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**NATIONAL ENERGY EFFICIENCY
IMPROVEMENT PROGRAMME
(NEEP)**

WORKSHOP

NYANGA, DECEMBER 16 - 17, 1993

VOLUME 2.

THE WORKING PAPERS

(Ministry of Transport & Energy/World Bank)



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I. ACKNOWLEDGEMENT

These working papers are a result of a two-day symposium on "National Energy Efficiency Improvement Programme (NEEIP)", held at Nyanga, 16-17 December 1993. A host of experts in the energy and related fields participated: energy economists and planners, farmers, energy scientists, engineers, donors, industrialists, policy makers, bankers, financial analysts and academics.

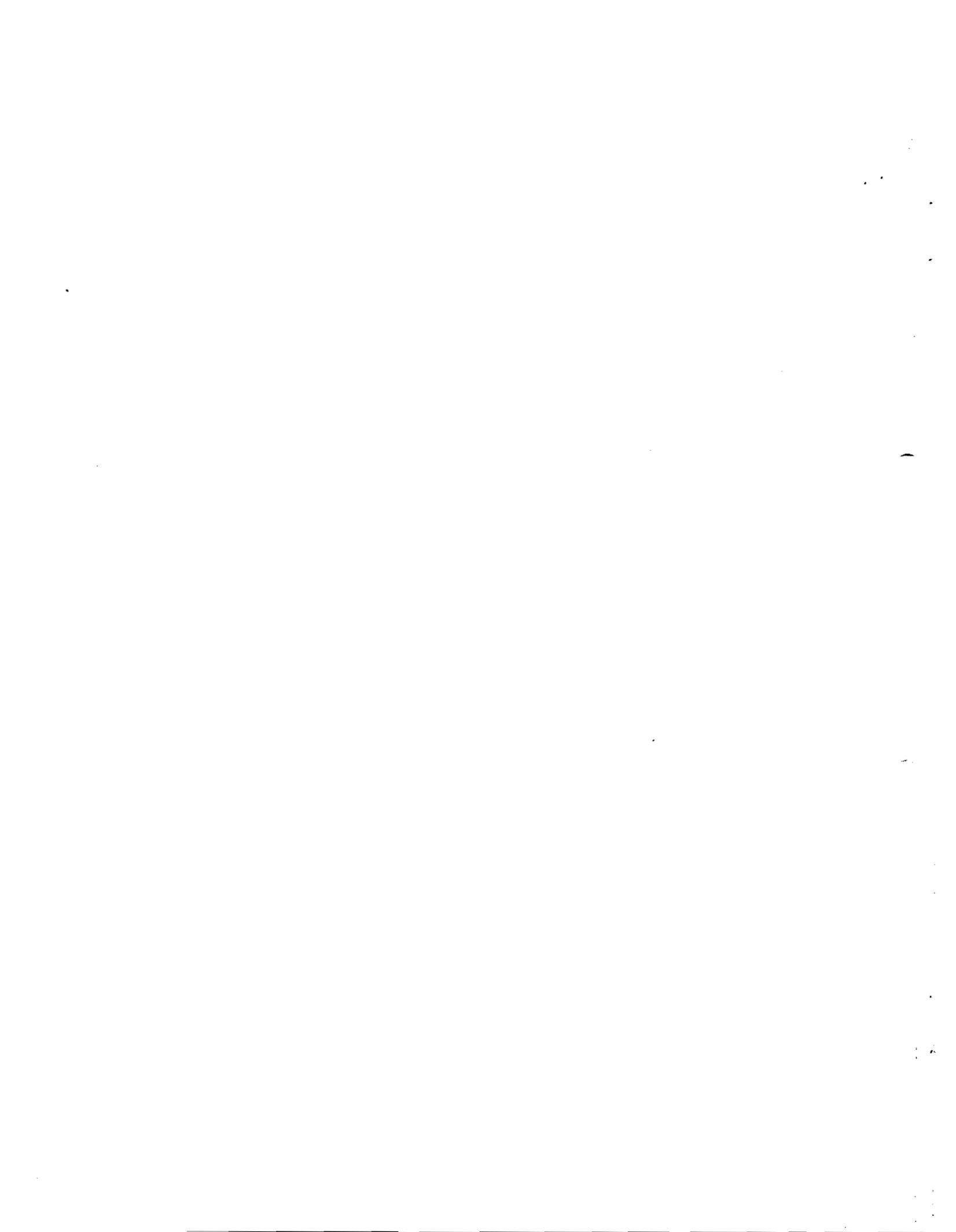
Particular thanks are due to the World Bank which sponsored the workshop, SIDA who provided funding through the Bank and the Department of Energy Resources and Development (DOERD) within the Ministry of Transport and Energy (MOT & E), which organized the symposium. We are specially indebted to those persons who authored session papers: J. Moyo, C.T. Mzezewa, K.F. Schenk, S. Brushett, A. Gilchrist, R. Spencer, D.D. Madzikanda, R.H.A. Williams, G.T. Rushwaya, J.J. Mangono, M. Nyambuya. C. Murove (DOERD) did the painstaking job of pre-workshop organization. The workshop was steered well on course by the able chairmanship of J. Moyo. The rapporteur of the workshop was G. Mandishona, who freely edited the session papers. Any errors or omissions are regretted.

Special thanks are extended to all participants whose deliberations and comments were occasionally caustic, often critical, but always stimulating. The Report is compiled in two volumes:

Vol. 1: Summary of Proceedings

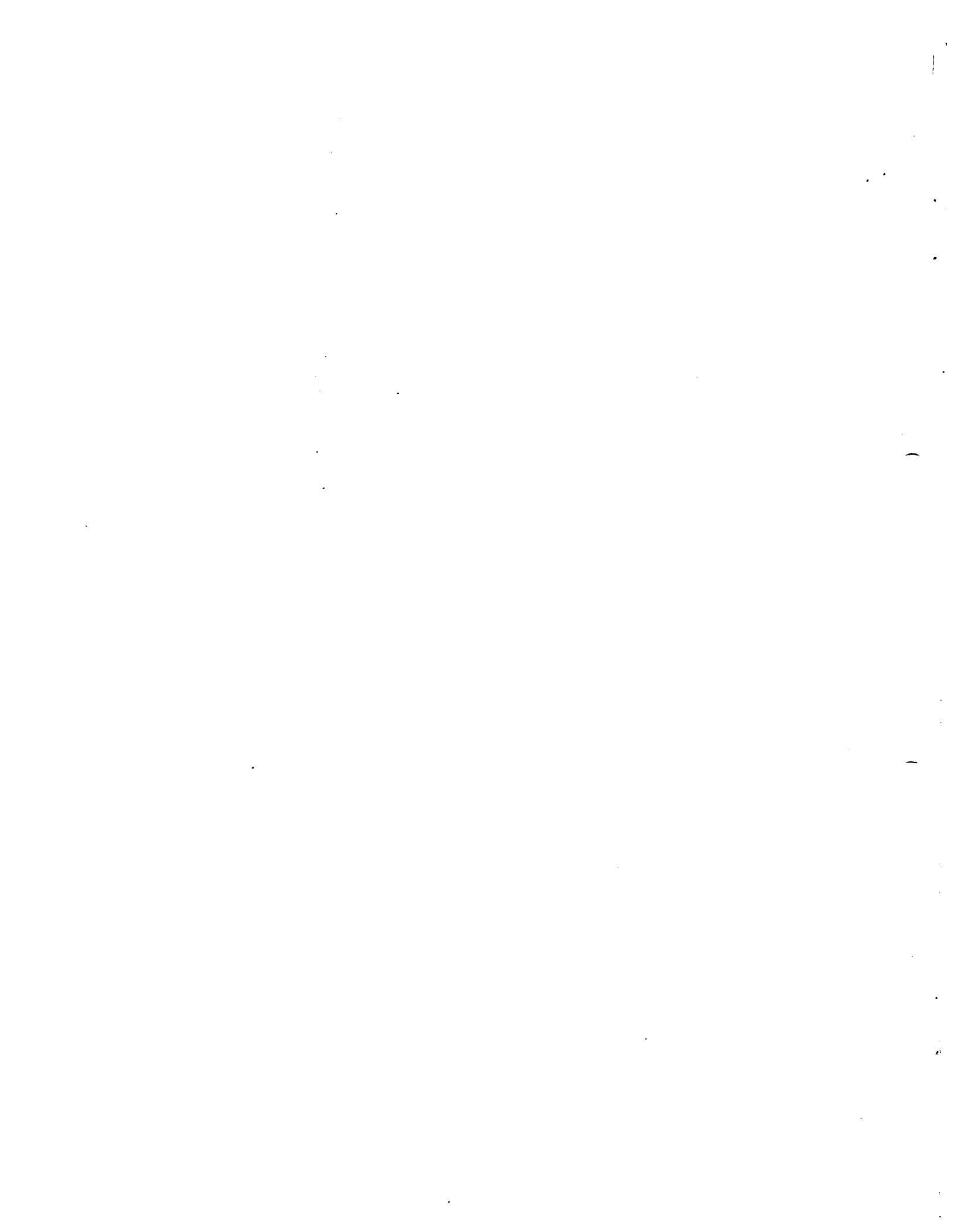
Vol. 2: The Working Papers.

..... G. Mandishona.
(Rapporteur)
January 1, 1994



II. LIST OF ACRONYMS

1. ADB: African Development Bank.
2. BUN: Biomass Users Network.
3. CCZ: Consumer Council of Zimbabwe.
4. CIDA: Canadian International Development Agency.
5. DOERD: Department of Energy Resources and Development.
6. DSM: Demand Side Management.
7. ESAP: Economic and Structural Adjustment Programme.
8. ESMAP: Energy Sector Management Assistance Programme.
9. ETSU: Energy Technical Support Unit.
10. GEF: Global Environmental Facility.
11. MOT & E: Ministry of Transport and Energy.
12. NEEIP: National Energy Efficiency Improvement Programme.
13. NOCZIM: National Oil Company of Zimbabwe.
14. NRSE: New and Renewable Sources of Energy.
15. R & D: Research and Development.
16. SAZ: Standards Association of Zimbabwe.
17. SIDA: Swedish International Development Agency.
18. SIRDC: Scientific and Industrial Research and Development Centre.
19. TQM: Total Quality Management.
20. UNDP: United Nations Development Programme.
21. ZABO: Zimbabwe Association of Business Organizations.
22. ZEEP: Zimbabwe Energy Efficiency Project.
23. ZESA: Zimbabwe Electricity Supply Authority.



III. INTRODUCTION

The Ministry of Transport and Energy, in collaboration with The World Bank, jointly resolved to hold a workshop to discuss the objectives, aims and goals of the National Energy Efficiency Improvement Programme (NEEIP), taking into consideration the modes of its implementation. The NEEIP is expected to focus on all sectors of the Zimbabwean economy.

The workshop objectives were to develop:

- a strategic framework for the NEEIP.
- institutional guidelines and mechanism for ensuring effective implementation of the programme.
- strengthening of the institutional capacity to identify strategic issues in the energy sector.
- integration of energy efficiency activities into policy formulation.
- ability to formulate present and future viable integrated energy strategies.

Participants to the workshop were drawn from a multiplicity of disciplines: energy engineers, economists, farmers, industrialists and energy consumers. The findings of the workshop were expected to include observations on energy use in Zimbabwe, identification of major actors and Government structures related to energy efficiency. The symposium further deliberated on generic types of energy efficiency improvement programmes undertaken world-wide and some models to implement them.

The overall objective of the workshop was to arrive at a consensus as to what will work vis-a-vis, energy efficiency programmes. It was not the intention of the workshop to impose recommendations on the best approaches, but rather to provide a platform for free debate whereby participants thought through key issues.

IV. OPENING SESSION

A. OPENING REMARKS: J. MOYO, PERMANENT SECRETARY, MINISTRY OF TRANSPORT AND ENERGY

NATIONAL ENERGY EFFICIENCY IMPROVEMENT PROGRAMME

The Honourable Minister and Distinguished guests. The aim of this Workshop, Ladies and Gentlemen, is to establish a strategic framework for efficient use of energy. The framework will encompass all energy sectors such as electricity, coal, liquid fuel and biomass. At this workshop, we hope to come up with policies and strategies that would act as guidelines to efficient utilisation of energy.

We are also going to discuss how these policies and strategies could be implemented. There are a number of models that can be adopted, which include agency based information programme, grant-based programme, utility-based demand side management (DSM) programme, stimulation of supply industry, contract energy management or regulation/standards. It is the onus of this workshop to determine which programme model is the best for Zimbabwe. Donors and financial institutions should also play a major role since the implementation has to start off with initial capital.

Ladies and Gentlemen, there are also a number of energy efficiency initiatives that are already under-way e.g. the ZEEP and the SADC. These activities should also fall under the framework that we are going to formulate at this NEEIP workshop. It should also be noted that some programmes have worked well in other countries but this does not necessarily mean that they should follow suite in Zimbabwe. So I encourage you to consider all the necessary aspects of Zimbabwe when formulating the policies and strategies. Remember this framework that we are going to establish at the workshop shall also cater for future programmes.

Thank you.

**B. OFFICIAL OPENING SPEECH: THE HON. D. NORMAN,
MINISTER OF TRANSPORT AND ENERGY**

NATIONAL ENERGY EFFICIENCY IMPROVEMENT PROGRAMME

Mr. Chairman, Distinguished delegates, Ladies and Gentlemen. It is a great pleasure for me to be availed this opportunity of officially opening this important workshop, on the National Energy Efficiency Improvement Programme. May I take this opportunity to extend to you all a warm welcome to this workshop.

Mr. Chairman, there is a growing appreciation of the role that improvements in energy efficiency can play, in bridging the gap between the energy supply and demand. At the same time, there is an increasing realisation that these improvements are not penetrating society as rapidly as they should. Attention is therefore being turned to the factors that determine the implementation, acceptance and spread of these improvements.

Ladies and Gentlemen, energy consumption is shaped by the behaviour of a number of factors at various levels, including: energy consumers, end-use equipment manufacturers, power utilities, local/financial institutions, Government and funding/aid agencies of International and Multinational organisations. To achieve improvements in the efficiency of energy use, action is required at one or more levels from the lowest level of the consumer through to the highest level of global agencies.

Mr. Chairman, as you are aware, energy literally fuels the global economy, securing us a steady flow of goods and services. Without energy, prosperity would cease and economic development would come to a grinding halt. Energy helps growth and refrigerates our food, pumps our water, removes our wastes, mines our minerals, manufactures and transports our goods, and gives us incredible mobility world-wide.

It should be noted, however, that these manifold services come at a price. Energy is expensive, consumes enormous sums of capital and is one of the major causes of damage to health and environment. The 1973 Arab oil embargo and subsequent oil disruptions raised serious global security concerns. These issues of cost, environmental damage, and energy insecurity are specially troubling for developing countries, like Zimbabwe, which are debt-strapped and face acute shortage of capital. In an effort, therefore, to minimize these soaring costs and risks, there is need to supply energy services that are more efficient, lower in cost, and safer.

Scientific advancement and technological innovations have produced a steady flow of more efficient and less polluting commercial products and services. These range from highly efficient gas turbines and pollution trapping equipment on the supply side, to a several-fold increase in the energy efficiency of end-use devices like lights, electric appliances, buildings, windows, vehicles, electric motors, and office as well as manufacturing equipment. The resource pool of cost-effective energy-saving options continues to grow, and the technical innovations show no sign of slowing. This is profoundly good news, because it offers a sound means of satisfying a substantial fraction of rapid growth in demand for energy services expected in the coming decades.

Mr. Chairman, a common feature of a successful energy efficiency programme, in a country like ours is Government commitment, and my Ministry has already embarked on such an initiative. Empowering the implementing agency with the legislative, administrative and long-term funding authority, needed to design and implement effective energy efficiency programmes is vital. Energy users must understand that energy efficiency is an important national priority. My Ministry is also aware of the need for Government not only to endorse energy efficiency practices at the highest level, but also to set the example by improving the efficiency of its own buildings and enterprises. In this regard, Mr. Chairman, my Ministry has embarked on a nation-wide lighting audit of major Government buildings and enterprises, beginning with Kaguvi Building where my Ministry is housed, to prove the case for demand side management.

Mr Chairman, commitment to energy efficiency programmes must exist on the donor side as well. A programme without continuity of support in terms of funding will not succeed. According to conventional approach to energy followed by financial institutions, the purpose of the energy system is to increase energy consumption, that means, increasing the energy supply. Efficiency improvements, which serve to reduce the supplies are therefore automatically ignored. I urge all financial institutions represented at this workshop to place more emphasis in future on energy efficiency improvements, on the list of options for providing services and pursuing least-cost planning.

Ladies and Gentlemen, the formulation of energy efficiency programmes require technical and managerial skills of a higher order, which are in extremely short supply within my Ministry. My Ministry will endeavour to tackle this problem through the implementation of extensive and intensive training programmes.

In conclusion, Mr. Chairman, I would like to re-emphasize the point that efforts to promote energy efficiency programmes, should not stop at paper studies or energy audits of individual facilities. There is need for an overall strategy for inducing, persuading, mandating, financing, or otherwise managing the implementation of the study and audit recommendations. The effectiveness of efficiency investments should be analysed with respect to energy savings achieved, and the cost per unit of energy saved so that mistakes are not perpetuated, and the cost of savings can be compared to the cost of providing additional supply.

Mr. Chairman, Ladies and Gentlemen, I would like, on behalf of the Government of Zimbabwe, to express my thanks and gratitude to the Energy Sector Management Assistance Programme (ESMAP), and all those who have made the organisation of this workshop possible. I wish you all a good stay and successful deliberations in your workshop. Ladies and Gentlemen, with these remarks, I declare the workshop on the National Energy Efficiency Improvement Programme officially open.

Thank you.

V. THE WORKING PAPERS

A. DOERD POSITION PAPER: C.T. MZEZEWA (DIRECTOR, DOERD).

NATIONAL ENERGY EFFICIENCY IMPROVEMENT PROGRAMME

1. ZIMBABWE'S ENERGY RESOURCE BASE

1.1 Zimbabwe's energy resources base is made up of vast quantities of coal reserves estimated at 10.6 billion tons in situ of which 2 billion tons is mineable. The only meaningful hydropotential is on the Zambezi river and it is estimated that a potential of 39 TWh per annum can be realised.

1.2 It is also estimated that the country can produce on a sustainable basis 13 million tons per annum of fuelwood.

The country has very high solar radiation averaging 3 000 hours/year of sunshine or 20MJ/m²/day. Wind speeds are generally low averaging 3m/S, which is considered too low for wind-based power generation but moderate for water pumping applications. Zimbabwe imports all its petroleum fuel requirements. The search for hydrocarbon deposits in the Zambezi Valley revealed only a limited chance for perhaps natural gas.

1.3 The potential for geothermal has not yet been evaluated. There has also been reports of uranium findings. Coalbed methane findings have been reported in the Hwange area and South Eastern lowveld (Chiredzi).

2. ENERGY UTILIZATION

2.1 The latest (1991) energy balance for Zimbabwe shows that the main sources of energy used in the country comprise of coal, electricity, fuelwood, petroleum fuels, making a total national consumption of 261 000 TJ.

2.2 The consumption patterns for the various fuels are worthy to note.

Some of the salient points are:-

- 2.3 The contribution of solar energy to the total national energy consumption is negligible in spite of the high radiation levels.
- 2.4 The contribution of coal especially to the domestic sector (1.2%) is also negligible .
- 2.5 In spite of the high levels of investment and foreign currency requirements, petroleum fuels and electricity only benefit a disproportionately small percentage of the population. For example only 13-16% of the population has access to electricity for domestic use.

3. GOVERNMENT ENERGY POLICY

Overall objectives of the energy policy centre around the following:

- 3.1 Ensuring adequate, secure, reliable and safe supplies of energy to all sectors of the economy at least cost, and consistent with economic growth and equity objectives of the Government.
- 3.2 Efficient utilization of all energy resources including inter-fuel substitution, more particularly of imported fuels.
- 3.3 Utilization of indigenous energy resources such as coal, hydro-electricity and biomass to enhance national self sufficiency in energy supply.
- 3.4 Research, development and promotion of new, renewable and environmentally friendly energy technologies.
- 3.5 Plan in an integrated manner the optimal mix of energy supply through appropriate energy policies and pricing signals.
- 3.6 Facilitate regional and crossborder cooperation in the production and supply of energy where it is economic and strategic to do so.

- 3.7 Encourage and promote the establishment of manufacturing and trading organizations in the energy sector.

4. *ENERGY EFFICIENCY*

- 4.1 The efficient utilization of all forms of energy is one of the pillars of the energy policy cited above.

The economic structural adjustment programme brings into sharp focus *the need not only to supply adequate energy to meet the anticipated economic growth, but also to reduce the energy costs of production so that our goods can compete on the international market. Environmental requirements also call on us to reduce carbon dioxide emissions into the atmosphere as we strive to meet our production targets. This can be achieved in part by ensuring efficient production and utilization of energy.*

- 4.2 The Department of Energy is doing some work into the diffusion of efficient wood burning stoves in rural areas.

The commercial sector is also receiving increasing attention. The main fuels in this sector in Zimbabwe are electricity, petroleum fuels and coal. Biomass is little used.

- 4.3 Many of you will be aware of the devastating drought in our region whose consequences are still playing havoc with our economies. To us in Zimbabwe the adverse effects were felt across the whole economy including the electrical energy supply system. Hydro-electricity production accounts for about 40% of electrical energy generating capacity in Zimbabwe. Hydro generating capacity has reduced to a level where the country was placed in a serious electricity energy supply deficit situation. We had to resort to a power curtailment programme which meant load shedding for domestic consumers in order to make power available to the productive sector. The productive sector itself was also subject to power rationing through a quota system where, depending on the tariff category, a consumer had his supply reduced by between 20% and 30%.

4.4 The situation resulted in lost revenue to the economy as some industries and mines reduced production although the reduction was also in part due to recession brought about by the drought. What the situation did was to bring *to light the fact that there are inefficiencies in terms of electrical energy use as some companies changed management habits and were able to meet production targets within their reduced quotas*. The situation also brought into sharper focus the need for us to accelerate programmes in the area of energy efficiency and conservation in order to capture the potential energy savings so evident in the economy.

4.5 Earlier, the SADC pilot project on industrial energy conservation under which 20 audits were undertaken in Zimbabwe had demonstrated potential for energy efficiency improvements of the magnitude of 15% to 25%. Some of these energy savings could be achieved with little or no investments by the companies.

The case for systematic energy efficiency programmes was therefore strengthened.

4.6 Thus, the Zimbabwe Electrical Energy Efficiency Project known by the Acronym ZEEP took form.

What is ZEEP?

This is an initiative between the Department of Energy and the International Energy Initiative (IEI) which is aimed at developing and implementing a comprehensive electrical energy efficiency programme.

4.7 *What is the Expected Outcome?*

The Zimbabwe Electricity Supply Authority (ZESA) is included as a major player from the onset. It is intended that the ZEEP Programme will evolve into a utility driven demand side management (DSM) programme.

4.8 *ZEEP Programme Organization*

Programme development is phased. The first phase is looking at project design and the action plan consists of priority programmes on efficiency demonstration projects through an energy audit based approach, efficiency projects through a *device based* approach (motors, lights, refrigerators, water heating systems) and training.

Demonstration projects are intended to prove the case for energy efficiency and demand side management.

Use of local consulting capacity is being made to implement project elements.

4.9 To move the programme forward a number of tasks have been identified and hereunder described. There are early action programmes as well as energy efficiency policy studies to be undertaken. The early action programmes reflect the intention of the project to commence implementation and "learn while doing" rather than to attempt to anticipate all the variables that must be managed to create a successful and comprehensive programme.

4.10 The project tasks are as follows:

Task 1 is Project Design and Implementation

Demonstration Sub-Projects (Task 2)

This task involves the design and implementation of electrical energy efficiency improvements in enterprises. We have initiated scoping audits (facility profiles, process descriptions, electric end-use allocation, identification and screening of energy conservation opportunities).

There have been site visits *to six companies* and more scoping audits will be undertaken before selecting three to four companies for detailed auditing and implementation of energy conserving measures. The demonstration sub-projects will input into the training activity which is discussed later.

Task 3 - Analysis: Critical Path Item On The Work Plan.

This task involves the determination of appropriate measures necessary to value both the benefits and cost of energy efficiency investments. This is being referred to as a screening tool.

The screening tool determines the value of demand savings (KW) and energy savings (KWH) that result from the installation of an efficiency measure on a year to year basis. With this information the present value of benefits to

- end-user
- the utility
- the nation (and society as a whole)

can be calculated. This brings to play the possibility of cost-sharing of efficiency investment. In addition, the screening tool will quantify avoided

- transmission
- distribution
- environmental (if appropriate) and
- other costs (risk mitigation).

4.11 This information can then be used to value

- savings to customers (reduction in energy bill versus required investment).
- savings to utility (avoided fuel or energy purchases, avoided generation carrying costs and avoided transmission and distribution costs vs required investment).
- savings to society (avoided fuel or energy purchases, avoided capital outlay (generation/transmission/distribution savings from avoided environmental impact and preservation of foreign exchange vs cost of investment).

4.12 The screening tool is essential for converting audit observations into investment opportunities.

A draft tool has been developed in the form of a spreadsheet containing the parameters and formulae required to make the necessary calculations.

Using project specific data in the spreadsheet the viability indicators quantified as present value of net benefits will be generated. It is also possible to run sensitivity tests which may lead to improvements in project design. The model is not without its problems because of data difficulties. Accurate figures of the LRMC of supply are needed, not just for electricity as a whole, but for each category of consumers, and these will have to be updated as more accurate information becomes available.

4.13 *Task 4 - Training and Public Awareness*

This task involves *increasing the available pool of technical resource persons able to perform audits*, while also increasing the *number of Government and utility professionals* well-versed in electrical energy efficiency methods and the requirements for implementation.

This task will assess *training needs* for ZEEP in

- Energy auditing/energy efficiency among local engineers in consulting, industry, agricultural and commercial/institutional buildings.
- Energy management generally
- DSM (integrated resource or least-cost) planning, resources and skills assessment, quality of training resources currently available in Zimbabwe to deliver the required energy auditing/energy efficiency/energy management DSM training for ZEEP would be assessed. (University, Polytechnics, Private Sector Training Institutions, ZESA, In-house Programmes).
- *Potential Linkages with Other Programmes*
ESMAP
SADC
(in developing and delivering training courses on these subjects).

4.14 The training task will have a short *early action training*

component whose objectives are:

- to provide background information and ZEEP philosophy, and
- brief personnel on the procedures and outputs of typical "energy audits" of the development of demonstration projects.
- to enable interpretation and assessment of energy audits and resulting demonstration projects themselves.
- to provide information on the financial analysis of energy efficiency projects.

4.15 Task 2 is employing the audit based approach whilst tasks 5 - 8 are being referred to as the device based approach and seek to determine programs to capture energy savings (in lighting, water heating, motors and refrigeration).

4.16 *Task 5 - Motor Investigation*

Assessment of the potential impact of improved motors, fans and rewind practices, and of the evaluation of alternative approaches to capture this potential.

Task 6 - Domestic Water Heating Investigation

It has been estimated that water heating constitutes 30% - 50% of the domestic electricity bill. Assessment of the potential of *improved hot water geysers* and/or *replacing these with solar hot water units*, and of the mechanism to realize this potential.

Task 7 - Lighting Investigations

Assessment of the potential of efficient lighting and the methodology to capture the potential. This will involve looking at *improved lighting technologies* and optimal lighting levels.

4.17 *Task 8 - Refrigerator and Freezer Investigation*

Assessment of potential for improvements regarding the end-use devices and ways to capture these improvements.

Under this activity the following elements will have to be addressed:-

- share of energy use
- relative efficiency
- local and foreign supply quantification
- best technologies
- barriers to implementation.

4.18 *Task 9 Independent Power Production (IPP)*

Identification of opportunities for co-generation and possible sale of excess electricity to the national grid.

The activity will review any initiatives in progress and identify barriers.

Potential test cases will be assessed.

4.19 *Task 10 - Decentralized Power Production (DPP)*

In addition to the programs cited above, government has also run jointly with NOCZIM, public awareness programs especially for the petroleum fuels. ZESA has also run the 'Switch-Off-Switches' program aimed at encouraging people to switch off unnecessary lights and other loads.

5. *What Have We Learned From These Programs?*

It is clear from these programmes and work carried out elsewhere that:

- 5.1 *There is a large potential for energy saving in all sectors of the economy.* These savings translate into financial savings for both the consumer and the utility, in either avoided or delayed investments. There are also economic benefits to the nation derived from the saved foreign currency (for power and petroleum fuels, power imports (\$200M,) petroleum fuels, over Z\$1,5 Billion, and avoided carbon emissions).
- 5.2 In spite of the obvious savings cited above and the relatively attractive pay-back period, the adoption of energy conservation projects and practices has not been as wide as would otherwise be desirable.

6. *Barriers to Adoption of Energy Conservation*

Certain barriers were identified which work against adoption of energy efficiency measures and practices:

- 6.1 Lack of information or awareness not only on energy utilisation patterns, but also of the opportunities available.

6.2 *Low Energy Costs*

For some industries, energy is a small component (5% - 10% of their production costs) and especially with hitherto artificially low energy tariffs, there has been little incentive in giving it the desired attention. Energy tariffs are bound to increase to reflect their true economic costs, and will therefore become a significant cost element in the production process.

6.3 *Lack of Forex*

This was identified as a constraint especially during the SADC - CIDA project where companies cited serious foreign currency shortages for equipment that needed to be imported. This seems to be getting less significant, but the shortage or high cost of capital on the local market seems to have taken over.

6.4 *Expensive Material*

Where an energy saving measure has been implemented through a retrofit, sometimes the equipment can be very expensive and so discourage a company from pursuing the option. What can be done to ease the burden of high costs involved in implementing energy conservation programs?

6.5 *Lack of Followup Service*

For any programme to be sustainable, there is a need for sustained and consistent followup. This requires the presence of full-time organisation, not only to keep the interest high, but also to assist where problems are encountered. This brings us to the main objective of our workshop today. What mechanism would be most effective in formulating and implementing energy conservation programmes?

6.6 *Lack of Skilled Manpower*

There is a dearth of energy specialists in our institutions. However, with an intensive training and dedication this problem can be alleviated.

7. *How is Government Geared for Energy Efficiency Programs?*

7.1 The Department of Energy (Ministry of Transport and Energy) is the Government arm in all energy programs. The Department has recently established an energy conservation section whose broad terms of reference are:

- formulate national energy conservation policy and programs to cover all sectors of the economy
- initiate/design and monitor energy conservation programs and projects, including fuel substitution
- design/conduct/coordinate energy efficiency awareness programs, including exhibits
- produce technological efficiency standards in all sections of the economy.

These functions should be seen in the general framework of the role of DOERD as coordinator, facilitator and initiator.

7.2 Other sections of the Department which play complementary roles are:

- energy economics and planning
- energy research and development
- energy administration.

In the SADC - CIDA energy conservation project, an officer from the Department was seconded to the project and devolved all his energies to it. He received valuable training, but the rest of the staff in the Department played a rather peripheral role.

7.3 In the ZEEP programme, an officer is working fulltime on the project, but within DOERD. Other staff within the Department have an opportunity to participate and learn.

These arrangements should be taken into account in considering institutional arrangements for the proposed National Energy Efficiency Improvement Programme.

8. *Conclusions*

8.1 *Large Potential Exists for Energy Saving in Zimbabwe* which would not only reduce the energy costs of production to all sectors of the economy, but would also save the country foreign currency/ and reduce the country's contribution to the emission of greenhouse gases.

8.2 *Barriers have been identified* which militate against adoption of energy conservation practices such as;

- the relatively low costs of energy
- lack of awareness
- absence of an effective programme
- funding.

- 8.3 This workshop should therefore *come up with recommendations* to Government on a *sustainable strategic framework* for an implementable and effective energy conservation improvement programme, which among other things;
- identifies the key players, classifies their respective roles,
 - strengthens and improves the effectiveness of each role player,
 - ensures that the programme is adopted nationwide on a sustainable basis.

B. WORLD BANK: S. BRUSHETT

**NATIONAL ENERGY EFFICIENCY IMPROVEMENT PROGRAMME:
OUTLINE PAPER**

Pleasure to be here and join in part of the deliberations.

Recognise Minister of Transport and Energy, PS for Transport and Energy, guests, ladies and gentlemen.

Bank very happy to be associated with this endeavour through ESMAP. Subject is critical and the level of interest shown in Zimbabwe is encouraging.

Many have asked about future Bank Group support. If GOZ favourable we can start preparation of a Power IV project in 1994 - this is understood on both sides to have a strong energy efficiency focus.

Opportunity to bring together various strands in Bank assistance to power sector over the recent past - lending (principally to Hwange and distribution); reform and commercialisation of ZESA; energy efficiency promotion (through ESMAP); power sector investment planning; reviewing alternative energy sources (GEF).

Strong link to adjustment process to be stressed. Industry in particular needs new investment and technology to compete-retooling in the direction of more energy efficiency has been spurred by competition, but also by rising power tariffs. Key question is nature of support needing to be provided for the transition to be

effected. A good start has been made on plugging the information gap, but more needs to be done. What other support functions have to be fulfilled? Recognise key role ESMAAP assistance has been playing in this regard.

Will follow discussions on this closely. Concern in era of civil service reform, downsizing and redefinition of function that we keep adding bits here and there. Need a lean and mean approach, with perhaps some private sector funding like ZIMTRADE.

**C. WORLD BANK: K.F. SCHENK
NATIONAL ENERGY EFFICIENCY IMPROVEMENT PROGRAMME**

Introduction

1. This short paper reviews briefly the lessons learned from recent years' experience in energy efficiency by the World Bank with reference to identifying those elements in energy efficiency policy and strategy that would assist in achieving a sustainable impact in the promotion of energy efficiency strategy objectives.¹ The Bank's interest in energy efficiency dates back to its earliest loans in the 1950s. Bank policies have clearly evolved in these four decades with various policy instruments added in response to changing circumstances and the evolution of new ideas and concepts. Regarding country policy priorities to improve energy efficiency, the underlying concept that has withstood the test of experience is that decisions should be made within an overall integrated energy strategy which would establish the priority objectives to direct the energy sector towards the most efficient, equitable and sustainable use of resources.
2. The availability of a reliable and diversified energy supply is vital for sustained economic and social development. Since energy permeates the whole economy, the formulation of an integrated energy strategy and policy is the responsibility of Government. For an integrated energy strategy, subsectoral plans and policies must be consistent with economic development objectives. For this, close coordination must be maintained between the various ministries of government.

¹ This short paper is based mainly on two Bank Policy Papers: (i) Energy Efficiency and Conservation in the Developing World, and (ii) The World Bank's Role in the Electric Power Sector, 1993.

3. The World Bank experience in energy efficiency² and conservation activities clearly indicate that to obtain continued benefits, consistent policies must be maintained over the longer term. Without a sustained effort within a well defined strategy to promote energy efficiency at all levels, including technical and managerial, development objectives will inevitably be compromised. It is also clear from the evidence that those countries which have set priorities and have formulated strategies that point the energy sector towards the most efficient, equitable, and environmentally-compatible use of scarce resources, have a comparative advantage over those that do not. This comparative advantage is reflected in increased efficiency and productivity which enhance the competitive position of the country. In Africa in general, the lack of competitiveness has caused a reduction of about 50% of market share to other developing regions since 1970.³

4. Energy efficiency should be the cutting edge of a country's national energy policy and sustainable development and measures to achieve it deserve the highest priority on national agendas. There are several reasons for seeking to improve energy efficiency, of which the following are the most important:
 - Improving economic efficiency and international competitiveness;
 - Enhancing national energy security by reducing dependence on imported energy;
 - Increasing the efficiency with which scarce domestic resources of energy are used;

² The concept of efficiency should be applied to the entire process of producing, managing, delivering and consuming energy. In this process there is a continuum of activities – from investment in energy supply capacity to end-use energy efficiency technology including improvement in management practices.

³ The challenges of African Development, E.V.K. Jaycox, The World Bank, February 1992. Recent analysis indicates that if low-income Africa had only maintained its 1970 market share of non-oil commodities, it would be receiving today an additional US\$9 - 10 billion per year in export revenues - regardless of price fluctuations.

- Conserving finite global energy reserves, and inhibiting future energy price rises;⁴ and
 - Reducing adverse environmental impacts.
5. The cost effectiveness of energy efficiency is well established. There are many cases where the energy consumption per unit of output of 'best practice' technologies is half or less of typically available equipment. In line with this, good management (including management commitment to energy efficiency) is as central to achieving efficiency as it is to managing the whole organization effectively and profitably.⁵ In many cases, the time required to pay back the additional investment in energy savings is often less than two years and is frequently measured in months or weeks.

Critical Factors for performance in Energy Efficiency

6. The lessons learned from the World Bank's experience in developed and developing countries' performance in energy efficiency has highlighted four critical factors that relate directly to differences in the efficiency of energy production and end-use. These are as follows;
- (a) *Energy pricing policies.* The best way to improve energy efficiency is to set prices at levels as close as possible to economic costs, that is, to the long-run costs of additional supplies. Such prices should take into account the environmental side-effects of energy production and use. A sensible and efficient pricing policy is basic to revitalizing the energy sector and development and is a priority item for an effective energy efficiency programme. Prices should thus reflect the total cost of producing/

⁴ This is of global strategic importance. Although developed countries use much more energy than developing countries, it must be kept in mind that an average family in sub-Saharan Africa uses five times more energy as an American or European family to prepare the evening meal. This, however, is the tragic paradox of poverty. It is not energy, but rather poverty which is the limiting factor for the poor.

⁵ Managing and motivating staff to save energy. Energy Efficiency Office. Department of the Environment, UK, 1993.

importing and delivering energy in the absence of subsidies. It is clear from the Bank's experience that subsidies encourage an increase in energy consumption and its inefficient use - the efficient use of energy does not require a subsidy.

- (b) Mechanisms for regulating energy supply enterprises - The essential features for such a regulatory framework are, inter alia:
 - (i) Transparency and openness, with clear and well-defined reform objectives, including tariff policy;
 - (ii) Legal framework that clearly defines the procedures for reducing Government involvement in management of enterprise operation and increasing the autonomy and accountability of energy enterprise directors and managers; and
 - (iii) Accounting for environmental issues.

- (c) *Extent of protection from competition of energy users* - World Bank experience indicates that the efficiency with which energy is consumed is directly related to the existence of private sector firms operating in competitive markets.⁶ Opening to private sector investment increases the likelihood of good commercial practices which raise the technical and managerial efficiency of the enterprise. The evidence shows that many industrial processes in developing countries with protected industries require far more energy per unit of output than do similar industries in more developed countries.⁷

⁶ Privatization - The Lessons from Experience. The World Bank, 1992. Note that in principle, a state-owned enterprise (SOE) should be able to operate as efficiently as a private firm if both play the same game under the same rules. But experience shows that governments find it difficult to level the playing field or to keep it level. The poor performance of SOEs may in many cases be attributed to the fact that governments have (i) awarded SOEs monopoly status in competitive or potentially competitive markets; (ii) provided SOEs with subsidies, cheap loans and loan guarantees and tax and duty exemptions; (iii) have failed to penalize SOEs for unpaid taxes and utility bills; and (iv) have burdened SOEs with noncommercial objectives such as employment creation and regional development.

⁷ For example, steel and ammonia production often require twice as much energy input per unit of output; pulp and paper production often require three times as much.

- (d) *Barriers to the efficient functioning of markets* - The inefficiencies are usually caused by legal, institutional and information barriers. Market imperfections usually include:
- (i) Information gaps on energy efficient technology and process options, the benefits, costs and ways of implementing energy efficiency measures as well as information about financing and joint venture opportunities;
 - (ii) Lack of a consistent, credible, and predictable government track record about policies to encourage energy efficiency;
 - (iii) Lag of consumers' response to price changes, when energy costs represent a small proportion of total costs and/or there is a limited availability of efficiency equipment and/or electricity substitutes;
 - (iv) Consumers' high implicit discount rates for energy efficiency investments; and
 - (v) General availability of energy inefficient appliances, equipment and structures due to the absence of minimum energy efficiency codes and standards and/or a weak institutional capacity to enforce such codes and standards.

Main Elements of Policy for Achieving Energy Efficiency

7. In the formulation of an energy efficiency policy, the Bank supports eight elements of policy that form key requirements for achieving energy efficiency.⁸ They have as common elements the four critical factors mentioned previously. The eight elements are:

⁸ Based on a draft note prepared by Dennis Anderson, The World Bank, November 1993.

- (a) *Economic stability and growth* - This will be the basis for creating an enabling environment that promotes the establishment of a strategic agenda for sustainable development including an efficient utilization of energy resources. In this regard, the challenge of good governance demands that attention be paid to those aspects that are crucial to the effectiveness of a government in achieving development, namely; accountability, transparency, predictability, openness and adherence to the rule of law.
- (b) *Sound pricing policies* - In the demand side, inefficient prices can spawn distortions in consumption patterns that lead to poor investment decisions; and in the supply side, by producing an unbalanced mix of energy fuels.
- (c) *Sound regulatory policies* - Governments have a choice of regulatory options to achieve the objectives of increased efficiency of supply and end-use, control of environment and social impacts and mobilization of financial resources for sector development. The important point is to establish arm's length regulation that is publicly accountable and independent of special interest groups whether they are governmental, industrial or other.
- (d) *Consumer services, on a commercial basis to encourage end-use efficiency*- These programs are essentially required to overcome the barriers to investment resulting from the lack of information and misinformation. They can also provide material that enable end-users to both handle and process information. The main aim of an information program is to encourage end-users to take actions that are in their own economic self-interest and use existing market mechanisms to stimulate the uptake of energy efficient technologies and techniques.⁹

⁹ Energy Efficiency Strategic Framework for Zimbabwe, Draft report by ETSU (Energy Efficiency Support Unit, UK), 14 October 1993.

- (e) *Openness to private investment (to foster market discipline and economic efficiency)* - A major argument for private investments is that private firms which are subject to shareholder scrutiny are more efficient than state-run firms. Another argument for privatisation that is specific to developing countries states that governments in these countries have sometimes used public funds to subsidize consumers by pricing below costs, thus adding to their own losses. The economic benefits of privatization are maximized when governments make improved efficiency the number one goal through using privatization to enhance competition and by ensuring a competitive market that reinforces the benefits of privatization. Maximization of revenues should not be the primary consideration. It is better to eliminate monopoly power and to unleash potentially competitive activities than to maximize revenues from sales into protected markets.¹⁰
- (f) *Addressing and improving rural energy supplies* - Although traditional (i.e., non-commercial - mainly woodfuels) fuels still play a significant role in the energy economy of many developing countries, a fast growth in commercial energy (i.e., petroleum, natural gas, hydro, coal, and geothermal) is required to maintain environmentally sustainable development. The increased use of commercial energy is related to income. The use of commercial fuels and electrical appliances are only possible if the incomes and assets of the lowest income groups grow. Enlightened policies for rural electrification, for the rational use of biomass and other renewable energy resources (such as solar), and for increased use of commercial energy are required.
- (g) *Environmental Policy*- Improving energy efficiency normally produces environmental benefits since less pollution is achieved by the same level of economic output with less energy. The Bank's experience is that

¹⁰ Two main questions are usually posed: (i) will privatized companies tend toward monopolistic behaviour, or are they under some pressures to be more competitive? and (ii) do managers of private sector firms have incentives to make efficiency gains that are a key element in strategies preferring private ownership? Clearly, the main factor likely to increase competitiveness is an increase in the number of firms selling into the same market. Refer to 'Comparative Behaviour of Firms under Public and Private Ownership'. ESMAP Report No. 155/93.

rational environmental policies have the decisive effect on pollution abatement. The use of clean fuels and low polluting technologies offer the best prospects for decoupling energy production and use from environmental pollution.

- (h) *R & D in energy efficient technologies and to formulate and establish priorities* - To encourage improved end-use energy efficiency, enlightened policies for R & D in energy efficiency technologies are required. Both publicly supported R & D as well as private sector R & D involvement are necessary. R & D efforts are commonly required in (i) transportation. (ii) choice of policy instruments. (iii) energy efficient building codes and retrofits, (iv) energy efficiency program dissemination, and (v) financing energy efficiency.

Broad Priorities for Energy Efficiency Programs

8. Taking into account the potential for energy savings, net economic benefits, and probability of successful implementation, broad priorities can be established as guidelines for energy efficiency programs. It is clear that energy efficiency programs must be tailored to the specific country situation taking into account the macroeconomic environment, maturity of the legal and regulatory frameworks and a rational energy sector strategy for the promotion of energy efficiency.¹¹ Nevertheless, in broad outline the following priorities can be established.

- (a) Energy intensive industries - steel, cement, pulp and paper, fertilizer and petroleum refineries;
- (b) Electric power sector - including (i) improvement of plant availability, thermal efficiency, and emission controls of generating plants; (ii) transmission and distribution loss reduction; (iii) improvement of power system operating practices through merit order dispatch and better hydro

¹¹ Experience indicates that roughly 20% (20-80 rule) of the effort (i.e. in an energy savings activity), can lead to 80% of the action (in actual energy savings) - following our good old friend Pareto. As well, experience also indicates that it is not unreasonable to expect at least a 5% reduction of energy use through the device of allocating ownership of energy problems. Refer to footnote 5 above.

resource management; (iv) load management by efficient price signals and tariff structuring to provide incentives for efficiency consumption, and remote control of consumer loads; (v) natural gas development;

- (c) *Large commercial and public buildings* - including (i) energy efficiency building codes for new construction; (ii) audits and retrofits for existing buildings;
- (d) *Transportation* - including (i) traffic management in cities; (ii) vehicle fleet tune-ups and equipment modifications; (iii) fuel quality monitoring; (iv) fuel pricing and taxation policy; (v) taxes and duties on vehicles; (vi) fuel efficiency standards for new vehicles;
- (e) *Electricity end-use efficiency* of lights, pumps, appliances, and water heating in smaller industries, commercial establishments and high income residences thorough; (i) appliance labeling programs, (ii) technical assistance to local manufactures; (iii) technical standards for energy efficiency;
- (f) *Residential building design* - including efficient lighting, water heating and air conditioning systems;
- (g) *Households* - improved fuel efficiency through (i) interfuel substitution, (ii) improved cookstoves, (iii) more efficient lighting systems;

D. ETSU PAPER 1. A. GILCHRIST

This is an outline summary of the ETSU document : "Energy Efficiency Strategic Framework for Zimbabwe." (ETSU, 14 October 1993).

1. ETSU is involved in energy efficiency projects in Africa and in Europe. Steep rises in energy costs and concern for pollution abatement have resulted in increased awareness of energy efficiency. Energy efficiency also implies efficient use of electricity, e.g. in electric motors and meters.

2. So far very little information exists on energy management or on how to measure and monitor energy efficiency. However, there are six basic generic methods for energy efficiency improvement programmes:

(i) Agency-based Information Programmes:

These are marketing, seller-buyer types. They are characterized by a variety of salient elements: distrust, literature/leaflets, advertisements, demonstration/case study programmes.

Advantages are high benefit-to-cost ratio, wide coverage of sector/fuel publicity. They cover a variety of technical and management issues; information is readily available and results are quick to come by.

Disadvantages: no guaranteed action; need for an efficient central focus; some sectors are difficult to deal with in terms of savings; difficult to encourage major investment decisions, e.g. major process change.

(ii) Grant-based Programmes:

Governments have encouraged investment in energy efficiency through grants, low-interest loans and tax reductions. Major objective is to reduce the payback and risk of an investment.

Summary:

- For:
- stimulates equipment/service supply industry
 - can be targeted at specific groups, e.g. low income groups
 - can be targeted at specific measures, e.g. novel technologies and long payback/ high return measures.
 - stimulates equipment supply industry
 - can deliver savings.

Against:- expensive per saving generated.

- costs and savings difficult to predict
- can distort market, leading to long-term uncertainties.
- action not always in users' commercial self-interest.
- does not guarantee optimum use/action
- coverage generally patchy.

(iii) Utility-based Demand Side Management (DSM) Programmes:

- (a) Fuel Substitution Programmes: in multi-fuel usage countries, programmes can be undertaken to promote, say, use of electricity or a rival fuel (e.g. gas). These programmes tend to offer the electricity utility benefits, and are not aimed at reducing the cost of electricity supply, though there are environmental benefits.
- (b) Load Management Programmes: electricity utilities can implement programmes to reduce costs; e.g. power-factor correction, tariff incentives.
- (c) Energy Saving Programmes: these programmes reduce the total cost of electricity supply by undertaking DSM measures that cost less than the cost of new generating plant. Costs are recovered through regulatory mechanisms. Examples can be drawn from:
 - Industrial sector (high efficiency motors, downsizing, audits, waste heat recovery).
 - Commercial sector (energy-efficient buildings, water heating recovery systems, coding/ventilation).
 - Domestic sector (solar water heating, audits, high efficiency appliances).

Advantages:

- reduces need for government intervention
- focus on mass volume products
- can provide quick savings
- can allow measures with low rates of return.

Disadvantages:

- needs substantial - technical and planning resources.
- requires knowledge of energy usage and market
- requires regulated price formula to recoup costs.
- possibility of market distortion.

(iv) Support for Equipment Supply Industry:

Governments can allow companies to write-off costs incurred against tax. Support for R & D gives the possibility of energy savings in the longer term.

Advantages:

- stimulates equipment supply industry
- projects can generate long-term viability

Disadvantages:

- energy savings only in the long term.
- no guarantee of technical/commercial success
- could be expensive compared with savings generated.

(v) Contract Energy Management (CEM)/Energy Service (ES) Company:

Such companies are sub-contracted by a host company to take over responsibility for the operation/management of energy services.

Advantages:

- CEM companies bring expertise to energy efficiency programmes.
- they target utility-type services
- can accommodate long payback.

Disadvantages:

- risky, and needs creation of a new market
- relevant only to industrial, commercial sectors
- savings difficult to establish
- needs a change in host management culture to accept a CEM company.

(vi) Legislation, Regulations and Codes:

These can further the uptake of energy efficiency. The main areas of activity are:

- Industrial and Commercial Processes (processes, emissions, combustion)
- Buildings (insulation standards, temperature control, lighting)
- Equipment Standards (appliances)
- Transport (speed limits, exhaust emissions).

For:

- guarantees energy savings in the long term
- ensures "level" playing field for manufacturers

Against:

- often long term
- difficult to get agreement on standards
- costly to enforce
- limited applicability.

3. Critical Success Factors in National Energy Efficiency Programmes

(i) Policy and Institutional Framework:

There must be a separation of responsibilities between policy formation and setting of programme objectives on the one hand; and design and implementation of programme activities on the other hand.

(ii) Individual Programme Formulation and Implementation:

- meet market needs.
- develop supporting technology and services infrastructure.
- establish formal targets and assessment procedures.
- develop skilled personnel with expertise and motivation.
- ensure provision of independent and authoritative information on energy efficiency programmes.

(iii) Success at Company Level:

- ensure senior management commitment.
- Energy champion: encourage initiatives of highly motivated staff in energy efficiency activities.
- access to information: ensure energy champions have easy access to information.

E. ETSU PAPER 2: R. SPENCER

1. There is a subtle relationship between utility and consumer. In a country like Zimbabwe, energy efficiency efforts should be targeted to rural energy consumers. We need to optimize on what they are using now.
2. Load limiting has been used as a means of conserving energy in the urban areas of Zimbabwe. This is common only in the high density areas. ZESA is gradually moving away from load-limiting to meter-limiting supplies.
3. There is need for energy consumers to have easy access to information generated by DSM programmes. Question is; how do we finance the energy efficiency programme?

F. ZESA PRESENTATION: D.D. MADZIKANDA

NATIONAL ENERGY EFFICIENCY IMPROVEMENT PROGRAMME

1. *INTRODUCTION*

The title of this workshop "NATIONAL ENERGY EFFICIENCY IMPROVEMENT PROGRAMME", could be translated as System Development Plans for the Zimbabwe Electricity Supply Authority. It is a subject that not only involves the end users, but also can be guided by the utility in regard to tariff policies and pricing.

2. *GOALS*

2.1 What are the goals that one wishes to achieve with Energy Efficiency and Demand Side Management within ZIMBABWE?

Some Utilities have set targets for Demand Side Management which they would like to obtain over a period of time. As an example, ONTARIO HYDRO from CANADA 30,000 megawatt system, had set a target of 5,200 megawatts by year 2000. This has since been found to be too excessive in costs and in these times of recession is not required immediately since growth has fallen on its own. This target has since been deferred to 2005 or later. On the other hand, another CANADIAN Utility MANITOBA HYDRO, has set a target of 100 megawatts reduction by the year 2000, for a 5,000 megawatt system, a 2% reduction. What must be considered in ZIMBABWE is what is a reasonable target and will it be cost effective, given the high load factor of the system, 72% annually and as high as 83% on a daily basis. When considering Demand Side Management where the load may be shifted from on-peak to off-peak it must be assessed whether truly there are gains in system operational costs. Here is an example of a typical days load shape on December 8 of this year 1993. The load up to the minimum load is supplied by 200 MW of import and the remainder by thermal power of 573 - 700 MW, up to 773 - 900 MW, from here the remainder of the load is supplied by Kariba Hydraulic energy and any shifting of the load merely results in reallocating the energy from on-peak to off-peak, at the same incremental cost of hydraulic energy and thus no reduction in operational costs. Here is the daily load curve on

the peak day 23rd July 1993, the same conclusion may be drawn for this day, that any shifting of load will have very little effect on operational costs. This is given as an example so we don't go off on the wrong track assuming anything we remove from peak and shift to off peak, has to result in savings in operational costs. On the contrary we should study very carefully what we wish to accomplish.

- 2.2 This is not meant to indicate that nothing can be done to help keep our tariffs down. There are many ways that the growth rate can be reduced by proper conservation programmes such as new building designs, in such areas as air conditioning and heating, lighting, etc., as well as programs to educate the consumers on conservation. A reduction of demand including line loss reduction programmes, the installation of co-generation projects and end-use efficiency schemes can effect the timing of new generation on the system and result in savings to the utility's costs, and the resulting savings to the consumer in tariff increases.
- 2.3 The other side of the equation is the reduction in energy use due to more efficient appliances, motors, power factor correction, etc; which in the final analysis is a function of tariffs regarding the incremental savings vs the incremental investment.

What the Utility must do is provide the consumer a low energy cost, which can be accomplished by proper planning, and in some cases by building new generating stations, and additionally convincing the consumer to conserve. If both are considered together in a cost effective manner, this should be the ultimate goal.

3. ***PRESENT AND FUTURE PLANS OF ELECTRICITY DEMAND & ENERGY***

- 3.1 The installed CAPACITY in 1995 of 1993 MW, will be made up of 927 MW of Thermal, 666 MW of Hydro and 400 MW of Imports.
- 3.2 From 1995 to the year 1998, the only capacity added to the system is 120 MW at the Old Thermal Plants, an additional 31 MW at Hwange and 84 MW at Kariba,

all involving upgrades and refurbishment at existing stations. The remainder of the growth is met by imports, all of which have Firm Agreements in place. The first real opportunity to see any effect of Demand Side Management and Conservation in the plan would be around the year 2000, the time at which Hwange units 7 & 8 are scheduled. The problem, however, becomes one where plant must be committed 5 to 6 years prior to commercial operation, and Batoka Hydro Plant must also be committed to very soon, therefore the time horizon for our Target should be somewhere in the time-frame 2000 to 2003, when Batoka is planned to be commissioned. Such a Target would provide some assistance should there be an unforeseen delay in Batoka.

3.3 Table 2 (overhead) indicates the available energy supplies from Thermal, Hydro and Imports, and it indicates that Energy Supply is not a problem even under drought conditions. Table 3 (overhead) indicates the increase each year in System Load both for Demand and Energy, and one can see that a possible target that might be attainable could be one year's Load Growth, (i.e.) 100 ME and associated energy.

3.4 The target can be assigned a value in today's dollars equal to approximately \$US13.6 million/year or \$ZIM 93.0 million/year, approximately 4.4% of the estimated 1994 ZESA Sales Revenue.

4. *TARIFFS AND THE EFFECT ON LOAD MANAGEMENT*

4.1 In the same way as the Utility attempts to optimize the System losses and provide a Least Cost Expansion Plan through Engineering studies of alternatives, so must the Consumer study the return of installing energy efficient motors, energy efficient lighting, etc, and analyse the overall costs vs the operating costs. This is where the Utilities tariffs appear in the equation. How does the Government, Supplier and the Consumer get together to encourage wise Energy Use? Other Utilities have met this problem with some of the following incentives:

- (a) Customer rebates for installation of Energy Efficient Appliances through subsidies.

(b) Vendor Incentives for the purchase of these appliances.

- 4.2 The rebates in (a), can take the form of a reduction in the Demand Tariff based on a calculated basis of what is already installed at the business vs what could be installed. The energy saving would be a direct saving, since less energy would be consumed and their monthly bill lowered.
- 4.3. Since the Utility depends upon its revenues from tariffs to sustain its operation, and the money is generated from the Demand and Energy meters, the method of and amount of rebates must be properly assessed so as not to ROB PETER TO PAY PAUL, as there will be consumers who cannot make a commitment to such an undertaking. Equally so, Cost of Service Studies and Tariff Pricing must form a large part of the study to properly administer any undertakings.

5. **CONCLUSION**

In conclusion, I am sure many of the points mentioned and many more not covered in this presentation, will be the subject of discussion over the next few days,. I thank you for the opportunity to present this paper on behalf of ZESA's Chief Executive.

G. **ZABO ENERGY TASK FORCE: R.H.A. WILLIAMS.
NATIONAL ENERGY EFFICIENCY IMPROVEMENT PROGRAMME**

1. Firstly this presentation is on behalf of the ZABO Energy Task Force (and not ZABO itself).

At short notice, it is difficult to get quantitative information, and thus this will in the main be qualitative in treatment.

2. I will briefly deal with two basic areas:
- (a) The electrical energy rationing, leading on to;
 - (b) Energy efficiency for industry in the broad sense

The energy rationing that occurred in 1991 and at the beginning of 1992 did have an impact. However, unfortunately the task force has been unable to totally quantify the impact due to other factors that occurred at the time.

3. Several major consumers were affected earlier than the rest with the effective appropriation of their interruptible demand from beginning of April. In the case of union carbide, major maintenance programs were brought forward. However, there was still a further reduction in production which resulted in a loss of production of \$45 million of ferrochrome. The other major consumers also had production drops. In the case of Sable, this may have been a blessing in disguise. Following the previous season's drought, there was a surplus of fertilizer in the system, and the demand in 1992 was lower than normal.
4. Zimbabwe Alloys also brought forward major furnace work, which under normal operations could have been delayed a year or two.

At this time, there was also voluntary action from the private sector to promote and try and encourage energy conservation across the country.

5. At the end of 1992 the impact of the Confederation of Independent States (CIS) dumping affected the ferrochrome producers and further cuts in production were then due to the uncertainty and instability in that arena.

When the energy quotas were introduced in consultation with ZESA, Zimbabwe Alloys and Bindura Nickel rearranged the combined allocation to minimise the impact and keep Bindura Nickel at full production.

6. Similar arrangements were made in other large mining houses, but this still affected operations.
7. Virtually every mine was affected. The reduction in energy curtailed operations and one of the main effects was a shorter working week, affecting employees' earnings. Many gold mines high graded their operations, and whilst this may have given an indication of no effect on the mine as gold output remained normal, the high grading would affect the long term prospects of those mines.

8. Smaller industries were affected in different ways. But the reduction in available energy initiated in many industries the need for trying to identify where wastage was occurring. Small operations banned the use of air conditioners in offices. Those using compressors sorted out air leaks. If there were any positive effects of the national energy shortage, it was to create an awareness for conservation of energy. However, I believe that with the "crisis" going away - Kariba filling and thermals stations having improved operations, the incentive for energy efficiency and conservation may have evaporated. Office lighting continues all night. Maybe only a small percentage of energy is utilised, or lost through this, but it illustrates the faded awareness to conservation and the next step, efficiency.
9. It has been suggested that only when electrical energy plays a role in the input costs of industry, does it get attention. When its input costs are small, 1-2% of input cost, or it is part of overheads, it gets lost and forgotten about. When the next round of tariff increases occur, there is the general complaint, but for many it's really a symbolic protest.
10. Those for whom electricity plays a significant role do not forget, and they try to improve their efficiencies - in many cases if they don't, they may not survive. Therefore, two areas need to be tackled:
 - (a) Educating those for whom the energy impact is small
 - (b) Creating an environment where, for those who both want to and/or need to be more efficient, are encouraged to do so.
11. Let me deal with the latter group first:

Many industries are fighting for survival, be they in the mining, manufacturing or agricultural fields. All have been affected by some or all of:

- high cost of money
- increasing cost of capital resulting from devaluation
- high local inflation
- local and international recession
- drop in international commodity prices

None of this is new to any one here.

12. A large organisation looked at replacing some of its motors for new energy efficient replacements. The payback period - 15 years. The result, the project is scrapped. The organisation just can't afford that sort of investment, and they will continue with the old equipment till a crisis occurs. As these motors were imported they would have incurred high import duties - somewhere in the order of 60%.

Until there is a real reduction in these tariffs, new technology for efficiency will not get off the ground. There has to be an incentive - a real incentive - for these companies to be encouraged to procure efficient equipment.

13. Take those organisations where a major change to the process could have really significant savings and be nationally measurable. Forgive indulgence, but may I return to Union Carbide. To install equipment to have a significant impact on the process and save somewhere in the order of 12% of energy requirements for the same output (on a full operation that's about 1% of that current national usage), would currently cost Z\$300 million, and like the previous example has a payback period that prohibits further investigation, particularly in a survival mode.

It took 12 years (1973 - 1985) for the mature economies of North America to achieve a large improvement of 20%; but they also showed that it is possible.

14. If the incentive, reduction of duties, and educational campaigns could build reasonably rapidly to that sort of figure annually, then there is no reason why although possibly slower but sufficiently sure, improvements in energy efficiency must occur.
15. Can I digress on to what I refer to as a possible incentive? Zimbabwe has one of the highest effective solar hours per annum in the world. A solar boffin advised me we were in fact second after Dubai. There should be encouragement for conventional, and unlagged - and wonderfully inefficient geysers, to be replaced with solar geysers. The imported components are subject to about 60% import duties. If this were reduced they would become more attractive. Then if ZESA were to actually create a separate tariff (and add another meter just for that circuit), but one that actually encouraged a change, the resultant benefits to both ZESA and the solar geyser owner must be an ultimate win-win situation.

16. It has almost become conventional wisdom that the investments in saving energy tend to be lower than the investment to produce and supply it, hence the suggestion of the need for that special and maybe lower tariff.

In the USA the utilities relate subsidies for energy conservation with equivalent generation reduction. This also needs to be addressed in some way here.

17. Earlier, I was generally referring to the big consumers. But what about the small consumer who may have also become energy conscious? He actually pays the high duties and imports a modern energy efficient motor, and has it installed at his operation at a growth point say, Juru. Key time to test - and the motor does not run. It's been saturated. This motor is a 380 volt motor, but as it has now been designed to modern tolerances, it has to operate at 380 volts. On test and no load it draws the rated full load current at 405 volts.

The result to be able to withstand the voltage fluctuations and operate the motor is to rewind to 405 volts in Zimbabwe. Therefore, if there is going to be encouragement to move to high efficiency equipment, ZESA will need to look at the voltage tolerances.

18. There also needs to be some guidance/control on ensuring that suitable equipment is imported.

There is also a need for information. Many industries in Zimbabwe are operating with equipment that was installed many years ago. They need access to information on modern techniques, both for their operations, and how to utilise energy more efficiently. Up-to-date information is not easily or readily accessible in Zimbabwe.

19. And if we ask the question, why the need for energy efficiency? Kariba's improved - the thermals are running, there is no more rationing or regular load shedding - why save energy? Unless there is really a genuine commitment from all participants here to achieve a way of encouraging and educating the users of electrical energy, that they can and must conserve and use this commodity for the ultimate good of Zimbabwe, the NEEIP program will never achieve any goals or improvements.

20. The Guru of the economic recovery and quest for zero manufacturing defects in Japan, Edwards Demming, advocates a win-win relationship between supplier and customer. I sincerely hope that this approach can be followed, so there is a way forward to encourage the business sector to conserve energy, both for their own gain, and in the electrical energy area, ZESA's and thus ultimately a gain for Zimbabwe.

**H. ZIMBABWE PHOSPHATE INDUSTRIES VIEWPOINT:
G.T. RUSHWAYA**

NATIONAL ENERGY EFFICIENCY IMPROVEMENT PROGRAMME

1. I am pleased to share with you this morning the experiences, efforts and results of our energy conservation programme in general, and the measures taken to cut electricity consumption without affecting production during the 1992 Energy Crisis, which came about as a result of the most severe drought in this country, in living memory.
2. Zimphos is a fertilizer and chemical manufacturing company, with fertilizer making 80% of its business, and has 750 employees on its payroll, 35% of whom live on company premises where water and electricity are supplied free.
3. The core of the factory is on an area of 300 000M² with other installations, a distance of up to 1,5km from the factory.
 - 75% of total energy consumption is steam and 25% electricity.
 - Before 1990, the only management system we had was power factor correction and Maximum Demand monitoring.
 - In 1990, an energy audit was carried out by ShawMont, under the general framework of the SADCC Industrial Energy Pilot Project.
 - The audit was fairly extensive and came up with recommendations which would save 60 776 GJ per annum, which is 24,6% of our energy consumption.

4. The recommendations from the energy audit were split into "no cost" and "low cost" measures.

Zimphos undertook to implement the "no cost" and "low cost" measures immediately, and by the end of 1991 all "no cost" measures had been implemented, as well as some of the "low cost" measures. However, some "low cost" measures were postponed because of cashflow problems experienced, as a result of the economic situation prevailing in the country then.

5. Examples of "no cost" measures which were implemented immediately, were repairs to steam leaks, air leaks, switching off of unnecessary lights, and recovery of condensate for re-use in certain areas of the plant.

- Low cost measures included insulation of some previously uninsulated vessels, replacing outdoor lighting with more energy efficient lights, and revamping boiler instrumentation.

6. To implement the energy conservation programme, we assigned one of our Section Engineers the extra responsibility of being Energy Engineer, who would report on a monthly basis the progress and savings achieved. Part of his responsibility was to make a monthly audit and submit his findings to management for action.

7. In early 1992 we forecasted an electricity rationing scheme because of the low water level in Kariba and Kafue Dam in Zambia.

- We were in a very difficult position because with the anticipated good rainy season in 1992/93, we were to run at maximum capacity in order to satisfy the Agricultural Industry's needs on which the economic recovery of the country was so heavily dependent upon.

8. We then went into overdrive on an energy saving campaign.
 - We re-evaluated our energy conservation measures and our energy usage. Recognizing that the plants were going to run at maximum capacity, it was by no means any easy task, because having implemented most of the energy saving measures we had cut our energy usage to the bone.
 - We began by analysing our electricity usage half-hourly going back about a year.
 - The results showed that we were using more electricity between 6:00 p.m. and 10 p.m., and also between 2 a.m. and 6.00 a.m.
 - Though we have several meters in the factory they were not adequate enough to give us all the information we would have desired.

9. We realised that our success was going to be considerably dependent upon the co-operation and involvement of every employee and resident of factory houses and flats.
 - Chaired by the highest authority of the factory, we organised meetings which included representatives from Workers' Committee, Village Committee, and Company Primary School.
 - A wealth of ideas, and various energy saving measures came up.

10. Besides the locking away of office fans and heaters, other measures implemented were:-
 - Switching off of Welding Machines when not in use (which were normally kept running during tea-breaks and lunch-breaks).
 - Switching off of Office Machinery such as Computers (when not in use).
 - Switching on Village Street Lights Between 9.00 p.m. and 5 a.m. (instead of 6.00 p.m. to 6.00 a.m.).
 - Improvement in effluent control i.e. in effluent suppression.
 - Switching off certain machinery in a process or plant when on planned maintenance, or on breakdown which were likely to take more than an hour.

- Immediate repairs to be done to leaking water taps or pipes, both at home and at work, in order to save both water and energy at Municipal Pump Stations.
- General water conservation.

11. The above measures yielded an 11% energy reduction against a calculated 15%.

- I need to emphasize that energy conservation like any fire, has to be added fuel on a continuous basis to keep it burning all the time.

12. We have not stopped looking for more energy conservation measures. We have currently embarked on a TQM programme company-wide. As you might be aware, zero defects is one of the aims of Total Quality.

- We are convinced we are going to get a sizeable amount of energy saving by reducing reworks and eliminating break-downs. (e.g. shaft misalignment and vibration).
- The most important factor of high energy efficiency is of course, the fact that you lower the input cost of your product.
- By increasing plant uptime, you obviously use more energy per given day than previously, but the energy usage per tonne of product comes down.

13. *SUMMARY*

Our success is greatly attributed to:-

- (i) Top Management Commitment, the driving force.
- (ii) The CIDA sponsored SADC Energy Audit, the catalyst.
- (iii) The awareness campaign we carried out at the factory; from top management down to the shopfloor, in particular, that, we encouraged participation by all; resulting in many ideas coming forward.

I. DOERD: ECONOMIST POINT OF VIEW: J.M. MANGONO

SOME ECONOMIC AND NON-ECONOMIC BARRIERS TO ENERGY-EFFICIENT INVESTMENTS WITHIN FIRMS

1. *INTRODUCTION*

- 1.1 Several estimates available to date suggest that Zimbabwe is using a lot more energy than would be the case if attention were paid to energy-efficiency practices and energy-efficient investments. The sectors that have been identified as potential areas for potential electric conservation in Zimbabwe are as follows: Industrial Sector (12% of total consumption), Domestic Sector (7%) and the Commercial Sector (3%). The total reduction in electricity consumption that can be achieved therefore is of the order of 22% of total consumption (World Bank Mission of April 1993). It may be worth observing that many of these potential savings appear to have very high rates of return in comparison to the economy-wide average cost of capital. It is surprising that most of the consumers reject energy saving investments that have rates of return of 30 - 40% or more.
- 1.2 The existence of such sizeable unrealized profits poses both theoretical and policy problems. On the theoretical side, how can we account for such a deviation from standard economic presumption of cost minimization or profit maximization? What characteristics of markets, agents, or of the observations themselves account for the discrepancy? On the policy side, it is natural to ask how government might intervene to improve the situation. The difference between what is and what could be realized suggest that well designed policies to improve energy efficiency might achieve one of the most sought after objectives of economic policy - Pareto improvement with gains for all concerned. Before ambitious policy goals can be set, however, it is necessary to examine the causes for the apparent gap between actual and theoretical performance.

2. *BARRIERS TO PROFITABLE INVESTMENT*

2.1 *Firms do not Behave Like Individuals*

In thinking about why firms may not always behave optimally, it is important to remember that a firm is a collection of individuals, brought together under a complex set of contracts both written and unwritten, but that the firm itself is not an entity acting with a single mind. Economists often talk about "the firm" as though it had its own consciousness, but this is either a (often very useful) theoretical simplification or an example of sloppy thinking. The behaviour of the firm is the outcome of the interplay of the motivations of the individuals comprising it, the rules and conventions governing their interaction, and the environment within which the firm operates. The firm makes choices and decisions, but these are generated through its rules of procedure, rather than being the products of an individuated volition. The top decision makers of the firm exercise a considerable degree of control, but that is not sufficient to transform it into a conscious entity with a unitary will.

Recognizing this possibility has important consequences. The individuals making up a business firm may all be rational seekers after their own interest, but the outcome of their collective action may be suboptimal. The logic of collective action is such that, in general, rational, self-interested individuals will not act to achieve their common or group interests. This principle applies to private sector corporations as well as to government bureaucracies or political collectives. The presence of public goods, externalities, and the clash between individuals' private incentives and the good of the whole all combine to produce outcomes that fall short of what could be obtained if all the resources of the group were deployed by a single guiding intelligence. From a mathematical point of view, it is not possible to maximize for two or more variables at the same time. This was clearly stated by von Neuman and Morgenstern (1947), but the principle is implicit in the theory of differential equations, dating back at least to D'Alembert (1717 - 1783).

2.2 *Failures of Complete Maximization are to be Expected*

Deviations from profit maximizing should not be surprising. Indeed, a long-standing and respected tradition in economic thought holds that business organizations can only approach or approximate profit maximizing behaviour, because of the complexity of the environment they face and limitations on the decision making resources they command. The most famous proponent of this view is Herbet Simon, the Nobel laureate who pioneered the notion that 'satisficing' rather than maximizing is descriptive of how firms actually operate.

According to this paradigm, economic agents resort to satisficing when approximation must replace exactness in reaching a decision. Instead of the profit maximizing first order conditions of the standard economic model, firms employ a variety of expedients in carrying out their activities; several procedures of rather general application and wide use have been discovered that transform intractable decision problems into tractable ones. One procedure is to look for satisfactory choices instead of optimal ones. Another is to replace abstract, global goals with tangible subgoals, whose achievement can be observed and measured. A third is to divide up the decision-making task among many specialists, coordinating their work by means of a structure of communications and authority relations. All these, and others, fit the general rubric of 'bounded rationality,' and it is now clear that the elaborate organizations that human beings have constructed in the modern world to carry out the work of production and government can only be understood as machinery for coping with the limits of man's abilities to comprehend and compute in the face of complexity and uncertainty.

Under this view of the operation of the firm, an understanding of the forces that lead to any particular pattern of behaviour (regarding, say, energy management) could only be obtained by a careful, microlevel examination of the actual decision making processes of the firms themselves. It would be necessary to see, in specific instances, exactly what sort of informational, computational and organizational constraints were faced by the particular firms in order to understand why they did or did not make particular investments.

2.3 Asymmetric information and divergent incentives

The conflict between individual rationality and the optimality of the firm's aggregate behaviour can manifest itself in other, quite distinct, ways. Even without limitations on the ability of individuals to "comprehend and compute" the complex reality they face, institutional or other restrictions on information availability and real differences in underlying interests of the parties can lead to suboptimal results contrary to the formal goals of the organization. A wide variety of circumstances can lead to a failure of the organizations to maximize profits or minimize cost, even though the individual agents are fully rational wealth maximizers.

A major task of organizational design is to induce the managers of a stockholder owned corporation to act in a manner as consistent as possible with the interests of the owners. This manifestation of the principal-agent problem leads to a variety of reasons why profitable investments might not be made.

One frequently cited factor causing underinvestment in energy saving technologies is the alleged shortsightedness of management. This myopia is usually thought of as being manifested in very short payback periods required for energy (and other) investments, or unduly high internal hurdle rates that must be met for investments to be undertaken. Take the case of the U.S.A. firms where recent data shows that the after tax hurdle rate is around 12% and the median payback period is two years. A payback of two years for a project with a 10 year lifetime is equivalent to a post-tax real rate of return of 56%. The question is why such overally stringent investment criteria, despite the fact that the cost of capital faced by the firms is considerably lower than the hurdle rates that projects are required to meet in order to be accepted.

Managerial compensation is often tied to recent performance, and in many corporations, managers are rotated through different jobs every few years. This sort of job turnover may lead managers to prefer projects with short payback periods even if those projects are inferior, in some global profit maximizing sense, to others of longer duration. A manager who only expected to be in a particular job for two or three years would have no personal incentive to promote a project having a more distant payoff (projects with longer gestation periods).

Therefore the manager hopes that if he selects the quick-return project, the stockholders may attribute the extra dollars to his ability and pay him higher wages not only in that period but also in subsequent period, since his pay is based on current and past performance.

2.4 *Problems of Focus and Attention*

Another hypothesis frequently offered to explain the failure of firms to exploit fully the cost saving energy investments available to them is that top management gives low priority to relatively small cost cutting projects such as energy saving ones.

2.5 *Selection Bias in Estimating Investment Returns*

It has been suggested that the optimistic bias results primarily from "myopic euphoria" in which the individuals responsible for preparation of the forecast were simply too involved with the projects to be totally objective.

Optimistic bias can also result from erroneous information provided to forecasting staff members by upper management - the 'pet project' phenomenon.

2.6 *Standard Barriers*

Let me now turn to the standard barriers that are often listed in the literature on energy conservation. I will not discuss these in detail, hoping that these have circulated in the public domain, and therefore will make a cursory reference to them for the sake of completeness.

- (a) lack of information or awareness among consumers, especially about recently available or rapidly evolving energy technologies.
- (b) Uncertainty regarding savings and cost effectiveness, as well as future energy prices.
- (c) lack of capital and resistance to buying equipment with a greater purchase cost.

- (d) Separation of responsibility for making capital investments and paying operating costs (e.g. tenant occupied offices and buildings in city central districts).

3. *Policy Implications*

3.1 In my opening remarks I pointed out the potential savings that can be achieved economy-wide. I would hastily say, indeed such savings are very desirable, but faced with the host of barriers pointed above, what then is the way forward? One such alternative is to increase the participation of Government in a way that is both innovative and courageous. I am sure the representatives of Government here would ask why they should be asked to play a greater role. There are several reasons why this should be the case, some of which are the following;

- (a) Energy efficiency is a proven resource, with substantial opportunities for future gains.
- (b) Many problems (externalities) associated with the production, transportation, and conversion of fuels are not reflected in the retail prices for fuels and electricity.

3.2 These externalities include air, water pollution and dependence on foreign oil supplies. Thus, improved energy efficiency brings many benefits to society in general.

- Market imperfections keep energy consumers from making what would otherwise be economically rational choices. Fuel prices generally do not fully reflect social costs. In addition, they often do not reflect the marginal economic costs (let alone the Long Run Marginal Cost) of providing the energy.
- Unlike most supply projects (e.g. development of power plant), energy efficiency improvements are very small and use a variety of technologies, affecting different end-use and economic sectors.

4. *Some Suggestions for the Role of Government*

4.1 I understand that one of the topics that this gathering is going to discuss is the question of institutional arrangements for carrying out energy conservation nation-wide. I will therefore not attempt to define any institution that will carry out the suggested actions, I will for the time being call that institution Department of Energy Resources and Development (DOERD).

4.2 The suggested future DOERD activities are as follows;

- (a) Make a national commitment to energy efficiency
 - a clear statement of energy efficiency must be embodied in the national energy policy
 - make funds available for the energy efficiency programmes
 - state clear goals that such a programme needs to achieve, e.g. reduction in energy use through energy efficiency improvements of some percentage to the GDP (say, 2.5% per annum)

- (b) Institute a National Energy Management Programme
 - create a variety of energy conservation programmes, e.g. industrial energy conservation, household energy conservation, conservation in the transport industry, etc.
 - use of innovative financing methods (including loans, rebates, grants, and performance contracting) to pay for the incremental costs of energy-efficient systems
 - adoption of strategies that will lead to the construction of more energy efficient domestic and office buildings.

- (c) Increase DOERD energy-conservation R & D (copy the example of Agritex)
 - government should ensure a DOERD conservation R & D programme that is stable in funding, focus and government support. Secure funding would permit DOERD to:

- (i) work more closely with industry to demonstrate new energy efficient technologies;
 - (ii) assess the long term performance of energy efficient technologies; and
 - (iii) carry out research on the patterns and determinants of energy related decision-making and barriers to adoption of energy efficient actions.
- set up demonstration units for each prototype industry (in a manner similar to the way AGRITEX operates).

4.3 Promote least-cost energy planning

- ensure least-cost energy planning capabilities are available within government
- ensure energy conservation is part of the least-cost planning options
- ensure that environmental costing is part of the least-cost planning scenarios

4.4 Increase DOERD technical assistance activities

- DOERD should be a centre for dissemination of technical information
- demonstrate the efficiency of individual energy components
- sponsoring demonstrations to practitioners
- working with trade allies to encourage dealers to stock these products
- sponsor programmes at vocational/technical schools to train those who install and maintain energy efficient systems
- sponsor inclusion of energy conservation in the curriculum of institutions of higher learning, i.e. universities.

4.5 Improve coordination between DOERD and firms' R & D programmes.

4.6 Strengthen energy-efficiency standards

- 4.7 Collect more information on energy use
- information on the patterns, trends, and determinants of energy use would be very useful in managing energy conservation programmes. Such information might indicate whether and why consumers participate in various programmes, what factors influence their purchase of energy using equipment, and what factors affect their operation and maintenance practices.

5. **CONCLUSION**

Fellow workshop participants, such then are the challenges that we face as energy efficient proponents in our country. However, implementing such programmes will save millions of dollars for consumers, reduce emissions of greenhouse gases and other pollutants, reduce considerably our dependence on imported oil, improve productivity and enhance international competitiveness of our products. Improving energy efficiency adds diversity and flexibility to the nation's energy system, insurance that is both inexpensive and valuable.

J. **CONSUMER COUNCIL OF ZIMBABWE: M. NYAMBUYA**

NATIONAL ENERGY EFFICIENCY IMPROVEMENT PROGRAMME

1. Distinguished Guests
Ladies and Gentlemen

It is my great pleasure to address you at this important workshop on Energy Efficiency Strategic Framework for Zimbabwe.

Energy in Zimbabwe and the World over is very crucial in keeping the wheels of industry, Commerce, and Agriculture as well as all the entire nations going.

2. Shortages and price escalations of fuel and electricity have been witnessed, and have adversely affected the economy, not to mention the vulnerable consumer who has to bear the adverse effects in the form of unsatisfactory services and unwarranted price escalations.

3. Ladies and Gentlemen, the 1991/1992 drought highlighted the Southern Africa region's vulnerability to shortages of power. The Zimbabwe Electricity Supply Authority was faced with a dilemma of trying to supply sufficient power to both the commercial and domestic industry, while at the same time aiming to acquire enough electricity from neighbouring Zambia and Zaire.

ZESA subsequently introduced the ration system in a bid to save electricity. During this period blackouts were experienced and many places went without electricity, leaving consumers at a very big disadvantage.

4. However, with good rains which we have experienced, Kariba and Kafue River are filling and the entire country has become optimistic that electricity supply problems would be reduced but are not over as yet. I would like to point out that the problem with the parastatal began to emerge some years back, and my organisation questioned the efficiency of ZESA with regards to the supply of electricity meter reading and the billing system which left a lot to be desired.

I feel ZESA must come up with an efficient system of recording units of electricity consumed and an accurate billing system which does not victimise innocent consumers.

5. I want to point out that since the takeover by ZESA with effect from the 1st of October this year, of the billing system, revenue collection and meter reading, already loud and painful cries have been heard from the exploited consumers. Some consumers who have been paying average bills of \$80 to \$150 a month, suddenly have received bills ranging between \$700 and \$800, of which they are expected to pay or else they risk having electricity cut-offs.
6. Everyone knows that ZESA is in serious financial deficits, but exploiting consumers by making them pay for sins they did not commit must not be the way for the parastatal to recoup its finances and equilibrium. To add salt to injury, the October statements are accompanied by a statement which wishes consumers a Merry Christmas, and yet in actual fact it might be a gloomy festive season without electricity.

7. The fact that ZESA is a monopoly should not empower the parastatal to act as a dictator to the vulnerable consumer, who under these tough times, is trying very hard to make ends meet.

At the beginning of the year, my organisation questioned ZESA's move to impose Penalty Charges on domestic and industrial consumers who had exceeded given quotas under the rationing scheme. The majority of Harare consumers suffered as they were made to pay exorbitant bills based on estimates.

8. What worried the CCZ and consumers in general was that ZESA's billing system based on estimates could not be validated, and thus increased the risk of consumers paying for units of electricity they did not consume.

For example, where the bill would have been assessed, it means the parastatal accounts department would have looked on the consumption trend of the consumer during the previous months and then calculate the average consumption.

9. Regrettably, the system has its own flaws because the consumers, may change the electricity consumption pattern and the assessment mechanism may have serious distortions on the bill received by the consumer. Hence, my organisation felt it would be almost 'fraudulent' to impose a penalty on consumers whose bills are based on estimates and not empirically determined.

As a result of pressure from the CCZ, ZESA advised Harare City Council the then ZESA agent; to exempt assessed bills from penalties.

10. However, of late, the CCZ has been receiving complaints from consumers who have been threatened with electricity cut-offs if they do not pay penalties based on assumption.

ZESA's public relations department should devise a way of handling consumer complaints instead of turning hopeless consumers away without offering any sound solution to their queries.

11. However, my organisation feels very little has been done in terms of legislation to protect consumers against restrictive business practices, which to a greater extent, are perpetrated by monopolies such as ZESA. The consumer has been forced to contend with the aggressive powerful monopolies which continue to exploit consumers.

I strongly feel this must come to an end in order to protect the vulnerable consumer. Since these restrictive acts have the tendency of excluding others, they automatically deny the consumer the "Right to Choose", "The Right to Basic Commodities" and the "Right to be Heard".

12. I want to take you back to ZESA during the time when penalties were forced on consumers and my organisation questioned such a move. ZESA referred its action to the Electricity Act of 1985 Section 39 (1) which states that: "If at any time the Minister is satisfied that for cases beyond the control of an authorised undertaker is or will be unable for a period exceeding seven days to supply electricity to all consumers to whom he or it is obliged to supply electricity, the Minister may permit the authorised undertaker, by notice in writing and subject to such conditions as the Minister may from time to time fix to lessen or discontinue the supply of electricity to any consumer or class of consumers in accordance with such plan or scheme as the authorised undertaker considers to be equitable in the circumstances".
13. ZESA went ahead and misinterpreted Section 39 (1) to mean giving the parastatal powers to impose fines on consumers. The CCZ failed to take ZESA to court because of the non-existence of a "GROUP PROCEEDINGS ACT", in Zimbabwe. In addition, ZESA's monopolistic characteristic left consumers with no option but to bear the burden imposed on them.

14. *NOCZIM*

Experience has shown that when the fuel industry catches a cold the economy sneezes, but the worst affected are consumers who have to come face to face with price increases. As you know, fuel and lubricants have such immense effect to keep the wheels of commerce and industry turning. The role played by the National Oil Company of Zimbabwe in economic development cannot be

underestimated, as it is the cornerstone of the economy, and every sector in the economic system focuses attention on the organisation.

15. It should not go without mention the NOCZIM's efforts in acquiring petroleum outside the country is of paramount importance. NOCZIM imports and distributes fuels, base oils, and bitumen within Zimbabwe which is a very important role. It is also commendable that the government consults NOCZIM to determine the price of the company's products so that it operates viably.
16. However, Ladies and Gentlemen, my organisation's concern on fuel is the issue of affordability and availability. Consumers need an assurance that there will be enough stocks of fuel to meet their present and future consumption needs.

Consumers need an assurance that the pricing structure on fuels are kept within their reach so that the final goods and services are affordable to them.

17. I am of the opinion that the fuel industry may become more viable through competition under ESAP, to avoid a crisis during times of shortages. NOCZIM should be geared to meet the challenges of changing economic times, and offer a highly appreciated service to consumers.
18. In addition, we greatly appreciate NOCZIM's efforts to achieve viability in industry, commerce and agriculture. This is seen through the company's facilitation of government's control in fuel logistics through the physical and operational control of storage tanks in the country and ensuring that fuel reserves are maintained. I also understand that most of the company's purchases are made on the basis of term contracts while a small proportion is supplied on the spot market where both terms of contracts and spot purchases are subject to competitive bidding. This government company is understood to have done its best to source products wherever market conditions have been favourable. Such an idea is rational and has foresight, because the consumer may benefit by purchasing fuel at reasonable prices.

19. As the issue of affordability is indeed of paramount importance for industrial and commercial needs, I would take this opportunity to urge NOCZIM to continue with the spree of shopping around for cheaper fuel sources for the benefit of consumers. It is not an absurd idea to also shop for other fuel outlets while the old ones are maintained. In fact it is a way of rationalising the marketing of fuel which may prove very useful. I have often said it is advisable to have blind faith in old suppliers when new ones cannot bring a change for the better, and I stand firm on this reasoning.

As a way of meeting the fuel consumption needs of this country I propose that oil companies such as Total, Mobil, Caltex, BP and Shell, should be consulted in the importation and distribution of fuel to users, as a way of encouraging ESAP. Opening up of the industry would be to the benefit of consumers as the oil companies would compete to get the best possible share market. There is increasing demand for efficiency in the fuel industry and a monopolistic/oligopolistic situation is very unhealthy for economic development.

21. Let me not be misconstrued that I am also proposing a wholesale removal of control on fuel prices - I totally agree with everyone that fuel is an important resource.

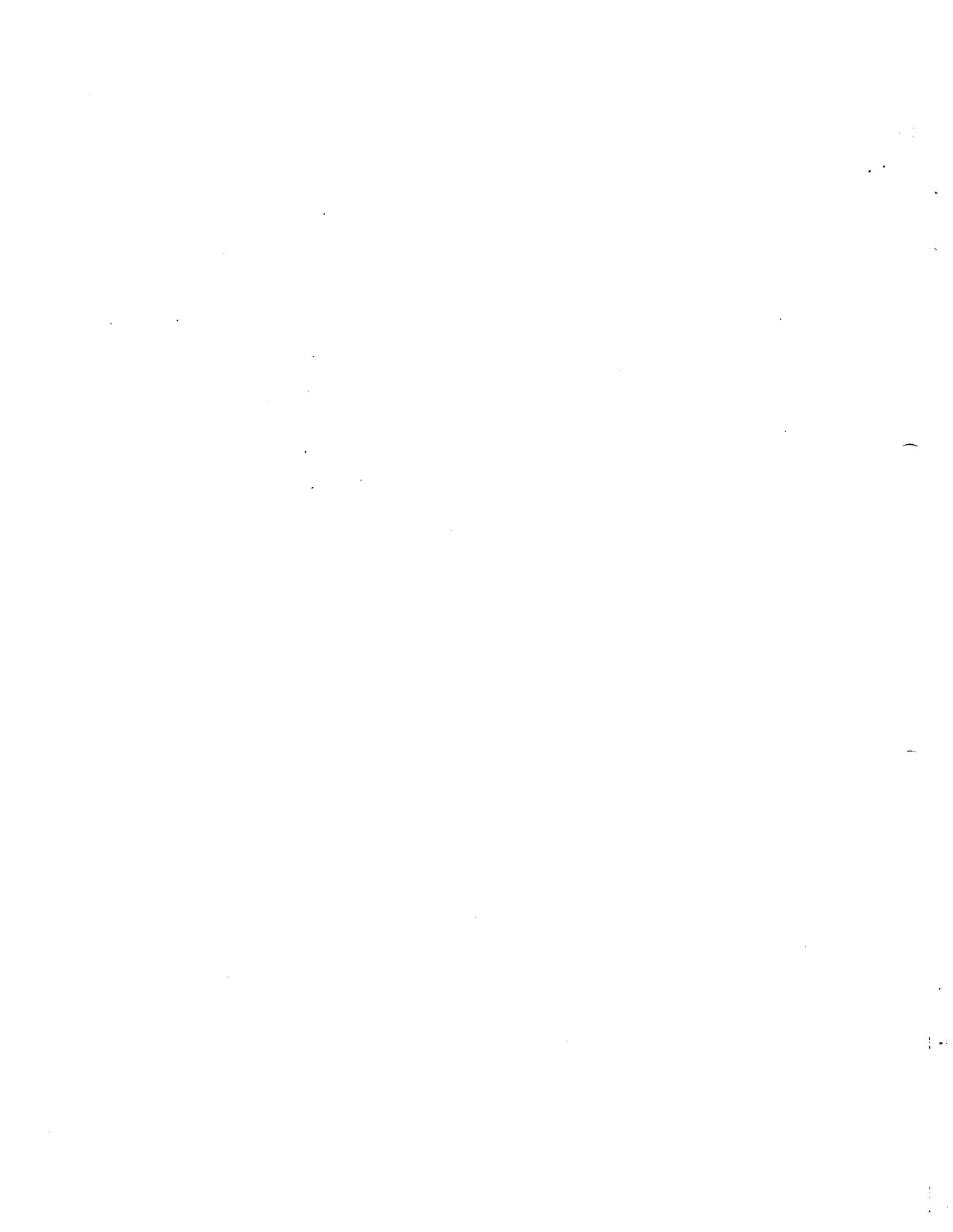
There is continued need for price stipulations or a system of subsidisation to keep the transport costs low and affordable to consumers. My proposal is also that fuel prices be constantly reviewed so that a degree of equilibrium can be achieved in the fuel and transport industry, and that the costs be maintained at affordable levels. The fact that fuel prices affect the prices of other goods and services makes it imperative that they should be checked on a regular basis.

22. It is also an unfortunate feature to note that devaluation has tended to make fuel imports more expensive to the detriment of consumers and the business community. NOCZM should therefore, be seen taking bold steps in advance in anticipation of devaluation changes so that when there are negative developments in the world markets, the impact does not become severe to disturb the economic fabric and harmony of the country.

23. With these words ladies and gentlemen, I conclude by recommending that there is need to boost electricity importation from neighbouring countries such as Zambia, South Africa and Mozambique; since we are now free to carry out trade with any country in Southern Africa.

Surplus importation of electricity from countries with surpluses, will augment existing supplies of electricity. The CCZ organisation is not suggesting that we should become over-dependent, but we will be encouraging interdependence since self-sufficiency alone can prove to be a failure.

Thank you!



VI. ANNEXE

ANNEX I: AGENDA

NATIONAL ENERGY EFFICIENCY IMPROVEMENT PROGRAMME
JOINT DOERD/WORLD BANK WORKSHOP 15 - 17 DECEMBER 1993
MONTCLAIR HOTEL NYANGA

Day 1 Thursday 16th December 1993

<u>Morning Session 1</u>	Chairman Mr. J. Moyo Permanent Secretary, Ministry of Transport & Energy
0800 - 0830	Registration
0830 - 0840	Opening Remarks. Purposes and objectives of the NEEIP Workshop The Permanent Secretary, Mr. J. Moyo
0840 - 0850	Opening Address: The Honourable Minister of Transport & Energy Mr. D. Norman
0850 - 0855	Administrative arrangements
0855 - 0915	DOERD Position Paper Director of Energy, Mr. C.T. Mzezewa
0915 - 0935	World Bank Mr. K.F. Schenk/Mr. S. Brushett Presentation
0935 - 1000	ETSU Overall situation in Zimbabwe & critical success factors for energy efficiency programmes Presentation
1000 - 1015	* * * Tea/Coffee

Morning Session 2

Chairman **Mr. J. Moyo** Permanent Secretary
Ministry of Transport and Energy

1020 - 1050

Questions on ETSU's presentation and report

1050 - 1115

Z E S A
Senior Manager (Corporate Planning)
Mr. D.D. Madzikanda
Presentation

1115 - 1140

ZABO, Chamber of Mines, CZI
Mr. R.H.A. Williams
Presentation

1140 - 1205

Zimbabwe Phosphate Industries
The Chief Engineer, **Mr. Rushwaya**
Presentation

1205 - 1230

Economist Point of View of NEEIP
Mr. J.J. Mangono (Department of Energy)

1230 - 1300

Consumer Council of Zimbabwe
Director, **Mr. M. Nyambuya**
Presentation

1300 - 1400

* * *

Lunch Break

Delegates are placed into four (4) discussion groups 10 - 12 people.

Each group chooses the Chairperson for the particular session

1400 - 1500

Aims/Purpose of NEEIP

1500 - 1530

Report back, agree definition of NEEIP

1530 - 1545

* * *

Tea/Coffee

1545 - 1645

Type of activity desired for NEEIP

1645 - 1715

Report back, agree desired activities

1715 - 1730

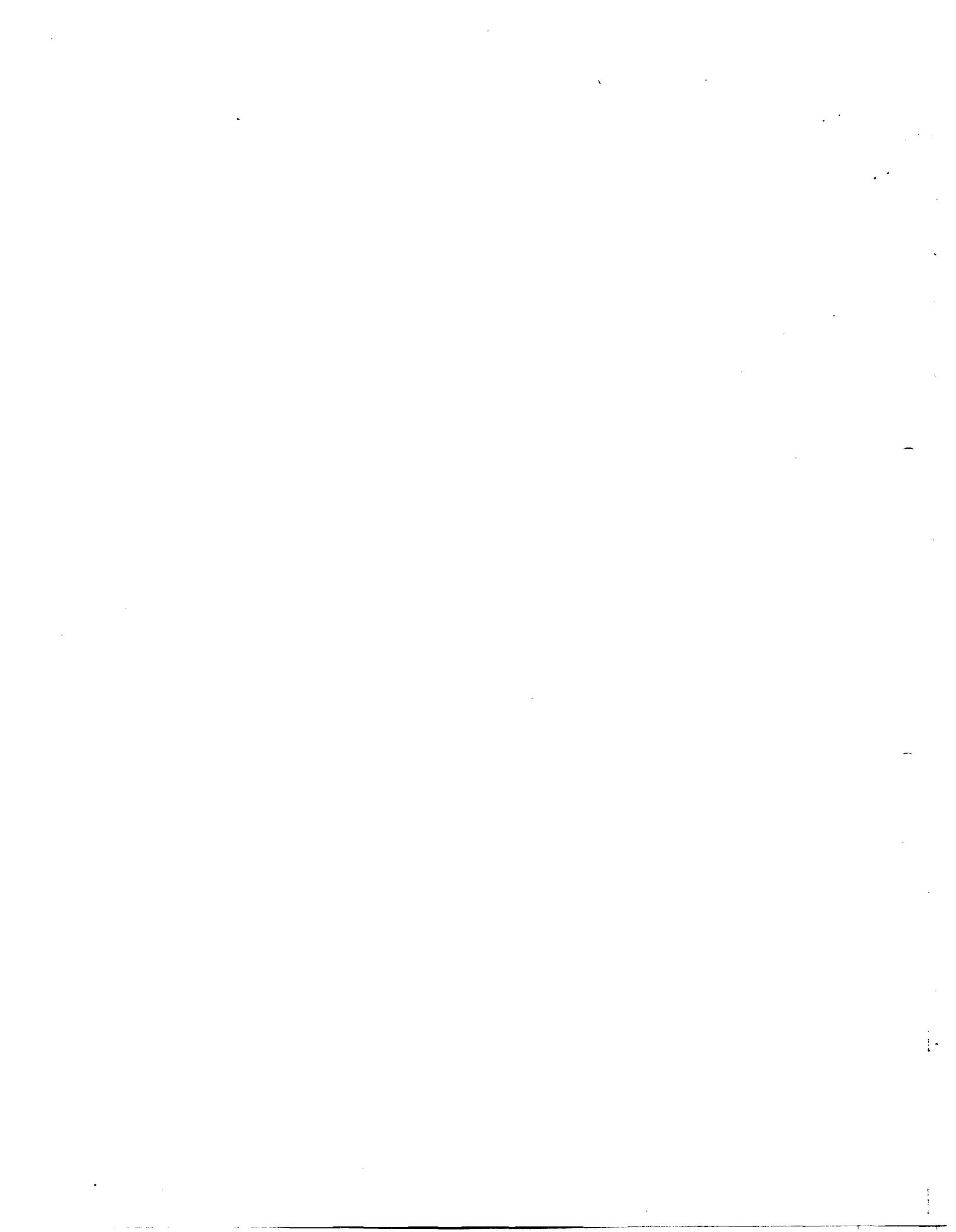
Announcements for the following day. **The formal DINNER**

Day 2 Friday 17 December 1993

Chairman Mr. J. Moyo Permanent Secretary
Ministry of Transport and Energy

Plenary Session:-

0800 - 0830		Review of previous day Then continue to work in groups
0830 - 0930		NEEIP Coordination and relevance to existing programmes
0930 - 1000		Report back, and agree
1000 - 1030	* * *	Tea/Coffee break
1030 - 1130		Individual programme implementation
1130 - 1200		Report back, and agree
1200 - 1230		ETSU summary of recommendations
1230 - 1300		Closing remarks Ministry of Transport & Energy
1300 - 1400	* * *	Lunch Break
1430		Delegates leave for home



ANNEX II

NATIONAL ENERGY EFFICIENCY IMPROVEMENT PROGRAMME LIST OF PARTICIPANTS

- | | | | |
|-----|--|-----|---|
| 1. | Mr. D. Norman
The Honourable Minister
Ministry of Transport & Energy | 2. | Mr. J. Moyo
Permanent Secretary
Ministry of Transport & Energy |
| 3. | Mr. C.T. Mzezewa
Director of Energy
Ministry of Transport & Energy | 4. | Mr. C.S. Murove
Assistant Director
Ministry of Transport & Energy |
| 5. | Mr. J. Chirara
Assistant Director
Ministry of Transport & Energy | 6. | Mr. T.W. Samunyai
Assistant Director
Ministry of Transport & Energy |
| 7. | Mr. J.J. Mangono
Principal Energy Dev. Officer
Ministry of Transport & Energy | 8. | Miss E. Muguti
Principal Energy Dev. Officer
Ministry of Transport & Energy |
| 9. | Mrs D. Kayo
Principal Energy Dev. Officer
Ministry of Transport & Energy | 10. | Mr. S.R. Wadesango
Principal Energy Dev. Officer
Ministry of Transport & Energy |
| 11. | Mr. F.N. Maziweyi
Principal Energy Dev. Officer
Ministry of Transport & Energy | 12. | Mrs J.Z. Mawema
Senior Energy Dev. Officer
Ministry of Transport & Energy |
| 13. | Miss E. Zhande
Planner
Ministry of Transport & Energy | 14. | Mr. C. Phaira
Energy Development Officer
Ministry of Transport & Energy |
| 15. | Miss S. Madau
Energy Development Officer
Ministry of Transport & Energy | 16. | Mr. H. Gonye
Energy Development Officer
Ministry of Transport & Energy |
| 17. | Mr. N. Msakwa
Energy Development Officer
Ministry of Transport & Energy | 18. | Mr. E. Bunjira
Energy Development Officer
Ministry of Transport & Energy |

- | | | | |
|-----|---|-----|--|
| 19. | Mr. F. Mambwere
Energy Development Officer
Ministry of Transport & Energy | 20. | Mr. A.F.N. Mangena
Assistant Secretary
Local Govt. Rural & Urban Dev. |
| 21. | Miss E.M. Hlazo
Senior Economic Planner
National Economic Planning Commission | 22. | Mr. W.T. Vengesai
Director of Professional Services
Min.of Public Const. & Nat.Housing |
| 23. | Mr. L.D. Mwaita
Under Secretary
Ministry of Mines | 24. | Mr. A.Z. Matiza
Design Policy Analyst
Min. of Environment & Tourism |
| 25. | Mr. M.I. Muzondo
Project Officer
Biomass Users'Network | 26. | Mr. O. Gomm
Programme Coordinator
Energy Programme Zimbabwe |
| 27. | Mr. I. Dube
Research Engineer
Z E S A | 28. | Mr. D. Madzikanda
Senior Manager (Corporate Plan.)
Z E S A |
| 29. | Mr. M. Mushambi
Marketing Manager
NOCZIM | 30. | Dr. E.G. Mtetwa
Member
Research Council of Zimbabwe |
| 31. | Mr. M. Chateuka
Lecturer
University of Zimbabwe | 32. | Mr. T. Mutiti
Marketing Manager
Wankie Colliery Co. Pvt Ltd |
| 33. | Mr. L.K. Chirombo
Partner/Architect
The Institute of Archetects | 34. | Mrs M.P. Mutasa
Director of Standards
Standards Association of Zimbabwe |
| 35. | Mr. H.R.A. Williams
Production Manager
ZIMASCO Kwekwe Division | 36. | Mr. D. Chigodora
Production Manager
Sable Chemicals |
| 37. | Mr. G. Stiles
Industrial Energy Consultant
S A D C | 38. | Mr. M. Nyambuya
Director
Consumer Council of Zimbabwe |
| 39. | Mr. C. Manzira
Chief Economist
Ministry of Finance | 40. | Mr. S. Brushett
Deputy Resident Representative
World Bank Mission |

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| 41. | Mr. K.S. Ndoro
Senior Economist
Commercial Farmers'Union | 42. | Ms. A. Muskwe
Assistant Secretary
Ministry of Industry & Commerce |
| 43. | Mr. P. Karhammar
Resident Representative
S I D A | 44. | Mr. O. Onyango
Principal Financial Analyst
African Development Bank |
| 45. | Ms. P. Hensnen
The Chief Executive
Zimbabwe Institution Engineers | 46. | Dr. C. Mukora
Director
Zimbabwe Farmers'Union |
| 47. | Mr. G.T. Rushwaya
Chief Engineer
Zimbabwe Phosphate Industries | 48. | Mr. B. Kanu
Programme Officer
U N D P |
| 49. | Dr. G. Mandishona
National Project Manager
Global Environmental Facility | 50. | Mr. S. Moyo
Research Fellow
Z I D S |
| 51. | Mr. L. Sibanda
Senior Agricultural Economist
Min. of Lands, Agric. & Water Dev. | 52. | Mrs. J. Madzongwe
Energy Specialist
C I D A |
| 53. | Mr. C.S. Moyo
Maintenance Manager
Monomatapa Hotel | 54. | Dr. C.B. Thornton
Technical Director
Hunyani Holdings Ltd. |
| 55. | Mr. Kurt F. Schenk
Power Specialist
WB ESMAP Operations Division | 56. | Dr. A. Gilchrist
Industrial Utilities Specialist
Energy Technology Support Unit |
| 57. | Mr. R. Spencer
Energy Efficiency Marketing Specialist
Energy Technology Support Unit. | | |

NB

SADC	Southern Africa Development Community
SIDA	Swedish International Development Agency
IBDC	Indegenous Business Development Centre
UNDP	United Nations Development Programme
ZIDS	Zimbabwe Institute of Development Studies
CIDA	Canadian International Development Agency
WB	World Bank
ESMAP	Energy Sector Management Assistance Programme
NOCZIM	National Oil Company of Zimbabwe

ANNEX III

WORKSHOP DISCUSSION GROUPS

GROUP A	GROUP B	GROUP C	GROUP D
Mr. C.T. Mzezewa Director Energy CHAIRMAN	Mr. Chirara Ass. Director DOERD CHAIRMAN	Mr. Samunyai Ass. Director DOERD CHAIRMAN	
Ms. E. Muguti PEDO DOERD	Mr. F. Maziweyi Pedo DOERD	Mr. J.J. Mangono PEDO DOERD	Mrs D. Kayo PEDO DOERD
Mr. C. Pfaira EDO GEF Project	Mrs J.Z. Mawema SEDO DOERD	Mr. N. Msakwa EDO DOERD	Mr. E. Bunjira ED DOERD
Miss S. Madau EDO DOERD	Mr. H. Gonye EDO DOERD	Ms. E.M. Hlazo Snr Econ. Planner (NEPC)	Mr. W. Vengesai Director Prof. Services (MPCNH)
Mr. F. Mambwere EDO DOERD	Mr. A.F. Mangena Acting Sec. LGR & UD	Mr. M. Mzondo Proj. Officer BUN	Mr. O. Gomm Prog. Co-ord. GTZ
Mr. L.D. Mwaita Under Secretary Min. of Mines	Mr. A.Z. Matiza Design Policy Analyst (MoE & T)	Mr. M. Mushambi Sales Manager NOCZIM	Mrs MP Mutasa Director of Standards SAZ
Mr. I. Dube Rrsearch Eng. ZESA	Mr. Madzikanda Sen. Mgr (CP) ZESA	Mr. S. Brushett Deputy Rep. World Bank	Mr. K.S. Moyo Sen. Economist CFU
Mr. M. Chateuka Lecturer UZ	Mr. T. Mutiti Marketing Mgr Wankie Col. Co.	Mr. T. Onyongo Princ. Financial Analyst (ADB)	DR. E.G. Mtetwa Member RCZ
Mr. R. Williams Prod. Manager ZIMASCO	Mr. D. Chigodora Prod. Manager Sable Chemicals	Dr. C. Mkora Director ZFU	Mr. S. Moyo Research Fellow ZIDS
Mr. G. Stiles Ind. Energy Consultant SADC	Mr. M. Nyambuya Director CCZ	Mr. G. Rushwaya Chief Engineer Zimphos Ind.	Mr C.S. Moyo Maintenance Eng. Monomatapa Hotel
Mr. Kurt Schenk Power Specialist WORLD BANK	Ms. A. Muskwe Ass. Secretary Min of Ind & Comm.	Ms. E. Zhande Planner MoT & E	Dr. C.B. Thornton Group Tech Mgr. Hunyani Pulp
	Mr. P. Karhammar Resident Rep SIDA	Dr. A. Gilchrist Ind. Util Specialist ETSU	Mr. R. Spencer EE Marketing Specialist ETSU
	Mrs Madzongwe Energy Specialist CIDA		

