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Minerals and Energy
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ASSESSMENT STUDY OF THE ENERGY EFFICIENCY ACCORD



South African corporations doing more with less

November 2008

Final Report

Voluntary Energy Efficiency Accord



EXECUTIVE SUMMARY

Introduction

In 2005, following the adoption of the Energy Efficiency Strategy of the Republic of South Africa, a number of progressive South African companies signed a voluntary Energy Efficiency Accord with Government through the Minister of Minerals and Energy. This Accord was facilitated by the National Business Initiative (NBI) and its main aim was to assist in implementing the strategy and contributing to the achievement of the announced energy efficiency targets.

In terms of the National Energy Efficiency Strategy, the national overall target was a final energy demand reduction of 12% but the industry target was 15%. To convene the business of the Accord and its link with Government, an Energy Efficiency Technical Committee (EETC) was formed with NBI playing the management and secretariat roles. The committee meets on regular basis to share best practices on the promotion of energy efficiency within their respective companies and to exchange ideas of common interest with regards to energy efficiency. The EETC is chaired by one of the signatory companies and the deputy chair is provided by the Department of Minerals and Energy (DME)

This assessment study highlights the demonstration of the commitment of large South African corporations to energy efficiency and demand reduction. It further reports on the key achievements and challenges of the Accord, discusses the value of the Accord going forward, especially in the context of current electricity emergency, and identifies areas where the Accord needs to be strengthened in terms of business commitment and Government support.

Private Sector Commitment

Through the Voluntary Energy Efficiency Accord, the largest companies have been working with Government to promote and implement energy efficiency. A number of Business Leadership South Africa companies have also demonstrated examples of electricity savings and reduced demand.

There has been growth in the number of signatories since the initial signing of the Accord indicating value and traction. At the initial signing of the Energy Efficiency Accord in 2005 there were 30 signatories comprising 23 companies and 7 business associations. Currently there are 44 signatories of the Accord comprising 36 companies and 8 key business associations who help mobilize their members towards energy efficiency. The company signatories are from the mining, industrial, petrochemicals, commercial and financial sectors and they are mostly the top energy users in the country including Eskom, Sasol, BHP Billiton, Anglo American, AngloGold Ashanti, Anglo Platinum, Xstrata, ArcelorMittal and Exxaro. There are companies like Harmony Gold, Liberty Life, Absa, Liberty Life, Pick n Pay, eBucks and Hollard that have indicated willingness to sign the Accord. This momentum will be taken forward following the commitment of the Minister of Minerals and Energy to negotiate a revised Accord based on the lessons learnt and the demands of the current electricity crisis.

The growth in the Accord membership has been mainly in the industrial and mining sectors. This is mainly due to the fact that the Accord deliberately focused on the top energy users during the first three

years. Given the energy intensity of the South African economy this was a rational strategy. Going forward, there is a need to broaden the Accord to include commercial buildings and the hospitality sector. Thus there is a need to create a separate meeting for the commercial sector which deals specifically with energy management in the commercial sector in order to attract more commercial sector signatories. The implication of this is that more resources would be required to provide the necessary technical support. It is worth noting that a few leading companies outside the mining and industrial sectors signed the Accord, as it was not restricted to heavy energy users.

Completeness of Accord Assessment

Out of the 36 company signatories of the Accord, 24 signatories have remained active participants in attending the functions of the Accord, especially the meetings of the Energy Efficiency Technical Committee. 21 of these 24 active participants of the Accord responded to the assessment study questionnaire. This means that over 87% of the active participants responded to the questionnaire.

Since the data for this assessment study was collected in early 2008, this assessment study is largely based on the 2007 financial year information of companies. Thus this study cannot claim to be a full assessment of the first 3-year cycle of the Accord. It may be useful to collect 2008 financial year information in order to update this information as a full assessment of the first 3-year cycle of the Accord. Furthermore, the completeness of this assessment would be enhanced if such information collection could endeavour to improve the data on other energy sources besides electricity. This is important because there are industrial sectors that are heavily dependent on other energy sources like coal, for example, the cement and steel industries. Such an effort would enable the calculation of the overall energy intensities of companies for assessing improvements and benchmark comparisons with international best practices.

Energy Efficiency Potential

Given the collective electricity consumption of over 56 560 GWh by about 19 Accord signatories, which is about 24% of the national electricity consumption, the energy efficiency potential of the Accord is very significant. All the major coal consumers and suppliers are in the Accord and therefore the Accord could be a central place for collaboration on energy management in coal mining, transportation and consumption. The study shows that there is significant potential in energy efficiency in other energy sources amongst the Accord signatories like natural gas, diesel and alternative energy and therefore the Accord did not only focus on electricity.

Energy Management Performance

The assessment included qualitative information collection which required the Accord members to respond to a Total Energy Management Performance Matrix. This is a self assessment matrix to which majority of the Accord Members responded with a score above half of the total performance score. The overall result proved that the majority of the Accord Members have a well established Energy Efficiency philosophy within their respective companies but that there are deficiencies which need to be

addressed. Areas where consistent progress has been made included energy policy formulation and energy efficiency investment. One main area of deficiency amongst majority of the Accord members that required attention and perhaps support is the lack of sufficient skills and training in energy management. Another aspect that stood out was the Accord members' dissatisfaction with the Eskom Energy Efficiency and Demand-Side Management programme in terms of the lengthy delays in project approvals and the complexity of the approval process.

Energy Savings Achieved

The quantitative assessment shows that over 2 405 GWh of electricity was collectively saved by 15 of the Accord signatories who were able to report their information in the 2007 financial year. This is over 8 660 TJ and is equivalent to more than 3.5 days of average national electricity demand which gives an indication of how significant this would have been if all the signatories had managed to report on their electric energy savings. Assuming a total of 12.5 million households in South Africa and the residential electric energy demand of 17% of the total electricity demand, the collective electric energy demand reduction by these 15 companies is equivalent to an average annual consumption of over 730 000 households in South Africa. These savings could even be more impressive if all the signatories were able to report on their electricity savings.

The electricity demand reduction achieved by the signatories who were able to report on their energy savings ranges up to 38%. AngloGold Ashanti reduced its electricity consumption by 16.7% in 2007 compared with 2005 whilst Xstrata South Africa (Pty) Ltd and Richards Bay Coal Terminal reduced their consumption by 12.7% and 12% respectively. Other companies that exceeded the required 7% significantly were ABB, Woolworths and two of the main cement manufacturing companies AfriSam and Pretoria Portland Cement.

Energy Intensity Improvements

The study provided an indication that not all absolute energy savings might have resulted in energy intensity improvements. This is the reason why there is a need to shift from the focus on energy demand reduction to energy intensity improvement. A clear example was the case of De Beers whose final electric energy demand reduction was a mere 2.5% but in terms of energy intensity improvement it stood out amongst rest with 23.5% improvement. Other companies with energy intensity improvement of more than 10% were Sappi, the South African Brewery (SAB), two of the main cement manufacturers (AfriSam and PPC) and Richards Bay Coal Terminal (RBCT). The companies in the Chemical Industry improved their energy intensities by 13% on average. Energy intensity improvements for other energy sources estimated included coal, diesel and petrol.

Energy Efficiency Investments

The Accord signatories have collectively made significant investments in energy efficiency. Up to date energy efficiency investments made by the Accord signatories since they signed the Accord amount to over R9.9 billion while investments earmarked for the next three years amount to over R13.5 billion.

Such significant investments indicate that the Accord signatories are backing their commitment with resources. Most of these investments are dominated by initiatives in the industrial sector and the top 3 leaders in energy efficiency investments are Xstrata, AfriSam and Sasol.

Energy Efficiency Measurement and Reporting Challenge

One area where the Accord has not been effective is the lack of common reporting requirements as well as agreed and enforced measurement and verification methodology. Companies differed in their perception of energy savings due to lack of agreement on baseline determination and Business-As-Usual projections of energy demand. This could result in misleading reporting of their achievements. A clear definition of energy efficiency improvements should be agreed to at the onset to avoid misconception in its measurement and reporting. Instead of an absolute reduction of energy consumption, energy intensity improvement should rather be used to give the signatories the flexibility of exploring energy efficiency potentials in the different processes of their production or service delivery.

The complexity of measuring energy efficiency gains has not made it possible for all companies to report on the energy reduction achieved. This is particularly the case for companies with many diverse product derivatives and changing operating conditions like the mining industry. The study clearly shows lack of reporting of monetary savings from energy efficiency by a significant number of the respondents which gives an impression that adequate monitoring systems are not in place. A greater commitment is required by the top management of such companies to develop and install the appropriate measuring and reporting systems for monitoring the energy efficiency gains.

Energy Efficiency Financing Support

The study shows that the commitment of Government made in the Accord to provide support to the signatories in terms of financial incentives for energy efficiency projects has not been followed through. It also shows that the uptake of Energy Efficiency and Demand-Side Management (EEDSM) funded projects has been very low and that the contribution of the EEDSM funds to the promotion of energy efficiency amongst the Accord signatories remains insignificant. The hurdle rate of mostly 18 to 24 months for EEDSM project approval has been unattractive to business implementation of energy efficiency projects. Furthermore, despite the potential for carbon emission reduction through energy efficiency, not much has been achieved in the promotion of CDM. Again this is an area where the commitment of government in the Accord to assist in streamlining CDM approval process has not been forthcoming.

Lessons from Best Practices

Some lessons emerging from best practices amongst the Accord signatories and some companies outside the Accord include the following:

- **Energy Policy:** The monitoring of Energy Intensity (lower GJ or kWh/ton) as key Performance Indicator for staff has helped the improvement of energy efficiency significantly (AfriSam - former Holcim, Richards Bay Coal Terminal).
- **IT Systems:** Energy efficiency communication strategy using company intranet in monitoring and reporting consumption in a centralised automated system has helped companies to make real-time interventions in controlling their energy use within a specified threshold. This helps build awareness of energy efficiency and give an up to date picture of the effects of savings initiatives. Examples of such IT systems can be found at Woolworths, AngloGold Ashanti and Engen.
- **Organisation:** The formation of Energy Efficiency Committees through representation of divisional champions responsible for driving energy efficiency within company divisions has helped to implement energy efficiency in a more organized way with strategic direction. Quarterly reporting to Exco level and feedback to the divisions ensure improvement and sustainability of progress. Examples of these committees have been formed at Eskom, SAB and BMW.
- **Investment:** Significant number of companies are shifting towards Preferential Energy Efficiency Procurement incorporating measures to include their suppliers in their own energy efficiency initiatives. For example, Eskom has included energy efficiency as a key consideration in Board and EXCO investment decisions to ensure that the energy efficiency implications of all projects are assessed and considered in decision making. Further, a process has been initiated to address energy efficiency amongst suppliers regarding their operations and products. SAB include suppliers in their electricity saving workshops to allow better sharing of knowledge on the subject. Pick n Pay includes their suppliers in their energy efficiency management strategy. The benefit of this approach is a more widespread and integrated coverage of the energy efficiency drive.
- **Marketing and Communication:** This involves engagement with staff and company supply chain regarding identification of best practices and creating ownership of energy plans targeting potential energy savings. Company examples are Richards Bay Coal Terminal, SAB, Pick n Pay, Eskom. It also involves awareness campaigns with newsletters, emails and competitions like at PG Group and Pick 'n Pay. Communication and awareness programmes have helped change knowledge levels, attitudes and perceptions about energy use at Eskom.
- **Skills and Knowledge:** Training of selected employees in energy efficiency techniques has been effective at Anglo Coal and other companies.

Accord Future and Concerns of Signatories

Regarding the future of the Accord, it is clear from the assessment of the Energy Efficiency Technical Committee that there is continuous interest in the Accord but the signatories are concerned that the efforts and gains made by companies who made an early move on energy efficiency may not be taken

into consideration in the planned power rationing programme of Eskom. For a renewed Accord, the signatories have called for the following:

1. Assurance from Government that the voluntary efforts on energy efficiency by business will be taken into consideration in the planned Power Conservation Programme.
2. In order to avoid crippling the economy, Government should be more assertive in getting the intended power rationing shared fairly amongst all sectors of the economy instead of business bearing the brunt of it all.
3. More Government commitment to the Accord through Higher Level engagement/participation from Government Departments.
4. It is important for Government to honour its commitments through an integrated regime of incentives and financial mechanisms which are key to further stimulation of energy efficiency by business because currently this function is scattered in different Government departments and agencies.
5. Support from Government for effective skills and training in Energy Management and its reporting. Skills and Knowledge pose a challenge across all levels from Energy Managers to technical operators and ESCOs who must support the companies in auditing and implementation. Apart from high end training such as professional Industrial Energy Management, unit consumption standards have still not been established and the Energy SETA has not been effective in this regard. For effective energy management there would be a need to require a benchmarked number of energy managers/supervisors for each company depending on energy consumption level of the company but this makes training/skills development strategies imperative. It is recommended that the Deputy President considers making the development, retention and importation of skills in the energy sector a key priority in the Joint Initiative on Priority Skills Acquisition (JIPSA) programme.
6. Government Research and Development through the Department of Science and Technology and the newly approved South African National Energy and Development Institute (SANEDI) under CEF needs to beef up its support for energy efficiency innovations. Currently, companies are investing in this to some degree but government support would help ensure coordination, collaboration and partnerships.

Conclusions and Recommendations

As an overall conclusion, the study revealed that the Accord was instrumental in, or played a facilitating role with regard to Energy Efficiency projects which were undertaken by the Accord Members. As the Accord convening entity, the Energy efficiency Technical Committee played a key role in the Accord activities and through its facilitation role, the Accord Members could effectively communicate and exchange ideas and views. The study shows that the Accord played a key role in the signatories'

readiness to meet the electricity supply challenges during the first part of 2008 and are still coping with these challenges. The specific conclusions and recommendations are as follows:

1. *Gains made by the Accord in energy efficiency should be considered in revised Accord and aligned with other Government policies*

Although difficult to measure in all cases, significant gains have been made by the Accord signatories in terms of energy management, energy savings, energy intensity improvements and energy efficiency investments which need to be recognised and built on. The revision of the Accord commitments should ensure that energy efficiency gains made are properly acknowledged and aligned with Government policies (e.g. the Long-Term Mitigation Scenarios of DEAT) and initiatives dealing with current energy security challenge (e.g. the proposed Power Conservation Programme, Energy Efficiency and Demand-Side Management Fund, supply-side costs, etc).

2. *Sectoral dynamics should be considered in measurement and verification system adopted in revised Accord in order to reduce measurement complexities.*

The assessment has shown that sector dynamics in terms of energy use are different making energy efficiency determination more complicated in some sectors than in others. Operating environments in some sectors like mining keep on changing thus requiring a need for adjusted baselines. A sectoral approach could be used in measuring and verifying (M&V) energy efficiency in order to incorporate sector dynamics. Changes in operating environment should be taken into consideration in M & V. Activities cutting across sectors like lighting, pumping, heating, cooling, compressed air management, variable speed drives, etc, could also be used with sectoral dynamics taken into consideration.

3. *Energy efficiency targets for the Accord should be energy-intensity oriented with intermediary timelines to accommodate company expansion and regular monitoring.*

Although many gains have been achieved in the electricity savings, very little could be accounted for in the other energy sources. The focus of the Energy Efficiency Target has been too (1) end-point (2015) oriented with no agreed intermediary Targets and, (2) one-energy source oriented (mainly on Electricity) with little gains in other fuels accounted for. The assessment shows that some companies are even more dependent on other energy sources than electricity but much attention has not been paid to energy savings from those other sources. Clearer targets need to be set for Short-, Medium- & Long-Term goals of the Accord and these should be broadened to cover all other energy sources. Targets need to be energy-intensity oriented instead of absolute consumption in order to accommodate company expansion and ultimately promote economic growth.

4. *Commitments on clear periodic communication of best practices should be made by both business and government to create more awareness.*

Many best practice learnings from the Accord signatories have emerged and promoted amongst the Accord signatories but these have not been properly articulated and effectively communicated beyond

the Accord. A revised Accord should include commitments of clear periodic communication of best practices and achieved energy efficiency data in demonstration of energy efficiency championship.

5. Commitments should be made on the level of monitoring system required for effective measurement and verification of energy efficiency improvements based on agreed baseline and BAU projections.

The assessment study has evolved an initial wealth of database on signatories' energy consumption and efforts on energy efficiency. Confidentiality on this information should be continued to be secured to encourage more companies to provide more quality information to enrich the database for monitoring and planning. However, the current Accord has not enforced the installation of a monitoring system at significant levels for specified activities for Measurement and Verification. The lack of adequate information on Baseline Determination and difficulties with Business-As-Usual (BAU) Projections resulted in poor quality of information provided by the companies in the quantitative survey. A revised Accord should make commitments to measure and verify energy efficiency improvements based on sound installed monitoring system. Realistic Baseline Determination based on available information would have to be agreed to and systems should be developed for BAU Projections.

6. Periodic common reporting system should be essential in the revised Accord commitments.

Although most of the Accord signatories found the information requirement in the quantitative survey too onerous, some have found the questionnaire a useful starting point for reporting on their energy efficiency commitments. However, the current Accord does not have a common reporting system in place as committed in the Accord and no periodic reporting has been required besides this assessment study. Thus very scanty quantitative reports evolved in this study. A revised Accord should make commitments to develop and enforce a periodic common reporting system which is simple and verifiable based on sound installed monitoring system.

7. Clearer, verifiable and well-resourced commitments to skills and training development are needed in revised Accord to ensure effective energy management.

Although the Accord committed to Skills & Training Development, not much occurred in any significant way as committed by both Government & Business. This is one area where the Accord can be said to have failed both on the part of Business and Government. It is only going to be possible for Government to regulate how many approved energy managers would be required at any production or service delivery site depending on the level of energy consumption if Government puts in place the required resources for training the required number of energy managers with the required competence. The revised Accord should identify key skills and training gaps in energy management at all levels and make clear, verifiable and well-resourced commitments to develop required skills and training to deliver energy management systems required for reaching targets agreed to.

8. An Action-oriented government commitment on support for incentives, technology development and transfer and CDM projects facilitation as well as regular progress review are imperative for a revised Accord

Another area of failure of this Accord is in the area of Government support for the Accord. The commitment made by Government by way of involvement and support for incentives, technology transfer and CDM projects facilitation never materialised in any significant way in the implementation of the Accord. As shown from the review of the Accord commitments and the stakeholder perspectives, there was very limited high level Government involvement in the Accord and key departments were ignorant of the existence of the Accord. Government has not helped in streamlining the approval of projects by the Eskom Energy Efficiency and Demand-Side Management (EEDSM) Fund and the EEDSM funding level has remained low while supply costs have escalated. Thus EEDSM projects have unacceptably long payback periods which make the projects unattractive for investments. An important agency of Government, NERSA, which approves and oversees the EEDSM fund does not participate in the Accord, thus making such an important agency unaware of the problems with the fund. Government has also not helped in CDM projects facilitation in partnering with other governments in industrialized countries regarding technology transfer using CDM.

A revised Accord should make explicit Government's commitments in an action-oriented way regarding support for incentives, technology transfer and CDM by specifying the institutions required, timing, level of involvement, etc. Government could support the Accord in negotiating technology transfer and partnerships from advanced countries through CDM and bilateral agreements.

9. Commitments should be made on resources required for implementing and monitoring all the revised Accord's commitment.

The main and most profound outcome of the Accord is the Energy Efficiency Technical Committee. This could be seen as the mainstay of the Accord in that it has allowed interaction within the Accord Signatory group and the sharing of best practices which have effectively helped in promoting energy efficiency. The NBI has provided dedicated technical and process support to the EETC, funded through a three year investment and financed by its voluntary membership fees. Following this catalytic input, it will be important to identify adequate resources to sustain the work of the EETC.

A revised Accord should clarify what resources would be required for implementing all the commitments made. These should aim at gradual transition to a more formalised institutional structure. The NBI has demonstrated commitment and support to facilitate such a transition and to ensure proper institutionalisation of the energy efficiency effort. Future management of the Accord in terms of monitoring and verification methodology and reporting systems would require more resources for which Government and donor support would be of great help. More resources would be required for sound data collection and modeling to support effective planning and investment decisions by both the private and public sectors.

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1. INTRODUCTION

1.1 Purpose of Assessment Study

The South African Energy Efficiency Strategy, which was approved in 2005, is due for review in 2008 as stated in the strategy document. Accordingly, the Energy Efficiency Accord, which was based on the Energy Efficiency Strategy, requires a review in 2008 after its first 3-year phase of implementation. The main purpose of this report is to critically assess the effectiveness of the Accord in mobilizing business to implement energy efficiency. The report uses both qualitative and quantitative assessment of the Accord's achievements, as well as identification of its barriers and challenges as a tool for effectively strategizing towards improvement of the Accord. It must be stated clearly at the onset that study does not cover the full 3 years of the first phase of the Accord but, rather, it effectively covers the first 2 years. This is because companies could only provide information up to the 2007 financial year since the study data collection was carried out in early 2008.

1.2 Background

In the foreword of the Energy Efficiency Strategy of the Republic of South Africa, published in March 2005, the then Minister of Minerals and Energy, Phumzile Mlambo-Ngcuka, made the following statement: "In South Africa we take energy for granted, with the consequence that our energy consumption is higher than it should be." She continued to say that South Africans, in many respects, start with a clean slate with little energy efficiency measures having taken place in practice.

The importance of energy efficiency in enabling the fast growth of the country and in contributing to environmental conservation was recognised much earlier by both government and business. In 2005, in response to the adoption of the Energy Efficiency Strategy of the Republic of South Africa, the National Business Initiative (NBI) formulated and facilitated a voluntary Energy Efficiency Accord which was signed by a number of progressive South African companies and government. The government was represented in this Accord by the Department of Minerals and Energy (DME) and the Accord was aimed at assisting the implementation of the strategy and contributing to the achievement of the announced targets.

Through the leadership of NBI, the Accord attracted a variety of business entities from different sectors. The first public commitment came in May 2005 when 23 leading companies and 7 business associations signed onto the Accord, agreeing to work towards a 15% reduction in their final energy demand by 2015 in relation to the year 2000 baseline energy demand, taking into consideration projected production growth. The number of Accord signatories has since then grown to 44 signatories representing almost every one of the top 20 most energy intensive companies in the country. This includes top 36 companies and 8 business associations (refer to Appendix A for the list of all the Accord signatories). The continuous convening of business to pursue the objectives of the Accord and its direct link with the government is achieved through the secretariat services offered by the NBI to an Energy Efficiency Technical Committee (EETC) formed by the Accord signatories under the Chairmanship of Mr Ian Langridge from Anglo American and his Deputy-Chairperson, Dr Elsa du Toit of the DME.

1.3 Energy Efficiency Strategy of the Republic of South Africa

The Strategy, which was published in March 2005, proposed “To encourage sustainable energy sector development and energy use through efficient practices thereby minimising the undesirable impacts of energy usage upon health and the environment, and contributing towards secure and affordable energy for all. In view of recent developments within the electricity supply sector it is also important to look at the objectives which could be realized by this initiative as listed in the strategy:

- To improve the health of the nation
- To facilitate job creation
- To alleviate energy poverty
- To reduce environmental pollution
- To reduce CO₂ emissions
- To improve industrial competitiveness
- To enhance energy security
- To reduce the necessity for additional power generation capacity

To achieve these objectives an overall national target of a 12% reduction in final energy demand was set for 2015 against the forecast baseline energy consumption for that year, which is based on an annual economic growth rate of 2.4% from 2000. It is important to note that the year 2000 is merely the statistical baseline from which future energy demand and usage is extrapolated and to which national reductions will be compared; it was not intended as a “baseline” for the Accord participants, who are free to choose a baseline date according to the availability and reliability of their own data.

The Strategy also included an objective to continuously monitor progress, using a monitoring system from which annual reports would be issued. To date, this has not been done and there is no indication of how government intends to monitor progress in energy efficiency.

1.4 The objectives and commitments of the Accord.

The overall objective of the Energy Efficiency Accord is to reduce energy consumption and in this regard the Accord uses the National Energy Efficiency Strategy targets as a basis. The Accord therefore also has a projected target of 12% energy savings by 2015, expressed as a percentage reduction against the energy use in 2015, as illustrated in the graph below, captured from the Strategy. Specific sector targets were also specified in the Strategy. The targets for the Industrial, Mining and Commercial Sectors are all set at 15%.

In terms of the Accord the signatories also agreed on 2000 as the baseline year against which performance would be measured. (In practice, this will have to be altered to suit individual company data constraints, and as noted above the national Strategy does not actually specify a baseline year, only a target year.). Furthermore it was agreed that the Energy Bill, which was hoped to be enacted by the

end of 2005 but is still under review, would contain elements of energy efficiency and that these elements would be implemented in consultation with the parties.

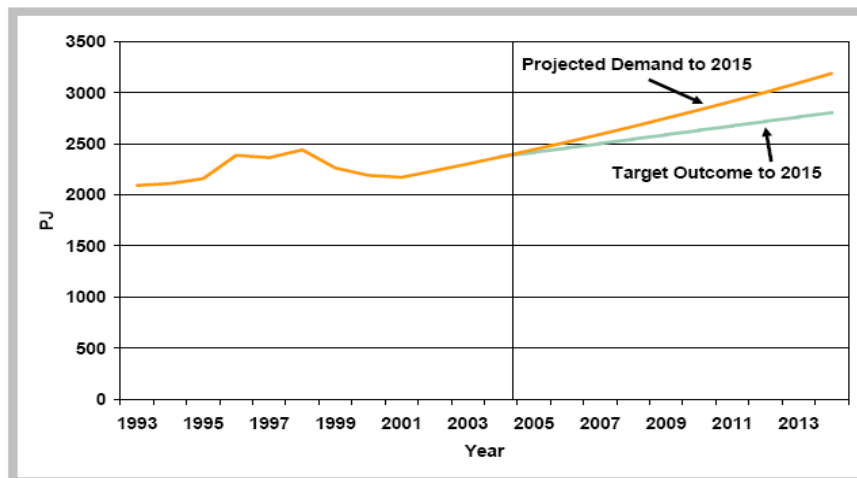


Figure 1.1: The projected electricity demand as per the National Energy Efficiency Strategy

Other than a final target for 2015 in the graph in Figure 1 above, neither the Strategy nor the Accord specifies annual energy savings targets. The Accord merely includes a statement that signatories will “promote the development of sector specific strategies and targets, in partnership with Government that will contribute to the achievement of the overall energy efficiency target set by the Government.”

The “Energy Efficiency Baseline Study” carried out by CABEERE and the DME provides large quantities of data on potential energy savings which was used to determine eventual energy savings targets for the National Energy efficiency Strategy.

The potential for savings was expressed in terms of sectors and subsectors in the form of extensive tables. The tables provide the following data, which could serve as an indication of potential targets for 2007:[2]

Sector	2007	2015
Iron and Steel	24.8	38.2
Mining sector	9.5	12.2
Chemical industries	23.2	38.6
Non-metallic minerals (cement etc.)	5	7.7
Non-ferrous metals (Aluminium etc)	3.9	5.3
Textiles	1.3	1.9
Commercial sector	7.9	13.3

Table 1.1 : Potential of energy savings in different sectors (GJ) from 2002

The importance of the above data is that it confirms that every industry is unique and that each has its own potential with regard to energy savings and that to have a single target for all would be unreasonable. However, the recent energy crisis and the subsequent developments proved that such

targets were probably conservative and need to be re-examined in light of current technologies and the changing tariff regime.

In terms of the Energy Efficiency Accord, signed by Accord Members and co-signed by the Department of Mineral and Energy, a number of objectives were set. These objectives can be encapsulated in the following points:

- The establishment of a mutually beneficial framework towards voluntary energy efficiency initiatives, which would also attract investment in Clean Development Mechanism i.e. Carbon Trading.
- The establishment of a programme that industry associations and companies will join voluntarily.
- To achieve higher economic growth rates as part of this initiative.
- To pursue national energy efficiency targets as per the National Energy Efficiency Strategy, i.e. 12% by 2015.
- To collaborate on initiatives which could result in Clean Development projects.
- To form part of the regular reviews provided for in the National Energy Efficiency Strategy.

1.5 Increasing Importance of Energy Efficiency in South Africa

Eskom, is the world's 13 biggest electric utilities by generation capacity, and is in the top 9 in terms of electricity sales (224,366GWh) [1]. It generates around 95% of the electricity used in South Africa, and over 50% of that produced in Africa. Eskom also exports and imports electricity, to and from, a number of other African countries.

The dramatic slowdown of economic growth of South Africa, due to “apartheid”, to the point where the economy was shrinking, resulted in Eskom having an excess capacity of more than a third of its installed capacity in the early nineties. Thus, it was in the utility’s interest to encourage electricity load growth in identified sectors of the economy in order to improve its revenue. With most of the capital cost of generation already sunk, and its source of coal mainly locally accessed through long-term contracts at negotiated low prices, Eskom was able to promote cheaper electricity price compared to the rest of the world and South Africa benefitted a great deal from this cheap source of electricity for many years. Its electricity price has been one of the lowest in the world.

Although these factors jointly resulted in South Africa becoming an attractive destination for investment in energy-intensive industries such as aluminium smelters, these advantages also contributed to the emergence of the present electricity supply shortages. These shortages can be explained as follows:

- Energy conservation was not on the agenda until relatively recently
- Electricity sales were promoted together with initiatives to switch from other fuel sources to electricity
- Mass electrification of previously disadvantaged areas without adequately planning for its supply implications in terms of peak and energy demand.

- The provision of free basic services to the poor without seizing the opportunity to promote efficient use of the resource in the broader residential sector.
- Energy efficiency investment has remained cost-ineffective due to low electricity prices and consequent long payback periods.
- Post 1994 rapid economic growth, which created additional demand not properly factored into Eskom's long-term planning.

The mass electrification programme mentioned above started in 1991, at which time only about a third of South Africa's population had access to electricity. Since then almost 3.5 million homes have been electrified. The goal of the programme is to ensure that every home has access to electricity by 2012.

Due to the explanation above, together with some additional factors, electricity demand has in recent months outstripped supply with Eskom's reserve margin drastically reduced to about 5% instead of the required over 15%. Since 2006 there have been increasing incidents of load shedding by Eskom. In January and February 2008 the energy security of the country was severely challenged when Eskom had to embark on continuous load shedding which resulted in the requirement of some mining and energy-intensive industries to shut down some of their operations. This occurrence has had a severe consequence for the nation including:

- Inflationary pressures resulting from an abrupt hike in the electricity price. The National Energy Regulator granted the approval of this price hike mainly for the recovery of high costs of primary energy incurred by Eskom during the crisis
- Disruptions of industrial, mining and commercial operations leading to a lot of company losses
- Pressure on many businesses to acquire diesel generators due to decreased reliability of electricity supply

Since the crisis, Eskom has been working together with the South African Government in analysing the challenges in bringing the electricity supply and distribution system back into balance by engaging all stakeholders. In January 2008, the Department of Minerals and Energy and Eskom released a response document called "National response to South Africa's electricity shortage".

On the supply-side, the response document aims to ensure that the R343 billion new generation capacity expansion projects over the next five years stay on track. It also ensures that there is sufficient investment in the maintenance, upgrade and expansion of the country's electricity distribution infrastructure to cope with the increased demand and the planned capacity expansion. It also calls for an acceleration of projects by independent power producers.

However, none of the new capacity expansion projects is expected to come online before 2013 and therefore significant restoration of Eskom's operational reserve margin will require massive interventions at the demand-side. One of the major interventions is electricity co-generation projects between Eskom and private industry, where waste heat generated as a by-product of industrial processes is captured to produce electricity for own use by the industries themselves, or purchased by

Eskom for the national grid. Due to the delays in the approval and planning of co-generation projects, the main intervention that could bring significant relief to the reserve margin in the short to medium term is energy efficiency and demand-side management. Knowing that the only plausible intervention is at the demand-side, Eskom and the government are planning to introduce a power ration scheme called Power Conservation Programme (PCP) that will reward and/or penalize customers based on their energy usage. There is a concern though that this programme should ensure that the typical characteristics of different industries are accommodated in the design of the programme in optimizing energy efficiency potential in key areas of operation without jeopardizing the overall company operations with power supply curtailment.

It is anticipated that a properly designed conservation programme that takes industry characteristics into consideration, instead of a mandatory overall energy consumption reduction, will require a highly skilled staff for monitoring. Thus, the business case for a voluntary energy efficiency implementation with a more rigorous monitoring of committed targets has become stronger than when the Energy Efficiency Accord started in 2005. Furthermore, due to the heavy dependence of the South African energy supply on coal (79%), energy efficiency has become a key climate change mitigation option in accordance with the Long Term Mitigation Scenario Study of government [3].

1.6 Significance of the Energy Efficiency Accord

Figure 2 below gives the sector split of final energy use in South Africa. The accord members typically belong to three of the sectors shown, namely the Industrial Sector, the Mining Sector and the Commercial Sector. The figure indicates that these three sectors constitute over 50% of the national final energy use. Thus if the Energy Efficiency Accord is made to effective, it could be one single major instrument for implementing energy efficiency over 50% of the national energy use if the top energy users in these sectors are made part of the Accord.

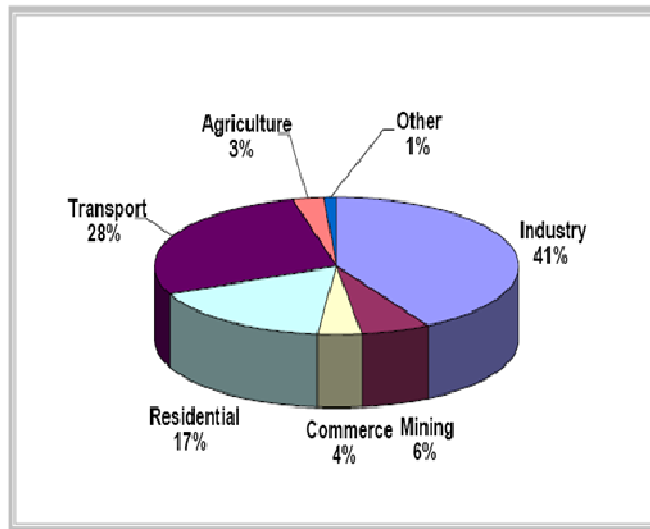


Figure 1.2: Sector split of 2000 final energy use in South Africa

2. COMPANY RESPONSE TRENDS

This chapter is limited to a presentation of the trends in which the company signatories to the Energy Efficiency Accord responded to the quantitative questionnaire of the Accord Assessment. This is because the other sections of the questionnaire were well responded to by all the respondents. The research methodology for the research has been outlined in Appendix B.

2.1 Growth of the number of Energy Efficiency Accord Signatories

It is important to examine the composition of the Accord before analyzing the trends of companies' response to the assessment questionnaire. Appendix A provides a list of all the companies and business associations that have signed on to the Accord since its formation in May 2005. Figure 3.1 below summarises the number of each sector that have joined the Accord each year. The figure shows that there has been growth in the number of signatories since the initial signing of the Accord indicating value and traction. At the initial signing of the Energy Efficiency Accord in 2005 there were 30 signatories comprising 23 companies and 7 business associations. Currently, there are 44 signatories of the Accord comprising 36 companies and 8 key business associations.

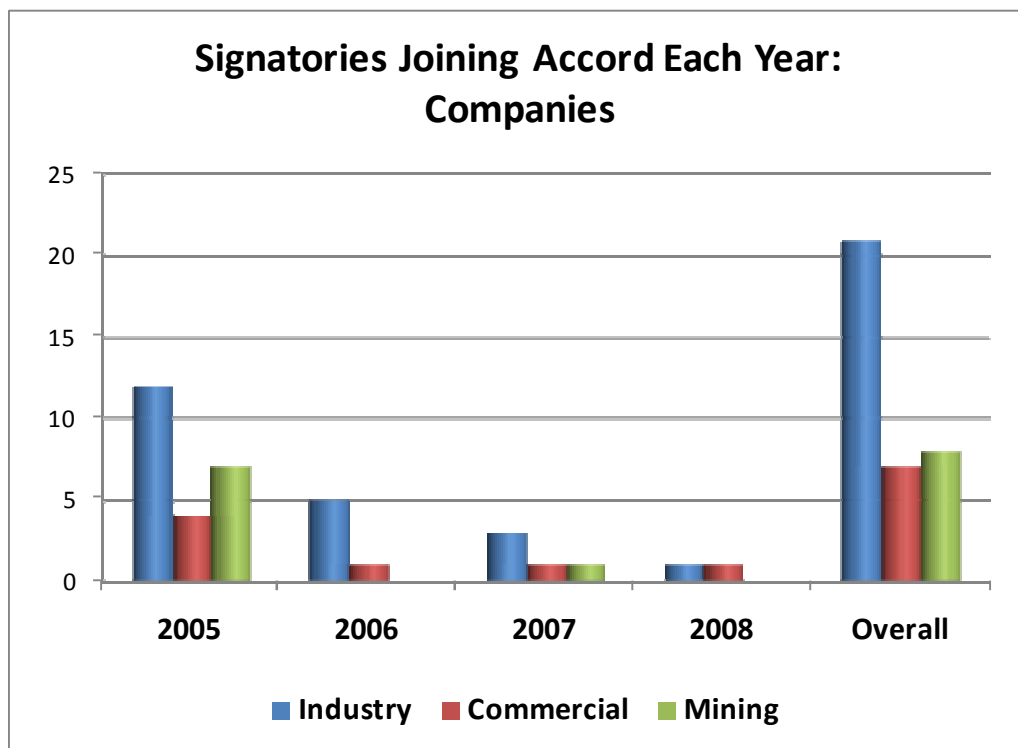


Figure 2.1 Number of companies joining the Energy Efficiency Accord yearly

The company signatories are from the mining, industrial, petrochemicals, commercial and financial sectors. For analysis purposes in this study, the manufacturing and petrochemicals sectors have been aggregated into the industrial sector while the commercial sector includes the financial sector. The

company signatories are mostly the top energy users in the country including Eskom, Sasol, BHP Billiton, Anglo American, AngloGold Ashanti, Anglo Platinum, Xstrata and ArcelorMittal. Even now there are companies like Harmony Gold, Liberty Life, Absa, Liberty Life and Pick n Pay waiting to sign up to the Accord. The business associations help mobilize their members towards energy efficiency and the associations are the South African Property Owners Association (SAPOA), Business Unity South Africa (BUSA), Chamber of Mines (CoM), South African Petroleum Industry Association (SAPIA), Association of Cementitious Material Producers (ACMP), Aluminium Federation of Southern Africa (AFSA), Chemical and Allied Industries' Association (CAIA) and National Association of Automobile Manufacturers of South Africa (NAAMSA).

Figure 2.1 shows that up till now the growth in the Accord has been mainly in the industrial sector with the initial 12 signatories in 2005 more than doubling to 21 signatories in 2008. The mining sector signatories have also doubled from 4 in 2005 to 8 signatories in 2008. The growth of the Accord in the industrial and mining sectors has been positive for energy efficiency since most energy-intensive users are in those sectors. The commercial sector has also grown from 4 signatories in 2005 to 7 in 2008, even though commercial entities abound in numbers in the countries than the other 2 sectors in the country and the sector has significant energy efficiency potential. It is important to widen the scope of the energy efficiency drive to other sectors of the economy so that the burden and benefits are shared equally without stifling growth in particular sectors.

The limitation of growth of the Accord in the commercial sector is mainly due to the fact that the meetings of the Accord have been too technical without addressing the specific needs of the commercial sector which mainly involve energy management of commercial properties and the hospitality industry. Thus there is a need to create a separate meeting for the commercial sector which deals specifically with energy management in the commercial sector in order to attract more commercial signatories. The implication of this is that more resources would be required to provide the necessary oversight of such a separate entity.

2.2 Response Trends

Out of the 36 company signatories of the Accord, 24 signatories have remained active participants in attending the functions of the Accord, especially the meetings of the Energy Efficiency Technical Committee. Figure 3.2 shows that dormant participation in the Accord has remained about 29%. 21 of these 24 active participants of the Accord responded to the quantitative questionnaire. This means that over 87% of the active participants responded to the questionnaire. As shown in Figure 2.2, however, in terms of the overall 36 company Accord membership, 62% of the signatories responded with only 9% being active signatories who did not respond.

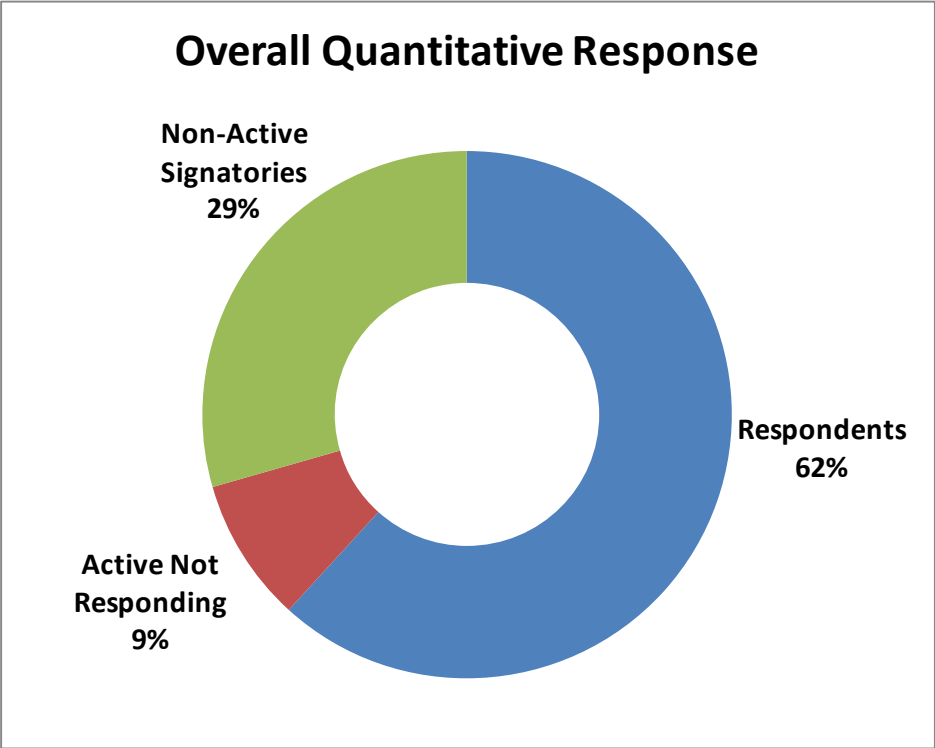


Figure 2.2 Overall response of the Energy Efficiency Accord signatories to the quantitative questionnaire

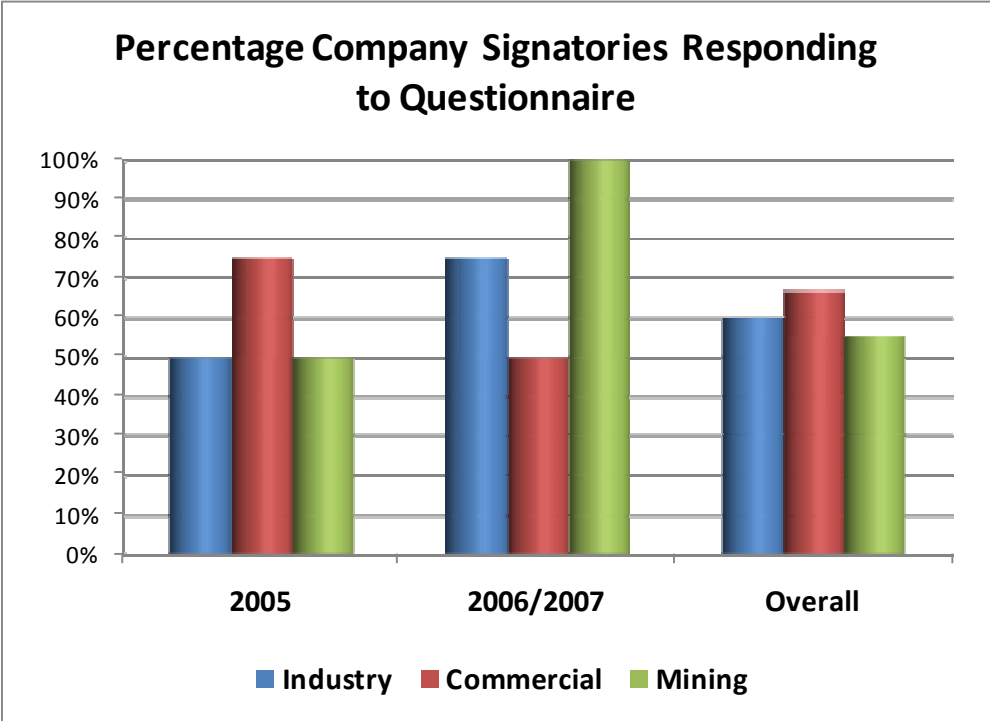


Figure 2.3 Sectoral response to Accord questionnaire with respect to year of signing the Accord

The overall response by companies who signed up before 2008 was 55% or more in each of the 3 sectors as shown in Figure 2.3. It can be observed in this figure that, with the exception of the commercial sector, the responses of the Accord signatories who signed the Accord in the latter 2 years were far higher than those who signed up initially in 2005. This shows that after the euphoria of signing the Accord some of the industrial and mining companies slackened in their energy efficiency drive.

Sector	Company	Baseline Year	Accord Year	
Industry	PPC	2000	2007	
	Richards Bay Coal	2000	2006	
	SAB	2000	2005	
	Eskom	2006	2005	
	BP	2006	2005	
	Unilever	2006	2006	
	ABB		2005	
	Holcim Afrisam	2000	2005	
	Sappi	2000	2007	
	Sasol	2000	2005	
	BHP Billiton Bayside Aluminum	2007	2006	
	BHP Billiton Hillside Aluminum		2006	
	BHP Billiton Samancor Manganese		2006	
	ArcelorMittal South Africa	2006	2006	
	Commercial	Siemens Real Estate		2005
		Woolworths	2005	2006
Sanlam Life		2006	2005	
Nedbank			2005	
Mining	Gold Fields	2005	2005	
	Anglo Platinum	2004	2005	
	De Beers	2003	2005	
	Xstrata	2005	2007	
	AngloGold Ashanti	2004	2005	
	BHP Billiton Energy Coal		2006	

Table2:1 List of companies that responded to the quantitative questionnaire of the Energy Efficiency Accord Assessment

Table 2.1 lists the 24 respondents to the quantitative questionnaire with an indication of when they signed the Accord and which year they chose as their baseline year for the measurement of their progress on their Accord commitments. These 24 respondents constitute 21 companies since the 4 BHP Billiton business units amongst them reported as separate entities in terms of their energy use. As

shown on the table, all these responding companies had signed the Accord by 2007 because the 2008 Accord signatories were too late to be part of the study since the data for the study was collected in early 2008.

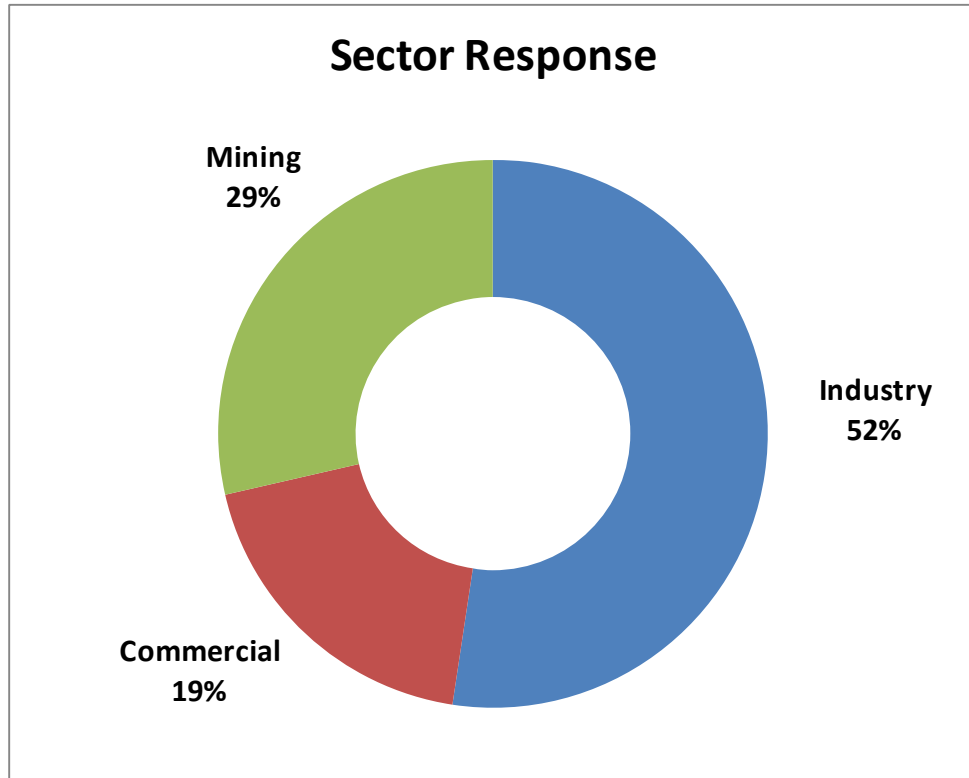


Figure 2.4 Sectoral composition of the response to the quantitative questionnaire

As shown in Figure 2.4 the industrial sector dominated the respondents to the quantitative questionnaire (52%) followed by the mining sector (29%) and the commercial sector with 19%. While this a true reflection of the Accord composition, it also shows that the industrial sector that is responsible for most of the final energy use in South Africa (41% according to the NEES) is also taking serious interest in utilizing its energy use efficiently.

3.3 Quality of responses

The quality of company responses to the quantitative questionnaire was generally not impressive. The main concern here was the low level of completeness of companies' responses. A number of respondents have indicated that the questionnaire was too detailed and complicated and this would have to be rectified in future. However, a few companies were outstanding in their completeness of their quantitative questionnaire. The analysis shows that only 4 out of the 24 respondents (16.7%) provided useful responses to over 50% of the quantitative questionnaire and only 7 out of the 24 respondents (29%) provided responses to over 40% of the quantitative questionnaire. De Beers,

Richards Bay Coal Terminal Company Ltd, Sappi and Unilever excelled in their completion of the quantitative assessment questionnaire by providing useful responses to 84%, 76%, 64% and 59% of the questions respectively. About 71% of the respondents answered less than 25% of the quantitative questionnaire.

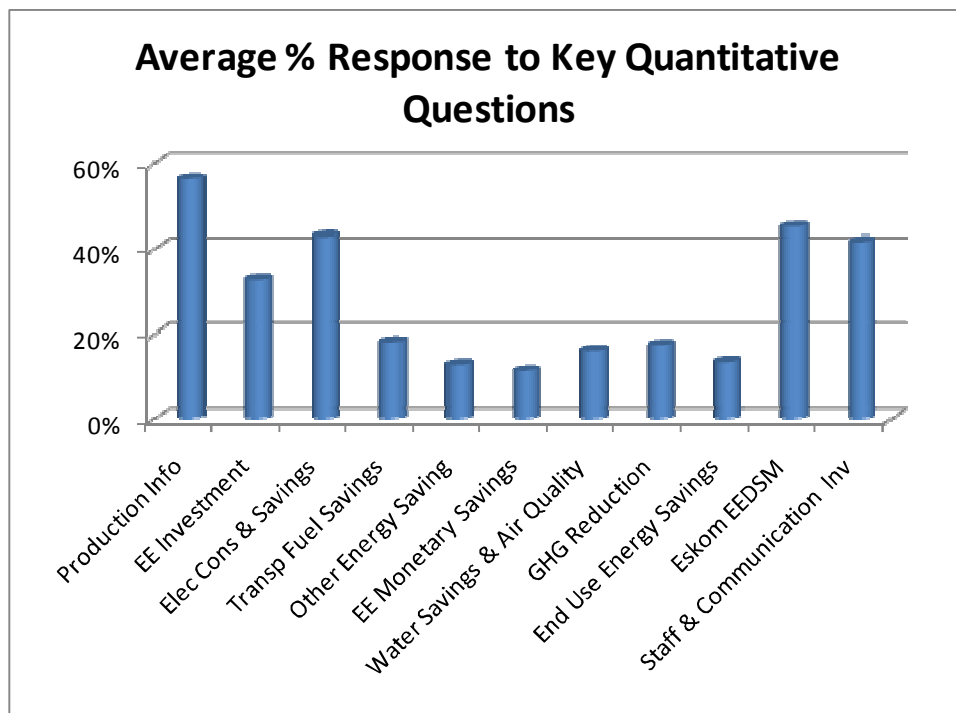


Figure 2.5 Average percentage of key quantitative questions companies responded to

The low level of questionnaire completeness was more acute in certain sections of the questionnaire than others. Figure 2.5 provides information on average percentage of questions from key sections of the quantitative questionnaire to which companies provided useful responses. There were 5 sections of the questionnaire to which on average more than 30% of the questions were responded. These sections asked questions about company production and revenue, Energy Efficiency and Demand-Side Management (EEDSM) Fund, electricity consumption and savings, investment in skills and communication and energy efficiency investment with 56%, 45%, 43%, 42% and 33% of the sections questions answered respectively. The rest of the sections had less than 20% of the questions responded to by the companies on average.

The above observations indicate that, apart from electricity, not much attention was paid to the measurement and reporting on the consumption and savings of the other energy sources of the companies even though the Accord is a commitment to energy savings and not limited to electricity savings. This low level of questionnaire completeness should be borne in mind in examining the analysis of consumption and savings of the other energy sources in Chapter 4. This also made it impossible to calculate the overall improvements in energy intensities of the companies since data provided on the

energy sources used by the companies were incomplete. Thus energy intensity improvements had to be calculated based on individual energy sources.

It must be mentioned that not all companies who provided information on their consumption of electricity and other energy sources also provided information on their production or companies' output. In such cases the energy information provided was not helpful in assessing the energy intensity improvements. The relatively better information on company production, electricity consumption and savings as well as energy efficiency investments, as shown in Figure 3.5, assisted the assessment greatly in estimating the electric energy intensities.

There are a number of reasons for this poor quality of the responses to the quantitative questionnaire. One of the main reasons is the fact that companies just did not have the data available, at least in the detailed form required, because there are no installed monitoring systems at that level of detail. The questionnaire was also found to be too onerous in its level of detail.

3. ENERGY MANAGEMENT PERFORMANCE

The first step in assessing the progress made by the Accord is a qualitative approach using the Energy Management Performance Matrix. The Accord signatories were asked by the NBI to use the Matrix to score themselves in terms of 6 categories of Energy Management Performance namely Energy Policy, Organisation, Skills & Knowledge, Information Systems for Target Monitoring, Investment Decisions, and Motivation through Communication and Marketing. 5 levels of progress were allowed for the scoring for all the categories, from 0 to 4. While 0 indicated that there were no systems in place, 1-2 score indicated increasing levels of informal system and 3-4 score represented more formal and sophisticated systems for energy management performance.

As shown in Appendix C, each column of the matrix deals with one of the 6 categories of Energy Management Performance with the ascending rows, from 0 to 4, which represent increasingly sophisticated handling of these issues. The objective would be to move up through these levels towards current 'best practice' and, as a company achieves this a balance is achieved across the columns. The performance descriptions for each strategic element are given in the matrix cells. However, it is useful first to characterize a company in general, based on the levels 0 through 4, as shown in Appendix D. The main challenge when it comes to completing the Total Energy Management Matrix is to understand where a company is with regard to the performance criteria in the matrix and to be absolutely objective.

3.1 Overall Energy Management Assessment

Apart from the Energy Management Performance assessment of the Accord conducted in this study in 2008, an earlier assessment was conducted in October 2007. It is worth comparing the overall matrix results from the 2 assessments shown in Figure 3.1 as the total number of respondents to both assessments was the same (23), although there were few differences in the companies that responded.

Figure 3.1 shows that apart from Information Systems and Skills and Knowledge there have been significant improvements in other 4 categories of energy management namely; Energy Policy, Organisation, Investment Decisions and Motivation through Marketing and Communication. Organisation and Motivation (Marketing & Communication) have clearly moved away from the informal approach (score of 1-2) in the 2007 assessment towards more formal systems in the 2008 assessment. Skills and Knowledge in energy management have remained almost the same as in the 2007 assessment without much improvement from informal approaches in skills and knowledge development which is still a major concern. Information Systems remain high without change.

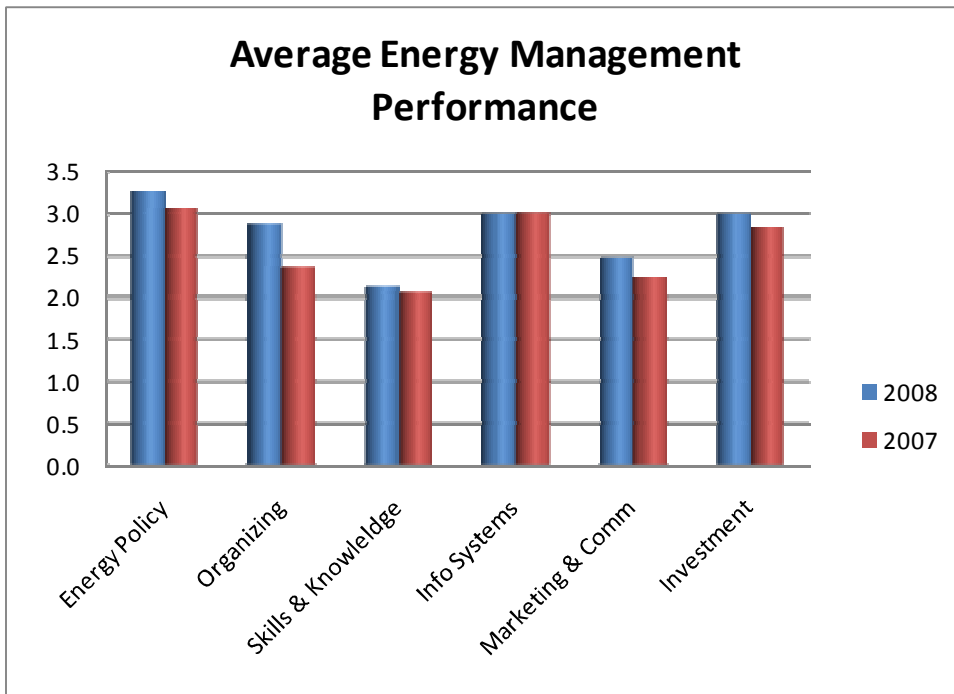


Figure 3.1: Average energy management performance for 2007 and 2008 assessments

The analysis of improvements from the 2007 to the 2008 energy management performance assessments is made clearer when one examines the details of the average total scores for the different criteria of energy management in the 2 years as shown in Figures 3.2 and 3.3. A shift of each of the criteria towards the right indicates a transition towards a more formal system of energy management. Comparing Figures 3.2 and 3.3 it can be seen that there have been significant shifts towards the higher end of the scale in Energy Policy, Organisation, Investment Decisions and Marketing and Communication which indicate improvements in those criteria of energy management. However, Skills and Training show no significant shift which indicates that Skills and Training in energy management remain a concern with no improvement.

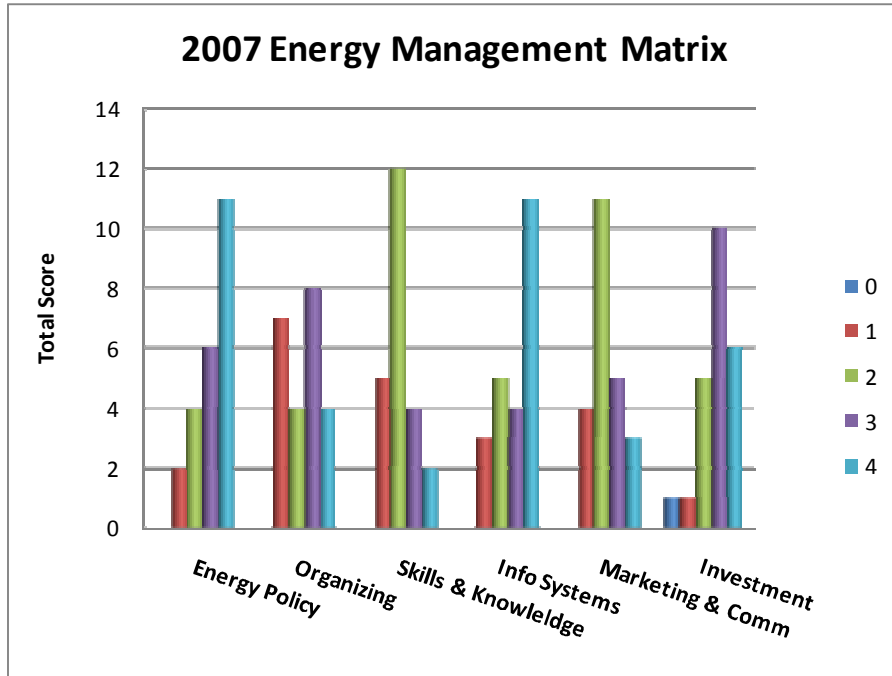


Figure 3.2: Average total score for the different levels of the energy management criteria for the 2007 assessment

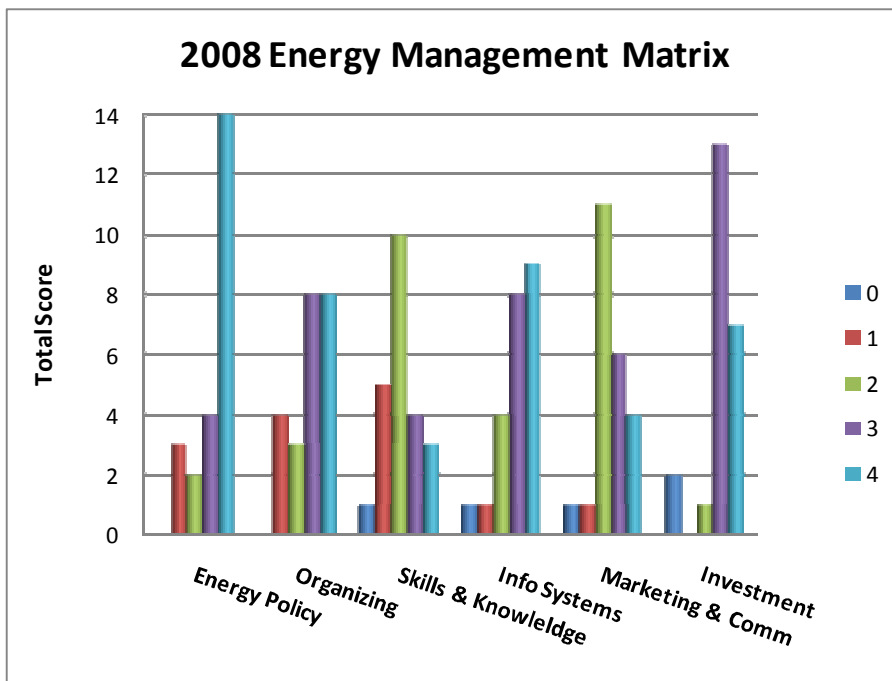


Figure 3.3: Average total score for the different levels of the energy management criteria for the 2008 assessment

Figure 3.4 depicts the total energy management performance for all the responding companies numbered 1 to 23 symbolically. It must be mentioned that apart from ArcelorMittal that did not respond to the qualitative questionnaire, all the other 23 companies that responded to the quantitative questionnaire also responded to the qualitative questionnaire fully including the energy management matrix. The figure shows that most of the companies performed higher than half of the required total score of 24. Only 3 companies (13%) scored below half the total score. This indicates that energy management is generally taken seriously amongst the Accord membership.

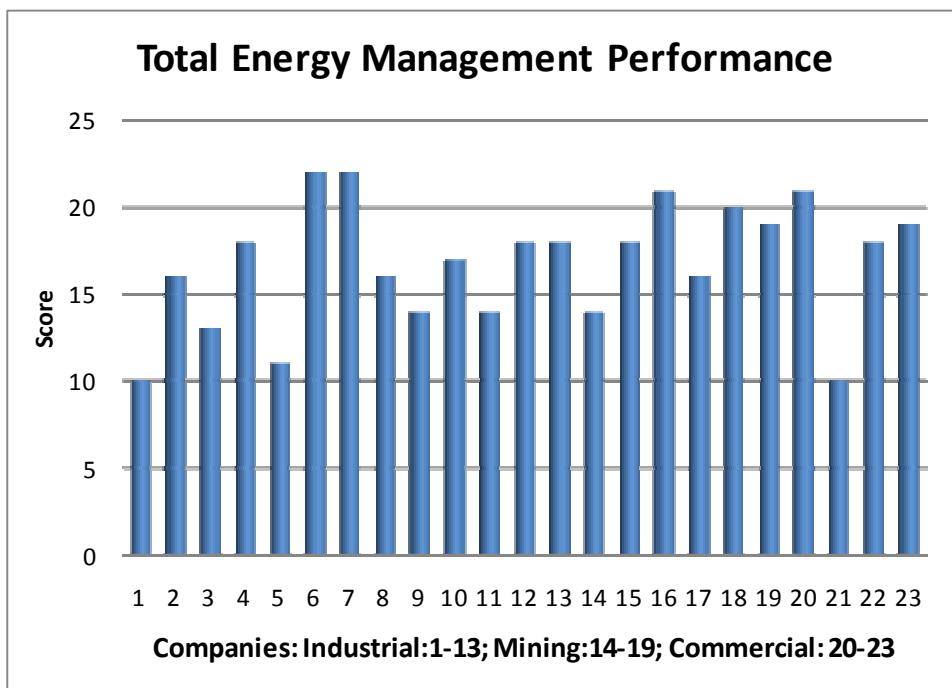


Figure 3.4: Total energy management performance scores for individual companies

3.2 Detailed Assessment of Energy Management Performance Criteria

Energy Policy

At an average score of 3.3 out of a total of 4, companies scored themselves high in terms of having an Energy Policy in place. In fact, Energy policy had the highest average score amongst all the criteria. Bearing this in mind, it is not surprising that the average performance is significantly

increasing because having an energy policy in place would imply that designated staff has been appointed to be responsible for implementing such policy. The rest of the company profiles should therefore be high as well. This should also be reflected in all other aspects which could be seen as performance indicators, such as energy savings.

Figure 3.5 shows that 18 out of the 23 respondents scored themselves 3 or more which indicates that more than 78% of the responding companies have energy policy in place. 14 out of these 18 respondents scored 4 which indicate that more than 60% have energy policy in place which is fully supported by action plans and regular reviews with the commitment of top management as part of business and environmental strategy.

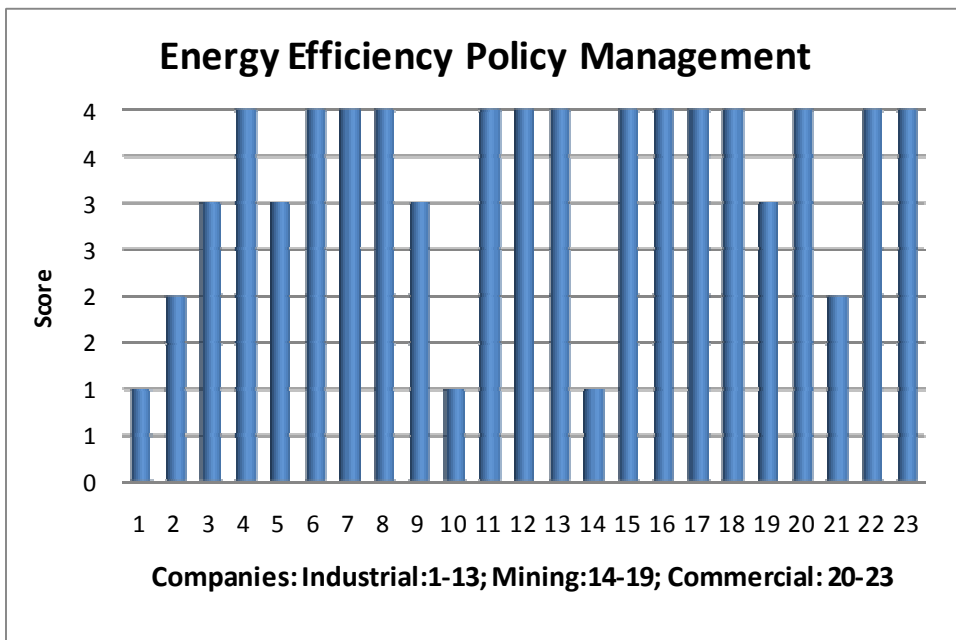


Figure 3.5: Energy policy performance by individual companies

4 of the companies scored themselves 3 on energy policy. This means that they have a formal energy policy in place but without active commitment from top management. 5 out of the 23 respondents scored 2 or less, indicating that senior managers accept the importance of energy management, but there is no formal policy in place and there is little active support for energy management functions. Without a formal energy policy or commitment from top management, such companies are likely to encounter challenges in their energy management which could reflect in a form of poor quality of energy efficiency information like that witnessed in the responses to the quantitative questionnaire in this assessment study.

Energy Efficiency Investment Decisions

Investment Decisions regarding energy efficiency scored an average score of 3 which is an indication of widespread commitment to energy management in the sense that the same payback criteria are employed as for all other investments. As shown in Figure 3.6, out of the 23 responding companies, 20 scored 3 or more, which indicates a positive discrimination by over 86% of the respondents in favour of green schemes with detailed appraisal of all new build projects and refurbishment opportunities and/or that the same payback criteria is employed for investments in energy efficiency projects, as for all other investments. The two companies which showed an apparent 0 score actually did not indicate any score at all, but in the Quantitative Questionnaire indicated significant investments made. Thus the correct scores of these two companies would even make companies commitments to energy efficiency commitments look even more positive.

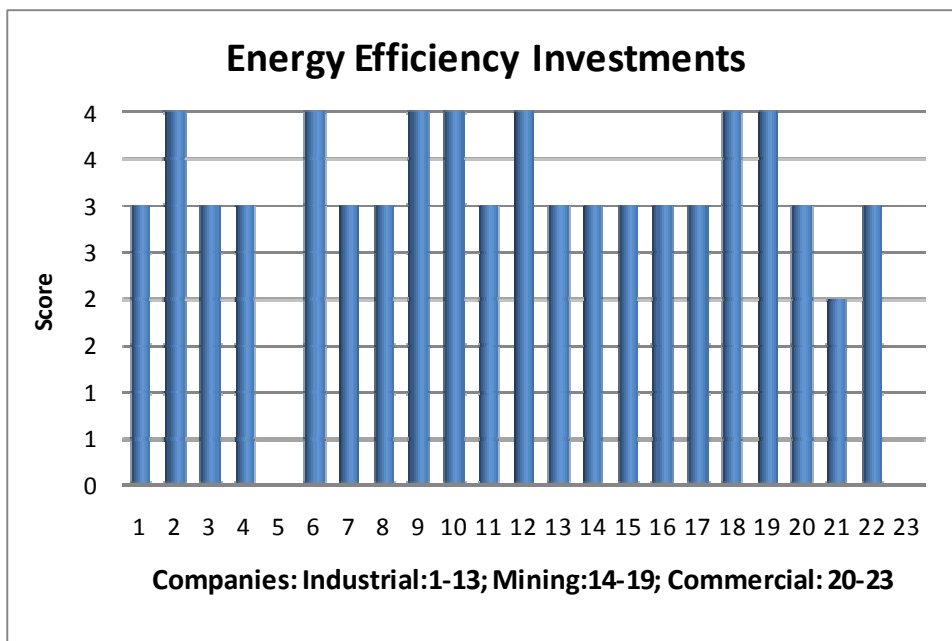


Figure 3.6: Energy efficiency investments performance by individual companies

Information Systems

The average score for the Information Systems criterion is 3, which means that monitoring and targeting reports for individual areas based on sub-metering is occurring generally amongst the responding signatories, but that energy savings are not effectively reported to the specific operating units within the companies using the energy resources. In this instance, as shown in Figure 3.7, 9 responding companies scored 4 which imply that about 39% of the respondents have

comprehensive systems information systems in place to set targets, monitor consumption, identify faults, quantify energy savings and provide budget tracking.

Of the responding companies 8 out of 23 scored 3, which indicates that about 35% of the respondents have monitoring and targeting reports for individual areas of work based on sub-metering in place, but energy savings are not effectively reported. About 5 of the respondents scored 2 or less which is an indication that the energy units within the companies have adhoc involvement in budget setting. This is what contributed to a situation where energy savings could not be reported by some respondents.

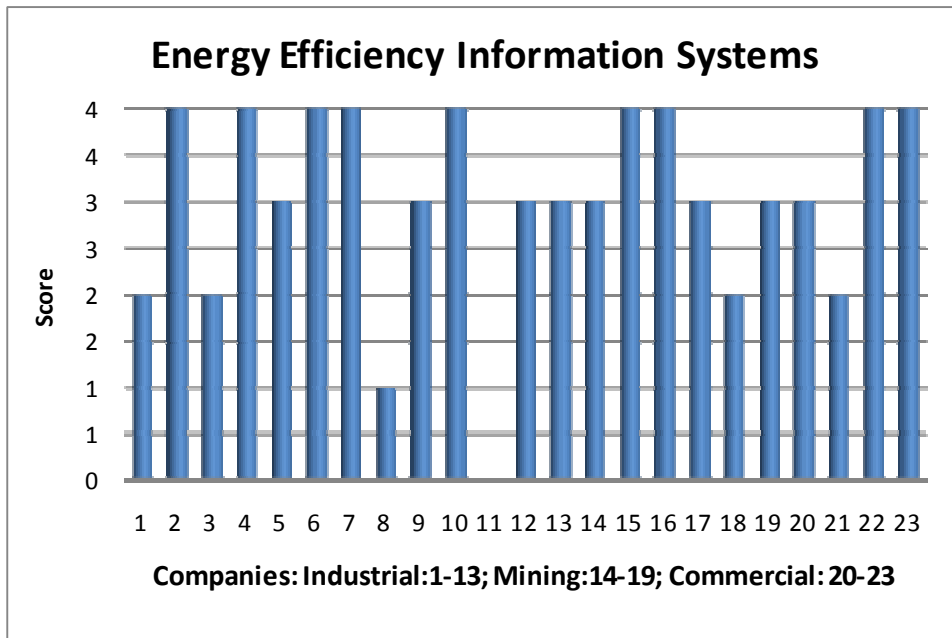


Figure 3.7: Energy efficiency information systems performance by individual companies

One of the major challenges identified with regard to the quantitative questionnaire of this assessment study was that companies failed in this regard in many of the companies could provide good quality information to the questions asked. Verbal feedback from some of the respondents indicated a lack of understanding on how to establish a baseline and a number of questionnaires confirmed this problem. In view of the overall quality of the quantitative questionnaires it would appear that some companies scored themselves too high.

Energy Efficiency Organisation

As seen in Figure 3.8, 16 out of 23 respondents (about 70%) scored themselves 3 or more in terms of having an organizational structure in place to promote and manage energy management initiatives. In terms of the Matrix this implies that an energy manager accountable to an energy committee, representing all users, has been appointed. At the same time 7 out of 23 (about 30%)

scored 2 or less indicating that energy management was the part-time responsibility of someone with only limited authority or influence. It should be noted that the mining sector scores the highest in this category with the mining companies scoring 3 or more.

It can be concluded that the average score of 2.9 in this organisation category implies that there should be a responsible person in place at 16 of the responding companies. This more than anything else, raises questions with regards to why the overall company performance on a number of aspects is not higher. It should be noted that this does not apply to all the responding companies in that some can clearly be seen as having implemented energy management initiatives.

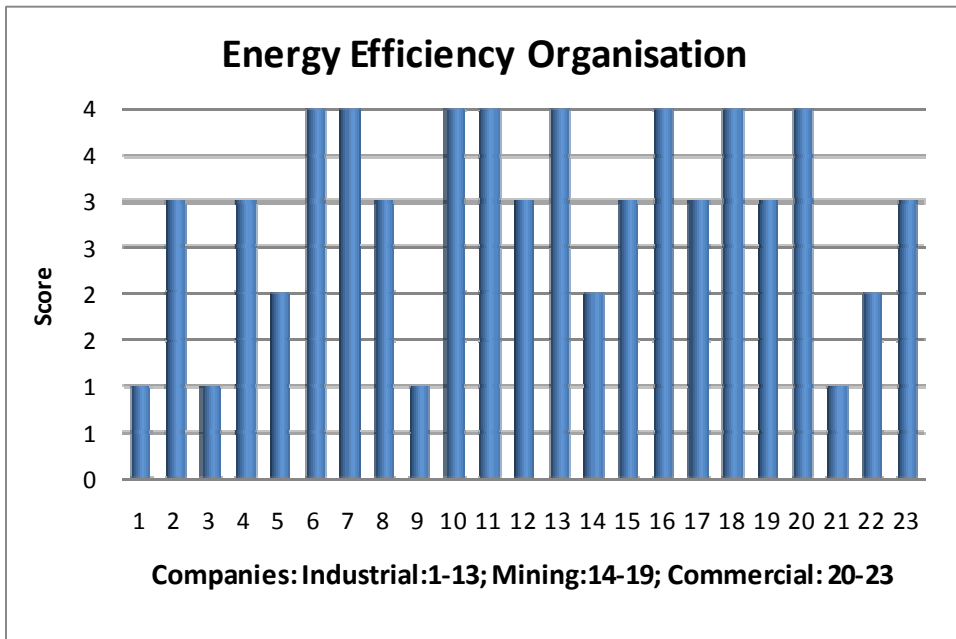


Figure 3.8: Energy efficiency organisation performance by individual companies

Marketing and Communication

An average score of 2.5 for marketing and communication systems was one of the lowest scores amongst all the criteria. This indicates that most of the staff awareness training is being carried out in an ad-hoc manner. As shown in Figure 3.9, only 4 of the 23 responding companies (17%) scored themselves 4 indicating that the value of energy efficiency and the performance of energy management is marketed and communicated within their company and outside the company.

6 companies out of the 23 responding companies scored themselves 3, indicating that these companies have programmes in place for staff awareness and regular publicity campaigns.

However, 11 scored 2, one company scored 1 and one company does not have a score at all, an indication that only informal contacts or adhoc measures are used to promote energy efficiency in more than half of the responding companies and in one instance there is no marketing and communicating system in place.

Marketing and communicating to staff and other stakeholders is a critical component with regard to obtaining full cooperation from all concerned and if this is not done effectively the overall performance potential would be severely limited.

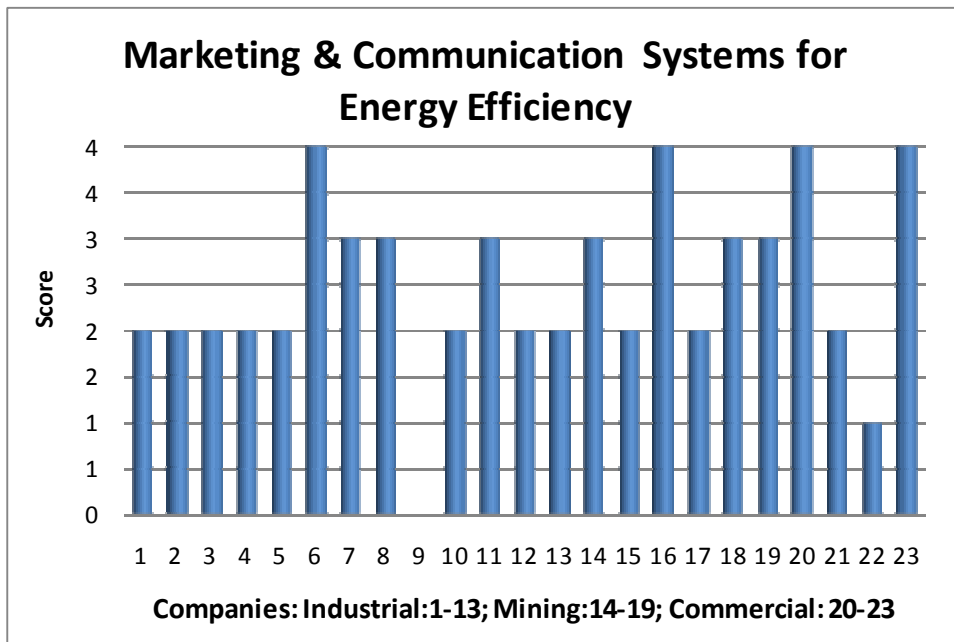


Figure 3.9: Energy efficiency marketing and communication performance by individual companies

Skills and Knowledge

An average score of 2.1 for Skills and Knowledge was the lowest score amongst all the energy management criteria, which means that in general awareness training is limited to only key energy users and this usually occasional system-specific training, while in some cases information is passed on informally to energy users. In other words no formal training is undertaken.

Only 3 of 23 companies, shown in Figure 3.10, scored themselves a 4 which means that only 13% of the respondents have energy specific training targeted at all energy users as well as integrated

into other development activities. About 70% of the companies scored 2 or less indicating that energy users rely largely on their existing knowledge. On closer analysis this shows that all sectors need to pay more attention to Skills and Knowledge Development.

It would appear that this is one area where the Accord signatories have not made significant progress and much effort would have to be spent on this in the next phase of the Accord since without the necessary skills and knowledge the other criteria of energy management cannot be carried out effectively. This is also evident in the quantitative questionnaire in that only few companies reported any significant investment in energy management training of their staff. The companies that reported significant investment in staff training included PPC, Sappi and De Beers. A company’s knowledge and skills in regards to energy management would be clearly evident in their energy management performance.

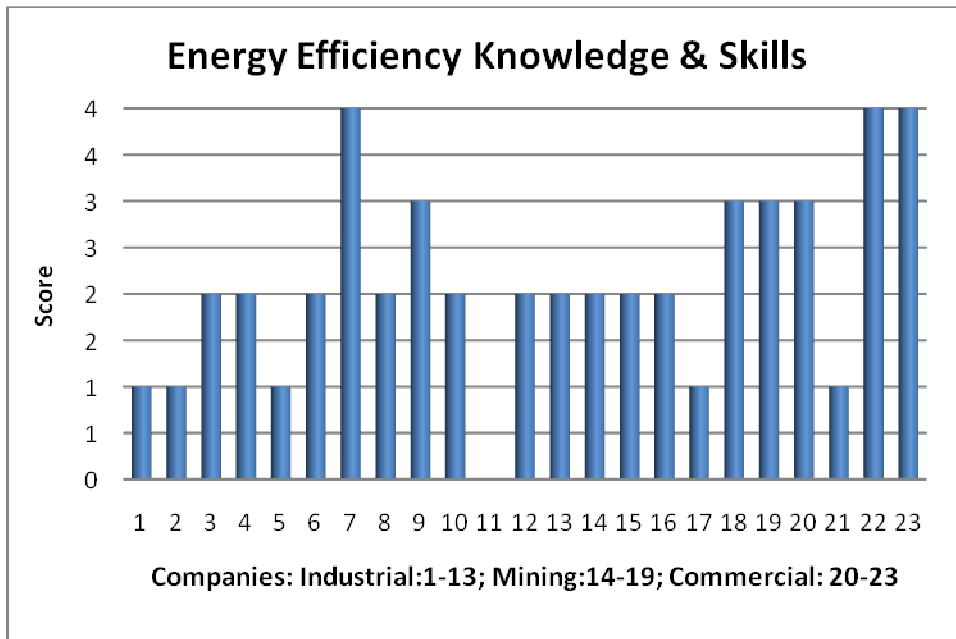


Figure 3.10: Energy efficiency skills and knowledge performance by individual companies

4. QUANTITATIVE ASSESSMENT OF ACCORD

This chapter assesses the progress made by the Accord signatories in meeting their quantitative commitments made in the Energy Efficiency Accord. The main quantitative commitment the signatories made with the Department of Minerals and Energy (DME) is a **final energy demand reduction target** which is based on the National Energy Efficiency Strategy (NEES). The Strategy breaks down the target as follows [4]:

Sectoral energy efficiency targets for ten years (2005 -2015) in a phased approach, each phase consisting of three years duration beginning from 2005. The overall national target of the Strategy is a final energy demand reduction of 12% by 2015 with specific targets of 15% for industry and mining, 15% for commercial and public buildings, 10% for residential and 9% for the transport sector. There is also a 15% target for the power generation sector.

From the above statements of the Strategy, it can be summarised that the energy efficiency target of the Accord is a 15% reduction of final energy demand by 2015 for all the Accord signatories since all the signatories are from the industrial, mining and the commercial sectors. The current electricity supply challenge necessitates a review of these sectoral targets; however, the current assessment of the Accord should be based on the 2015 15% target as agreed by both business and government.

Although the Strategy does not prescribe the baseline year from which this final energy demand reduction should be measured, both parties in the Accord made a commitment to [5]:

.....agree on 2000 as the baseline year against which performance will be measured....

Thus this chapter will assess the attainment of the Accord commitments on the following key quantitative and related aspects as specified in the Accord document [5]:

1. That the signatories' energy efficiency performance could be measured against 2000 as the baseline year;
2. That the signatories are on track of achieving the 15% final energy demand reduction by 2015;
3. That a partnership between government and business has made progress in establishing methodologies for estimating quantified energy use and intensity for different sectors as well as Business As Usual (BAU) energy use projections taking industry growth into account. This involves the development of generic energy auditing protocol.
4. That progress has been made in developing a common reporting system and requirements for energy use for all energy sources in collaboration with government;
5. That, with the support of government, progress has been made in energy efficiency projects through the funding support of Energy Efficiency and Demand-Side Measurement (EEDSM) and the Clean Development Mechanism (CDM).

4.1 *Baseline and committed target*

Figure 4.1 summarises the number of the Energy Efficiency Accord signatories that have chosen specific years as the baseline for measuring their progress made on the Accord commitments. Although the parties to the Accord agreed that 2000 will be the baseline year, the figure shows that only 6 of the 24 respondents (25%) managed to find sufficient energy use and related data on 2000 as a baseline year. A lot of the respondents rather chose more recent years in which they have reasonable data as their baseline. Besides 2000, 2006 was the year the highest number of the Accord signatories could find reasonable data for as a baseline year. Figure 4.1 and Table 2.1 also show that 6 out of the 24 respondents could not state their baseline year.

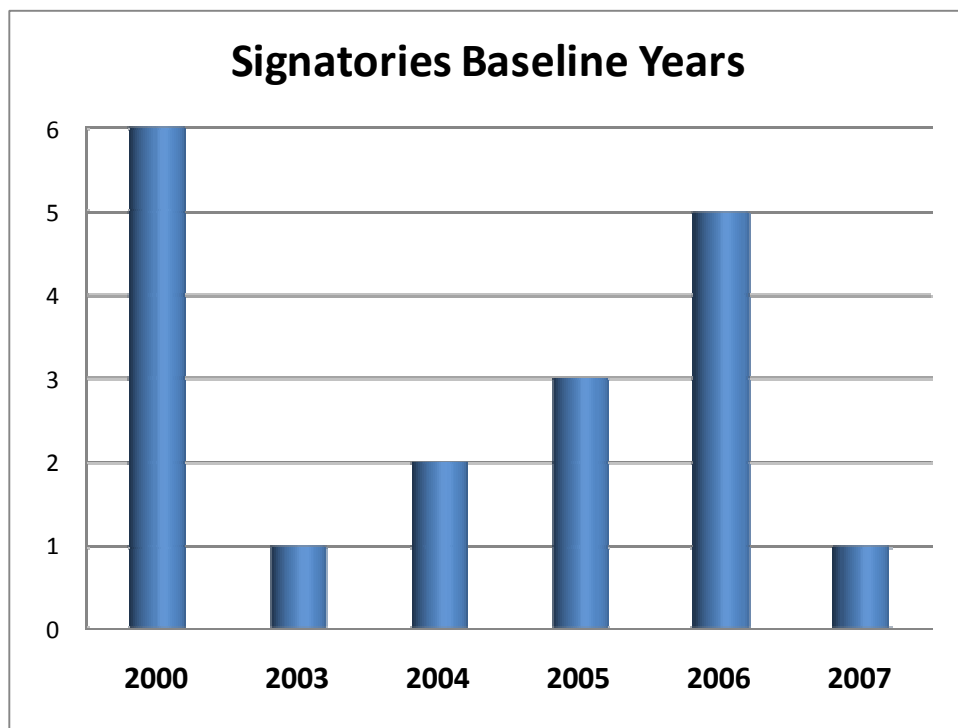


Figure 4.1: Number of the Energy Efficiency Accord company signatories that have chosen specific years as their baseline for measuring progress

It can be concluded from these observations that the year 2000 was not suitable for a large number of the Accord signatories as a baseline year against which their progress on the Accord commitments should be measured against. This means that a significant number of the signatories made the Accord commitments without assessing their preparedness to report on their progress. It can also be inferred that baseline data determination seems to have been a major challenge to a reasonable number of the companies. This is because it has taken a lot of companies some time to establish their baselines and even now some are still unable to determine their baseline data. It is also probably because adequate measuring and monitoring systems had not been put in place until recently. This goes to show that the

claim of a higher score of 3 or 4 in the Energy Management Performance criteria on Information Systems amongst a significant number of the Accord signatories can perhaps be attested to a fairly recent occurrence. Otherwise such claims should be interrogated and verified.

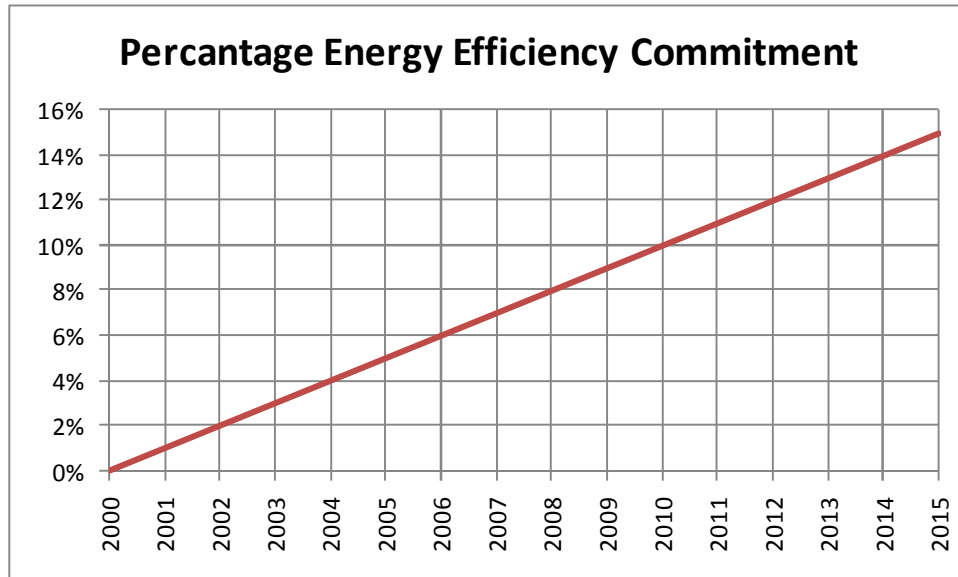


Figure 4.2: Linear interpolation of the 2015 15% energy efficiency commitment of the Accord

Even though the Accord had a 2015 15% energy efficiency target to be determined against 2000 baseline, no intermediary targets between the years 2000 and 2015 were agreed upon. Thus for this assessment a simple linear improvement in energy efficiency between the two end points of the commitment period is assumed as shown in Figure 4.2. This assumption requires an annual 1% energy efficiency improvement from the year 2000 to the year 2015.

Thus the assessment of the Accord for essentially the 2007 financial year should be made against a required final energy demand¹ reduction of at least 7%.

One misconception observed from the company responses to the quantitative questionnaire was that some companies calculated their energy savings as the difference between their current consumption and that which they used to consume in the baseline year (2000 or any other later year they have chosen). This worked in the favour of a few companies whose energy consumption has decreased for specific reasons but for most of the companies this would not indicate any energy savings but rather increase in energy consumption mainly because of company production growth. The required 7%

¹ The final energy demand commitment in the Accord document refers to energy consumption in its final form of conversion and should not be confused with electrical maximum demand. Thus the "final energy demand" used in this chapter does not refer to maximum electric demand but energy consumption.

reduction in final energy demand should rather have been calculated as the difference between what would have been the projected final energy demand without any energy efficiency interventions and the current energy consumption attained through application of energy efficiency measures. Thus there could be some inherent errors in the reported energy savings of companies depending on the approach used in determining the savings. In future this determination would have to be in accordance to a common agreed reporting formula. To avoid a situation where companies make claims of incorrect energy savings, only energy consumption figures should be requested for so that the savings could be computer-generated based on the information provided.

From the above discussion the following conclusions and recommendations can drawn on the baseline and committed target:

- 1. The baseline year varied amongst the signatories depending on the availability of energy consumption and related data. Given the experience the Accord signatories have had, there is a need for flexibility in setting a common baseline year dependent on availability of data by majority of the signatories.*
- 2. The Accord committed target was long-term focused and therefore did not spell out for signatories what their immediate requirements were. The committed energy efficiency target of the Accord should be made clearer with intermediary targets either in terms of annual percentage energy efficiency improvement or phased final energy demand reduction based on projected energy demand growth of companies.*
- 3. Companies differed in their perception of energy savings which could lead to wrong reporting of their achievements. A clear definition of energy efficiency improvement should be agreed to at the onset to avoid misconception in its measurement and reporting.*

4.2 Final Energy Demand

Before analyzing the final energy demand reduction achieved by the signatories, it is important to assess what final energy sources are utilized by the Accord signatories. Again, as noted in Section 4.1, final energy demand used here denotes energy consumption in its final form of conversion and not electrical maximum demand. The knowledge of the quantum of these energy sources consumed collectively by the Accord signatories could provide an indication of how significant the Accord could be as a tool for mobilizing energy efficiency through a single voluntary action group.

Table 4.1 provides a snapshot of the collective consumption of key final energy sources by the Energy Efficiency Accord signatories in the year 2007. Although this is not the complete picture of the level of energy consumption by these Accord signatories since not all key energy users provided their consumption figures, it shows how significant the group is in terms of the use of energy resources of the country. Despite the data gaps in this assessment study, the table demonstrates that energy consumption by these Accord signatories is wider than electricity and it includes coal, diesel, petrol and natural gas. Other energy sources reported to be consumed by smaller number of Accord signatories

were illuminating paraffin, jet fuel, heavy fuel oil (HFO), liquefied petroleum gas (LPG), crop husks, wood bark and black liquor.

Source of Energy	Electricity	Diesel	Petrol	Natural Gas	Coal
<i>Unit of Measure</i>	<i>GWh</i>	<i>kilolitres</i>	<i>kilolitres</i>	<i>m³</i>	<i>Tonnes</i>
No of Signatories that Reported	19	10	6	4	10
Industrial	35,530	202,214	1,463	265,626,789	127,934,371
Mining	20,472	170,905	2,462	71,037	250
Commercial	561	10,685	-	-	-
Total	56,563	383,803	3,925	265,697,827	127,934,621
National Consumption	240,000				
% of National	24%				

Table 4.1: Summary of 2007 collective consumption of different sources of energy by indicated Energy Efficiency Accord Signatories that reported

The table shows that over 56 560 GWh of electricity is consumed by 19 Accord signatories that reported their consumption. It must be mentioned that this figure includes only the Anglo Platinum company in the Anglo American Group, the rest of the companies in the group who are relatively key energy users like the Base Metals and Anglo Coal are not part of this consumption figure. Furthermore, it must be mentioned that although the key coal supplier Energy Coal and Samancor Manganese companies of BHP Billiton reported their energy consumption as part of this collective consumption, the other energy-intensive BHP Billiton business units like the Aluminium smelters did not provide their electricity consumption figures as part of the collective. The collective consumption also excludes that of BP.

Compared with the national electricity consumption of about 240 000 GWh, this implies that about 19 Accord signatories consume about 24% of the national consumption which has a huge significance for the energy efficiency potential in the Accord. Had all the Accord signatories reported their electricity consumption this would have shown even more significance in terms of the energy efficiency potential of the Accord

In terms of transport energy usage, most companies reported that they have outsourced their transportation services to an external provider and therefore they do not manage their transport energy themselves. However, 10 of the signatories reported a significant amount of over 383 000 kilolitres of diesel and over 3 900 kilolitres of petrol.

4 companies reported a significant natural gas consumption of over 265 million cubic metres which helps improve their energy efficiency and reduce their carbon emissions. The natural gas usage was dominated by the steel company ArcelorMittal which consumes over 86% of the reported collective consumption. Sappi uses about 13% of the reported natural gas and the rest is used by Unilever and

Sappi. It is important to mention here that the natural gas consumption of the collective would have been much higher if Sasol which is a major supplier and user had reported on its consumption.

10 companies reported about 128 million tonnes of coal consumption but this was dominated by the power utility Eskom which consumed about 93% of the collective consumption. Apart from Eskom, other key users of coal are mainly the industrial sector and to a lesser extent some mining companies like Anglo Platinum, Xstrata and AngloGold Ashanti. The steel producer ArcelorMittal consumed about 5.96 million tonnes in 2007 while the paper and pulp manufacturer Sappi consumed about 1.24 million tonnes. Other reported key coal usage includes cement manufacturing and beer making. It is noteworthy that the collective coal consumption reported here excludes that of Sasol, a major coal consumer that did not provide information on its consumption. It is known that the Sasol's coal consumption has significantly reduced since its fuel switch to natural gas a few years ago.

4.3 Final Energy Demand Reduction

Electricity Demand Reduction

The Accord commitment is in terms of final energy demand reduction, which is expected to be at least 7% for the 2007 financial year for each signatory. Table 4.2 estimates the collective final electric energy demand reduction of 15 Accord signatories who provided information on their electric energy demand reduction. The table shows that over 2405 GWh of electricity was collectively saved by these 15 Accord signatories in the 2007 financial year. This is over 8 660 TJ and is equivalent to more than 3.5 days of average national electricity demand which gives an indication of how significant this would have been if all the signatories had managed to report on their electric energy savings. Only few of these 15 signatories could report on their cumulative savings since they signed the Accord, majority could report only their 2007 savings. Comparing the final energy reductions in the 3 sectors most of these reductions came from the mining sector.

Sector	2007
Industry	789,857
Mining	1,594,374
Commercial	21,410
Total Savings (15 Signatories)	2,405,641

Table 4.2: Total annual (2007) electricity savings by 15 Energy Efficiency Accord Signatories (MWh)

Table 4.3 estimates this collective electric energy consumption reduction by 15 Accord signatories in terms of equivalent number of average household electricity consumption in South Africa. Assuming a total of 12.5 million households in South Africa [6] and the residential electric energy demand of 17% of the total national electricity demand, the collective electric energy demand reduction of these 15 companies is equivalent to an average annual consumption of over 730 000 households in South Africa.

These savings could even be more impressive if all the signatories were able to report on their electricity savings.

Furthermore, some of the Accord signatories have saved electricity through alternative means. A unique example is Unilever through the use of its waste from its oil mill at Boskburg for steam generation. Another example is Sappi that generates about 44% of its electricity through the use of its black liquor and wood wastes. That translates into over 1 162GWh of electricity that is saved through the use of its by-products.

Total SA Electricity Consumption (GWh)	240,000
% Residential Consumption	17%
Total Residential Electricity Consumption (GWh)	40,800
Total Number of Households in SA	12,457,581
Average Household Consumption (kWh)	3,275
Electricity Savings by 15 Signatories (GWh)	2,406
Equivalent Number of Households Consuming Average Electricity Consumption Each	734,521

Table 4.3: Total annual electricity saved in 2007 by 15 Energy Efficiency Accord Signatories and equivalent number of households that consume similar amount of electricity.

The breakdown of the electricity demand reduction by the individual companies is provided in Table 4.4. This list does not indicate that other companies not listed here have not made any gains. It rather indicates that the complexity of measuring energy efficiency gains has not made it possible for all companies to report on the energy reduction achieved. This is particularly the case for companies with many diverse product derivatives and changing operating conditions. A greater commitment is required by the top management of such companies to develop and install the appropriate complex measuring and reporting systems for monitoring the energy efficiency gains.

It can be seen from this table that one mining company, AngloGold Ashanti, reduced its electricity demand in 2007 by as much as over 695 GWh which is very significant when compared with other companies' demand reductions. However, it must be stated that their questionnaire response shows that this electricity demand reduction was calculated by the company by merely subtracting the 2007 consumption from the 2005 consumption. This approach of calculating the electricity demand reduction ignores the impact of the Business-As-Usual (BAU) projections of the electricity demand and could thus underestimate the gains made. This is due to the following factors:

Company	Electricity Saved (MWh)
A	5,344
B	64,774
C	68,700
D	11,608
F	28,000
H	6,581
L	20,150
N	140,000
O	290,000
Q	17,500
R	881,174
S	695,700
V	19,800
W	1,610
Y	154,700
Total	2,405,641

Table 4.4: Details of annual electricity (MWh) saved in 2007 by different companies.

1. The general BAU operating conditions of an old gold mining company like AngloGold Ashanti in 2007 might be worse than in 2005 due to the increasing mining depth and the consequent exponentially escalating rock temperatures. Such conditions would require more energy than the original baseline and therefore the baseline would have to be continuously adjusted depending on the changes in the operating conditions.
2. The grade of the ore mined (or the richness of the ore) usually decreases with increase in mine depth for older mines. The questionnaire responses from AngloGold Ashanti, Gold Fields and Anglo Platinum clearly show this phenomenon. Thus more energy would be required to produce a unit product as the mine age grows.
3. The haulage distances keep on increasing with increased mine depth, thus requiring more energy.

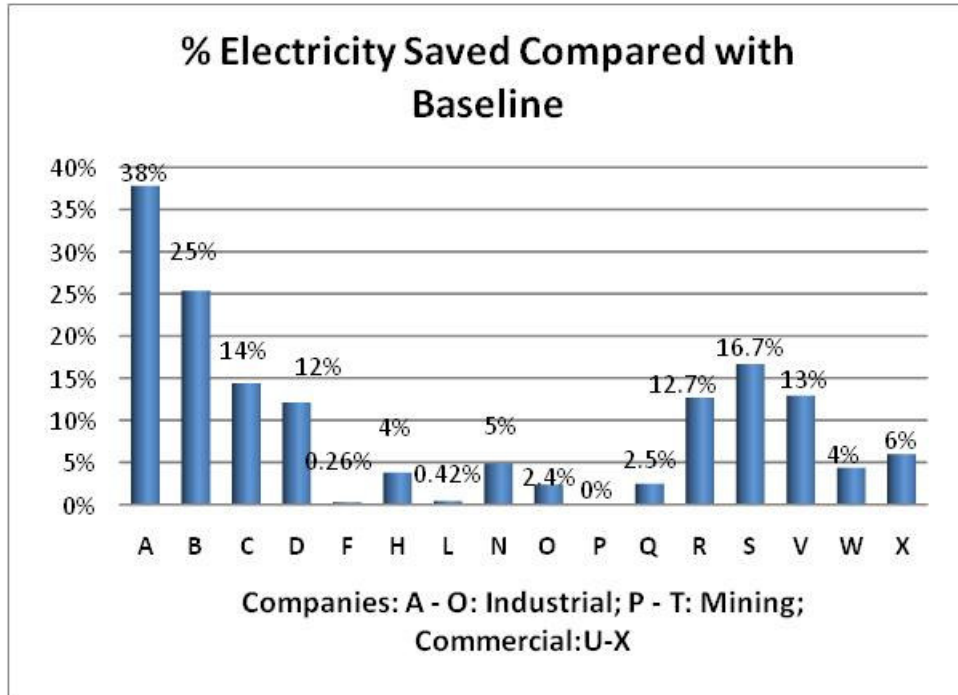


Figure 4.3: Percentage electricity demand reduction by the Accord signatories compared with the baseline

The percentage electricity demand reductions by the Accord signatories are depicted in Figure 4.3. The electricity demand reduction achieved by the signatories who were able to report their energy savings ranges up to 38%. The figure shows that, through this approach of measuring energy efficiency based on the absolute quantity of electricity reduced and not on its energy intensity improvement, only 7 of the companies that reported their savings achieved the required 7% electricity demand reduction by 2007. There is a likelihood that these savings might have been underestimated as explained above since most companies did not seem to have developed a reporting system that takes into account the changing operating conditions like the growth of a company.

AngloGold Ashanti was one of those companies that exceeded the required 7% reduction in electricity demand. AngloGold Ashanti reduced its electricity consumption by 16.7% in 2007 compared with the 2005 consumption whilst Xstrata and Richards Bay Coal Terminal reduced their consumption by 12.7% and 12% respectively. Other companies in the Figure 4.3 that exceeded the required 7% were ABB, Woolworths and two of the main cement manufacturing companies AfriSam and Pretoria Portland Cement.

Consumption Reduction of Other Energy Sources

For diesel, only 1% of the total fuel used by all the respondents that reported on their diesel use was reported as saved. This confirms that not much is being done on the energy efficiency in the transport and machinery fuels sector. These savings were reported by 6 companies with PPC reporting the

dominant fraction. For natural gas, only ArcelorMittal reported some saving and this was about 8% of its baseline year (2006). The saving in natural gas was equivalent to over 200GWh (720 805GJ). Only AfriSam reported its saving on coal and this was a very high percentage of its baseline year but the actual percentage is not disclosed here for the sake of commercial sensitivity. Only Unilever indicated a small scale use of solar water heating to save electricity but the amount of electricity saved had been monitored.

4.4 Energy Intensity Improvement

Energy intensity of the production of a product or delivering as service is defined as the amount of energy consumed in the production or service delivery usually measured in GJ expressed as a ratio to total production for any given year. Internationally, this is a more acceptable measure of energy efficiency since it indicates the extent to which energy is used in producing a specific output. The approach of using final energy demand reduction as an indicator for energy efficiency (as used in the Energy Efficiency Accord target) can be flawed because the fact that final energy demand has dropped is not a guarantee that energy has been used in an optimal way in producing a product or delivering as service. A final energy demand reduction can result simply from a reduced production but this may not be energy efficient. It must be noted that increases in energy efficiency takes place:

when either energy inputs are reduced for a given level of service or there are increased or enhanced services for a given amount of energy inputs.

Such a situation can easily happen in the current proposed Eskom's Power Conservation Programme (PCP) which is being brought in to help manage the current electricity supply shortage. This programme is aimed at heavily penalising electricity customers that do not reduce their consumption by an allocated percentage with extremely high tariffs. Since many company processes and service delivery outputs are usually largely dependent on a required volume, the only way some companies may be able to achieve the required PCP consumption reduction without incurring those penalties would be by shutting down certain sections of their operations. The shutting down of such sections of their operations could result in more energy being used per unit output produced which is contrary to energy efficiency. Such an approach would negatively impact on companies' growth and consequently the economic growth of the country. Instead of an absolute reduction of energy consumption, energy intensity improvement should rather be used to give customers the flexibility of exploring energy efficiency potentials in the different processes of their production or service delivery.

Ideally energy intensity is calculated by summing up all the energy contribution to the whole production process in various forms and dividing this total by the total quantity of output. Such energy intensity values would have been useful for benchmarking with international best practices. However, since many

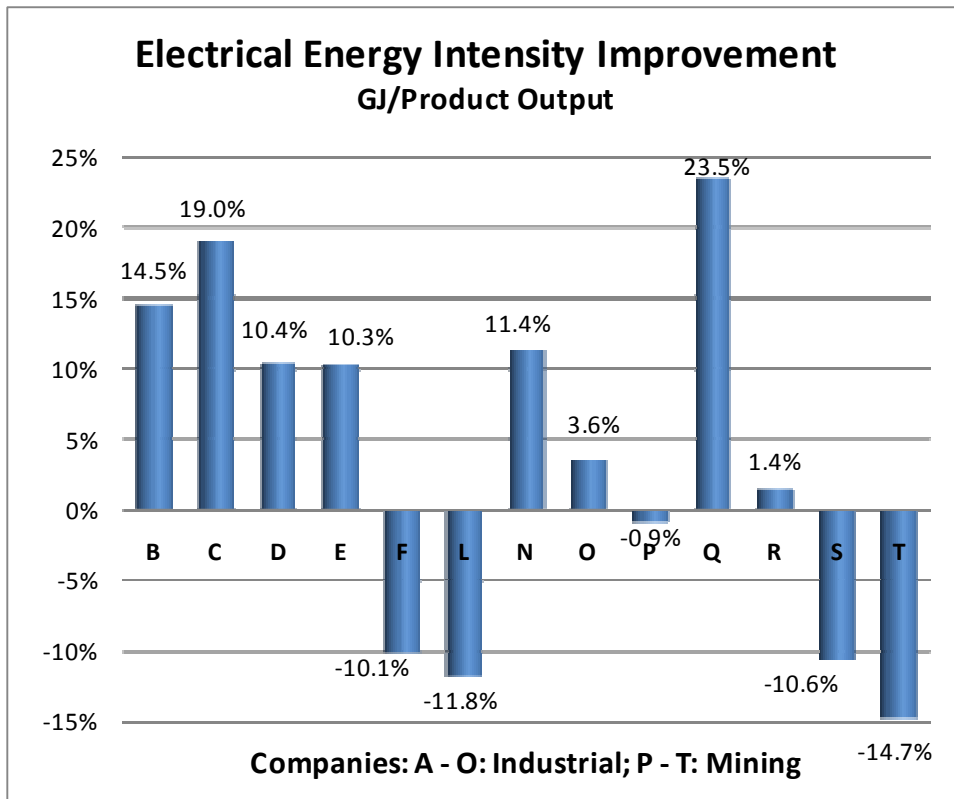


Figure 4.4: Electrical energy intensity improvement of the Energy Efficiency Accord signatories measured in GJ/product output

companies did not provide information on all their different energy sources, a calculated overall energy intensity encompassing all energy sources may have a large margin of error. Thus it was found prudent to rather calculate energy intensities with respect to individual energy sources. When later the data gaps are improved the overall energy intensities could be calculated for international benchmarking. Even in benchmarking comparison it is important that the different operating conditions are carefully taken into consideration.

The electrical energy intensity improvements depicted in Figure 4.4 were not provided by the signatories but calculated by this assessment study with respect to the primary energy product of companies. For example, even though there is energy requirement for each of the products of a cement manufacturer like cement, aggregate and ready mix, the cement output in tonnes is used in these calculations since cement production is the main energy consuming process in the whole production process. While the electrical energy is measured in GJ the production output in the figure is measured in tonnes of cement, hectoliters of beer, total floor space, etc. This was only possible where both electricity consumption and primary product figures have been provided for the baseline year and the year 2007. Figure 4.4 shows that 8 of the respondents in the graph had positive electrical energy intensity improvement (i.e. they had become less energy intensive) while 5 of the respondents had negative energy intensive (i.e. they had become more energy intensive).

It is interesting to note that De Beers (represented as Q) stands out amongst the rest with about 23.5% improvement in electrical energy intensity in Figure 4.4 even though its electricity demand reduction in Figure 4.3 was one of the least (2.5%). Another interesting example depicted by Figure 4.4 is AngloGold Ashanti (represented as S) that has become more energy-intensive by 10.6% even though it excelled in terms of its electricity demand reduction. This is the case for AngloGold because less gold was produced in 2007 compared with 2005. However, the questionnaire response shows that more ore was mined which required more energy and the processing of this larger ore for less gold would also require more energy. Thus, the baseline conditions had changed and had to be taken into consideration in calculating the energy intensity improvement, if these conditions were known to the study. In this case an adjusted baseline should rather be used in calculating the energy intensity improvement. This is a clear illustration of why the proposed Eskom PCP should not be applied indiscriminately without proper consideration of each specific situation.

Other companies with energy intensity improvement of more than 10% were Mondi, Sappi, the South African Brewery (SAB), AfriSam, PPC and Richards Bay Coal Terminal (RBCT).

Another interesting measure of electrical energy intensity in terms of the Rand value added. In calculating this energy intensity for a particular year the electrical energy (GJ) was divided by the Rand value created from the company products. All the Rand values for the years before 2007 were converted to 2007 values using the Consumer Price Indices (CPI).

In terms of the Rand value added, all the respondents had improvements in their electrical energy intensity except one company as shown in Figure 4.5. Most of the companies had very high energy intensity improvements due to generally improved commodity prices on the international market. Sasol and Anglo Platinum were amongst the companies with very high energy intensity improvement with respect to value added. Other companies that had 20% or more electrical energy intensity improvement were two of the main cement manufacturers (AfriSam and PPC), SAB, ABB, Unilever, Sappi and De Beers, It would have been interesting to observe how positive AngloGold's energy intensity would have been if they had provided information on their value created. It is interesting to observe how a mining company represented as "T" with more energy-intensiveness in terms of products output by over 14% in Figure 4.4 had turned to be 9% energy intensity improvement in terms of value created.

This measure of energy intensity in terms of value created also helps in benchmarking with international best practices. However, due to the fluctuating nature of commodity prices it usually presents a distorting view of energy intensity.

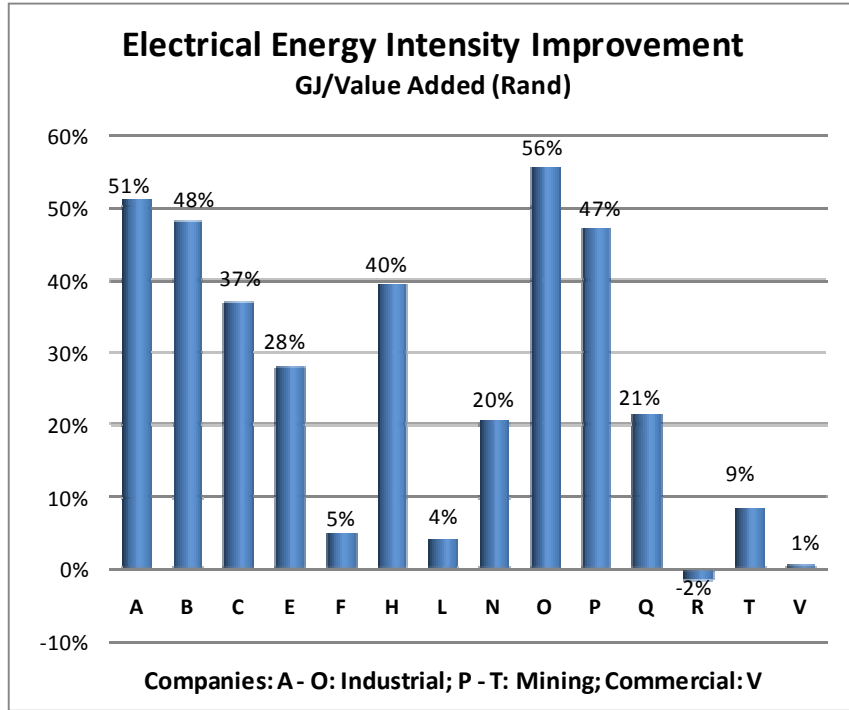


Figure 4.5: Electrical energy intensity improvement of the Energy Efficiency Accord signatories measured in GJ/Rand Value Added

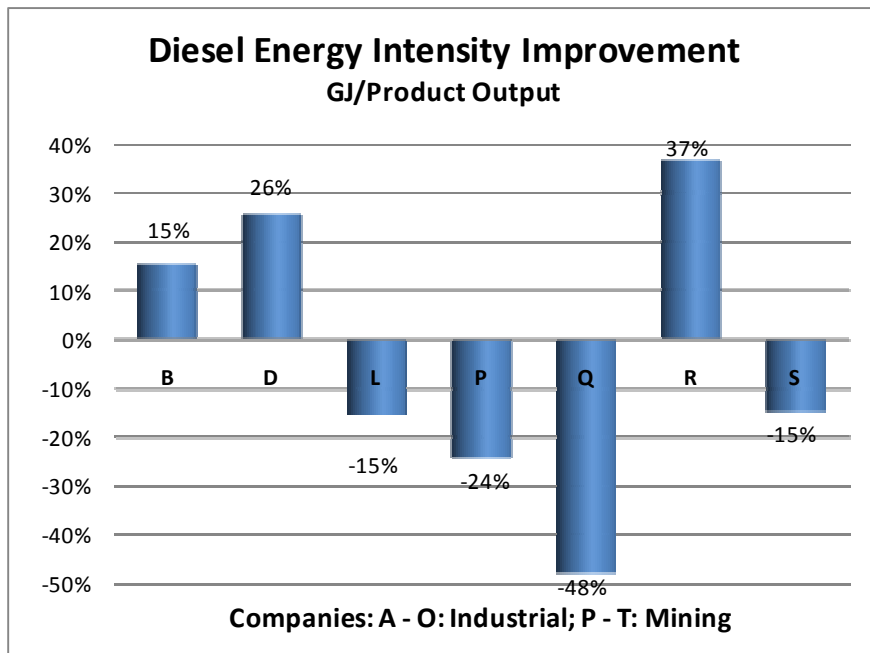


Figure 4.6: Diesel energy intensity improvement of the Energy Efficiency Accord signatories measured in GJ/Product Output

Figure 4.6 depicts the diesel energy intensity improvements for 7 companies that provided sufficient information for the calculation of the intensities. Only 3 out of the 7 respondents had improved their diesel energy intensity, the rest had become more energy-intensive with respect to diesel consumption. Companies who had improved on their diesel energy intensity were Richards Bay Coal Terminal, Xstrata and AfriSam. It is interesting to note how all the mining companies, with the exception of Xstrata, had become more diesel energy-intensive. The reason for this is likely due to increased haulage and therefore adjusted baselines could present a different picture. Since increasing diesel energy-intensiveness seems to be common amongst the mining companies, there is obviously a need for these mining companies to pay particular attention to the management of their diesel usage as well as the development of appropriate methodology for estimating their diesel energy intensity to enable them monitor their improvement properly.

It must be stated also that Figure 4.6 does not present the full picture of the diesel energy intensity improvement because significant number of the respondents indicated that their transport service was outsourced and therefore companies had very little control of their diesel consumption. It appears like the diesel consumption in most companies generally does not have energy efficiency focus like electricity has. The Energy Efficiency Accord would therefore have to focus some attention on the transport sector and tighten its commitment in this regard. This also goes to show that the focus of energy efficiency mainly on electricity by government, Eskom and business would have to change and be broadened to include other energy sources like transport fuels.

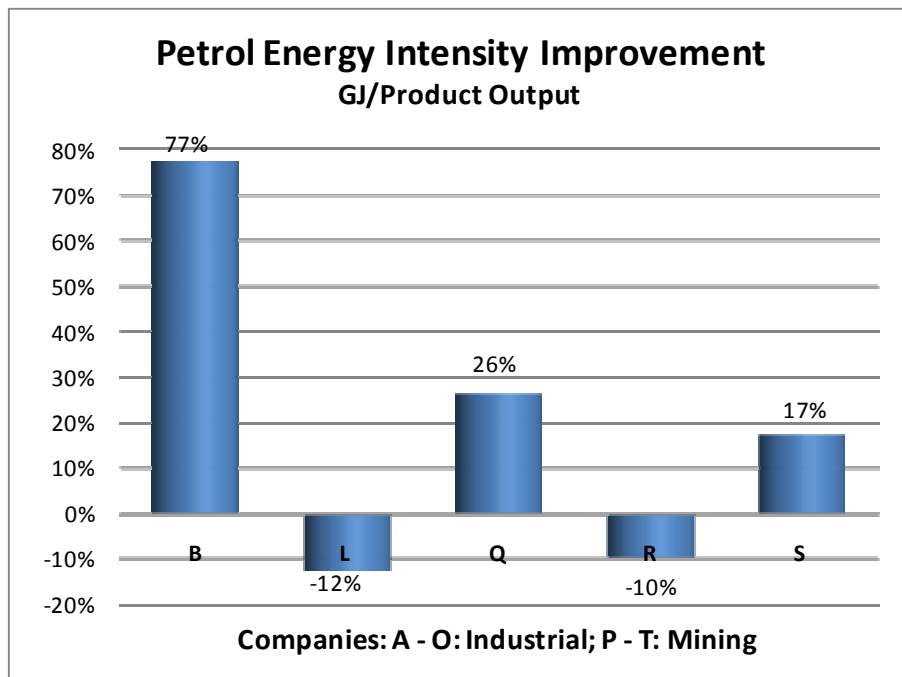


Figure 4.7: Petrol energy intensity improvement of the Energy Efficiency Accord signatories measured in GJ/Product Output

For petrol, 3 out of the 5 respondents had become less energy-intensive as shown in Figure 4.7. This included De Beers and AngloGold Ashanti. Petrol consumption by these companies is relatively small compared with diesel consumption as shown in Table 4.1 and therefore it is not worth dwelling much on this.

Figure 4.8 depicts energy intensity improvement with regards to coal consumption. Out of the 9 respondents that provided useful information for this calculation, 4 of them had become less coal energy-intensive significantly by 20% or more. Companies with significant improvement in their coal energy intensity were SAB, Xstrata and two of the main cement manufacturers (AfriSam and PPC). It is important to note that there is significant improvement in the energy intensities of the coal usage in the cement manufacturing industry because cement manufacturing is more dependent on coal than electricity for its energy requirements. In fact, contrary to the general perception, the data collected shows that coal contributes about 80% or more of the energy required for cement manufacturing compared with electricity.

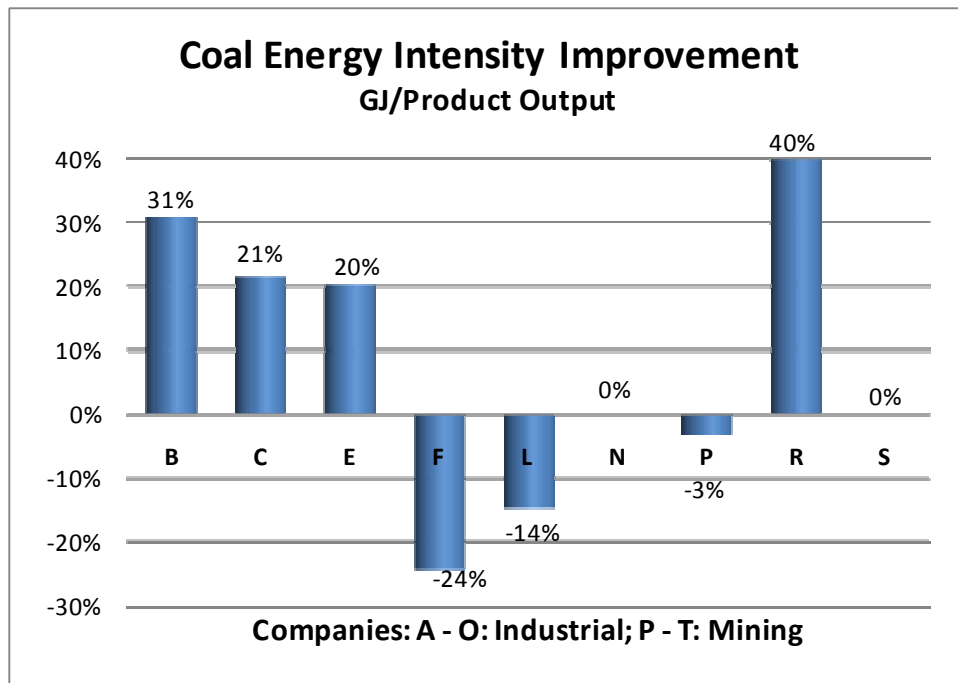


Figure 4.8: Coal energy intensity improvement of the Energy Efficiency Accord signatories measured in GJ/Product Output

The analysis shows that Eskom and ArcelorMittal had become more coal energy-intensive by 14% or more. This observation is very significant because the two companies were the most coal-intensive users amongst the respondents who provided information on their coal use. The drop in the coal conversion efficiency of Eskom’s electricity production is a major concern for the current electricity supply shortage. Some of the reasons for this coal conversion efficiency at the power utility include (1) the narrow reserve margin impacting on the maintenance schedule of power stations and consequently affecting

the efficiencies of the power stations (2) use of poorer coal quality due to market conditions and (3) reduced stock of good quality coal. Eskom and government have jointly undertaken major steps including both supply-side and demand-side interventions to address this situation through several engagements with key stakeholders. A key intervention at the demand-side is the proposed Power Conservation Programme (PCP) that seeks to introduce both incentives and punitive measures for customers to control their electricity usage in order to assist in widening the system reserve margin. Internally too, Eskom has embarked on a programme to save a billion kWh within the organisation through focusing on internal initiatives to reduce energy consumption through education, communication and awareness and technically feasible and economically viable efficiency improvements within the organisation. Refer to Chapter 9 for more on this.

The energy intensity relating to both coal and electricity for ArcelorMittal increased in 2007 due to the fact that the Blast furnace D at the Vanderbijlpark Works was out for rebuilt (reline) from February to May 2007 and the Electric Arc Furnaces (EAF) were used to supplement the steel supply shortage created by the reline. The high market demand for steel products during the reline period enforced the decision to go the EAF route resulting in an increase in electricity and coal demand per ton of liquid steel. Furthermore, there was a significant increase in market coking coal which is sold to the Ferro metal industry – this however could skew the picture as to look like an increase in coal use. However, a downward trend was seen in the pulverized coal injection of coal fines at the blast furnaces due to the reline of Blast Furnace D resulting in reduction in coal use from 604 292 tonnes (2006) to 426 218 tonnes (2007). ArcelorMittal has currently planned massive multi-billion rand projects on energy efficiency, co-generation and renewable energy which will impact significantly on their energy intensity and CO₂ emissions.

4.5 Energy Intensity Improvement in Companies in the Chemical Industry

The Chemical and Allied Industry Association (CAIA) is the only industry association signatory to the Accord that has initiated a protocol for collecting basic information for monitoring the sectoral energy efficiency of its members. In order to provide an industry level aggregate, CAIA reviewed production and energy consumption data provided by chemical companies who are Responsible Care signatories over the period 2003 to 2007. In order to ensure comparability amongst all years, only those companies that provided data for all five years were included in the calculation. The sum of the total electricity consumed in GJ by all the companies that reported for all five years was divided by the sum of the total production in tonnes for the same companies for each year. This figure was determined for each of the five years. The results are presented in Figure 4.9.

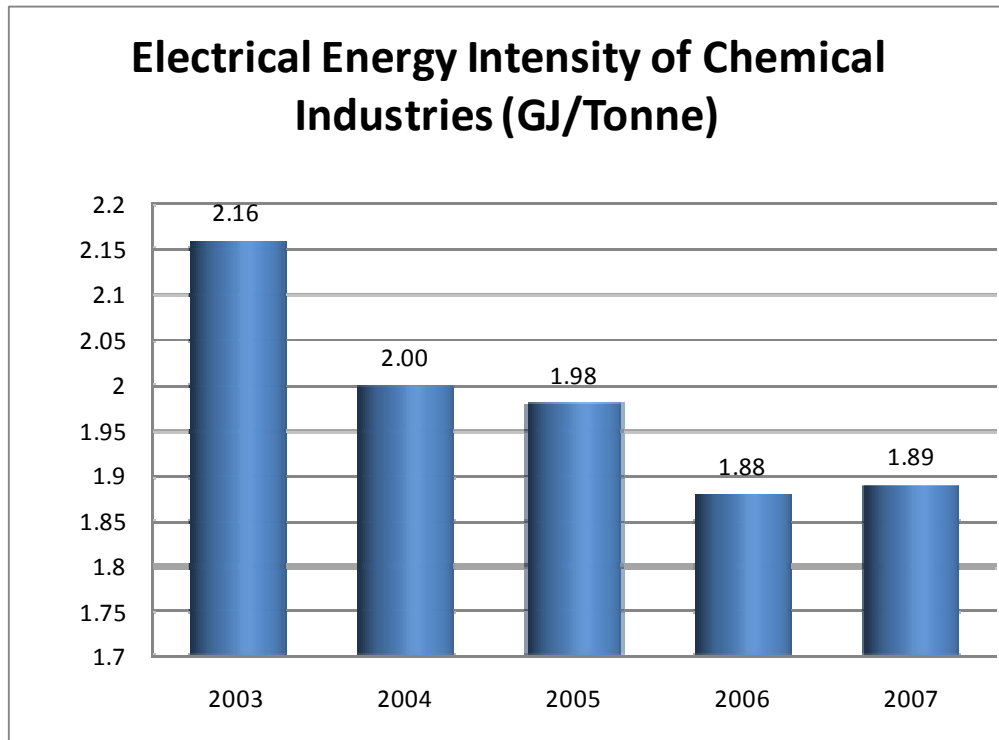


Figure 4.9: Electrical energy intensity of the Chemical Industries from 2003 to 2007 (GJ/Tonne)

The improvement in energy efficiency for the period 2003 to 2007 was then calculated as the difference between the energy efficiency for 2003 and 2007 expressed as a percentage of the energy efficiency in 2003. On this basis the companies effectively improved energy efficiency by 12.5% over that period.

4.6 Investments and Monetary Savings in Energy Efficiency

Energy Efficiency Investments

	Invested (R) <i>(Since 2005)</i>	Earmarked (R) <i>(For Next 3 Years)</i>
Industry	7,432,778,647	9,950,800,000
Mining	2,494,000,000	3,568,958,800
Commercial	6,500,000	30,000,000
Total	9,933,278,647	13,549,758,800

Table 4.5: Current and future energy efficiency investments by Accord signatories

Table 4.5 shows that the Accord signatories have collectively made significant investments in energy efficiency. Up to date energy efficiency investments made by the Accord signatories since they signed the Accord amount to over R9.9 billion while investments earmarked for the next three years amount to over R13.5 billion. Such significant investments indicate that the Accord signatories are backing their commitment with their resources. As shown in the table, most of these investments are dominated by initiatives in the industrial sector.

Energy Efficiency Leadership Index

Based on the responses received from the companies, an index was developed for assessing leadership in energy efficiency investments amongst the Accord signatories. Separate indices were developed for investments made for the past 3 years of the Accord and investments earmarked for the next 3 years. This was done in a 2-stage approach. In the first stage the index was determined by comparing companies' investments made or earmarked relative to companies' turnovers, consumption of electricity and consumption of coal. The higher the level of a company's Energy Efficiency Investment Leadership, the lower the company's index. It must be mentioned that this is based on only companies that provided information on their investments and the related information for the index determination. Where a company does not provide a particular information, the index for that particular basis of the determination is left blank. This could be improved if all companies had provided the relevant information.

It is interesting to note the differences in the indices that evolve depending on the basis of the determination. For example, while Xstrata is clearly the company that exhibited the highest investment leadership in energy efficiency relative to its turnover and consumption of coal, AfriSam clearly showed the highest leadership when the companies' investments are compared with their levels of electricity consumption.

The second stage of the index determination involved a combination of the indices based on turnover, electricity consumption and coal consumption through an average and re-assigning the indices based on the averages that evolved. As in the first stage, the higher a company's investment leadership the lower the company's index. The results showed that the top 5 leaders in energy efficiency investments made over the past 3 years of the Accord were Xstrata, AfriSam, Sasol, Sappi and Siemens in a descending order. In terms of energy efficiency investments earmarked for the next 3 years, both Xstrata and AfriSam were the top leaders followed by Sasol in second position, Sappi in the third position, ABB and ArcelorMittal in the fourth position and Nedbank in the fifth position. It is worth noting that even though ArcelorMittal was not even amongst the top 10 of the Energy Efficiency Investment Leaders in the past 3 years of the Accord, it has become a leader in terms of investments earmarked for the next 3 years (fourth position). This is a clear indication of ArcelorMittal's increased commitment to energy efficiency and climate change.

Eskom’s Energy Efficiency and Demand-Side Management (EEDSM) Fund

The Energy Efficiency and Demand-Side Management (EEDSM) fund is an allocated financial support approved by the National Energy Regulator of South Africa (NERSA) for energy efficiency and demand-side management projects that are more financially and environmentally beneficial to the economy compared with supply-side solutions. The disbursement of the funds is implemented by Eskom after its own established approval processes. Annually Eskom proposes a budget for anticipated EEDSM projects for NERSA’s approval as part of the tariffs approval. In the current EEDSM regulatory policy DSM (load management) projects qualify for 100% funding whilst energy efficiency projects qualify for only 50% EEDSM funding which is an anomaly in the current energy security challenge. NERSA has oversight over the funds after approval and Eskom reports on achievements periodically to NERSA.

Sector	No of Applications	Successful Applications
Industry	8	6
Mining	19	10
Commercial	6	2
Total	33	18

Table 4.6: Number of Accord signatories’ applications for the Eskom Energy Efficiency and Demand-Side Management Funds for their energy efficiency projects

Due to the historically low price of electricity in South Africa most EEDSM projects have unreasonably long payback periods and are therefore usually unattractive for investment. The main objective of the EEDSM funds is to assist in making EEDSM projects viable. Table 4.6 indicates how many EEDSM projects have been submitted by all the Accord members that responded to the quantitative questionnaire and how many of them have been successfully approved by Eskom since the Accord was signed.

The table depicts a very dismal performance of the EEDSM fund amongst the Accord signatories. For all 24 respondent companies, only 33 applications for the funds were reported to have been submitted to Eskom throughout the Accord period and these were submitted by only 8 companies. Out of the 33 applications reported majority of them were from one mining company. Only 18 of the 33 projects were reported to have successful, with that particular mining company having half of its applications approved. The rate of approval of the projects was reported to range between 3 and 24 months but the majority of the approvals were reported to be between 18 and 24 months.

Customer Holding Company	Customer Division	Sector	Contracted MW	Costs
ABB Holdings	ABB Holdings	Commercial	0.69	923,305
Anglo	Amcoal	Industrial	1.93	4,855,692
	Anglo Platinum	Commercial	2.20	7,865,568
		Industrial	47.54	101,060,747
	AngloGold Ashanti - Vaal River	Industrial	53.61	97,289,452
	AngloGold Ashanti - West Wits	Industrial	38.56	67,495,620
	De Beers	Commercial	0.64	2,740,871
BHP Billiton Plc	Richards Bay Coal Terminal	Commercial	0.45	2,853,985
	Richards Bay Minerals	Industrial	0.23	1,492,747
	Samancor	Industrial	35.40	33,872,000
Exxaro	Exxaro	Industrial	0.45	1,343,490
Gold Fields	Gold Fields	Industrial	96.93	180,644,834
Johnson & Johnson	Johnson & Johnson	Commercial	0.10	542,208
ArcelorMittal	Mittal Steel - Vanderbijl Park	Industrial	2.75	14,216,527
PetroSA	Petro SA	Industrial	4.25	2,033,850
PPC	PPC Dwaalboom	Commercial	0.18	710,983
Sasol Limited	Sasol	Commercial	20.35	43,560,992
Unilever	Unilever	Commercial	0.43	2,319,290
Total Contracted (Post Pipeline)			306.69	565,822,161

Table 4.7: Investment contribution by the Eskom Energy Efficiency and Demand Side Management Fund

Table 4.7 gives an indication of total funds contribution by the Eskom Energy Efficiency and Demand-Side Management (EEDSM) fund. The total amount contributed by the Eskom EEDSM fund is over R565 million. This EEDSM fund contribution, compared with the over R9 billion the Accord signatories have invested themselves in energy efficiency projects, indicate how insignificant the Eskom EEDSM funds have been in promoting energy efficiency amongst the signatories.

The above discussion shows that the commitment of Government made in the Accord to provide support to the signatories in terms of financial incentives for energy efficiency projects has not been followed through. It also shows that the uptake of EEDSM projects has been very low and that the contribution of the EEDSM funds to the promotion of energy efficiency amongst the Accord signatories remains insignificant. The hurdle rate of mostly 18 to 24 months for EEDSM project funds approval has been unattractive to business implementation of energy efficiency projects. An interview conducted by this assessment study with Eskom gave an indication that Eskom does admit the EEDSM process is cumbersome and that it is in the process of being overhauled to make it easier for project application and approval.

Another major problem with the Eskom EEDSM funds is the lack of skills amongst the Energy Service Companies (ESCOs) who are supposed to be implementing the projects. It is widely reported by the participating companies that out of the over 100 ESCOs on Eskom database of registered ESCOs only about 10 are competent to undertake projects at the level of the Accord signatories. Skills development is therefore a key need for the ESCO industry.

Related Energy Efficiency Investments

Other investments related to energy efficiency which were reported included water, communication, marketing and training. Investments in water efficiency which amounted to almost R470 million had been undertaken mostly by only 2 companies. These were made to a large extent by ArcelorMittal and to a lesser extent by De Beers. 28 energy management appointments were reported but only 3 people were reported to have been sent on energy management training. Staff training investments were reported to be collectively amounting to R200 000 but marketing and communication were reported to be low in the range of R20 000 and R50 000 collectively.

Monetary Savings from Energy Efficiency

Very scanty information was provided by signatories on money saved through electrical energy efficiency measures. As shown in Table 4.8, only about R116 million were declared as savings from electrical energy efficiency. These savings were declared by only 8 signatories out of the 14 companies that declared electrical energy savings in Table 4.3. Given that the total electricity declared as savings in Tables 4.3 and 4.4 is over 1441GWh, the monetary savings should have been about double what was reported.

It is not surprising that most of the savings declared were from the industrial sector given that most of the investments reported in Table 4.5 were from the industrial sector. However, since most of the electrical energy savings reported in Table 4.3 were from the mining sector, it was expected that the monetary savings from the mining sector would have been far higher than what was reported. This shows that the achievements of energy efficiency lack proper monitoring systems. This is contrary to the self assessment on energy management performance matrix in Chapter 3 which claims that significant number of companies have established information systems in place. Self assessment on energy management performance in information systems would require some verification.

AfriSam reported the highest monetary savings from energy efficiency savings when these savings of the respondents are compared with their levels of electricity consumption. The other companies that declared significant monetary savings are Unilever, Woolworths, Sappi, De Beers, Richards Bay Coal Terminal, Sasol and ArcelorMittal in a decreasing order when compared with their electricity consumption.

Sector	Electricity Savings (R)
Industry	97,176,848
Mining	13,600,000
Commercial	5,760,000
Accord (8 Signatories)	116,536,848

Table 4.8: Monetary savings from energy efficiency

4.7 Greenhouse Gas Emission Reduction

South African industries appear to be slow in taking advantage of carbon trading as an aid to overcome barriers inhibiting the initiation of projects which has Clean Development Mechanism (CDM) potential. Similarly, the Accord signatories do not seem to have managed to harness the CDM potential in their energy efficiency projects to any significant extent.

Sector	Reported	Calculated
Industry	391,687	762,189
Mining	16,000	942,326
Commercial	1,764	1,764
Total	409,451	1,706,279

Table 4.9: Carbon trading potential of energy efficiency projects.

Table 4.9 provides an indication of the aggregated CO₂ emission reduction (CERs) potential in the Accord. The table provides information on CERs potential only in electricity saved since that was the only reliable source of information for its estimation. Only 8 companies provided information on their achieved CER through energy efficiency projects. The reported aggregated CER potential was extremely underestimated as 409 451 tonnes whilst the potential calculated from the reported electricity savings from the 14 Accord signatories amount to over 1.7 million tonnes annually, using the Eskom baseline of 1.2 tons CO₂ emitted for every 1MWhr generated. The most significant contributor to this potential was AngloGold Ashanti. Although individual projects in some companies may be too small for carbon trading transactions because of economics associated with transaction costs, the CER potential shown in only these 14 Accord signatories shows that there is significant potential to be harnessed in CDM and other carbon trading platforms.

There is also a major CDM potential from other savings such as fuel savings, fuel switching and water savings which could be harnessed. Water savings usually have associated carbon emission reductions

since electricity is usually required for its processing and supply. With proper quantification of all these potentials collaboration on CDM in the Accord could prove to be beneficial to the signatories.

The low level of CDM reporting as compared with the potential emission reductions, calculated using energy savings data could be as a result of the following:

- Confidentiality agreements with carbon buyers, traders or brokers.
- Confidentiality with regard to competitive edge.
- Additionality and/or sustainability.
- Projects being too small.
- A lack of CDM understanding.

The above discussion shows that despite the potential for carbon emission reduction through energy efficiency, not much has been achieved in the promotion of CDM. Again this is an area where the commitment of government in the Accord to assist in streamlining CDM approval process has not been forthcoming.

5. STAKEHOLDER PERSPECTIVES

An attempt was made to obtain inputs from as wide ranging stakeholders as possible. These included government departments, non-governmental organizations and industry. The objective was to gain an insight into how the Energy Efficiency Accord was viewed, as well as, where possible, what is being done by other bodies and organizations towards energy efficiency which may complement what is being done by the Accord Members. An attempt was made to make the interview list as inclusive as possible. However, in some instances it proved difficult or impossible to obtain interviews with the relevant representatives.

The stakeholders who provided their perspectives on the Accord included:

- Department of Minerals and Energy
- Department of Environmental Affairs and Tourism
- Designated National Authority
- National Electricity Regulator of South Africa
- Eskom
- National Energy Efficiency Agency
- Earthlife Africa
- Energy Efficiency Technical Committee (EETC)
- Chemical and Allied Industries Association

The discussions below include those with whom either personal or telephonic interviews could be arranged or from whom information could be obtained.

Department of Minerals and Energy

As a co-signatory to the Accord, the Department of Minerals and Energy (DME) has a direct stake in the Energy Efficiency Accord and as such Dr Elsa. du Toit, the Director for Energy Efficiency and Environment, represents the DME at the Energy Efficiency Technical Committee meetings. Furthermore the Accord itself takes its targets and objectives from the National Energy Efficiency Strategy.

Specific feedback on the Accord from DME was as follows:

- That the Accord is seen as relevant with regards to its objectives considering the energy challenges facing South Africa, and that it should continue.
- That the Accord membership should be expanded to include more companies and that ideally every company should be a signatory.
- That the Accord can play an important role with regards to Government initiatives which are being planned such as annual reporting on energy losses by the larger energy users.

In terms of a move towards implementing its own drive towards energy efficiency and making its own contribution towards the targets and objectives of the National Energy Efficiency Strategy, the DME indicated that it has established the following priorities towards the implementation of energy efficiency:

- Monitoring energy efficiency targets
- Training and education
- Drafting and implementing Standards in all sectors
- Full implementation of appliance labeling for fridges
- Energy efficiency awareness campaign
- The establishment of the Energy Efficiency Agency
- Energy efficiency in commercial and public buildings

The Government's energy efficiency campaign forms part of a National Electricity Response Plan. This plan sets out the following objectives.

- A long term plan which would see Eskom double its capacity over the next 20 years
- An energy efficiency campaign which includes voluntary and mandatory programmes to reduce electricity consumption by between 15% to 20% through electricity rationing which would involve quotas for various energy users. Eskom will also manage residential consumption with new wireless technologies and the use of energy efficient appliances.
- The continued promotion of compact fluorescent lamps.
- A solar water heating programme aims to install 1 million solar water heaters over the next three years. The hospitality industry, a major hot water user will be required to convert to solar power for water heating.

The Energy Efficiency Agency has been established and resides under the control of the Central Energy Fund. The Government's initiative towards the promotion of energy efficiency in public buildings includes the following steps and activities:

- A Memorandum of Understanding (MoU) with other Line Departments to employ an energy manager each and to include energy management in their policies.
- The implementation of energy efficiency in all of the 145,000 buildings owned by government through the Department of Public Works.
- The development of a Building Energy Audit training programme which was co-funded with the Capacity Building in Energy Efficiency and Renewable Energy (CaBEREE) programme. Reviewing housing standards in co-operation with the Department of Housing.
- Co-operation with Eskom, NERSA and the National Energy Efficiency Agency with regards to measuring and verification. In this regard, a number of tertiary institutions have been appointed to carry out measurement and verification.
- An exchange programme to replace all inefficient lamps in public buildings with energy efficient lamps such as compact fluorescents.

Department of Environmental Affairs and Tourism

It was interesting to note that the person interviewed from the Department of Environmental Affairs and Tourism (DEAT), although a senior staff member, was not aware of the Accord and its contents. After reading the Accord document, the resultant feedback was as follows:

- That the Accord does not provide sufficient detail to act on.

- That the link with the National Energy Efficiency Strategy was not sufficient to provide this detail to ensure that it would be read in conjunction with the Accord.
- That the Accord should receive wider publicity especially among government departments.
- That DEAT has a specific interest in such initiatives because of their commitment to the reduction of pollution and by implication Greenhouse Gas emission reduction and Climate Change.

A recommendation was made that the “2006 IPCC Guidelines for National Greenhouse Gas Inventories” could be of interest to the Accord members. This document can be found at: www.ipcc-nggip.iges.or.jp/

Designated National Authority for CDM

The meeting with the Designated National Authority (DNA) for Clean Development Mechanism (CDM) revealed that representatives of the Energy Efficiency Technical Committee have already attended some workshops of the DNA. The DNA was concerned that companies and project developers’ expectations in terms of the type of assistance they can provide go beyond their mandate which in essence is the oversight of Clean Development Mechanism in South Africa. This would entail project approval as one of the prerequisites of the international registration of potential CDM projects with the UNFCCC. The scope of this approval is limited to assessing the voluntary participation of South Africa in the CDM and the contribution of the project’s sustainable development to the country. The assessment of other eligibility criteria is not carried out by the DNA and is the responsibility of Designated Operational Entities.

Other than this the DNA is also tasked with CDM awareness programmes. In this regard they hold CDM workshops, to which representatives from all relevant entities are invited, on a regular basis. The DNA expressed a clear interest in assisting the Accord Members where possible but also pointed out that they do not have the capacity or mandate to do the work for which expert consultants are better equipped to do.

National Energy Regulator of South Africa (NERSA)

The individual interviewed at NERSA appeared to be aware of the Energy Efficiency Accord but it did not appear like decision makers at NERSA were aware of the Accord because no clear views on the Accord itself could be expressed. When asked to comment on the effectiveness of the Energy Efficiency and Demand-Side Management (EEDSM) programme the following comments were made:

- That the EEDSM programme is currently being considered for evaluation and revision.
- It was agreed that the EEDSM process is cumbersome but that there is a lack of insight and understanding from industry and/or ESCOs and consultants.

When a concern was raised that the current electricity tariff structure is not conducive to energy efficiency project initiation, the feedback from NERSA was that there are pricing methodologies which are followed and that tariffs and charges are approved in the manner prescribed by regulation. However, inputs from the EETC to the review process for the next Multi-Year Price Determination would be critical to enhancing the role of DSM

Eskom

The feedback received from Eskom on the Energy Efficiency Accord was as follows:

- That the Accord is seen as extremely relevant especially considering recent electricity supply constraints experienced by Eskom.
- Whereas the Accord had a role to play in terms of targets which was hoped to be achieved in terms of the National Energy Efficiency Strategy, that role has developed a new level of significance in assisting Government and Eskom to stabilize the electricity supply situation.
- The Accord should tie in with the Power Conservation Programme in that the Accord's targets should be aligned with that of the Programme.
- Generally, the good work which has been done to date should tie in with new developments and the Accord should be dynamic in its approach.
- The Energy Efficiency Technical Committee should liaise with the National Energy Recovery Team (NERT) regarding the Power Conservation Programme and ideally invite the NERT leadership to address the Energy Efficiency Technical Committee.

With regards to initiatives which would impact on the Accord signatories, Eskom has a clear strategy to manage capacity shortage for the short-, medium- and long-term. For the other sectors, for example the residential sector, there are plans to introduce load reduction through smart metering and time-of-use tariffs.

National Energy Efficiency Agency (NEEA)

The National Energy Efficiency Agency (NEEA) is one of Government's recent initiatives, see DME above. It appears that the NEEA has a number of challenges and in this regard confirms some of the challenges encountered during the collection of data for this report. It appears that the availability of data is a significant problem and that existing data are scattered in different institutions. This is why companies are having a problem with establishing baselines. While some companies have the information, they are uncomfortable making it available because it might undermine their competitive basis. Woolworths was one of the companies mentioned as being an exception in that they have the technology in place to know what the electricity consumption is at any of their stores.

The NEEA also has the view that some companies, initially, merely signed the Accord for publicity purposes without deeper consideration of the implications in terms of implementation. However, the Energy Efficiency Technical Committee (EETC) of the Accord has proved to be an excellent forum for sharing information.

An important input was that a central repository for information needs to be created and maintained. It is however crucial that reporting is done on a regular basis preferably on a monthly basis. The advantages of this are ease of benchmarking, monitoring and target setting. The Accord could be a driver or initiator of this but it should ideally be driven on a national basis and be all inclusive.

The only criticism from NEEA was the fact that all the business sectors were represented by one body namely, the EETC, without sufficient scope for addressing sectoral specific needs. This, however, does not eliminate the EETC as the correct forum to represent all the sectors. The various sectors could be formed into subcommittees if they so wish but sharing should still take place in a combined forum.

On final conclusion, the NEEA feels that the voluntary Accord was a positive step and the right thing to do but that there should be a carrot and stick approach to ensure performance. This will create peer pressure and a need to perform.

Earthlife Africa

The Earthlife Africa interview was carried out by phone. The gist of the interview was that not enough was being done to implement energy efficiency and renewable energy programmes effectively.

Energy Efficiency Technical Committee

The Chairman of the Energy Efficiency Technical Committee (EETC) of the Accord felt that industry in general is facing significant challenges with regards to the significant reductions in energy consumption required by Eskom. Technology purchased some time ago cannot easily be modified and there have not been any significant breakthroughs with regards to energy efficiency and that without real technological breakthroughs the expected targets are probably unattainable. Load shedding will add to the challenges in this regard in that it will cause a further human resource drain resulting in targets being more difficult to attain.

It was also felt that measurement of energy efficiency in primary industries is very difficult. Government cannot effectively legislate energy efficiency in the absence of a good measurement system and the required skills for monitoring implementation. Many of the companies have found that measurement of energy efficiency, especially in the primary industries, is complex and not an exact science.

With regards to the Accord, it was felt that the Accord has been successful in that it has created a forum for like-minded companies to get together and learn by sharing their energy efficiency experience. However, there is a need to differentiate between the EETC memberships in terms of sectors. There should also be a move away from focusing on significant electricity users to broader energy users and that there should be regional chapters of the Accord to speed up action on energy efficiency. There is also a need to expand the membership of the Accord. Furthermore, there is also a need for Government and Eskom to provide reasonable incentives to promote performance such as import tax rebates on energy efficiency equipment and tax relief for energy efficiency implementation. There is a need for ISO Standards for energy management to provide a stimulus and in this regard Government has a role to play.

Regarding the future of the Accord, it has been clear from the Technical Committee that there is continuous interest in the Accord but the signatories are concerned that the efforts and gains made by companies who made an early move on energy efficiency may not be taken into consideration in the

planned power rationing programme of Eskom. For a renewed Accord, the signatories have called for the following:

1. Assurance from Government that the voluntary efforts on energy efficiency by business will be taken into consideration in the planned Power Conservation Programme.
2. In order to avoid crippling the economy, Government should be more assertive in getting the intended power rationing shared fairly amongst all sectors of the economy instead of business bearing the brunt of it all.
3. The Accord requires re-negotiated commitments with short to long term targets, clearer measurement and reporting requirements with wider scope to cover other energy sources besides electricity.
4. More Government commitment to the Accord through Higher Level engagement/participation from Government Departments.
5. It is important for Government to honour its commitments through an integrated regime of incentives and financial mechanisms which are key to further stimulation of energy efficiency by business because currently this function is scattered in different Government departments and agencies.
6. Effective alignment of Government policy and support with the Accord targets and commitments, for example, the energy efficiency targets of the climate change Long-Term Mitigation Scenarios (DEAT), electricity usage allocations of the Power Conservation Programme (DME/Eskom), the cost of supply-side investments versus demand-side (DPE/NT/Eskom) and incentives for energy efficiency investments (DTI/NT/NERSA/DME).
7. Support from Government for effective skills and training in Energy Management and its reporting. Skills and Knowledge pose a challenge across all levels from Energy Managers to technical operators and ESCOs who must support the companies in auditing and implementation. Apart from high end training such as professional Industrial Energy Management, unit consumption standards have still not been established and the Energy SETA has not been effective in this regard. For effective energy management there would be a need to require a benchmarked number of energy managers/supervisors for each company depending on energy consumption level of the company but this makes training/skills development strategies imperative. It is estimated that government has over 100 000 government buildings requiring energy efficiency to be rolled out and therefore the issue of skills will surely be important for this roll out.

Government's effort on skills and training could be supplemented from international co-operation and assistance. It is recommended that the Deputy President considers making the

development, retention and importation of skills in the energy sector a key priority in the Joint Initiative on Priority Skills Acquisition (JIPSA) programme.

8. Future management of the Accord in terms of monitoring and verification methodology and reporting systems would require more resources for which Government and donor support would be of great help. More resources would be required for sound data collection and modeling to support effective planning and investment decisions by both the private and public sectors.
9. Government support in streamlining CDM procedures both internationally and locally would facilitate energy efficiency CDM projects.
10. Government support in negotiating technology transfer and partnerships from advanced countries through CDM and bilateral agreements.
11. Government Research and Development through the Department of Science and Technology and the newly approved South African National Energy and Development Institute (SANEDI) under CEF needs to beef up its support for energy efficiency innovations. Currently, companies are investing in this to some degree but government support would help ensure coordination, collaboration and partnerships.

Chemical and Allied Industries Association

A pilot study of six firms in the Chemical and Allied Industries Association (CAIA) has revealed significant scope for improved energy efficiency. However, implementation requires investment which cannot be achieved in the short term. Thus, CAIA believes that government incentives should be provided to promote investment in energy efficient equipment.

CAIA further believes that implementation of the Accord could be significantly strengthened if an agreed measurement methodology could be adopted to promote quantitative evaluation of progress towards achievement of targets. It is recommended that Government urgently establish and populate the database on energy use contemplated in the Energy Bill with a view to maintaining a reliable source of information on national energy use against which all sectors and companies could measure their performance.

CAIA would therefore like to see agreement reached on the definition of energy efficiency for measuring performance in respect of the Energy Efficiency Accord. CAIA proposes that the US definition be used as the basis for reporting on energy efficiency. This defines energy efficiency in terms of amount of electricity/energy consumed in GJ expressed as a ratio to total production for any given year.

CAIA has used a calendar year for the annual measurement period for its pilot study but in order to ensure compatibility amongst sectors a period for regular measurement needs to be agreed to. As it is not possible for all sectors to achieve complete company participation, CAIA believes there is a need to

have a way of collecting national data on energy consumption and production on the basis of SIC codes. This is a government task and therefore there is a need to agree on how it is going to be done.

6. REVIEW OF ENERGY EFFICIENCY ACCORD COMMITMENTS

The Energy Efficiency Accord had as its principle objective the promotion and stimulation of energy efficiency projects within the Accord membership. The Accord was not a free standing document but was an extension of the National Energy Efficiency Strategy and as such endorsed the strategy and through signing the Accord the signatories committed themselves both to the objectives and targets of the Accord and to those of the National Energy Efficiency Strategy. This chapter seeks to review the key commitments made in the Accord and how effective they have been regarding their relevance to current issues.

Purpose of the Accord

The signatories of Accord (DME and the signatory companies and associations) agreed to collaborate to establish a mutually beneficial framework for voluntary energy efficiency initiatives that will help move the country towards its goals of attracting investment in Clean Development Mechanism (CDM) projects and efficient energy use.

The Energy Efficiency Technical Committee was established as a step towards this collaboration, providing a mechanism which would ensure that the signatories were able to share information on energy efficiency and report systematically on their achievements. The Committee meets on a regular basis where it also serves as a forum where company representatives can exchange ideas and show case energy efficient projects undertaken by them. For this purpose the Accord has been partially successful in keeping the momentum in sharing best practices in energy efficiency. However, it has been partially unsuccessful in attracting significant CDM investments. There have been only few reports of successful CDM projects and the Programmatic CDM pilot project started by the Accord has not made any significant progress.

Key Accord Commitments

Under the Accord the signatories recognise the national imperative to achieve higher economic growth rates and agree that energy efficiency improvements need to be considered within the context of this overarching imperative. They also agree to cooperate to pursue the national energy efficiency targets on a voluntary basis, recognising that energy usage is a major contributor to greenhouse gas emissions in South Africa. They also agree to collaborate on initiatives that could result in CDM projects. The Accord was in fact intended to be a contributor to the regular reviews provided for in the Energy Efficiency Strategy.

The signatories also agreed *inter alia* to:

- develop common reporting requirements for energy usage from all energy sources, taking into account, where possible, existing internationally recognised protocols for reporting such as those developed by the Global Reporting Initiative;

- define industry-specific projected energy use in the future, based on Business-as-usual (BAU) growth expectations;
- agree on 2000 as the baseline year against which performance will be measured;
- establish methodologies that will allow the baseline quantification for energy use/intensity (consumption per unit of production or any other relevant denominator) in various subsectors, and to take into account the need to measure specific energy intensity (providing for the differing subsectors) rather than absolute energy use in order to promote industrial growth whilst achieving energy efficiency and recognising the energy conservation measures already in use in some subsectors;
- establish methodologies to take into account increased production so that the pursuit of improved energy efficiency does not hamper industrial growth.
- To develop a generic energy auditing protocol that can be adapted for use by the individual sectors and company signatories.

The results of the survey suggest that a number of these key commitments have not been implemented, or if implemented have been ineffective. For example:

1. There is clearly confusion over the requirement for a baseline year, and this needs to be reviewed and resolved by the Technical Committee. The fact that a number of respondents seemed uncertain over how to establish baselines suggests that earlier efforts to provide training on this subject have been insufficient.
2. The commitment to a “common reporting requirement” seems to have been largely forgotten, as the erratic nature of the survey responses would indicate.
3. The idea of developing BAU projections and methods for incorporating increased production into these projections and hence into the baseline methodology, seems to have been neglected if not forgotten.
4. Finally, the concept of a generic energy auditing protocol has not been systematically addressed, although discussion of this issue is ongoing. One Accord association signatory, CAIA, has initiated implementation of such a protocol on its own.

Targets

The signatories have also committed themselves to the targets specified in the National Energy Efficiency Strategy. However, the strategy does not establish interim targets and as a result the Accord also fails to address this issue. Although the Accord is under review and the energy performance of Accord signatories is being assessed, there are no clear or specific intermediate targets against which performance can be evaluated. Thus the intermediate target had to be interpolated.

Industry Collaboration

The industry signatories agreed to collaborate with each other and with Government on a number of issues towards the promotion of initiatives and strategies that will contribute to the achievement of the overall energy efficiency target set by Government. The assessment indicates that signatories are amenable to collaborate with each other and through industry associations. Other than the established interaction through the Energy Efficiency Technical Committee, however, it would appear that this has

not manifested itself in tangible, structured collaboration. Feedback from stakeholders suggests that closer cooperation could be achieved by forming technical sub-committees on either a sub-sector basis or a technology basis. Such committees could operate on an ad hoc basis as or when needed.

Use of Energy Efficiency and Demand-Side Management Fund

The Accord advocates the use of the Energy Efficiency and Demand Side Management (EEDSM) fund for providing required incentives for speeding up achievement of the 2015 target. Generally, feedback from the questionnaire shows that most signatories find the process cumbersome and onerous and the process time too long as shown in Section 4.6.

Specifically, the Quantitative Survey feedback suggested approval times of 3 months to as much as 24 months for EEDSM projects. Further feedback indicated that there are insufficient competent Energy Service Companies (ESCOs) and consultants to assist companies with this process. This suggests that the Eskom EEDSM programme in its present form is not addressing the concerns of signatories and has been a fairly minor factor in their efforts to achieve the Accord goals. Should these problems be resolved, however, DSM could eventually become a significant factor in assisting the Accord signatories.

Energy Savings Reporting

Despite the somewhat disappointing results from the quantitative survey in terms of reporting on energy savings, there was evidence that many signatory companies did initiate energy savings measures in some form or the other, although not all were able to report on actual savings achieved. The assessment shows that the major motivating factors for energy savings measures were:

- the Energy Efficiency Accord itself
- the need to cut costs.
- concern for the environment.
- reducing dependency on purchased power.
- Government intervention through the DME's Energy Efficiency Strategy.
- Eskom's EEDSM program.

This suggests that the low apparent energy savings reported by some Accord Members result either from a lack of monitoring or an inability to establish a reliable baseline. This has been confirmed during telephonic discussions with some respondents as well as through the Quantitative Questionnaire. As noted previously, there was some confusion about what the baseline year is, whether the baseline year for the Accord should be the same as for the Strategy and how to establish such a baseline. All of this points to a lack of capacity within some of the signatory companies and a need to address the baseline question urgently with additional capacity building activities.

Capacity Building

The Accord committed signatories "to endeavor that, where appropriate, training material would be prepared during the course of this accord and be accredited through the relevant Sector Education and

Training Authority (SETA) and that the sector skills plans of the various sectors include the development of the skills necessary to sustain the commitments made in this accord.”

Although as part of its commitments to the Accord and the Strategy, the DME did develop a number of courses on energy efficiency as well as unit standards and/or skills programmes for each course, none of these is currently registered with a SETA, according to the Energy Sector Education and Training Authority (E-SETA).

Although the Accord has to some extent acted as a catalyst towards the development of training initiatives, it is clear that there is much more that needs to be done. The Accord Technical Committee as part of their mandate could assist the E-SETA to complete the registration process and promote the use of these courses to members.

An additional problem is the lack of accredited trainers. This too could be assisted by the Accord Committee through promotion and the creation of additional demand for courses, which would create a market for trainers and thereby stimulate the accreditation process.

GHG Mitigation and the CDM

The Accord stipulates that “where appropriate, opportunities presented by energy efficiency projects to develop CDM projects would be exploited”. As noted in section 4.7 above, there are probably many opportunities to translate GHG emissions reduction from energy efficiency into CDM projects, but this opportunity has been explored by only a few signatories.

South Africa is a relatively recent signatory of the Kyoto Protocol (2004) and South African companies are on a steep learning curve. The CDM process is still not widely understood, and is perceived to be complex and costly with a long timeframe. Furthermore, because of the transaction costs smaller-scale projects (CO₂ equivalent reductions below 60 000 tons per year) may not be of interest to buyers or will attract lower price for Carbon Emission Reduction units (CERs). In addition, factors such as additionality and sustainability are often misunderstood.

Despite the reservations about CDM which are evident from the survey responses, some CDM activity was recorded by the respondents. Of the 80 CDM projects submitted to the DNA consisting of 58 Project Idea Notes (PINs) and 22 Project Design Documents (PDDs) the following Accord signatories are listed as being at the PDD stage or later:

- Sasol
- ArcelorMittal
- BHP Billiton Samancor

For the Accord to have a more profound impact in terms of development of CDM projects, more information dissemination and training are required, e.g. attendance at CDM workshops organized by

the DNA and at training courses presented by various specialist consultants. It is not necessary for companies to be expert in any of these matters but instead to have the ability to recognize projects which may have CDM potential. In this regard Accord members who have undertaken projects with CDM potential can play an important role by sharing experiences at the Technical Committee meetings.

DME Commitments

As noted in section 4.6, the signatories appear to have limited faith in Government to deliver the necessary policies to incentivise the Accord. The general sentiment expressed is that Government including the various Government structures such as NERSA and Eskom (in terms of the EEDSM programme) have failed in their commitments both under the Accord and the National Energy Efficiency Strategy.

Impact of the Proposed Power Conservation Programme on Target-Setting

The current electricity supply problems and the resultant steps taken by Eskom and Government to address these problems have significantly altered the energy efficiency scene. For one thing, the government is now preparing to set a reduction target of 10% for major customers through a proposed Power Conservation Programme (PCP), with substantial penalties for companies failing to meet the new quotas. Once implemented, the PCP would in theory force the Accord signatories—many of whom will fall into the major customer category—to radically and immediately reduce their energy consumption.

The PCP does not, of course, stipulate that such reductions must be due to energy efficiency improvements, and it is likely that companies will investigate other options for reducing energy use (production cutbacks, staff lay-offs, changes in shift and occupancy patterns) as well as embarking on an energy efficiency programme in order to avoid the heavy penalties. This has the potential to seriously compromise the Accord programme, both because it will impact heavily on companies' expansion plans because it could potentially create a new (and lower) baseline for new entrants to the Accord.

7. COMPANY EXPERIENCES

7.1 *Lessons from Best Practices*

Some lessons emerging from best practices of energy efficiency within the Accord and some few companies outside the Accord include the following:

- **Energy Policy:** The monitoring of Energy Intensity (lower kWh/ton) as key Performance Indicator for staff has helped the improvement of energy efficiency significantly (AfriSam - former Holcim, Richards Bay Coal Terminal).
- **IT Systems:** Energy efficiency communication strategy using company intranet in monitoring and reporting consumption in a centralised automated system has helped companies to make real-time interventions in controlling their energy use within a specified threshold. This helps build awareness of energy efficiency and give an up to date picture of the effects of savings initiatives. Examples such IT systems can be found at Woolworths, AngloGold Ashanti and Engen.
- **Organisation:** The formation of Energy Efficiency Committees through representation of divisional champions responsible for driving energy efficiency within company divisions has helped to implement energy efficiency in a more organized way with strategic direction. Quarterly reporting to Exco level and feedback to the divisions ensure improvement and sustainability of progress. Examples of these committees have been formed at Eskom, SAB and BMW.
- **Investment:** Significant number of companies are shifting towards Preferential Energy Efficiency Procurement incorporating measures to include their suppliers in their own energy efficiency initiatives. For example, Eskom has included energy efficiency as a key consideration in Board and EXCO investment decisions to ensure that the energy efficiency implications of all projects are assessed and considered in decision making. Furthermore, a process has been initiated to address energy efficiency amongst suppliers regarding their operations and products. SAB include suppliers in their electricity saving workshops to allow better sharing of knowledge on the subject. Pick n Pay also includes their suppliers in their energy efficiency management strategy. The benefit of this approach is a more widespread and integrated coverage of the energy efficiency drive.
- **Marketing and Communication:** This involves engagement with staff and company supply chain regarding identification of best practices and creating ownership of energy plans targeting potential energy savings. Company examples are Richards Bay Coal Terminal, SAB, Pick n Pay, Eskom. It also involves awareness campaigns with newsletters, emails and competitions like at PG Group, Pick n Pay and Kumba. Communication and awareness programmes have helped change knowledge levels, attitudes and perceptions about energy use at Eskom.
- **Skills and Knowledge:** Training of selected employees in energy efficiency techniques has been effective at Anglo Coal and other companies.

7.2 Individual Company Experiences

Anglo Platinum

Voltex Mine Lighting (VML) was developed to meet the requirements of Anglo Platinum mines. The original installation was done in Amandebult Mine. It is said to have achieved an 80% average reduction in power consumption. VML carries a few technical, economic and health related advantages. The advantages include the reduction in breakage, shrinkage, maintenance costs, and better handling of major voltage fluctuations, to name but a few. The project by Voltex is intended to replace existing 60 watt and 100 watt incandescent lamps with 13 watt industrial CFL. The incandescent lamps have 800 – 1 000 hours of lamp life. Other advantages include the fact that the materials are non-flammable and non-toxic, unskilled labour can be used to replace the lamps without any danger and it offers other applications other than mining.

The design of the lights is characterized by the following:

- Mine light has remote ballast
- They operate at 110V or 230V
- 40 000 hours lifespan, which translates to 4.5 years
- CFL has 4 pins making it so unique it is unattractive for theft
- Tested and certified for compliance to the SANS and IEC standards

A few energy savings have been realised by the project because the Amandelbult Mine realised a saving of 1,75 MW, which was verified by ESKOM DSM M&V team. The VML translates into a savings in energy of 15 324 131 kWh, and savings of R2 285 / kW, and provides 12 – 15 lux compared to mine health and safety requirements of 5 lux. There was a maintenance savings at the Amandelbult of R300 000 per annum and a savings in lamp replacement costs of R330 000 annually. Following the experiment at Amanadelbult the Voltex Lighting was commissioned to conduct similar exercises in Lebowe, Rasimone, Union and Modikwe Mines. Further large 8 projects will be undertaken in the Rustenburg field for Anglo Platinum. The anticipated saving is estimated to be 11 MW.

AfriSam

As a founding signatory of the Energy Accord, AfriSam is committed to continually improve our energy efficiency on both Electrical and Thermal energy. From the base year (2000) AfriSam has made a serious effort to achieve the required 15% energy efficiency per production unit saving by 2015. AfriSam has increased its production output by 50% from 2000 to 2007 while only consuming 11% more energy. This equates to an Energy Efficiency improvement of 27%. As electricity is a major crisis in South Africa at the moment and for the next few years special attention has been given to electrical efficiencies. Our

Electrical Energy Efficiency per production unit has improved by 24% over the same period.

ArcelorMittal South Africa

ArcelorMittal South Africa is one of the signatories of the Energy Efficiency Accord. The Energy accord offered opportunities with ESKOM DSM projects partnerships. A total of five projects were registered during 2005. The first project was completed during 2006 at Vanderbijlpark works at a cost of R14Milj the envisaged savings target were achieved. One DSM efficiency improvement project at our Saldanha plant, similar to the Vanderbijlpark project, was approved by DSM and will be implemented during 2009 at a cost of approximately R32Mij. DSM has however run out of funds. ArcelorMittal SA will however apply for funds should it become available in future.

After the electricity crises of January 2008, ArcelorMittal joined Industry to assist in finding solutions to curb a similar occurrence. The announcement call by ESKOM for 10% electricity savings sped up the process to finish off the outstanding energy audits at our different plant sites. Energy efficiency opportunities of approximately R500Milj were identified and are now being investigated and developed for final implementation. Energy efficiency lighting options are also investigated as part of the energy audits and pilot projects are being set up to study possible industrial solutions. This is to replace existing plant lights with more efficient lights. A saving of up to 70% on electricity can be achieved.

The implementation of two additional DRI kilns in the last Quarter of 2008 which was driven by higher market steel demand coupled with a drive for energy efficiency and a cleaner atmosphere led to a strategy to use waste heat energy to generate electricity and resulting in a 29MW Nett power station to come in operation in Q 1 2009 at a cost of R185 Mill.

The electricity supply challenges and proposed price increases from ESKOM enabled us to re-look at our own Power generation projects. In an effort to secure electricity supply, the proposed power plant for Vanderbijlpark has been fast tracked. A 130 MW power plant, utilizing current flared process gasses, will be in operation by end 2011 at a cost of approximately R2.7 B. A similar power plant is being investigated for Newcastle works as part of the published expansion plan e.g. New Blast furnace, rolling mills and 130 MW power plant etc.

A study on renewable wind energy is being investigated at our Saldanha plant. A 60 meter wind tower will be erected during 2008 to gather wind statistics for a year and confirm the viability of this project.

We are in the process of evaluating several renewable energy solutions in an effort to address the issue of utilizing the maximum renewable energy as part of our electricity supply strategy and efforts as a environmentally responsible company to lower our Carbon footprint. These earmarked investments could more than double depending on the outcome of the economics of these alternative energy projects.

As part of the global ArcelorMittal family, we are able to tap into the companies available resources to benchmark with the world best practices. This opens up opportunities for us to set plans in motion to improve our processes efficiencies to the maximum of what science and physics will allow.

BHP Billiton Energy Coal

BHP Billiton Energy Coal is a major supplier of coal to Eskom and as such has been making a huge contribution to the energy security of the country by helping Eskom improve its coal stocks. The company is currently in the execution phase of two major projects which include efficient motors, lighting, water heating, power factor correction, etc. The company decided, since some years ago, to scrap all 0 to 22kW motors upon failure and replace them with more efficient Eff2 units. The scrapping of these old inefficient motors has helped avoid compromising energy efficiency. Any motor replacement up to 200kW is made Eff2 quality. The construction of two new coal beneficiation facilities with energy efficient lighting, solar water heating and fully Eff2 motor compliance will help reduce energy consumption in production significantly compared with the older designs. Through many operations, the company monitors and controls its electricity maximum demand and this has improved over the years. For research and implementation of energy efficiency projects the company relies on consultants and Energy Service Companies (Escos) as well as Eskom's advice. Energy efficiency awareness amongst staff on energy saving both at work and at home is being created through energy campaigns and at high level coal industry functions.

De Beers Consolidated Mines

The subject of Power and Energy Efficiency is one of the key drivers included in the De Beers strategy. It is being driven across all Business Units, not only in Southern Africa, but globally as well. Forums have been set-up within the company to address the subject in alignment within regulatory requirements and guidance from organizations such as the NBI.

Incremental benefits have been achieved in the electrical and diesel fuel fields. New projects are scrutinized to ensure good energy management practices are employed. Awareness training of its employees remains a focal point to ensure understanding and acceptance. The 15% efficiency improvement by 2015 remains the target, along with Eskom's requirement to manage power within the baseline allocations agreed with De Beers.

Eskom

Eskom is placing increasing demands on South Africans to become more energy efficient as it struggles to avoid blackouts for the next five to seven years. But what is the national electricity generator doing to save power in its operations and reduce its own greenhouse gas emissions which amount to about half of the nation's.

Eskom set in October 2006 a target to save 1 billion kilowatt-hours (kWh) of electricity in its own operations. This is equivalent to South Africa's total electricity consumption for 1,6 days. Put another

way, 1 billion kettles boiling for an hour would consume that much electricity. Eskom says that as at June 30 this year, it had recorded savings of 28 804 017 kWhs and that this has been verified by internal and external auditors.

The utility explains it aims to "cultivate and entrench an energy efficiency culture within the organisation through the creation of 30 000 energy efficiency ambassadors who over time will permeate into broader society". Eskom says energy efficiency will be taken into account in all new projects. It is also encouraging suppliers to practice energy efficiency in their operations and to supply energy efficient products.

Various initiatives have been undertaken to entrench energy efficiency within business practices and processes, including:

- Incorporation of energy efficiency criteria in the investment committee submission guidelines to ensure that the energy efficiency implications of all new projects are assessed and considered in decision making. A similar process has been initiated to ensure that energy efficiency is considered in all procurement practices to make sure that suppliers are practising energy efficiency in their operations and are providing Eskom with energy efficient products.
- Incorporation of energy efficiency as a key criterion within the research process, thereby ensuring that the energy efficiency implications of all research projects are assessed.
- Initiation of assessments to determine energy efficiency opportunities within the IT department including; data hubs, labelling of computers, and replacement of traditional cathode ray tube computer monitor screens with low energy consumption liquid crystal displays. A more comprehensive study to assess energy efficiency opportunities within IT is currently in progress.
- Initiation by Divisions of assessments to identify opportunities for improving energy efficiency including initially undertaking audits focusing on lighting and heating, ventilation and air conditioning.
- Embarking on a ramped up communications and awareness programme. In order to effect and sustain people adopting energy efficient behaviour, a key component of this programme involves also addressing the elements of change management in conjunction with the Human Resources Department.

Exxaro

Exxaro was one of the early signatories of the Energy Efficiency Accord, in their previous form as Kumba Resources. Since then the Eskom "request" for a 10% electricity saving requires a more urgent response. In April 2008 Exxaro's energy efficiency team met to outline the company's strategy to address the crisis and to develop savings projects for implementation in the short, medium, and long term. These energy saving ideas are currently in various stages of implementation, and include the conversion to low-energy lighting; the conversion to solar appliances for hot water applications; right-sizing of electrical motors;

the use of high efficiency pumps, fans, and motors; improved power factor correction; and demand-side management projects.

Alternative energy sources are being investigated at various sites where both solar and wind power could be generated. These projects are currently entering pre-feasibility phase. Capturing of process energy in off-gas streams is also being investigated at various sites, creating the possibility of offsetting the company's carbon footprint.

Gold Fields

Gold Fields has committed themselves to the Energy Efficiency Accord since 2005. In line with this commitment a lighting audit was done by Lemay Electrical Projects, at the Kloof gold mine. The project was to replace existing luminaries (3 x 36 watt linear fluorescent tubes with magnetic ballast) with new luminaries (2 x 36 watt tri-phosphour fluorescent tube and electronic gear. Where it was possible, low voltage halogen spot lights were replaced with 13 watt fluorescent from 50W. Further achievements to the project included the following:

- Project started in March 2006, taking 2 months to implement
- Cost to the project was R330 000, for supply and installation (in August and September 2006)
- For the period October 2006 to September 2007, average consumption was 97 000 kWh per month, achieving a saving of 20.5% (maximum demand is 355 kVa)
- For the current period October 2007 to September 2008 the average consumption went down to 78 000 kWh, resulting in a further saving of 19.5% (maximum demand is 285 kVa)

It is acknowledged that more savings could be achieved if newer energy efficient lighting and room occupied sensors are installed in commercial buildings. Retrofitting projects have attractive pay-back periods, and they do make business sense.

Mondi

Mondi's Richards Bay operation won the industrial category in the annual ETA Awards 2006 for using a responsible approach towards total energy management and cost control. The result was that their mill used 44.3 percent less purchased energy in 2005 compared to the baseline year 2003, due to the implemented savings measures. The lower energy use also resulted in a reduction in sulphur dioxide emissions from the mill. This was mainly as a result of a lower demand for coal due to the decreased demand for steam generated by the power boilers. Analysis also showed that the implemented energy saving measures produced an energy and water cost saving of R38 million based on the performance of the last six months in 2005 (27 percent of base). The Gas Turbine Project was implemented late 2006 with a capacity of 29 MW in Richards Bay, resulting in the mill being nearly self sufficient.

Currently 3 Clean Development Mechanism (CDM) projects are either in the process of being registered or already verified awaiting first issue of Certified Emission Reductions (CERs) under the of the Kyoto Protocol:

- Fuel switch from coal to biomass
- Co-generation of electricity on cleaner energy source (gas)
- Process energy efficiency improvement

Richards Bay Coal Terminal Ltd

Energy efficiency has to become "a way of life" for a company and all its employees in order to be effective, says Richards Bay Coal Terminal (RBCT) chief operating officer Ray Chirwa. Judged as the Top Performing Energy Efficiency Accord Signatory in 2007, RBCT has received glowing accolades for its efforts.

"The company has stood tall above its peers with astounding commitment, drive and impetus in transforming its operations towards energy efficiency," says the National Business Initiative (NBI) which manages the Accord on behalf of its 44 corporate signatories and the Department of Minerals and Energy. Within a year of becoming a signatory, notes the NBI, RBCT reduced electricity consumption by 3,5% and fuel consumption by 3,2%, indicating that the company is well on track to meeting the Accord's targeted 15% reduction in energy usage by 2015 against its year 2000 baseline. RBCT has adopted a corporate energy efficiency policy and established project Yongamandla (save energy) led by a team which "continuously monitors and measures our performance and, above all, integrates the energy saving imperative in every aspect of our operations".

RBCT says the first phase of an energy efficient lighting initiative has led to a 3% saving in electricity usage. Another project has cut diesel usage by 45 000 litres. It estimates these projects have avoided some 600 tons of greenhouse gas emissions. Chirwa attributes RBCT's progress to enthusiastic involvement of all employees and management, a factor identified by the NBI as one of the key elements of energy efficiency best practice.

SAB

Beer brewer SAB says it has already achieved more than half of its 15% energy reduction commitment under the Energy Efficiency Accord. It has also targeted for this year a 10% reduction in its current electrical use as its response to the Eskom energy crisis. Among numerous initiatives, SAB says it has installed solar geysers at its Newlands and Chamdor breweries and now plans installations across the business. It is planning to roll-out recovery of biogas from waste water treatment facilities at five of its seven breweries. A boiler at its Alrode brewery now operates on methane gas produced from an on-site waste water treatment plant. SAB says it is working to measure its entire carbon footprint and to reduce it.

Siemens Real Estate Management

As part of an ongoing process to contribute to the energy saving targets forming part of the voluntary agreement between Industry and the DME, Siemens Real Estate Management has shown substantial progress in most of the key functions as per the last submitted Matrix report of August 2008. Some of the initiatives include an energy management guideline, information recording systems including establishment of a baseline, Building Management System upgrade and awareness creation. The net effect of these initiatives have contributed to a 20% saving in energy use per capita over a period of 11 months at Siemens Ltd. head office, in Midrand.

Woolworths

In other sectors of the economy, food and clothing retailer Woolworths has included energy efficiency as part of its Good Business Journey programme incorporating transformation, social development and environmental and climate change issues. It has targeted a 30% reduction in energy usage by 2012 and claims to have already reduced usage by 10% against its 2004 benchmark.

Energy-saving initiatives include:

- All light fittings in Western and Eastern Cape stores have been changed to energy efficient fittings.
- Electrical profiles of selected stores, depots and offices are monitored remotely to ensure that lighting and air-conditioning units are managed in the most efficient way.
- Automated lighting switching equipment has been installed in Woolworths' top 20 stores to ensure that lights do not remain on after hours.
- Ongoing energy efficiency awareness programmes among staff.
- Selling only energy efficient light bulbs.
- None of Woolworths stand-alone food stores have air-conditioning, except in KwaZulu-Natal where air-conditioning is required to control humidity.
- Energy efficient refrigeration plants installed in stores and depots over recent years have reduced power consumed by refrigeration by up to 40%.
- Waste heat, recycled from the refrigeration system, is pumped back in to the food market, helping to maintain comfortable trading conditions.

In developing new properties and stores, Woolworths aims to incorporate natural ventilation, use of natural light, energy efficient lighting and a Building Management System for light switching, solar powered water heating, and re-use of heat generated by plant and machinery to heat buildings in cold periods of the year.

Unilever

One of the sustainable energy innovations at Unilever South Africa is its use of husk from its oil press as an alternative fuel for its boilers. Unilever South Africa has an oil mill and refinery on the site of its margarine manufacturing facility in Boksburg. One of the waste products from the oil mill is the oil seed husks, which remain after the seeds have been pressed, and the oil is extracted for use in the factory. These husks were identified by Unilever as a constant and accessible alternate fuel source for the

factory's coal-fired boilers. By supplementing some of the factory's coal requirements with these waste husks, Unilever lessens the environmental impact caused by its generation of steam. Over 14 000 tonnes of the husks are produced annually and with the calorific value of 11.6GJ/tonne this resources provides an equivalent of over 45 000MWh energy for the Unilever boilers.

Unilever is a global manufacturer and distributor of FMCG products. Due to the nature of its business, Unilever is required to transport hundreds of different products from a handful of large factories to the thousands of wholesale and retail customers that serve our millions of consumers across the country on a daily basis. The complexity of this distribution requirement provides opportunities to optimise the efficiency in which Unilever uses the networks especially in terms of transport energy and its climate change impacts. An independent study has shown that the Carbon Footprint of the distribution network is bigger than the combined footprint of all of Unilever's South African factories. Unilever South Africa is currently re-engineering the entire distribution model from scratch and has set itself ambitious optimisation targets. By consolidating and designing new, world class distribution centres and then modelling the network around the business needs, Unilever South Africa should reduce its distribution-related energy consumption and Carbon Footprint by as much as 23%. Within the next year, Unilever will be the proud owner of a world class distribution network and will definitely be a class leader within South Africa.

Xstrata-Merafe PSV

Xstrata has signed the Energy Efficiency Accord with the DME to be more energy effective. Xstrata-Merafe PSV invested R2.4 billion in projects Lion (phase 1) and project Bokamoso to save approximately 12.7% on energy consumption. These investments were done to meet obligations to the Energy Efficiency Accord and were done prior to the reference period (Oct 2006 to Sep 2007) suggested for the proposed national Energy Conservation Scheme (ECS). This made the Xstrata-Merafe PSV by far the most energy efficient ferrochrome producer in the world currently. If these investments were made after the baseline was determined it would have enabled the PSV to operate at full load within the 90% energy allocation by the proposed ECS. Xstrata and Merafe are listed companies and are regularly audited. The improved efficiencies from these two projects can therefore easily be verified.

Additional savings to these initiatives on energy consumption can only be achieved through very intensive capital investments. The PSV is currently investigating an investment of R5.7 billion for the second phase of project Lion that will improve the energy efficiency of the group by another 7.2%. This will however only be possible if Eskom approves the additional 125 MVA that the PSV applied for.

Xstrata Alloys has proprietary rights to the process technology at Lion which is by far more energy efficient than any other furnace technology currently available in the industry. The Lion furnaces consume 2.2 to 2.5 MWh per tonne as opposed to 3.5 to 3.8 MWh per tonne of the other most energy efficient technologies currently available in the market (similar to the Boshhoek and Bokamoso technology). At full production capacity of 330,000 tonnes of ferrochrome per annum a total saving of

(330,000 tonne x 1,300 kWh per tonne) 429,000,000 kWh per annum is achieved within the Xstrata Alloys group.

The Bokamoso project was completely funded by the PSV and was implemented at Wonderkop. This initiative has enabled the PSV to run their furnaces more efficiently, thereby reducing energy consumption at the Wonderkop and Rustenburg furnaces from 4.3 to 4.6 MWh per tonne to 3.5 to 3.8 MWh per tonne on a total production of 565,217 tonnes of ferrochrome. Therefore a total saving of (565,217 tonne x 800 kWh / tonne = 452,173,600 kWh per annum) in the Xstrata Alloys group is being achieved.

The Chemical & Allied Industry Association (CAIA)

The Chemical and Allied Industry's Association (CAIA) promotes energy efficiency through implementation of its Responsible Care initiative. The Responsible Care initiative is a global initiative of the chemical industry and is managed in South Africa by CAIA. The initiative promotes the achievement of ongoing improvements in sustainability in the chemical industry. In respect of energy efficiency, companies provide an annual set of data to the association for an annual report on progress in various areas of sustainability. In respect of energy use, consumption of electricity and production data are used to determine the electricity intensity at company level.

Energy use has been collected since 2003. This data has been used to determine the improvement in energy efficiency from 2003 to 2007. A 12.5% improvement in energy intensity has been achieved from 2003 to 2007.

In addition, CAIA has encouraged participation in the National Cleaner Production Centre energy efficiency initiative, which supports energy efficiency audits in companies in order to identify opportunities for energy efficiency investment either through operation changes or investment in energy efficient equipment.

8. CONCLUSIONS AND RECOMMENDATIONS

As an overall conclusion, the study revealed that the Accord was instrumental in, or played a facilitating role with regard to Energy Efficiency projects which were undertaken by the Accord Members. As the Accord convening entity, the Energy Efficiency Technical Committee (EETC) played a key role in the Accord's activities and through its facilitation role, the Accord Members could effectively communicate and exchange ideas and views. The study shows that the Accord played a key role in the signatories' readiness to meet the electricity supply challenges during the first part of 2008 and is still coping with these challenges. The specific conclusions and recommendations are as follows:

1. *Gains made by the Accord in energy efficiency should be considered in revised Accord and aligned with Government policies*

Although difficult to measure in all cases, significant gains have been made by the Accord signatories in terms of energy management, energy savings, energy intensity improvements and energy efficiency investments which need to be recognised and built on.

The revision of the Accord commitments should ensure that energy efficiency gains made are properly acknowledged and aligned with Government policies (e.g. the Long-Term Mitigation Scenarios of DEAT) and initiatives dealing with current energy security challenge (e.g. proposed Power Conservation Programme, Energy Efficiency and Demand-Side Management Fund, supply-side costs, etc).

2. *Sectoral dynamics should be considered in measurement and verification system adopted in revised Accord in order to reduce measurement complexities.*

The assessment has shown that sector dynamics in terms of energy use are different making energy efficiency determination more complicated in some sectors than in others. Operating environments in some sectors like mining keep on changing thus requiring a need for adjusted baselines.

A sectoral approach could be used in measuring and verifying (M&V) energy efficiency in order to incorporate sector dynamics. Changes in operating environment should be taken into consideration in M & V. Activities cutting across sectors like lighting, pumping, heating, cooling, ventilation, compressed air management, variable speed drives, efficient motors, etc, could also be used with sectoral dynamics taken into consideration.

3. Energy efficiency targets for the Accord should be energy-intensity oriented with intermediary timelines to accommodate company expansion and regular monitoring.

Although many gains have been achieved in the electricity savings, very little could be accounted for in the other energy sources. The focus of the Energy Efficiency Target has been too (1) end-point (2015) oriented with no agreed intermediary Targets and, (2) one-energy source oriented (mainly on Electricity) with little gains in other fuels accounted for. The assessment shows that some companies are even more dependent on other energy sources than electricity but much attention has not been paid to energy savings from those other sources.

Clearer targets need to be set for Short-, Medium- & Long-Term goals of the Accord and these should be broadened to cover all other energy sources. Targets need to be energy-intensity oriented instead of absolute consumption in order to accommodate company expansion and ultimately promote economic growth.

4. Commitments on clear periodic communication of best practices should be made by both business and government to create more awareness.

Many best practice learnings from the Accord signatories have emerged and promoted amongst the Accord signatories but these have not been properly articulated and effectively communicated beyond the Accord.

A revised Accord should include commitments of clear periodic communication of best practices and achieved energy efficiency data in demonstration of energy efficiency championship.

5. Commitments should be made on the level of monitoring system required for effective measurement and verification of energy efficiency improvements based on agreed baseline and BAU projections.

The assessment study has evolved an initial wealth of database on signatories' energy consumption and efforts on energy efficiency. Confidentiality on this information should be continued to be secured to encourage more companies to provide more quality information to enrich the database for monitoring and planning. However, the current Accord has not enforced the installation of a monitoring system at significant levels for specified activities for Measurement and Verification. The lack of adequate information on Baseline Determination and difficulties with Business-As-Usual (BAU) Projections resulted in poor quality of information provided by the companies in the quantitative survey.

A revised Accord should make commitments to measure and verify energy efficiency improvements based on sound installed monitoring system. Realistic Baseline Determination based on available information would have to be agreed to and systems should be developed for BAU Projections.

6. *Periodic common reporting system should be essential in the revised Accord commitments.*

Although most of the Accord signatories found the information requirement in the quantitative survey too onerous, some have found the questionnaire a useful starting point for reporting on their energy efficiency commitments. However, the current Accord does not have a common reporting system in place as committed in the Accord and no periodic reporting has been required besides this assessment study. Thus very scanty quantitative reports evolved in this study.

A revised Accord should make commitments to develop and enforce a periodic common reporting system which is simple and verifiable based on sound installed monitoring system.

7. *Clearer, verifiable and well-resourced commitments to skills and training development are needed in revised Accord to ensure effective energy management.*

Although the Accord committed to Skills & Training Development, not much occurred in any significant way as committed by both Government & Business. This is one area where the Accord can be said to have failed both on the part of Business and Government. It is only going to be possible for Government to regulate how many approved energy managers would be required at any production or service delivery site depending on the level of energy consumption if Government puts in place the required resources for training the required number of energy managers with the required competence.

The revised Accord should identify key skills and training gaps in energy management at all levels and make clear, verifiable and well-resourced commitments to develop required skills and training to deliver energy management systems required for reaching targets agreed to.

8. *An Action-oriented government commitment on support for incentives, technology development and transfer and CDM projects facilitation as well as regular progress review are imperative for a revised Accord*

Another area of failure of this Accord is in the area of Government support for the Accord. The commitment made by Government by way of involvement and support for incentives, technology transfer and CDM projects facilitation never materialised in any significant way in the

implementation of the Accord. As shown from the review of the Accord commitments and the stakeholder perspectives, there was very limited high level Government involvement in the Accord and key departments were ignorant of the existence of the Accord. Government has not helped in streamlining the approval of projects by the Eskom Energy Efficiency and Demand-Side Management (EEDSM) Fund and the EEDSM funding level has remained low while supply costs have escalated. Thus EEDSM projects have unacceptably long payback periods which make the projects unattractive for investments. An important agency of Government, NERSA, which approves and oversees the EEDSM fund does not participate in the Accord, thus making such an important agency unaware of the problems with the fund. Government has also not helped in CDM projects facilitation in partnering with other governments in industrialized countries regarding technology transfer using CDM.

A revised Accord should make explicit Government's commitments in an action-oriented way regarding support for incentives, technology transfer and CDM by specifying the institutions required, timing, level of involvement, etc.

9. Commitments should be made on resources required for implementing and monitoring all the revised Accord's commitment.

The main and most profound outcome of the Accord is the Energy Efficiency Technical Committee. This could be seen as the mainstay of the Accord in that it has allowed interaction within the Accord Signatory group and the sharing of best practices which have effectively helped in promoting energy efficiency. The NBI has provided dedicated technical and process support to the EETC, funded through a three year investment and financed by its voluntary membership fees. Following this catalytic input, it will be important to identify adequate resources to sustain the work of the EETC.

A revised Accord should clarify what resources would be required for implementing all the commitments made. These should aim at gradual transition to a more formalised institutional structure. The NBI has demonstrated commitment and support to facilitate such a transition and to ensure proper institutionalisation of the energy efficiency effort. Future management of the Accord in terms of monitoring and verification methodology and reporting systems would require more resources for which Government and donor support would be of great help. More resources would be required for sound data collection and modeling to support effective planning and investment decisions by both the private and public sectors.

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ACRONYMS

BAU	Business-As-Usual
CDM	Clean Development Mechanism
CAIA	Chemical and Allied Industry Association
DME	Department of Minerals and Energy
DEAT	Department of Environment and Tourism
EETC	Energy Efficiency Technical Committee
EEDSM	Energy Efficiency and Demand-Side Measurement
NEEA	National Energy Efficiency Agency
NEES	National Energy Efficiency Strategy
NERSA	National Energy Regulator of South Africa
NERT	National Energy Recovery Team
PCP	Eskom's Power Conservation Programme
PPC	Pretoria Portland Cement Company Ltd
RBCT	Richards Bay Coal Terminal Company Ltd