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17695-E

Distr.
LIMITED

ID/WG.494/2(SPEC.)
17 August 1989

ENGLISH
ORIGINAL: FRENCH

United Nations Industrial Development Organization

Regional Workshop on Energy
Conservation in Industry

Cairo, Egypt, 1-5 October 1989

THE NATIONAL ENERGY CONSERVATION PROGRAMME*

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* The opinions expressed in this document are those of the authors and do not necessarily reflect the views of the UNIDO Secretariat. This document has been translated from an unedited original.

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A. BACKGROUND

The sudden increase in oil prices in 1973 caused most industrialized countries to initiate active energy conservation and substitution policies.

In 1981 Côte d'Ivoire entered a period of economic crisis and the need for better energy consumption control became apparent as a result of several factors:

- The world economic recession, which slowed down the growth in exports and thus brought about a sharp reduction in public revenue;
- The serious 1983 drought, which exhausted hydroelectricity resources.

In order to correct this situation, the Head of State as early as December 1983 invited the ministries to cut the energy bills of their respective departments by 25 per cent. Then, in July 1984 the Ministry of Industry was instructed to launch a National Energy Conservation Programme.

The National Energy Conservation Programme was established by the Directorate of Energy and Infrastructures, Ministry of Industry, with UNIDO support in the preparatory stage, on the basis of recommendations emerging from the surveys by the World Bank and US-AID (in April and November 1985 respectively).

This programme was submitted to and adopted by the Council of Ministers at its meeting on 9 April 1986 with a view to its implementation by the Energy Conservation Office.

B. NATIONAL ENERGY CONSERVATION PROGRAMME (NECP)

The NECP relates to the various sectors of the national economy:

- INDUSTRY;
- PUBLIC SECTOR;
- TRANSPORT;
- DOMESTIC SECTOR.

I. OBJECTIVES OF THE PROGRAMME

The principal objectives can be summarized as follows:

- To stabilize energy demand with a view to delaying the need for new investments in the generation, conversion and transportation of energy;
- To optimize energy use in enterprises to achieve economic benefits and increase competitiveness;
- To reduce the energy bills for government buildings;
- To reduce domestic energy consumption and in particular the consumption of firewood and charcoal, in order to slow down periurban deforestation.

II. IDENTIFIED POTENTIAL

The potential for energy conservation, evaluated in the US-AID report at more than 10.5 billion CFA francs per annum, includes:

- 3 billion in the industrial sector;
- 4 billion in the transport sector;
- 2.5 billion in government;
- 1 billion in the domestic sector.

C. ENERGY CONSERVATION OFFICE (ECO)

The Energy Conservation Office of the Directorate of Energy and Infrastructures, Ministry of Industry, established by decision of the Council of Ministers in April 1986, has four sections corresponding to the four main areas in which savings can be effected:

- Government buildings section;
- Industry section;
- Transport section;
- Domestic energy section.

I. OBJECTIVES

- Medium term: to save the Côte d'Ivoire economy at least 5 billion CFA francs per annum.
- Final: to achieve the potential identified in the US-AID survey, i.e. to save more than 10 billion CFA francs per annum.

II. ACTION

- Co-ordination of energy conservation measures, promotion and organization of their technical and financial implementation, and monitoring of progress;
- Awareness and training;
- Promotion of energy-saving equipment and facilities;
- Drafting of regulations.

III. ACTIVITIES OF ECO

- Conduct of energy audits in industry and the tertiary sector;
- Mobilization of funding for energy conservation schemes;
- Examination of energy conservation plans in enterprises;
- Promotion of awareness and issue of documentation;
- Administration of the tax régime applicable to energy conservation;
- Preparation of energy conservation recommendations;
- Energy conservation in government.

IV. RESOURCES OF ECO

1. Since its establishment, ECO has spared no effort to carry out its task. Consequently, the initial measures adopted by ECO have so far qualified for various sources of financing:

- State budget;
- US-AID funding;
- Fonds National de Régulation (FNR) funding;
- Fonds d'Aide et de Coopération (FAC) (France) funding;
- UNIDO funding;
- ACDI funding.

2. The staff of ECO is multidisciplinary, and comprises:

- Four engineers;
- Four economists;
- One chemist;
- One accounting secretary;
- One technical adviser.

D. ENERGY CONSERVATION IN GOVERNMENT

I. OBJECTIVES

- Identified potential: over 2 billion CFA francs per annum;
- Medium-term objective: 1.5 billion per annum within five years.

II. ACTION

- Computerized monitoring of energy consumption;
- Optimization of power levels;
- Elimination of penalties for poor power factors;
- Reduction in specific energy consumption;
- Reorganization of the transformer stock;
- Survey and reduction of the vehicle fleet;
- Awareness among managers and users.

III. ACHIEVEMENTS

1. Computerized monitoring of energy consumption

Since 1984, LBTP and ECO have organized computerized monitoring of the electricity invoices for 522 establishments:

- 63 ancillary budgets (BA);
- 296 government establishments (AD);
- 163 national public establishments (EPN).

In all, 5,842 electricity invoices have been examined since 1984.

This measure made it possible to bring down the average price per kWh from 54.00 to 43.54 CFA francs/kWh in 1987, despite a considerable increase in electricity consumption (1.6 per cent in 1985/1986 to 5.8 per cent in 1986/1987).

2. Optimization of power levels

The power levels have been optimized and readjusted in 322 government establishments.

This measure made it possible to achieve an appreciable reduction in fixed subsidies between 1984 and 1986.

3. Installation of condenser sets

Four stages have been completed in a total of 205 establishments, as follows:

- 78 national public establishments;
- 127 government establishments.

IV. SUMMARY

Cumulative savings per annum in CFA francs

Year	1985	1986	1987	1988
Savings (millions)	750	1 630	1 942	1 942

E. ENERGY CONSERVATION IN INDUSTRY AND THE TERTIARY SECTOR

I. OBJECTIVES

- Identified potential: more than 3 billion CFA francs per annum;
- Medium-term objective: 1.5 billion per annum within five years.

II. METHODS

- Optimization of energy management;
- Improved energy equipment operation;
- Implementation of higher-performance procedures;
- Replacement of fossil energy by renewable energy.

III. ACTION

- Improved management through better monitoring of consumption;
- Expert appraisals of energy facilities;
- Training and awareness of enterprise personnel;
- Technical and economic feasibility study;
- Search for funding assistance;
- Substitution of non-commercial energy for commercial fuels (exploitation of agro-industrial residues).

IV. ACHIEVEMENTS

1. Energy audits

As part of the first stage of the Collective Training Programme in Energy Conservation Techniques, energy diagnoses were made in 34 industrial sector establishments and 26 tertiary sector establishments in the first half of 1987. These energy diagnoses indicated an energy conservation potential of 4.8 billion CFA francs per annum with an investment of 9.6 billion in industry and 1.19 billion with an investment of 1.54 billion in the tertiary sector.

2. Training

During 1988 two training sessions were held for the personnel of the audited enterprises. This programme was financed by the National Regulation Fund (FNR).

	<u>Number of</u> <u>courses</u>	<u>Number of</u> <u>modules</u>	<u>Number of</u> <u>participants</u>
First session	17	7	107
Second session	29	10	171
Third session	<u>4</u>	<u>1</u>	<u>25</u>
Total	50	18	303

F. ENERGY CONSERVATION IN TRANSPORT

I. OBJECTIVES

- Identified potential: 4 billion CFA francs per annum;
- Medium-term objective: 1 billion CFA francs.

II. METHODS

- Improved management and use of transport fleets;
- Promotion of energy-saving vehicles.

III. ACTION

- Energy expertise in transport fleets;
- Implementation of energy conservation plans;
- Awareness of users;
- Training of drivers in economical driving techniques;
- Monitoring of the government's vehicle fleet;
- Implementation of pilot operations.

IV. ACHIEVEMENTS

ECO has made the general public aware of matters relating to the transport sector. The following items were prepared for this purpose:

- A film on economical driving techniques;
- Brochures containing advice on economical driving techniques and on vehicle maintenance.

However, the most important work remains to be done, i.e. a programme similar to that being implemented for industry and the tertiary sector.

G. ENERGY CONSERVATION IN THE DOMESTIC SECTOR

I. OBJECTIVES

- Identified potential: 2 billion CFA francs per annum for conventional energy (electricity, gas and oil)
20 billion per annum for wood and charcoal;
- Medium-term objective: 500 million CFA francs within five years for conventional energy
2 billion for firewood and charcoal.

II. METHODS

- Rational use of electricity;
- Optimized use of domestic electrical appliances;
- Improved performance levels in the habitat;
- Reduction in consumption by domestic electrical appliances.

III. ACTION

- User awareness campaign;
- Promotion of the climatic habitat;
- Promotion of improved homes;
- Display of consumption standards on domestic electric appliances.

IV. ACHIEVEMENTS

The main achievement of ECO in this sector was to alert users to the situation by means of a major energy conservation awareness campaign based on the following:

- A broadcast message on charcoal;
- Brochures.

The subjects covered dealt essentially with improved use of domestic electrical appliances and improved domestic use of wood and charcoal.

In collaboration with IPNEPT and LBTP, ECO is currently carrying out a programme to promote improved homes, initiated by the Entente Council and FAC.

H. AWARENESS PROGRAMME

The energy conservation awareness programme comprises two parts:

- ECO technical documentation;
- Mass media publicity campaign.

1. Technical documentation

The ECO technical documentation is made up of:

- Several specially-produced works and periodicals;
- Numerous documents from Quebec (Canada) and France.

2. Publicity campaign

The publicity campaign took place between 2 February and 30 April 1987.

All the items in the campaign were produced between November 1986 and January 1987. These were:

- 2,000 T-shirts;
- 5,000 brochures;
- 10,000 posters;
- 3 radio messages (electricity, economical driving techniques and charcoal);
- 3 television spots along the same lines as the radio broadcasts.

According to the findings of an opinion poll conducted by the Côte d'Ivoire Public Opinion Institute (IIOP), this initial energy conservation awareness campaign had a great impact in the country's two larger towns (Abidjan and Bouaké).

Since the end of this initial awareness campaign, ECO has frequently participated in the organization of radio and television broadcasts. Calendars, T-shirts and brochures are distributed during these broadcasts.

I. PLANNED ACTION

Continuation of all the measures already started and search for funding to enable them to be followed up and to study bankable projects.

Promotion and encouragement in all areas of energy conservation measures.

Promulgation of decrees to enforce the display of consumption or output levels of electrical appliances and the performance level of certain items of equipment (vehicle-borne air conditioners, etc.).

Demonstration projects.

Organization of "energy conservation" workshops.

Carrying out of other audits and provision of assistance to enterprises.

Establishment of an energy conservation plan for individual enterprises.

Promotion of exploitation of the energy available from agro-industrial and forestry residues.

Introduction of maintenance contracts including an energy conservation incentive clause.

Programme of regulations.

Annex 1

ENERGY IN COTE D'IVOIRE - KEY FIGURES

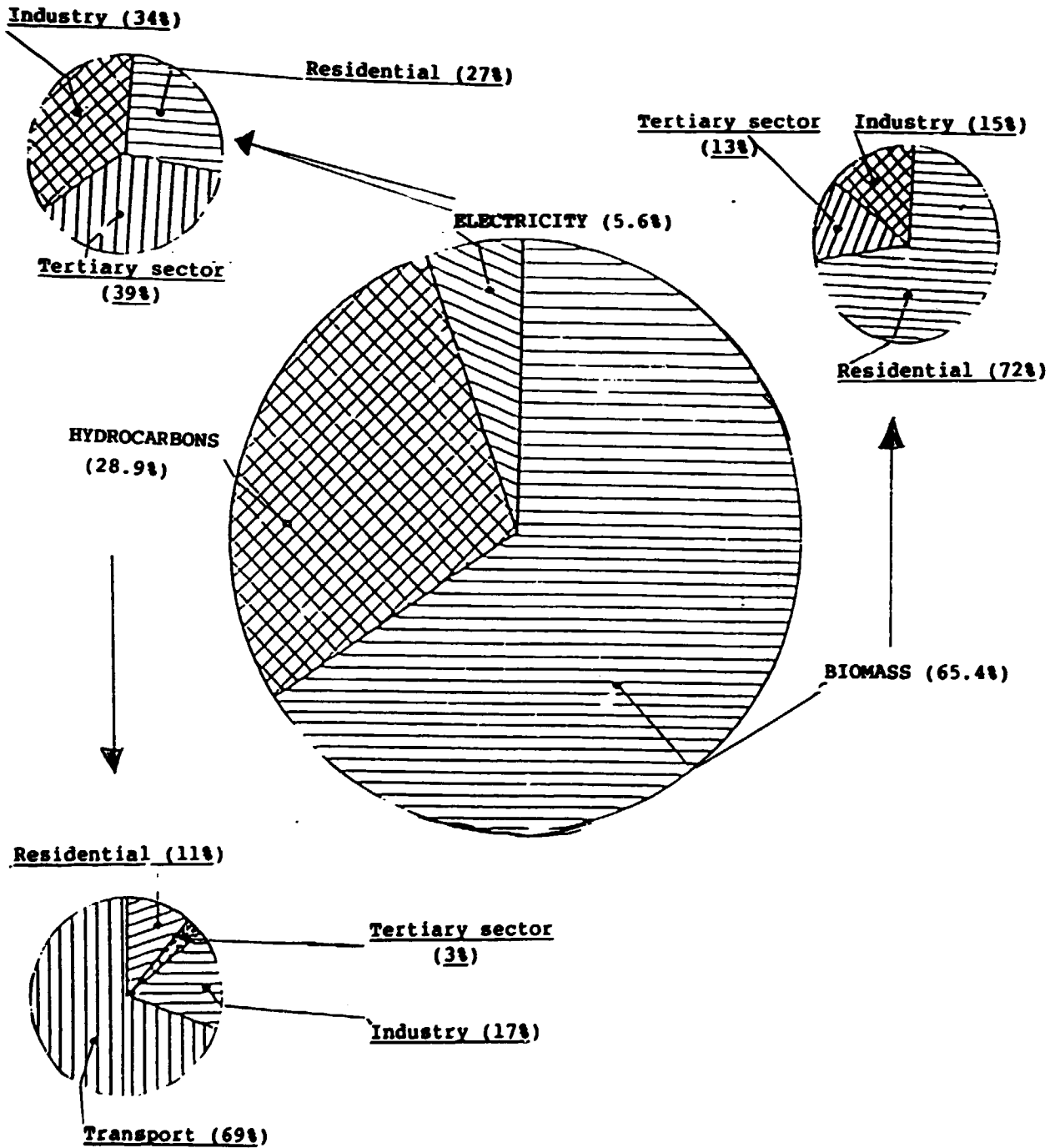
<u>Electricity (87/88)</u>	:	1,934 GWh, of which
- <u>Low voltage</u>	:	822 GWh, of which
Domestic	:	510 GWh
Commercial	:	205
Private	:	154
Public	:	51
Public lighting	:	82
- <u>Medium voltage</u>	:	997 GWh
- <u>High voltage</u>	:	113 GWh, of which
Industry	:	614
Tertiary sector	:	411, of which
Private	:	176
Public	:	225
<u>Petroleum products (87/88)</u>		
- F.O. 380 (EECI)	:	150,000 t
- F.O. 180	:	130,000 t
. Industry	:	60,000 t
. Bunkers	:	70,000 t
<u>DDO</u>		
- Industry	:	140,000 t
- EECI	:	60,000 t
- Tertiary sector	:	30,000 t
- Bunkers	:	20,000 t
<u>LPG</u>		
- Domestic	:	16,000 t
- Ind. + tertiary sector	:	5,000 t
<u>Wood</u>		
- Residential	:	1,112,000,000 toe
<u>Charcoal</u>		
- Residential	:	193,000 toe

Annex 2

ENERGY END USE
BREAKDOWN BY ENERGY

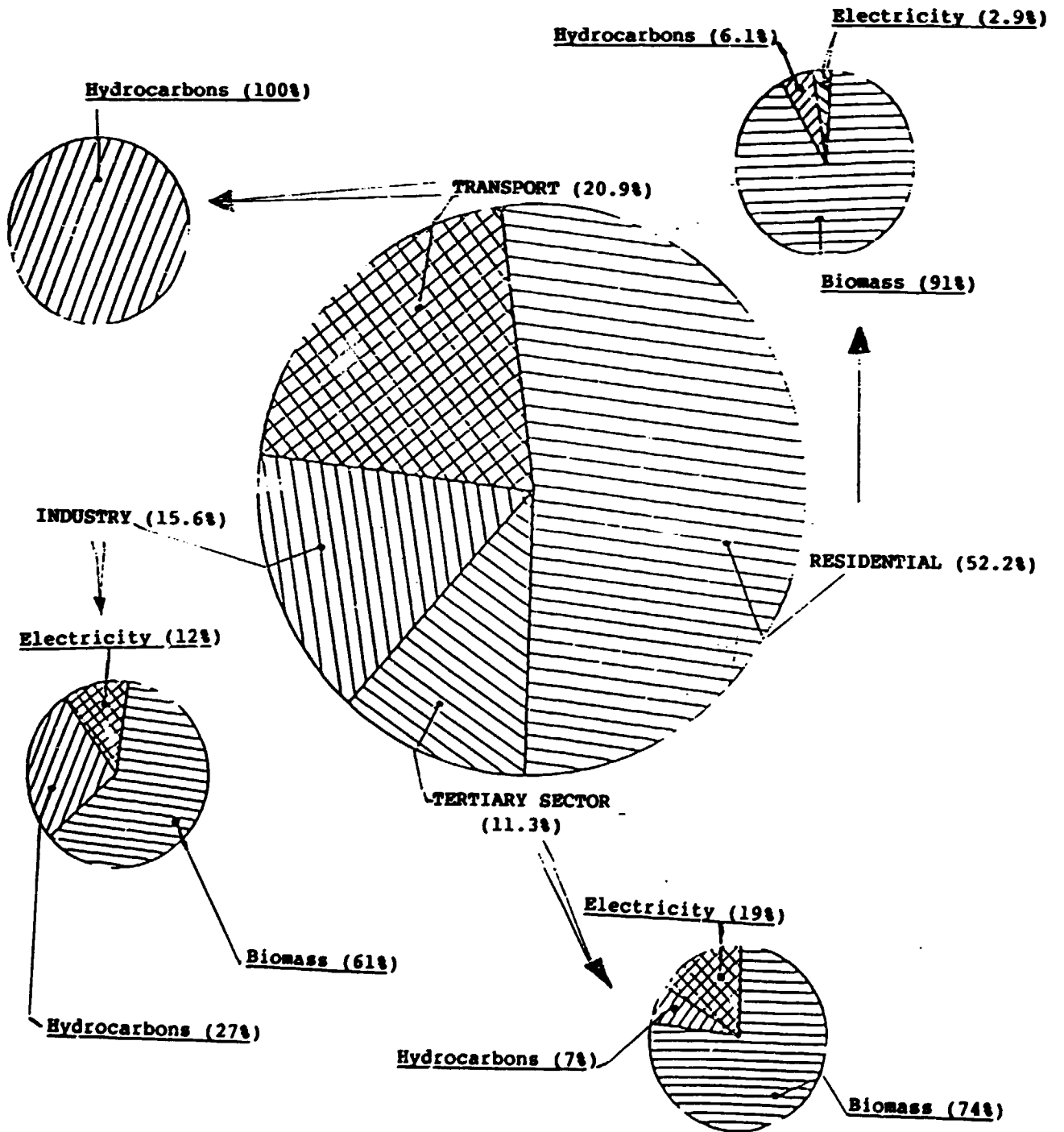
DIAGRAM 1

YEAR 1985



ENERGY END USE
BREAKDOWN BY SECTOR
YEAR 1985

DIAGRAM 2



Annex 3

TABLE 3. CONSOLIDATED TOTAL INTERNAL ENERGY DEMAND (1985-1986)

(in thousand toe)

SECTOR	BIONASS				ELECTRICITY	HYDROCARBONS									TOTAL
	Wood	Charcoal	Agricultural residues	Total		Regular + Premium	Gas oil	DDO	Fuel oil	AVGAS	AVJET	Kerosene	LPG	Total	
Industrial	-	-	139	139	51	-	-	76	57	-	-	-	1	134	324
Tertiary + Public lighting	156	73	-	229	60	-	-	2	-	-	-	9	4	15	304
Residential	1 112	193	-	1 305	42	-	-	-	-	-	-	66	17	83	1 430
Transport	-	-	-	-	-	189	391	17	10	1*	9	-	-	617	617
Agriculture and fisheries	-	-	-	-	-	28	9	-	-	-	-	-	-	37	37
TOTAL	1 268	266	139	1 673	153	217	400	95	67	1	9	75	22	886	2 712

* High estimate

Annex 4

TABLE 13. BREAKDOWN OF ENERGY CONSERVATION MEASURES IN THE 34 INDUSTRIAL ESTABLISHMENTS ON THE BASIS OF PAYBACK TIME

	Annual savings (CFA francs)	Cumulative investment (CFA francs)
Measures involving no initial investment	145 000 000	-
Measures with a payback time of under one year	520 000 000	166 000 000
Measures with a payback time of between one and three years	3 662 000 000	7 808 000 000
Measures with a payback time in excess of three years	450 000 000	1 631 000 000
TOTAL	4 777 000 000	9 605 000 000

(Source: ECO)

TABLE 14. ENERGY CONSERVATION POTENTIAL IN THE 34 INDUSTRIAL ESTABLISHMENTS AUDITED

	Petroleum fuels (toe)	Electricity (MWh)
Current consumption	56 708	262 405
Potential savings	27 390	29 484
Percentage conservable energy	48.3%	11.8%

(Source: ECO)