include, understanding and controlling airborne emissions; improving our understanding of our greenhouse gas emissions; and managing our mineral and non-mineral wastes.

Social

Rio Tinto implements its social policy through the development and maintenance of systems and processes that facilitate attracting, retaining and motivating employees at all levels by:

- Providing a challenging work environment with opportunities for promotion and personal development;
- Offering highly competitive levels of remuneration for superior performance; and
- Maintaining a reputation as a highly ethical corporate citizen and employer

We aspire to create and sustain a workplace where:

- Senior staff set standards of performance and behaviour that inspire those around them;
- Employees are encouraged to develop professional personal skills; and
- People respect others and take responsibility for their own behaviour.

Health and Safety

Rio Tinto's goal is zero injuries and to eliminate occupational disease in the Group.

To achieve our safety goals, our focus is on leadership, setting appropriate targets, interaction in the workplace and implementing minimum safety standards and auditing performance against those standards. Examples of safety programmes across the Group include:

- Safety audits by senior management in the workplace focussing on behaviour;
- Workshops on topics such as underground safety, risk management, safety standards and contractor management;
- Setting minimum safety standards for supply contracts;
- Safety audits and auditor training for senior management participation;
- Setting business level safety targets;
- The safety intranet, a tool for people to communicate incidents, best practice and safety alerts, as well as access safety standards and other documentation; and
- The Chief Executive's Safety Award.

We aim to achieve our health goal by implementing effective practices to manage exposures in the workplace. Our strategic plan to achieve this goal includes:

- Businesses to have their own occupational health strategy including targets for each applicable category of occupational disease and a brief description of the actions required to achieve each target;
- The development of standards and guidelines for occupational health management; and

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- Recognising and managing current and future health risks and adopting best practice management programmes to control them.
 - Industry collaboration - WCI, GMI, MMSD, WBCSD and policy development work which come from it.

Rio Tinto - Industry Collaboration on SD and Coal Public Policy

Rio Tinto and its energy businesses are actively working with Governments, NGOs, and other stakeholders, and co-operating within the industry, to encourage the improved use of coal within the context of sustainable development.

Rio Tinto is an active member of the World Coal Institute (WCI). The WCI represents many international coal producers, and promotes the improved use of coal in accordance with sustainability principles, which have been agreed amongst its members. Details can be obtained from the WCI website at <http://www.wci-coal.com>. In addition Rio Tinto is a participant in the Australian Coal Association's Sustainable Development Programme.

Rio Tinto has an active programme on climate change and supports taking voluntary precautionary action to address climate change. Climate change initiatives are undertaken by each of the Rio Tinto businesses, and are coordinated through its Climate Change Executive based in London. Rio Tinto is a member of the US based Pew Centre Business Environment Leadership Council, and the Australian Greenhouse Challenge. Rio Tinto participates in the government voluntary reduction schemes in Australia (Greenhouse Challenge), New Zealand and the UK.

Rio Tinto played a major role in the Global Mining Initiative, a mining industry initiative under the auspices of the World Business Council for Sustainable Development. The GMI initiative was chaired by Rio Tinto's chairman, Sir Robert Wilson. Rio Tinto is also a founding member of the International Council on Mining and Metals (ICMM), which was recently created to provide industry leadership on sustainable development. The ICMM will develop and articulate the industry's sustainable development case, promote best practice, and act as the principal point of engagement with stakeholders at the global level.

Rio Tinto is actively pursuing SD policies in each of its businesses. Rio Tinto is actively striving to improve the performance in its own organisation to better reflect community priorities and it is encouraging improved use of its products. This is being pursued through a combination of:

- First rate operational performances on safety, environmental, social and economic grounds,
- Engaging with major stakeholders and
- Developing new technology to address process and product issues.

Rio Tinto recognises the important role of coal in providing reliable and affordable energy, but also recognises that the environmental performance of the coal industry needs to improve if coal is to support sustainable development. To this end Rio Tinto has an extensive programme to encourage development and deployment of clean coal technologies, and to seek improved social and environmental outcomes from the use of coal.

More details on Rio Tinto's various programmes may be obtained from its website at <http://www.riotinto.com>, particularly the Social and Environment review section.

Clean Coal technology program

Rio Tinto Energy Technology Programmes

Rio Tinto Energy has invested in commercial enterprises and is participating in collaborative research programmes to develop and commercialise new technologies, with the aim of improving the environmental performance of coal. Some examples follow.

- Coal in Sustainable Society: this is collaborative program of life cycle analysis and communication that compares existing and emerging coal utilisation technologies with alternatives – fossil and non-fossil – and identifies improvement opportunities for coal.

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- The Cooperative Research Centre for Coal in Sustainable Development: a \$AU 61 million, seven year program with 17 participants from coal producers, electricity generators, key research providers and governments. The aim is to conduct research to improve the contribution of coal to sustainable development in Australia and its export markets.
 - The CO2 Cooperative Research Centre: this is a proposal to establish a seven-year research and development programme focussed on the capture and geological sequestration of carbon dioxide from major industrial point sources in Australia.
 - Investment in Pegasus Technologies: this company's leading product is a neural network technology that is being used to optimise the operation of coal-fired electricity generators. Coal consumption and the emissions of carbon dioxide and other pollutants, notably nitrogen oxides, are reduced by real-time control of the combustion process.

The wider Rio Tinto Group has longer-term research programmes that are relevant to the future use for coal as well as other energy sources. Two examples follow.

- Hydrogen on demand: Rio Tinto Borax is cooperating on the development of the "Hydrogen on Demand" TM process that supplies pure hydrogen from sodium borohydride storage devices without the need for compression or liquefaction. The invention has the potential to provide hydrogen for use in a wide range of applications, from transportation to small portable electronic devices.
- Maxygen: collaboration on biotechnological research is focussed on greatly enhancing the rate of uptake of carbon dioxide by micro-organisms. This research could open the way to the industrial production of biofuels from carbon dioxide sources as well as other ways to utilise carbon dioxide.

Rio Tinto Energy has established a central energy technological capability that manages collaborative research and development activities, provides consulting services on energy and the environment, and assists with identifying opportunities to translate research and development outcomes into practical initiatives. These activities have already and will continue to foster greater cooperation throughout the coal chain, and closer relationships with coal consumers; however significant challenges remain which require continued emphasis upon these activities and a willingness to innovate.

More detail is available on the Rio Tinto Social and Environmental 2001 Report site: <http://www.riotinto.com/library/microsites/SocEnv2001/home.html>.

RWE Rheinbraun

RWE Rheinbraun: Program for Power Plant Modernization

We are continuously developing our plants and processes within the bounds of what is economically feasible with the goals of optimising efficiency and minimizing energy consumption, raw material inputs and emissions. For us, environmental protection is more than just meeting statutory requirements.

In recent years, as part of the retrofitting program, RWE Rheinbraun has modernised its power plants' steam turbines and equipped them with three-dimensional blades with improved fluid dynamics that use the energy of steam much more efficiently. The output of the power plant population rose by 300 MW as a result, without the construction of new plants. Since the start of the program, RWE Rheinbraun has invested 280 million Euros that resulted in a reduction in CO2 emissions by 2 million tons per year.

Among the steps being taken are setting up lignite blocks of optimal facility technology (BoA) in Niederaussem in the Rhineland's lignite industry. This new power plant has an operating efficiency of over 43 percent and replaces old facilities with efficiency levels of about 31 percent. It will go on steam in August 2002 after approximately four years of construction. An annual reduction of 2-3 million tons of CO2-emissions is expected by the new lignite fired power plant with optimised technology, BoA (Supercritical PF technology).

The continued development of this facility to BoA Plus is already being tested. Plus means that fluidised bed drying and mechanical-thermal lignite de-watering processes are used. These are pre-processing steps that further increase energy efficiency during combustion. RWE will increase the energy efficiency of its power plant facilities through further expansion and modernisation

Recultivation- Environmentally Compatible Lignite Mining

RWE Rheinbraun makes careful and responsible use of natural resources. We place the heaviest demands on the effort made to restore and reuse the land affected by mining operations. In particular, we are pressing ahead with the steady further development of our recultivation standards –also in ecological terms- which are recognised the world over.

Opencast lignite mines are inevitably connected with impact on and interference with the environment of man, flora and fauna. The probably most significant interference of the opencast mine with the eco-balance is the surface use, and this is not least due to the fact that the Rhenish lignite mining industry is located in a densely populated area that is also intensively used for agricultural purposes. Therefore, the lignite mining industry has always regarded as its most important and urgent task the compensation for this interference by starting recultivation as quickly as possible. The example of the Garzweiler opencast mine shows the recultivation activities in the Elsbach valley, which have immediately followed mining operations. Recultivation of the opencast lignite mines takes place in parallel with mining and dumping so that the mining areas and the periods between surface use and recultivation are minimised.

In the last 30 years, the focal point of the guiding model for opencast mine recultivation has repeatedly shifted, viz. from the restoration of agricultural and forestry areas via the establishment of recreation areas all the way to the holistic development of biosystems. While in former times priority was given to the most efficient raw material production possible with subsequent shaping of the post-mine landscape according to agricultural and forestry aspects, it is today the interest of recreational use and biotope and species protection that are gaining more and more importance.

Since about the mid-80s, numerous biotope structures have therefore been integrated into areas recultivated for forestry purposes, and to a much larger extent into agriculturally recultivated areas. In addition to open fields in the form of meadows and succession areas, spot-like and linear plantings along the paths and tracks constitute the components which are a kind of biotope linking between the rehabilitated sites and the structures located outside the opencast mine. Thanks to the creation of such structures which due to differently dumped soil types, varying exposure and refined shaping have developed in various ways, fauna and flora have the greatest possible location and re-colonisation potential at their disposal. Moreover water sheets are also increasingly integrated as animating elements and for the creation of biotopes to be colonised by water- and moisture-dependent fauna and flora species.

There is no doubt that this type of recultivation is linked with considerable additional expenses. The results which were obtained from scientific investigations accompanying recultivation have shown that these expenses are worthwhile in order to restore a viable landscape that fulfils biotope and species protection requirements and is also attractive for man as far as its suitability for sustained economic use and its recreational value are concerned.

To shape the post-mining landscape, RWE Rheinbraun recultivated f. e. a total of 535 hectares from July 2000 to December 2001. This land compensates for the acreage that is currently being used for mining.

Limiting possible dust and noise pollution in residential areas close to strip mines is an avowed goal of RWE Rheinbraun. During dry seasons, excavated material and coalfields are sprayed with water or landscaped to reduce dust emissions. Comprehensive emission measuring provides evidence for how high the actual pollution level is and what effect the measures have had. Noise is reduced to a large degree at the source through the use of sonically optimised drive assemblies, gears and conveyor roads, electric motors or enclosure of driving units. Moreover, at the edges of the mine, protective dams or walls were erected with a total length of around 26 kilometres. To protect the wetlands in the Maas-Schwalm-

Nette Nature Reserve and in the area around the Niers and the Erft, RWE Rheinbraun will allow some 50 million cubic meters of treated well water to drain into the subsoil or pipe it directly into the affected ponds every year. The extensive network of branching waterlines and discharge and absorbing installations was expanded by the end of 2001 to approx. 150 kilometres.

Promotion of Sustainable Development Worldwide (F. e. Matra, Hungary)

RWE Rheinbraun promotes sustainable development world-wide by transfer of its knowledge. A lot can be done for sustainable development if know-how and standards are transferred to countries, which have not yet reached our level of development in building up their infrastructure and industry. We can contribute to this in two ways: Through our subsidiaries and affiliates as well as by giving expert advice to and supporting development projects.

In its foreign power plant interests, RWE-Rheinbraun does its part to reduce the environmental impact of its operations. RWE-Rheinbraun helped to retrofit the lignite power plants of MATRA (Hungary, power plant 800 MW) so that they now meet the EU requirements on emission limits. RWE Power and RWE Rheinbraun have installed one of the most sophisticated flue gas desulfurizing plants and are currently recultivating the totally decarbonized strip mines according to the recultivation standards of RWE Rheinbraun.

RWE Rheinbraun Engineering markets the know-how, collected in its own sphere and by RWE Rheinbraun, comprising technical, organisational and economic aspects relating to mining and handling of near-surface energy resources and minerals. A major criterion for almost all consultations, studies and projects is the consideration of environmental concerns and the social outline conditions without which no project funding is possible at the moment.

The Environmental and Social Policies and Guidelines of the World Bank and the International Monetary Fund are applied in this context.

Substitute Fuels

Sustainability requires above all else that business be based on closed loop principles. Also required are intelligent production processes, which help to reduce raw material and water consumption and keep waste levels as low as possible. Dealing with resources responsibly leads to cost savings which, in turn contributes to economic success.

RWE Rheinbraun burns around 40,000 metric tons of used wood and 350,000 metric tons of sewage sludge annually in its power plants (f. e. Berrenrath power plant). In this way, RWE Rheinbraun preserves valuable raw materials and disposes of waste safely. It is also worthwhile economically: burning sewage sludge in lignite fired power plants is much less costly than building new incineration facilities. RWE Rheinbraun is even planning to erect an additional facility at the Frechen power plant for the joint incineration of sewage sludge and scrap wood. Since December 2001, at the Frimmersdorf power plant, paper sludge is being test-burned together with other fuels.

UK Coal PLC

UK COAL has successfully bid to join the UK emissions trading scheme, the world's first such scheme designed to reduce the volume of greenhouse gases emitted to the atmosphere. The emissions trading scheme forms part of the UK's Climate Change Programme designed to meet the country's commitment under the Kyoto Protocol. The scheme will account for over 5% of the planned reduction in the UK's annual emissions by 2010. Trading under the scheme's rules began in April 2002.

To kick-start the emissions trading scheme, and to encourage companies to volunteer for the risk of absolute caps on their emissions, the Government offered a £215 million incentive via an on-line auction held over two days in March 2002. 34 organisations took part in this initial auction, bidding in emission reductions equivalent to more than four million tonnes of carbon dioxide in the year 2006.

UK COAL made one of the largest bids, with methane emission reductions accounting for about 10% of the target reduction, and now qualifies for an incentive of over £21 million, which will be paid in annual instalments. Methane is the main constituent of natural gas and has a global warming potential 21 times that of carbon dioxide.

To meet the annual emission reduction targets and so become eligible for the incentive payments, UK COAL is installing 1.4 MW reciprocating gas engines at its collieries to convert methane extracted from mines for safety reasons into electricity for use on-site. These highly efficient, state-of-the-art engines are able to use mines gas containing as little as 30% methane, making them a flexible choice for a demanding application where gas quality is rarely uniform.

UK COAL hopes that the experience gained in the UK trading scheme will enable it to influence development of the proposed EU-wide emissions trading scheme. For the coal industry as a whole, it is vital that emissions trading does not simply lead to fuel switching away from coal but instead encourages the adoption of technologies and approaches that reduce emissions from coal use.

Restoration of Dereliction

Two hundred years after the industrial revolution began in Great Britain; there is still much work to be done to clean up some of the less attractive legacies left behind by those who created the first Schumpeterian waves of innovation that quickly created the modern society many now enjoy. UK COAL PLC plays its part in this cleanup by restoring areas of industrial dereliction, creating valuable land in the process. The cost of this work is covered by extracting underlying coal during the restoration process; local communities benefit and there is no drain on public finances.

The operational surface mine at Orgreave is just one example of UK COAL's ability to plan and undertake complex reclamation projects. Close to Sheffield, the land at Orgreave was almost entirely derelict prior to working due to a history of deep mining, a coke works, a gasification plant and a poorly constructed domestic waste landfill. The 256 ha scheme has involved the removal and containment on-site of extensive quantities of highly contaminated material. The scheme has also involved the restoration of a colliery tip, construction of a new road and diversion of the River Rother onto uncontaminated land. Around 4 million tonnes of coal will have been extracted by the end of the nine-year project, creating employment for 120 people.

The tip restoration has created new wildlife habitats and other areas of ecological interest. Working with the Regional Development Agency, UK COAL is developing 100 acres of the site into a new business park to attract businesses specialising in materials and manufacturing - Sheffield's traditional strengths. Boeing, the world's largest aerospace manufacturer has already announced plans to locate at this new Advanced Manufacturing Park.

Gaining planning permission for surface coal mining projects in the UK is extremely difficult. Schemes like Orgreave, where there are clear benefits for the local community and the environment, allow the coal industry to publicly demonstrate the positive aspects of its activities.

Sponsorship of Coal related Research and Development

UK COAL financially supports the work of the British Coal Utilisation Research Association (BCURA) and helps direct the work of this registered charity, which began life back in 1938. Since 1980, around 75 university research projects have been funded and each year, half a dozen new post graduate or postdoctoral projects are started.

An interesting and relevant example of current work is research to investigate the partial removal of CO₂ from flue gases using coal-derived carbons. The aim is to assess the potential of carbon found in fly ash and breeze to be used as substrates for immobilising amines to capture CO₂. Aqueous solutions of amines have long been used by industry as absorbents for acid gases, including CO₂. For treating flue gases from coal fired power stations, they have a number of shortcomings: energy intensive sorbent regeneration,

degradation by SO_x and NO_x, corrosion of valves and piping, and vaporisation losses. This has led to a growing interest in the alternative technique of adsorption, using for example, activated carbon. However, adsorption capacities and separation factors are often low at flue gas temperatures. Immobilising amines on activated carbon substrates can substantially increase adsorption capacity and provides a route to devise and optimise adsorption technology for the continuous removal of CO₂ from flue gases. If carbon, separated from fly ash using commercially available processes can be used, then this research could lead to a low-cost means of capturing CO₂ from existing power plants.

UK COAL is proud to support the work of BCURA and currently chairs the Industrial Panel that directs funding into those research areas that will help ensure coal remains a viable fuel for the future.

Health, Safety and the Environment

The health and safety of UK COAL's employees, the environments in which they work and the communities in which the company operates are of paramount importance for a successful business.

Directors recognise that health and safety requires active management to ensure a process of continuous improvement. The Group Health and Safety Manager has a direct reporting line to the Board which fully supports the work of its employees on Health & Safety Commission working parties and in assisting with new legislation. UK COAL's achievements have been independently recognised by the British Safety Council who awarded its "Sword of Honour" to UK COAL in 2001, one of only 30 companies in the UK to receive this accolade for safety management.

The benefits of using an environmental management system certified to the international standard ISO 14001 have also been embraced. It provides managers with clear objectives, reinforced by regular auditing, to provide UK COAL's neighbours, customers and other stakeholders the reassurance that the company adopts a professional approach to minimising its environmental impact.

2. Description of Electricity Generators' Activities

Enel S.p.A

Since 1990 we implemented a significant program of environmental measures that affect our entire thermal generation. SO₂, NO_x, and dust emission values from our power plants are still below new targets established by new Large Combustion Plants Directive for next years.

Conversion of an oil fired power plant into coal fired (Torre Valdaliga Nord), increasing plant efficiency up to 44% and installing newly filtering facilities, provides a significant reduction of SO₂ (-74%), NO_x (-23%), and dust (-43%).

Since 1996 we publish a thoroughly environmental report. In 2000 Enel's environmental report has been awarded of the "OSCAR di Bilancio", given to companies whose balance sheets achieve the best corporate communication in Italy.

Eskom

Electrification programme - The provision of electricity leads to job creation and a subsequent rise in disposable income in a community. Electrification of schools and houses is highly likely to lead to increased education and productivity levels. The supply of electricity can lead to a decrease in the harvesting of firewood with resultant biodiversity implications. A decrease in respiratory disease will result due to the reduction of domestic fuel burning. The relative efficiency of using electricity will reduce the overall emission of pollutants and therefore decreases the level of ambient air pollution.

Prior to 1994, only 12% of the population in South Africa had access to electricity. The South African government, the electricity distribution industry and Eskom committed to electrify 2.5 million households by 2000. Since the start of Eskom's electrification program in 1991, the company has invested approximately US\$ 700 million and electrified 2.6 million homes in South Africa. An Eskom/Shell joint venture project has installed solar homes systems. Over 90% of urban areas, and more than 40% of rural areas, are now electrified.

HIV/AIDS - Eskom considers the implementation of their HIV/AIDS response strategy to be a focus area for the business and, as a result, it was included as a key measure in the human resources sustainability index. Response strategies developed from a 1999 surveillance study were implemented as an integral part of the business plans. The key focus areas remained education, communication, care and support, self-awareness and the management of associated risks. A new surveillance study will take place in 2003.

Eskom has continued to contribute to the national and international fight against HIV/AIDS, and has joined forces with other corporate organizations in this fight, through the SA Business Coalition on HIV/AIDS and the Global Business Council. Eskom also participates in the leadership of the South African Development Community utilities' HIV/AIDS committee. Eskom committed R30 million (\$3 million USD) to vaccine development research, of which R7,5 million (\$ 0.75 million USD) was paid during 2001 (2000: R15 million or \$ 1.5 million USD) through the Eskom Development Foundation, with the balance payable in 2002. Eskom received the HIV/AIDS Champions Award 2000 in recognition of its outstanding contribution to the fight against HIV/AIDS.

Eskom has succeeded in reducing its relative emissions of particulates by approximately 80% over the last 10 years. The technologies employed include electrostatic precipitators, bag filters and flue gas conditioning. Eskom has set an internal target to further reduce its overall particulate emissions to an average of 0.28 kg/MWh sent out, by the end of 2003, as part of a five-year strategy initiated in 1998.

Research and Development – Eskom has an extensive R&D programme that covers all three legs of sustainable development. Some of the key programmes are in the following areas:

- Clean coal technologies
- Environmental impacts and mitigation research
- Human performance
- Demand side management
- Supply side options including renewable energies, hydro, coal, and nuclear
- Performance improvements across the spectrum of Eskom's activities

KEPCO

Construction of DeSOx facilities for Samchonpo power plant unit 1~4 scheduled operation from December 2004

Construction of DeNOx facilities for Samchonpo power plant unit 3,4 scheduled operation from December 2006

Research on reduction of SOx and NOx for Samchonpo power plant unit 5,6 scheduled completion in July 2003

Electric Power Development Co.

Technology Transfer to Developing Countries

We have been transferring high-efficiency and environmental technologies for coal fired power plant to developing countries in a broad way. We have worked or are working as a consultant for PCF plant constructions in Philippines, Malaysia, and Indonesia, demonstration of simplified DeSOx systems from installation through operation in China, and various investment in IPP projects in developing countries.

R&D on advanced high-efficiency and clean coal technologies

For further high-efficiency and clean use of coal energy, we are proceeding R&D of such technologies as USC, IGFC, IGCC, and Advanced PFBC. Those technologies are to be transferred after being well proved and commercialised in Japan.

Preparing for Kyoto Mechanisms Utilization

To prepare for Kyoto Mechanisms utilization, we are proceeding following activities:

- Project finding and feasibility study for CDM/JI focusing on energy efficiency project in PCF, in south eastern Asia, Latin America, and eastern Europe
- Practical work of CDM project procedure such as baseline studies, PDD drafting, validation, and administration
- Reviewing corporate investment standard so that it can take into account of the credit value in case the subjective project can be CDM or JI.
- Afforestation in overseas countries including vegetation as coal mine rehabilitation after mining as well as commercial forestation

Reviewing the Mission and Strategy of National Coal Organization

Under consideration of recent change of coal status caused by climate change issue, we suggested main members of Japanese Committee for Pacific Coal Flow (JAPAC) that is the largest organization of companies related to coal development, trade and use, including EPDC to review its organizational mission and strategy. The reviewing is now under final process and we plan to make a political recommendation on national coal policy to the government.

Helsinki Energy Board

Combined production of electricity and heat through the efficient utilisation of fuel and district heating are the cornerstones of sustainable use of coal. The total efficiency of CHP plants is near 90 %, which means also lower emissions and make coal-fired production more environmentally acceptable.

Flue gas particle emissions are purified at coal-fired power plants using not only electric, but also fabric filters, which constitute a part of the desulphurisation process. The improved combustion technology has reduced emissions of nitrogen oxides.

Internal research projects: promoting the storage and utilisation of coal combustion by-products, improvement of the coal dust measuring system, a combustion experiment with woody pellets among coal

Collaboration in other research projects: Impact of micro particles on health, environmental impacts of ash fertilisation

Construction of environmental management systems according to international standards is included in the operating systems of each business. If necessary, the systems are certified or accredited. Power plants are certified according to the ISO 14001 standard.

District cooling using absorption technology, during warm seasons absorber energy is obtained from excess district heat in the combined production of electricity and heat. This is the way to achieve better efficiency in CHP-production during summer. In addition to this, environmentally harmful freons used in conventionally cooling can be replaced by clean water.

Coal storage project: the beginning of construction work for underground rock silos which will replace open coalfield in future. This will reduce environmental impacts of coal such as noise and dust.

Powergen UK plc

Funding R&D on how to improve the efficiency of coal-fired generation

In the past we have funded development projects for plant modelling and analytical tools. An example is PROATES Thermodynamic Software. This software system replicates all stages in plant operation. It is available for purchase by other plant operators in the UK and abroad.

Process Analysis for Thermal Energy Systems (PROATES) can be used as a predictive, analytical or design tool to improve pulverised fuel (coal) plant performance and allows a wide range of 'what-if' assessments to be made as part of evaluating plant improvements and potential returns on capital investment.

One example of its application was to resolve a problem related to excessive desuperheater spray flows required for the control of steam temperatures at one of our 500 MWe coal-fired plants. The increased use of spraywater caused under-utilisation of the HP heaters and resulted in a loss in Rankine cycle efficiency.

PROATES was used to assess a range of remedial measures over a number of plant operating states. Four measures were shortlisted with the final decision being to leave the boiler surfaces unmodified and to relocate the spray water extraction point after the HP heater. This was implemented on all four of the plant's units and led to fuel cost savings of £200k/unit per year.

In addition, we are currently participating in the EU Framework 5-funded THERMIE 700 project on ultra super-critical coal fired power stations. The specific contribution includes work on the corrosion behaviour of advanced alloys for high temperature use and a review of relevant literature on the interaction of coal quality with new boiler designs and materials.

Reducing the environmental impact of coal-fired generation

Concentrating on our UK operations, both of our coal-fired power stations are certified to ISO 14001, the international environmental management standard. ISO 14001 is not a direct measure for reducing environmental impacts; rather it provides a systematic framework for identifying and managing environmental issues. The stations are regularly audited against the standard's own specific requirements by on-site personnel, Internal Audit and our third party certification body.

In terms of atmospheric emissions, the larger of the two stations is fitted with Flue Gas Desulphurisation (FGD). All four of the station's units are equipped with wet limestone gypsum FGD plant. This is designed to remove at least 90% of the SO₂ from atmospheric emissions. It is also effective in reducing HCl and particulate emissions. Furthermore, it is company policy that the limestone used in the process is not sourced from national parks.

Both stations undertake continuous monitoring of pollutants and are fitted with low-NO_x burners to control NO_x emissions.

Waste management plans are in force and the stations follow a guiding hierarchy of elimination, minimisation, reuse, recycle, and disposal. For example, all lubricating oils used by the larger station are recycled by the supplier and metal scrap sold for recycling. Gypsum is a by-product from the FGD process here too. Almost all of this is sold for the manufacture of plasterboard. Sludge from the FGD waste water treatment plant is re-fired in the main boiler plant.

Furnace bottom ash and pulverised fuel ash are sold to the construction industry rather than being landfilled. Sales are close to matching production at both stations. For example, in 2001 the smaller station sold 92% of its ash production.

Our UK operations also include a coal importing facility. The facility's environmental controls aim to minimise coal dust emissions, largely through dust suppression sprays. These are fitted on fixed conveying plant and around the coal stockyard. They can be operated either manually or via a PC.

The facility is designed to store, treat and reuse water. The drainage system has been designed to collect all water run off around the site into a large concrete sump. This water is then pumped through a water treatment system that removes the solids and stores the clarified water in a storage tank ready for re-use. All coal slurry collected during this process is conditioned and returned to the coal stocks.

Waste oil is collected for recycling by a licensed contractor.

Stakeholder engagement

The company engages with a number of stakeholders, many in relation to coal.

One of the most recent examples was the consultation on the UK Government's Policy and Innovation Unit's (PIU) Energy Policy Review. In our submission to the PIU we raised a number of points with regard to improving the sustainable development performance of coal. For example, we argued that the co-firing of coal with biomass and waste would enable coal-fired generation to make a contribution to CO2 emission reduction whilst maintaining secure and diverse supply. We also raised a concern over the implementation of the EU Large Combustion Plants Directive, the main constraint on future UK coal-fired generation. We argued that the UK Government must implement this in a way which does not prejudice the contribution of UK coal plant to fuel diversity.

We have also addressed, among a wide range of issues, the sustainable development performance of coal and other fuels in our first Corporate Responsibility Report. We see this Report as a significant step forward in communicating with our stakeholders. The Report is an important development in that it required a commitment from the top down to measure and monitor CSR issues, such as the sourcing and burning of coal.

Improving the safety image of coal

We implement and maintain health and safety management systems at all our power stations as well as promote best practice through our Group Health and Safety Policy. This Policy extends to all business activities. In addition, our UK business operates a Strategic Health and Safety Group. This drives forward business-wide health and safety initiatives, including contractor safety management and health risk assessment. As part of our balanced generation portfolio, coal benefits from these initiatives.

All of our UK coal operations have been awarded Royal Society for the Prevention of Accidents (RoSPA) awards. Currently, both of our coal-powered stations together with our coal importing facility hold Gold Medal awards. This signifies that the operations have experienced five years at Gold Award standard. We participate in the awards process each year to demonstrate our commitment to safety and to benchmark our health and safety performance.

Organisation I

Active programs to reduce acidifying emissions to the air

Environmental performance reports

Demonstration projects on new coal burning technologies

Environmental management systems applied not only to installations but also to organization.

Active promotion of renewable energy sources and co-generation as a means to compensate the impacts of conventional electricity generation.

Organisation J

No submissions.

Organisation M

SINESBIOAR Project

This project consists in the implementation of a multidisciplinary instrument to evaluate and manage the air quality and its social impacts in the region of Sines. The entity responsible for the coordination and execution of the project is the regional environmental authority (DRAOT - Alentejo). The European Community, through the Program LIFE Environment, and national private institutions, finances this project.

Porta Atlantica

The PORTA ATLANTICA is an association for the promotion of Sines and Staniago do Cacem economic zone. The main objectives are, among others:

- To promote integrated and multidisciplinary initiatives, aiming the economic, social and cultural development of the Sines and Santiago do Cacem zones.
- Contribute to a better knowledge of the intervention area, in order to make possible for the private companies and national institutions to take the appropriate decisions for the development of this area.

An independent international power company

Development of a Global Sustainable Development Manual – Manual has incorporated Sustainable Development in all phases of our business from project development through to design, construction, pre-commercialisation and operations.

Development of Sustainable Development & Health, Safety and Environment KPIs (Key Performance Indicators) – The establishment of KPIs will support the development of an annual Sustainable Development and environmental performance report

Incorporation of Sustainable Development training into various corporate training programs – Sustainable Development training has been incorporated into a variety of training ranging from employee orientation session to senior level strategy sessions

Participation in the World Environment Centre's "ICSR" Program – Participation in the ICSR (International Corporate Social Responsibility) program includes involvement in a pilot project program

Organisation O

CO₂ sequestration Project with Battelle, BP and other industrial leaders to develop sequestration technology and monitoring.

Developing optimal way to "technology transfer" to countries where coal will continue to remain as most important resource for power generation.

We try to involve all stakeholders before a major decision is taken.

TEPCO

Environmental protection: We have attained the world's highest level of environmental protection, especially in the area of air-quality preservation, by promptly taking positive measures to reduce the environmental load from power generation and other aspects of the electric utility industry.

Optimal generating configuration: Based on our experience in such events as the oil crises of 1970s, we have pursued an optimal generating configuration which is well-balanced among available primary energy sources, including coal, nuclear power, LNG and oil. Through these

efforts, we have avoided price risks resulting mainly from sharp increases in oil prices, attained energy security by diversifying our plant fuels and reduced the environmental load of our operations, particularly in terms of CO2 emissions.

Thermal efficiency: We have attained both the curtailment of costs and the mitigation of environmental load by significantly improving the efficiency of electric service facilities, specifically the thermal efficiency of thermal power generation and the transmission and distribution loss rate.

3. Description of Other Organisations' Activities

Norfolk Southern

Years ago, NS transitioned from coal-fired locomotives to diesel locomotives and continues to this day to reinvest in higher efficiency locomotives.

NS encourages the establishment of SynFuel producing plants and is hopeful to have a plant on our line by the end of 2002.

Pocahontas Land Corporation (PLC), a wholly-owned subsidiary of NS, is very concerned about the economic and social well-being of its communities as it promotes the growth and development of coal and other resources on its properties. PLC owns or manages one million acres of natural resource properties in Alabama, Illinois, Kentucky, Tennessee, Virginia and West Virginia. Through cooperative efforts with its lessees, PLC has utilized innovative methods in post-mining land use to convert formerly rough mountainous terrain into usable land.

NS has participated in several collaborative with industry producers, consumers and transportation providers through industry associations, including but not limited to: Centre for Environmental Economic Development (CEED); Coal Utilization Research Council (CURC); Southern States Energy Board (SSEB); the U.S. Department of Energy, Office of Fossil Energy, Office of Coal and Power Systems-Strategic Initiatives for Coal and Power (SICP); National Mining Association (NMA); Coal Based Generation Stakeholders (CBGS); and Eastern Coal Council. Through these associations, focus is on the following:

- Educate governmental officials who establish energy policy by encouraging awareness that clean coal has a vital role to play in the fuel mix necessary to meet the world's demand for energy; sustainable energy requires diversified energy sources to meet economic, social and environmental objectives; certain policy action; and governmental investment and rapid development of clean coal technologies.
- Research of economic impact of coal utilization in U.S. by state.
- Educational activities that promote the use of clean coal through an ever-growing grass roots effort focused on the importance of a diversified energy base to enhance sustainable development.
- Avoidance of an unsustainable shift to other fuels as a result of current environmental pressures, recognizing that there is not one fuel that can, alone, meet the growing need for energy in this nation or in the world because: nuclear power is constrained by confidence in technological/human capability and international security; natural gas is scarce in many countries and, where available, requires substantial capital investment to create the necessary pipeline access; renewables (wind and solar) are not predictable and therefore not reliable; while coal is abundant, readily available, low cost, reliable, and easy to convert to electrical power and, therefore, remains a vital fuel source to the world.
- Transfer of environmentally friendly, clean coal technologies to developing countries to ensure that coal maintains its role in sustainable development by partnering to build power plants and encourage economic growth, and educate the population and assist in the development of technical skills.
- Programs that research, develop, analyse and promote mechanisms and policies to finance local solutions to global problems.

Organisation A

CQ Combustion - Burning Biomass/Energy Rich waste together with coal

Tree Planting program to absorb CO₂ from Coal burning

AC Sulphurization plus NO_x reduction in all coal boilers

Market 100% of ashes and gypsum as construction raw materials (replacing nature raw materials)

Organisation C

Increase of energy efficiency

Use of local coal (lignite)

Use of coal ash as raw material

Provide environmental information on a local and national level

Organisation H

No Submission

Questionnaire

SURVEY OF CIAB MEMBERS ON COAL AND SUSTAINABLE DEVELOPMENT

JUNE 2002

Purpose of Survey

This is a survey of CIAB Members of their organisation's position on and activities relating to coal and sustainable development.

The purpose of this survey is to assess the degree of practical expression being given to sustainable development within CIAB Members' organisations.

An analysis of the results will be included in the papers for the 2002 CIAB Plenary meeting.

Returning the Results

The survey is in electronic form and is suitable for returning by e-mail.

Please return your response to both:

Anthony Baker (email address supplied) and

David Cain (email address supplied)

Reply Date

To allow the CIAB associates to consider the survey results at their mid-July meeting in Washington we need to compile, analyse and circulate the results to associates before that date. Therefore it is important that your response is received as soon as possible and no later than **Friday June 28**.

Note: This document is protected, enter your responses in the unprotected areas indicated.

Enter free form text responses in the light blue areas. If you copy and paste part of your answers from other documents the blue shading may be lost. This is not a problem and will not affect the use of the survey by CIAB.

SECTION 1
GENERAL INFORMATION

Purpose: This section seeks general information about the nature of the CIAB Member's own organisation

Question 1.1

Please identify the nature of your organisation's involvement in the coal industry.

- Coal production
- Coal Marketing
- Coal Transport
- Electricity Generation from Coal
- Other (please specify)

Please comment as necessary:

Question 1.2

Please tick one or more of the following to describe the nature of your organisation

- Multinational organisation
- Domestic organisation operating in a developing economy
- Domestic organisation operating in a developed economy
- Government owned organisation
- Non-government corporation
- Other (please specify)

Please comment as necessary:

Question 1.3

Please identify one or more regions to which your responses refer

- Multinational operations
- Asia-Pacific
- Europe
- North America
- Africa
- Other (please specify)

Please comment as necessary:

Please proceed to the next section.

SECTION 2 SUSTAINABLE DEVELOPMENT AND YOUR ORGANISATION

Purpose: This section seeks information about the perceived importance and degree of acceptance of the principles of sustainable development within your own organisation.

Question 2.1

Please indicate how important you believe the principles of sustainable development are to decision making in your own organisation. (Select only one answer please.)

- Not at all important
- Somewhat important
- Very important
- Don't know

Please comment on the reason for your response:

Question 2.2

Please indicate whether the general acceptance of the principles of sustainable development in your own organisation has changed in the past three years. (Select only one answer please.)

- Less important now
- No change
- More important now
- Much more important now
- Don't know
- Not applicable

Please comment on the reason for your response:

Question 2.3

How widely within your own organisation are the principles of sustainable development accepted? (Tick more than one box if appropriate)

- Board level
- Senior management
- Operating personnel
- All employees
- No employees
- Not Applicable

Please comment as necessary:

Question 2.4

To what extent do you believe that your own organisation could gain commercial advantage through applying the principles of sustainable development? (Select only one answer please.)

- No advantage
- A little advantage
- Some advantage
- Much advantage
- Don't know

Please comment on the reason for your reply:

Please proceed to the next section.

THE COAL INDUSTRY AND SUSTAINABLE DEVELOPMENT

Purpose: This section seeks Members' views on sustainable development priorities for organisations in the coal industry. The "coal industry" includes all activities within the coal chain – such as mining, marketing, transport, consumption, waste management and by-products.

Question 3.1


Would you please give your opinion of the importance of each of the following actions for improving the sustainable development performance of the coal industry as a whole, not just your own organisation.

Please use a rating scale of 0 to 5, where 0 is of no importance and 5 is extremely important. Click on the "[]" boxes below to choose from a list.

1. Do nothing differently []
2. Adopt and endorse sustainable development principles in organisations operating in the coal industry. []
3. Provide a secure source of energy supply. []
4. Provide low cost energy. []
5. Take actions to reduce the environmental impacts of coal production and use. []
6. Develop and use new technologies that reduce greenhouse gas and other emissions from coal production and use. []
7. Assist transfer of technologies to developing countries to improve their performance of coal production and use. []
8. Improve product stewardship throughout the coal chain. []
9. Improve communication and collaboration throughout the coal chain. []
10. Improve the health and safety performance of the coal industry. []
11. Establish improved ways for engaging stakeholders. []
12. Establish market mechanisms that reward improved environmental performance. []

Comment

Please provide any comments you wish to make, including any other priorities not listed above that you believe are important.



Please proceed to the next section.

**SECTION 4
EXAMPLES OF SUSTAINABLE DEVELOPMENT INITIATIVES BY THE MEMBER'S
ORGANISATION**

Purpose: This section seeks examples of sustainable development activities undertaken by the CIAB Member's own organisation.

Question 4.1

Some organisations may wish to be publicly identified with the activities described below. Please indicate whether you wish to have your response to Question 4.3 identified with your organisation's name. Click on the "[]" box below to choose from a list.

[]

Question 4.2

If you answered "yes" to Question 4.1 please write the name of your organisation below:

[Redacted text box]

Question 4.3

Please describe up to four activities that your own organisation has undertaken or is undertaking with the aim of improving the sustainable development performance of coal. The description of each activity should not be more than one page in length.

For example, you may wish to comment on social and environmental performance reporting, research and development projects, internal company projects, collaboration with industry associations on sustainable development initiatives, organisational changes that reflect sustainable development priorities, improved health and safety initiatives; stakeholder engagement and technology transfer.

1.

[Redacted text box]

2.

[Redacted text box]

3.

[Redacted text box]

4.

[Redacted text box]

End of survey. Thank you for responding