National Energy Efficiency Policy, Strategy and Action Plan in the electricity sector in Cameroon

March 2014

This study has been elaborated on behalf of the Electricity Sector Regulatory Agency (ARSEL) – Cameroon, to develop a National Energy Efficiency Policy, Strategy and Action Plan.

Project team :
Issiaka FONFATAWOUO Responsible Project Manager
Ahmadou BOUBA OUMAROU Project manager

Contact address :
Siège : près Eglise Orthodoxe BASTOS
B P: 6064 Yaoundé – Cameroun
E : abouba9@yahoo.com
T : +237 22 21 10 11

Names of Consultant:
European Union Energy Initiative
Partnership Dialogue Facility (EUEI PDF)
David OTIENO, Responsible Project Manager
Ina DE VISSER, Project Manager
I www.euei-pdf.org

Consortium IED-EED-NBT Europe :

Bernard JAMET	Team Leader
Samuel WATCHUENG	National Coordinator
Philippe GARNIER	Industry Sector
Pierre SAVARY	Power system
Alexis KEMAJOU	Building Sector
Philippe BOUIX	Biomass sector
Gilbert NJOUA	Household and End user
Pierre BOUBOU	Legal Expert

I www.ied-sa.fr

Date of Publication:
March 2014

PREAMBLE

This report is the final report of a study that aims to produce an energy efficiency policy, strategy and action plan for the electricity sector in Cameroon. Its purpose is to support discussions with the various Cameroonian stakeholders, with a view to achieving consensus in the formalisation of the measures to be taken in the short, medium and long term in this area. It thus provides a summary of the work carried out since February 2013 to analyse the components of electricity demand in the country, its technical and economic characteristics and the imbalance that these create between the available electricity supply and the anticipated consumer requirements by 2025. On this basis, the report sets out a number of proposals and recommendations with regard to the implementation of an Action Plan in each of the consumption sectors concerned. So as to enable a reasoned discussion based on well-established background information, the Consultant has endeavoured to propose the scale of investments to be granted for each intended measure, as well as the expected impact in terms of energy savings.

Contents

List of tables

List of figures

Acronyms and abbreviations

AER	Agence d'Electrification Rurale
AFD	Agence Française de Développement
AfDB	African Development bank
ANOR	Agence de Normalisation
APECAM	Association des Institutions de Crédit
APRUE	Agence pour l'Utilisation rationnelle de l'Energie
ARSEL	Agence de Régulation du Secteur de l'Electricité
BAU	Business As Usual
CFL	Compact Fluorescent Lamp
CUY	Communauté Urbaine de Yaoundé
DFID	Department for International Development
DRC	Democratic Republic of Congo
DSM	Demand Side Management
ECOWAS	Economic Community of West African States
ECREEE	ECOWAS Center for Renewable Energy and and Energy Efficiency
EE	Energy Efficiency
EPB	Energy Performance of Building
ESCO	Energy service Company
EU	European Union
EUEI PDF	EU Energy Initiative – Partnership Dialogue Facility
FACTS	Flexible Alternating Current Transmission System
FAQ	Frequently Asked Questions
GEF	Global Environment Fund
GICAM	Groupement Inter-patronal du Cameroun
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit, GmbH
HV	High Voltage (Network)
IBRD	International Bank for Reconstruction and Development
IFC	International Finance Corporation (World Bank Group)
INS	Institut Nationale de la Statistique
IPP	Independent Power Producer
ISO	International Organization for standardization
LCL	Low Consumption Lamp
LED	Light-Emitting Diode
LV	Low Voltage network
MINEE	Ministère de l'Eau et de L'Energie
MINEPDED	Ministère de l'Environnement, de la Protection de la Nature et du Développement Durable
MINESEC	Ministère de l'Enseignement Secondaire
MINESUP	Ministère de l'Enseignement Supérieur
MINFI	Ministère des Finances
MINHDU	Ministère de l'habitat et du développement urbain

MINMINDT	Ministère des Mines, de l'Industrie et du Développement Technologique
MV	Medium Voltage Network
NEEAP	National Energy Efficiency Action Plan
PDSE	Power Sector Development Master Plan
PPP	Public Private Partnership
RESCO	Rural Energy Service Company
SIE	Système d'Information Energétique du Cameroun
SME	Small and Medium Enterprises
UNIDO	United Nations Industrial Development Organization
VAT	Value Added Tax
WB	World Bank

Part I

ENERGY EFFICIENCY POLICY IN THE ELECTRICITY SECTOR

If electricity consumption in Cameroon were to continue along current lines (please see description of the electricity context in Annex 1), it would lead to a growing imbalance between supply and demand. This could be only partially offset by the planned investments in new production capacities and, even then, only if these capacities could be implemented within the scheduled time frame and the considerable financial resources required could be raised.

Therefore, it is essential to implement an effective energy efficiency policy for the electricity sector as soon as possible, so as to enable a relatively short-term reduction of the pressure on demand. However, beyond the anticipated impact in terms of spreading out the investments required to equip the country with additional electricity-generating capacity, the formulation and development of such an energy efficiency policy must be seen as the foundation of any subsequent energy policy. This should help to avoid, or at least limit, the perpetual headlong rush towards new production capacities which, even when based on the use of alternative energy forms to fossil fuels, still require heavy investment and significant financing.

The sustainability of the energy efficiency policy to be put in place is therefore a fundamental criterion during its conceptual development.

1 Potential electricity savings

1.1 Potential savings in the industrial sector

The industrial sector in Cameroon includes all industrial branches as well as the secondary sub-sectors such as electricity, gas and water distribution and civil works. The energy efficiency scenarios demonstrate that potential electricity savings of between 20% and 30%

(depending on how quickly co-generation is developed) are attainable in the industrial sector by 2025. Technical energy efficiency measures are about to generate around 50% of the projected savings in this sector. The key objective is to reduce the losses imputable to an inefficient use of electricity due to the lack of a fully-fledged internal energy system management in most of the industries. This concerns particularly useless electricity consumptions during the waiting phases before the actual start of a production line, inadequate regulation systems of energy intensive equipment such as compressors, poor management of the lighting systems, use of obsolete and/or non-efficient technologies and downgraded maintenance procedures leading to increasing the inefficiencies. In this framework, the implementation of actions related to alter or improve the present way of doing would allow a more rational use of electricity and, as a result, savings representing around 485 GWh at the 2025 horizon.

Co-generation's contribution from biomass

In terms of energy efficiency in the industrial sector, the biomass targeted is that produced as waste matter by the agribusiness (cotton ginning, rice mills, sugar industry, and oil production) and wood-processing industries.
In practice, these industries use this biomass but only exploit part of its energy potential: in fact, as the prospects to sell on excess energy at an attractive price are lacking, the manufacturers limit their co-generation output to their internal needs.
The agribusiness and wood-processing industries have an annual electricity production potential equivalent to around 700 GWh of electricity. This corresponds to an electricity-generating capacity of 140 MW. Developing this generation potential would require an investment equivalent to that of a thermal power plant, but in the absence of adapted pricing and incentives, these projects are not being developed. However, the potential is very real[1].

In terms of energy efficiency in the industrial sector, the promotion of co-generation project development would lead to:

- the recovery of waste from the industrial process that could replace fossil fuels,
- reduced grid demand on the part of industry.

[1] There are currently only two sugar refineries in the same group that use their bagasse residues in co-generation facilities. Critical mass has been reached and the potential may be developed and the industrial group already has a 73 GWh project. Rice mills do not produce electricity even though it is accepted that the biomass energy resource is twice as large as the requirement. In the palm oil production sector, the situation is the same and these industries can also inject their surpluses into the interconnected network (plants in the Douala region). The wood industry has the most significant potential: an industrial site in Mbang has a 1.5 MW co-generation project with partial injection into a mini rural electrification network. In Yaoundé, another site belonging to the same group has the potential to supply a co-generation plant of about 1.5 MW.

1.2 Potential savings in the tertiary buildings sector

The tertiary building sector includes public administration buildings, commercial buildings, restaurants and hotels, education and health buildings, office buildings such as telecommunications, real estate and finance. In this sector, electricity-saving measures are primarily concerned with air conditioning and lighting. The potential savings for existing buildings are divided between:

- short-term actions covering organisation (e.g. energy management), awareness raising and the reinforcement of maintenance programmes.
- medium-term actions aiming to improve lighting and air-conditioning performance.

For all new buildings, the development of a building energy quality code, with the aim of improving construction quality by imposing realistic specifications based on the state of the art and on experience in construction in Cameroon, is a pressing need.

Public buildings represent 37% of energy consumption in the tertiary building sector, with other buildings accounting for the remaining 63%. The work undertaken on energy efficiency scenarios has led to estimations of possible savings of 30% in electricity consumption in all of these buildings by 2025. This goal is particularly tangible for the public sector, in which bringing down the cost of electricity bills is vital.

1.3 Potential savings in the residential and end-users sector

The residential sector is defined as the part of the economy having to do with the places people stay or live. As far as energy is concerned, it leads to consider households building and end-user equipment:

- Households' buildings include occupied or unoccupied buildings, owned or rented buildings, single-family or multifamily buildings, housing units and mobile homes, excluding institutional such as hostels or school dormitories, hospitals, night shelters, and military barracks.
- End-user equipment includes any equipment, appliance or systems that use electricity or any equipment that causes, controls or influences electricity consumption in the households.

The residential sector is characterised by a significant change in the level of household appliances through the effect of development policies and increased household incomes. The data breaking down household electricity use confirm the trend towards an increasingly large proportion used by electrical appliances. The potential for savings can be found both in the improvement of household equipment today (lighting, television sets, fridges) and in the goods that will be acquired in the years to come (housing, air conditioners, household equipment). The construction of housing in particular has a strong potential for savings,

especially by reducing the need for air-conditioning through specific EE measures focussing on building rules (insulation, sunscreens) and on the performance of air conditioning units (energy performance standards).

In the residential sector more so than in the other sectors targeted by the study, the significant potential for savings, estimated at 30%, lies in regulation and standardisation.

1.4 Potential savings in the generation, transmission and distribution sector (Energy Supply)

The electricity system on the supply side in Cameroon is characterized by heavy losses.

As far as generation is concerned, EE actions could essentially take place at the level of the thermal plants and could lead to saving 160Mwh/year and around 1,000 tons of fuel.

Transport electricity losses are estimated at 6.3% in average and could be reduced at 4%, representing 55 GWh as compared to the BAU consumption in 2025. Distribution losses are at a 12% level, which is twice the level of losses of an optimized network. The electricity savings potential is therefore quite important, representing 300 GWh as compared to the total expected consumption in 2025.

1.5 General overview of potential savings

Based on the savings identified in scenario development, the total potential with regard to the 2025 BAU scenario is 2,250 GWh, broken down as follows:

Table 1: Overview of potential electricity savings

	Energy Savings (in GWh)	Required Investment to achieve savings (in EUR)	Savings (in EUR)	Equivalent of avoided new generation capacity (in MW)	Avoided Costs for equivalent new capacity (in EUR)
Industry	1 165	139 550 000	149 187 000	233	582 500 000
Tertiary Buildings sector	505	28 950 000	64 669 000	101	252 500 000
Residential & End-use	280	18 400 000	35 856 000	56	140 000 000
Electricity Supply	300	38 000 000	38 438 000	60	150 081 000
Total	**2 250**	**223 900 000**	**288 150 000**	**450**	**1 125 081 000**

2 The macroeconomic aspects of an energy efficiency policy

Energy efficiency appears to be a vital instrument to address consumer demand in the short and medium term until new production units come into service, but also as a long-term objective enabling a reduction in energy consumption and limiting investment in electricity production. Energy efficiency does not mean rationing electricity; rather, it is the rational use of this energy form by increasing the efficiency of its production, transmission, distribution and final consumption. In other words, the aim of an energy efficiency policy/strategy is not to reduce consumers' access to electricity but to indeed improve it; thereby increasing their quality of life rather than diminishing it. This means disconnecting economic growth (which should not be compromised on any account) from energy growth. The country will thus benefit from greater energy security and make significant savings in terms of fossil fuel imports. As a result, economic growth will also be reinforced, since manufacturing businesses are today complaining that their activities are restricted by the lack of electricity supply. Finally, the pressure on the electricity system will be reduced, allowing more time for the rational planning of the commissioning of new production capacities and thereby leading to substantial savings in investment costs.

From a macroeconomic perspective, benefits of an energy efficiency policy should not be limited to the timely and temporary resolution of Cameroon's current problem with balancing supply and demand in the field of electricity many specific benefits will arise from the establishment and implementation of a national strategy to increase energy efficiency, in particular:

- The improvement of the reliability of the electricity supply through bringing the level of consumption below the generation capacity while maintaining the same level of service for end-users;
- The reduction of the use of emergency or back-up units using fossil fuels and, as a consequence, the reduced costs for these fuels (for example, the Cameroonian industrial sector is responsible for using 26% of the fuel consumed in the country and a large proportion of this is used to supply self-generating diesel generators);
- The reduction of polluting emissions and, in particular, greenhouse gases, linked to this use of fossil fuels;
- The stimulation of economic growth by giving companies access to the energy they require in a reliable manner and by reducing the extra expenses they incur in back-up generators and fuels, therefore increasing the competitiveness of industrial companies and securing their economic survival ;
- The modernisation of infrastructures and industrial production equipment, again increasing the competitiveness of Cameroonian companies;
- The improvement in the standard of living of Cameroonian households, notably through the reduction of their electricity bills.

Finally, it should be emphasised that an energy efficiency policy is characterised by its economic viability, both at a macroeconomic level and in terms of individually considered economic players: all studies undertaken in developed countries and in emerging or developing countries around the world have demonstrated that energy efficiency investments are proportionally less expensive per KWh saved than electricity generation investments per KWh produced: in other words, it is generally less costly to invest to save a KWh than to invest to produce this same kWh.

3 Institutional and regulatory aspects

It is therefore a matter of ensuring that energy efficiency is henceforth considered a source of alternative energy to be exploited just like other energy sources. To do so, it is necessary to rely upon an appropriate legislative and institutional framework that will notably enable:

1. The implementation of a strategy to inform, to raise awareness and to reinforce capacities so as to foster an energy efficiency culture among the general public;
2. The implementation of actions including training, development, scientific research, demonstrations of techniques, and technology transfer in the energy efficiency area;
3. The promotion and supervision of studies to be undertaken on the aspects affecting energy efficiency (in particular, energy audits and technical and economic feasibility studies);
4. The promotion of the use of low-energy equipment in industry, households and public and private services, notably through an informative and normative approach (creation of energy performance standards, labelling procedures for consumer appliances and products);
5. The mobilisation of private operators (such as ESCOs) to increase the availability of performing equipment, quality services, appropriate financing means, etc. on offer, through the creation of a permanent, stable and reliable working environment that inspires confidence among potential investors;
6. The implementation of incentive measures in favour of energy efficiency for the different categories of consumers, through the most appropriate mechanisms for each target (subsidies, pricing adjustments, taxation, etc.).

A thorough analysis of the legislative, regulatory and institutional framework for energy efficiency in Cameroon was therefore undertaken so as to verify its suitability to requirements and to highlight potential shortcomings and failings. There are over thirty (30) pieces of legislation that are likely to concern aspects related to energy efficiency, the principal ones being law N° 2011/022 of 14th December 2011, regulating the electricity sector in Cameroon, and law N° 96/117 of 5th August 1996 relating to standardisation. As far as institutions are concerned, ten (10) public agencies already exist and the creation of another four (4) is envisaged. Among the institutions to be put into place, it is important to

mention the Energy Conservation Agency (APRUE) provided for by the 2011 law, which will be responsible for implementing the national electric energy management programme as well as supporting the development of the activities of energy service companies such as ESCOs (Energy Savings Companies) and RESCOs (Rural Energy Service Companies).

However, it would appear that only some recent legislation refers specifically to energy efficiency or seems likely to also concern energy efficiency:

- Law N° 2011/022 of 14th December 2011 regulating the electricity sector defines "energy efficiency" (Article 5) and grants the Authority responsible for energy the power to organise electricity energy management activities as well as the conditions for the implementation of the national energy management programme (Article 70.1). It paves the way for the rational use of energy while incorporating the notions of standards, energy efficiency monitoring, compulsory and regular energy audits, incentives and measures of encouragement, improved knowledge of the energy system, increased awareness among users, etc. This law also entrusted ARSEL with the implementation of the national electric energy management programme that will be designed by the Authority (Article 70.2);
- Law N° 2013/004 of 18th April 2013 establishing incentives for private investment, which stipulates specific measures favouring companies that contribute to the development of energy and water supply (ref. Article 14) ;
- Article 128 of the General Tax Code as modified by the Finances Law for 2012: VAT exemptions for solar or wind energy operating materials and equipment.

It may also be noted that Decrees N° 2013/203 and N° 2013/204 of 28th June 2013 regarding the organisation and operation of ARSEL and AER (Rural Electrification Agency) do not attribute a specific role in terms of energy efficiency to either of these institutions and that Law N° 96/117 of 5th August 1996 relating to standardisation does not refer specifically to standards related to energy efficiency.

The next major stage should consist of creating the Agency for the Promotion and Rationalisation of Energy Use (APRUE). This Agency, a public administrative body with legal personality and financial autonomy, should aim, among other things, to increase energy efficiency in the use of energy sources, particularly electricity, and to promote renewable energy sources.

The conclusion of this analysis is simple: despite the plethora of legislation and institutions mentioned above, the Cameroonian legal framework does not currently provide for a reliable institutionalised energy efficiency governance system nor does it establish an adequate legislative and regulatory framework, including the appropriate norms and standards. In particular:

- The institutional framework governing the country's energy efficiency sector is insufficient;
- The legislative and regulatory framework is still at the embryonic stage, more specifically with regard to the structure and application of energy efficiency norms and standards;

- The development of incentives for investment in the energy efficiency sector remains meagre.

It is therefore important to improve this context and to create the appropriate environment in which to establish a permanent energy efficiency policy in the country.

Part II

ENERGY EFFICIENCY STRATEGY IN THE ELECTRICITY SECTOR IN CAMEROON

1 Introduction

The methodological approach developed in order to establish a National Energy Efficiency Policy in Cameroon included the analysis of energy efficiency scenarios. Specifically, in order to be able to compare potential strategic approaches to a *business as usual (BAU) scenario* as described in annex 2, two other energy consumption scenarios were developed, based on the different levels of ambition of public action to encourage or demand an increased efficiency of electricity use. These two scenarios, the first of which is called the *low hanging fruit scenario* and the second, the *ambitious scenario*, and the BAU scenario were the subject of a specific report ("Report on Energy Efficiency Scenarios in the Electricity Sector", which can be referred to in Annex 2) and are based on two different visions:

- *Low hanging fruit scenario*: this scenario describes the savings that can be achieved through a simple programme of moderate cost in order to reach the most easily accessible energy savings;
- *Ambitious scenario*: this scenario shows the results that are likely to be achieved through a consistent and pro-active programme of multiple public actions aimed at stimulating or imposing the implementation of all technically and economically possible measures, namely those whose lead times (time needed to make these measures become fully operational) are judged reasonable, depending on the sectors concerned.

The following table shows the results of these two scenarios in 2025 (details regarding the elaboration methodology of these two scenarios can be found in Annex 2), compared with the BAU scenario:

Table 2: Comparison of BAU scenario and energy efficiency scenarios

Scenarios	2012	2025	% savings in 2025	Amount of annual savings in 2025	Annual value of savings for consumers
	GWh	GWh	%	GWh	Billion FCFA[2]
BAU (Reference)	3,710	7,040	-	-	-
Low hanging fruit	3,710	5,630	20	1,410	180
Ambitious	3,710	4,920	30	2,120	271

In both contemplated scenarios, the electricity consumption is expected to grow as compared to the 2012 consumption but each scenario makes the case for respectively 20% and 30% energy savings at the 2020 horizon. As a result, these scenarios provided the working framework enabling the selection of the measures that seem the most appropriate for each sector in terms of their potential impact, their relative ease of implementation (in the short or long term) and their cost, with as a general result the reduction of the energy consumption by 2,250 GWh representing more than 30% energy savings by 2025. Such an achievement would allow for cancelling or at least postponing the creation of 450 MW of additional capacity. The proposed measures in this respect are detailed in the following chapters.

2 The strategic framework

The political will to make energy efficiency into a national priority in order to support and ensure economic growth, reduce pollution and improve the population's standard of living assumes a strong political act that provides clear direction for the country in the area concerned, in the short, medium and long term.

The suggested method, which will also address the current shortcomings of the institutional and regulatory framework, is the discussion and adoption of a law whose goal should be to increase energy efficiency in the use of energy sources, avoid wastage, ease the burden of energy costs on the national economy, contribute to sustainable development, etc.

Among other goals, this law should enable:

[2] Based on an average price of 84 FCFA/kWh (ARSEL)

- The precise definition of the roles and responsibilities of the different public stakeholders with regard to the measures to be taken on sectorial and general levels. The possible creation of new public bodies (such as APRUE, for example) or the confirmation of the role of, or the consolidation of, certain other bodies should also fall within the scope of the law;
- The specification of the respective obligations of energy producers and consumers with regard to the actions they themselves should undertake in order to increase energy efficiency at their level (for example, this could be an electricity operator's obligation to reduce its generation, transmission and distribution losses or the obligation that industrial companies and buildings have to carry out a regular energy audit of their facilities and premises);
- The establishment of a regulatory framework allowing the development of certain professions and activities that are likely to facilitate the transition towards a less energy-intensive economy, for example, internal energy management in the industrial or buildings sector, the energy auditor certification procedure, or even the emergence of the market for Energy Service Companies (ESCOs);
- The definition of regulations to be applied to energy management in public buildings (belonging to the State or to local authorities) and energy efficiency investments, notably through ESCOs, in such a way that the public sector leads by example;
- The establishment of the administrative and regulatory framework for the setting of standards for building energy consumption and energy-consuming equipment, and for compliance by suppliers and users (as well as procedures for informing consumers via energy labelling on products) ;
- The establishment of the financial framework for incentives for energy management investments through subsidies, pricing or tax arrangements.

3 Strategic cross-sectorial goals

The implementation of an energy efficiency strategy in the electricity sector in Cameroon requires suitable measures to be drawn up for each of the consumption sectors identified within the framework of this study. However, there are cross-sectorial aspects, which are identical in principle for each of the sectors (even if the method of taking them into account may vary depending on the sectors) and which imply a general approach. In addition to the creation, as mentioned in Part II, of an appropriate institutional and legal framework that includes in particular an arsenal of normative measures and which represents an essential pre-requisite, these cross-sectorial aspects are as follows:

- The necessity of putting in place well-designed data collection procedures and macro- and microeconomic studies and of creating appropriate data analysis

structures capable of permanently monitoring and checking the results and impacts of the actions carried out;

- The development of programmes to inform, train and educate, as well as others to raise awareness of energy efficiency issues and methods;
- The development of appropriate and innovative for Cameroon financing mechanisms which would encourage investment and the mobilization of private finance.

The National Energy Efficiency Action Plan (NEEAP) proposed in Part IV of this report will highlight the practical measures related to these cross-sectorial aspects.

4 Strategic goals by sector

4.1 Strategy analysis

It is essential to have one core institution responsible for the overall coordination of all EE activities in Cameroun. It is suggested that the APRUE will be the national coordinator of the Energy Efficiency Policy and Action Plan implementation. MINEE as the responsible Ministry will establish a network of focal points representing the various administrations concerned by energy efficiency issues.
It is important to highlight the importance of the cross-cutting topics for all sub-sectors as previously mentioned and to emphasize how cross-sector cooperation on these topics is likely to create positive synergies. The cooperation on these issues will be supervised by the APRUE and coordinated with the focal points. It is advisable to have regular meetings on these topics

4.2 Strategic goals for energy efficiency in the industrial sector

The growth in expected energy demand is strongest in the industrial sector. Without intervention, in 2025, industrial demand will have doubled in comparison with 2012. The principal reason for this is a major increase in economic activities, particularly in the Kribi area with the commissioning of the deep-water port and the accompanying industrial projects. In the short term, a gradual increase in demand from ALLUCAM and a general rise in demand will escalate the risk of returning to a critical situation with the electricity system, even more so as the commissioning of works such as Lom Pangar or Mévélé are planned only for 2018-2020.

The challenge for the industrial sector is to limit growth in demand by implementing measures that target consumption by electric engines, pumps and compressors and by recovering co-generation potential from the agribusiness and wood-processing industries.

The implementation of a rational energy efficiency approach to enable the achievement of the EE potential in the industrial sector requires independent energy audits to be carried out by an auditor who is both independent (external to the company) and qualified (making it clear that the need to implement an auditor certification procedure is an important priority for the Cameroonian authorities to work on). The energy audit will identify all actions to be undertaken in the company to improve its energy performance; these may involve both low investment cost actions (measuring and monitoring consumption, raising staff awareness, optimising maintenance and operations, etc.) and those requiring heavier investment (introducing more efficient technologies in terms of the industrial process itself as well as for facilities). An effective means of accelerating modernisation in the industrial sector and reducing its electricity consumption would be to encourage companies to undertake these audits by making them a regulatory requirement, with the added incentive of financial support (for example, a subsidy of 50% of the cost of the audit) for a period yet to be determined.

Table 3: Strategic goals for the industrial sector

	Strategic goals	Results	Reasoning
1	Improved energy management in industries	The reduction of energy intensity in the industrial sectors compared with 2012 levels	The effective setup of energy management systems is the first area to focus on. Their concept is to implement a long-lasting approach to the process to improve energy management. The national community equips itself with the necessary means to influence industrial decision taking. This means the creation of a national energy observatory that collects and disseminates information and the launch of the APRUE, one of whose missions is to help industries with energy auditing programmes that are subsidised at over 50%.
2	Technological upgrading of industries at all levels (production lines overhaul, utilities improvement, etc)	The dissemination of efficient technologies across industry and the development of an adapted and locally available energy efficiency technical equipment offer	The political will and the financial means for EE development exist; the development of investments in efficient technologies and investment in energy-efficient production machines require a programme-based approach targeting the market and the mobilisation of financial resources. Acting on market conditions (developing financial incentives and in some cases technical standards) enables the emergence of projects to pick up pace.

	Strategic goals	Results	Reasoning
3	Capacity building and skills development	Decision-makers and managers are trained in energy management and apply its principles	High-level expertise in industrial EE is developed in Cameroon. Organisations such as engineering companies and Energy Service Companies are strengthened.
4	Co-generation development in agricultural and wood-processing industries	The recovery of the biomass energy resource and the development and implementation of investment in co-generation	The potential for biomass-based co-generation in industry is exploited in order to resolve the generation deficits in the electricity system in the short term. Projects can be rapidly developed because the biomass resource exists on the sites and in the areas where they may contribute to generation for connected or isolated networks.

4.3 Strategic goals for energy efficiency in the tertiary buildings sector

Energy demand from tertiary buildings sector in Cameroon represents 20% of the demand for electricity on public networks (720 GWh in 2012) with forecast growth of around 55% between 2012 and 2025. Reducing electricity consumption here is therefore an essential issue that relies, above all, on the appointment and training of an energy manager responsible for coordinating awareness initiatives and implementing low investment cost measures (for example, imposing a reasonable but not excessively low internal temperature for facilities, i.e permitting the optimization of electricity consumption without reducing the level of comfort for the occupants). In addition, as for the industrial sector mentioned above, the energy audit is a pre-requisite for energy retrofitting buildings, with a particular view to introducing new and efficient air conditioning, ventilation and lighting technologies.

The major challenge in tertiary buildings sector is to manage consumption in air-conditioned buildings. Depending on the type of building and what it is used for, the air-conditioning systems are generally the greatest sources of consumption, representing between 45% and 60% of consumption of the buildings concerned. The Consultant's field surveys confirm that the high consumption by the tertiary buildings sector in Cameroon is due to their poor initial design (no insulation, and large glass surfaces that are very exposed to the sun but not protected), a lack of maintenance (leading to efficiency losses in equipment) and, finally, the behaviour of users who have little awareness of the cost of running air conditioning.

User behaviour is an important point because simple and monitored measures may lead to savings without investment (in addition to air conditioners, this also concerns lighting).

Table 4: Strategic goals for Tertiary buildings sector

	Strategic goals	Results	Reasoning
1	Improved energy efficiency in new buildings	A new energy efficiency code for the construction of buildings is implemented and enforced	A building code that takes energy efficiency into account is the most effective means of reducing energy consumption in new buildings. The added cost of a construction whose design implements solutions to make the new building intrinsically efficient is lower than the cost of improving the energy efficiency of an existing building. The building code establishes which designs improve energy efficiency.
2	Improved energy efficiency in existing buildings	In 2018, 60 % of the tertiary buildings have carried out an energy audit, reaching 100 % in 2025	The energy efficiency of existing buildings may be improved in a cost-effective manner by paying particular attention to how the building is run. Promoting the position of on-site energy manager and measures to help building owners finance energy audits and find financing for renovations are ways to incentivise progress in this direction.
3	Improved energy efficiency in public buildings	The electricity bill of public buildings is reduced by 20 % in 2020.	The concern of the Government is to reduce its electricity bills in public buildings. The implementation of an energy manager in public buildings is strategic. The manager is responsible for liaising with the central authority that manages all public buildings and is a driving force in terms of improving the site and developing action plans to renovate the building. They also supervise equipment, such as air conditioning, and raise user awareness.
4	Improved education and awareness of energy efficiency in buildings	Key professional players of the building sector (architects, energy managers, etc) apply on a permanent basis EE principles	Architectural students are trained in the necessary fundamentals to understand issues of energy efficiency in professional practice. Professional architects are trained and informed in order to improve energy efficiency in the construction of buildings.

4.4 Strategic goals for energy efficiency in the residential sector and for end-users

With an estimated share of 30% of total energy consumption[3], the residential sector is the second-highest electric energy consumer in Cameroon. Electricity consumption in the residential sector is characterised by a large discrepancy between urban and rural

[3] In 2012, household demand on the electricity networks was estimated at 1,113 GWh.

households. 87% of the urban population has access to electricity, compared to only around 18.5% of households in rural areas. According to an INS assessment in 2007[4], lighting represented over 30% of household electricity use; however, according to an SIE report in 2010, lighting only represented 20% of this consumption, thus showing an increase in the use of other electrical appliances by households. Nonetheless, lighting remains a strategic area in which to reduce consumption and, above all, limit peak power demand (the majority of lighting is still incandescent lighting). However, because of the high urbanisation rate and the improvement in income and standards of living, the use of electrical appliances such as fridges, air conditioners, television sets, radios and washing machines is increasing: the intrinsic energy performance and efficient use of this household equipment are therefore becoming important issues. Minimum energy performance ratings must be established for all domestic appliances used by households, either in a purely Cameroonian context or by referring to what is being done in other developed or developing countries. For example, we could refer to the global en.lighten programme where lighting is concerned, but a specific approach may be developed with regard to other equipment such as air conditioning. In any case, consultation with private-sector stakeholders is necessary, as is the implementation of accompanying measures allowing the effective application of regulations to be monitored.

Table 5: Strategic goals for the residential sector and end-users

	Strategic goals	Results	Reasoning
1	Improved energy efficiency in electrical appliances	Households use more efficient products to reduce their energy consumption	There is much equipment in the domestic market that is not very efficient and has an impact on peak consumption. No energy performance standard is applied in Cameroon and users are not informed of the performance of the appliances available on the market. It is recommended that minimum energy performance standards are developed, that verification tests are undertaken by approved test laboratories and that the energy labelling of equipment is gradually put in place. Once informed, the consumers change their behaviour and give more weight to energy performance in their selection criteria.
2	Raised awareness of energy efficiency issues by citizens as part of the daily life	Behavioural change of end-users	There is currently a lack of general energy efficiency awareness at all levels. Educational programmes must therefore be developed and incorporated into school curricula. Advertising campaigns must be broadcast on radio and TV and run in newspapers in order to inform the general public of the benefits: direct savings on their energy bills and reduced government charges with impact on the fiscal pressure. .

[4] ECAM3, Rapport de Synthèse, 'Troisième Enquête Camerounaise auprès des Ménages: Tendances, Profil et Déterminants de la Pauvreté au Cameroun', Institut National de la Statistique, INS, Yaoundé, Cameroun.

4.5 Strategic goals for the energy efficiency of the electricity system

The electricity system in Cameroon obviously needs important upgrading. This will require long-term planning of the necessary investments to be realised. However, certain EE measures can allow making more electricity capacity available for end-users and therefore reduce the tension on the demand. In this framework, it is of utmost importance that the electricity operator undertakes upgrading generation plants (especially the thermal ones) and the transport and distribution networks with the view of substantially reducing the technical losses. In addition, measures aiming at reducing the demand, especially during peak hours (demand-side management) through incentives and pricing measures are also measures contributing to improving the general efficiency of the system. Finally, measures aiming at supporting the implementation of energy efficiency investments on the demand-side through appropriate mechanisms such as, for instance, ESCO-like mechanisms.

Table 6: Strategic goals for the electricity system

	Strategic goals	Results	Reasoning
1	Reduction of internal technical losses in the electricity system	Auxiliary thermal consumption < 5% Specific heavy-duty diesel consumption < 230 g/kWh Transmission losses < 4% Distribution losses < 6%	The operator must restore order to all levels of the system to reach technical loss levels that are comparable to those of good operators in Africa. This involves an industrial approach of the same type as that expected from heavy consumers.
2	Reduction in demand	Reduce peak demand by 10%	The relative reduction in peak demand must be sought out, particularly in technically fragile areas such as Yaoundé. To this purpose, incentive pricing and intervention models must be develop in order to promote the use of efficient equipment
3	Attainment of a satisfactory quality of service for all electricity consumers	Annual duration of power outages less than 10 h for all MV and LV professional clients	The improvement of the quality of service is a determining factor in the reduction of economic losses caused by the inefficiency of the electricity system. In addition, it is a pre-requisite for motivating clients to manage their demand and for introducing a rigorous pricing and sales policy. Unjustified power cuts must be avoided. The maintenance of thermal plants and the transmission network are priority actions at this level.

Part III

PROPOSAL FOR A NATIONAL ENERGY EFFICIENCY ACTION PLAN (NEEAP) IN CAMEROON

1 National Action Plan

1.1 Presentation of the interventions by sector and implementation schedule

An overview of the proposed measures is given in the following table with an implementation time frame, which is either short-term (ST: measures to be put in place by 2017 and producing immediate and staggered effects until 2020) or medium-term (MT: measures to be put in place within 4 or 5 years and that will produce effects from 2018 until 2025. Naturally, some of the measures presented at a sectorial level are of the same kind (cross-sectorial measures) and will therefore have to be brought together at the NEEAP level: for the sake of completeness, they are listed in the table below. Each of the goals will be presented in more detail in section 1.3.

Table 7 : Action plan measures and implementation time frame

Sector	Goal	Description	Implementation time frame
INDUSTRY SECTOR	1	Generating information on the energy situation in the industrial sector	ST
		Promoting energy audits and energy management systems in industry	ST
		Encouraging the emergence of bankable energy efficiency projects	ST
	2	Introducing an electricity pricing structure that encourages energy efficiency	ST
		Industrial retrofit programmes	MT
		Developing a regulatory and standardised framework that promotes energy efficiency	MT
	3	Training and capacity building for professionals as well as industrial institutions on energy efficiency issues	ST/MT
	4	Developing the ability to generate power from biomass	ST
TERTIARY BUILDINGS SECTOR	1	Setting up an energy efficiency data collection and documentation centre in buildings	ST
		Providing training on energy management to building managers in the private sector	ST
		Drawing up a programme to optimise the efficiency of lighting, air conditioning and miscellaneous equipment	ST
	2	Appointing energy managers in public buildings	ST
		Optimising electricity bills	ST
		Renovating electrical installations (lighting and air conditioning)	MT
		Improving the performance of air conditioning systems through the introduction of energy performance standards	MT
	3	Drawing up an energy efficiency building code for the construction of new buildings and national regulations for energy performance in existing buildings [5]	MT
		Creating or upgrading laboratories for testing and approving construction materials and developing a labelling scheme for such materials	MT

[5] Including energy efficiency regulation for the residential sector

Sector	Goal	Description	Implementation time frame
	4	Introducing EE into secondary and higher education programmes: architects, urban planners and civil engineers	MT
RESIDENTIAL AND END-USERS	1	Drawing up national regulations for the energy performance of household electrical appliances including standards and labels	MT
		Developing a regional approach for testing and approving electrical appliances	MT
		Setting up an information centre for the general public	ST/MT
		Promoting compact fluorescent lamps or LEDs	ST
	2	Campaign aimed at sensitizing households on EE issues	ST/MT
		Campaign aimed at sensitizing professionals on EE issues	ST
ELECTRICITY SYSTEM	1	Reducing technical losses in the transmission network	ST
		Reducing technical and commercial losses in distribution network	ST
		Servicing of connected and isolated diesel generators (auxiliary and specific consumption)	ST
		Introducing an appropriate and reliable performance monitoring system that is independent of the operator, for the long term	ST
	2	Introducing incentive-based MV rates for DSM	ST
		Implementation of ESCO-type processes by the operator	MT
	3	Appropriate maintenance of diesel generators ahead of the dry season in order to avoid power cuts	ST
		Temporary and long-term reinforcement of the transmission network in the direction of Yaoundé	MT

1.2 Financial Resources Required

Table 8: Financial resources required

Priority Area	Potential GWh	Timming	Saving Potential	Financial Requirements (public)
Industry	1165	Short Term Actions	90%	30 800 000
		Medium Term Actions	10%	2 750 000
Tertiary Buildings sector	505	Short Term Actions	43%	7 250 000
		Medium Term Actions	57%	11 700 000
Residential and end use	280	Short Term Actions	46%	12 650 000
		Medium Term Actions	54%	5 750 000
Electricity system	300	Short Term Actions	83%	31 000 000
		Medium Term Actions	16%	-
Total	**2 250**		**32%**	**101 900 000**

In 2025, the savings generated are 2,250 GWh, which represent **a reduction in consumption of 30 %** compared to the BAU scenario. Public investment is estimated at € 101 900 000.

1.3 Cross-sectorial measures

As indicated in Part III, the implementation of the NEEAP necessarily means taking account of measures of a cross-sectorial nature that have a general impact or apply simultaneously to several sectors. These measures are summarised in the following tables:

Table 9: Cross-sectorial measures – Data collection and analysis systems

Action list	Data collection and analysis systems			
	Industry	Buildings	Households	Electricity supply
Establishing sectorial working groups comprised of all stakeholders	MINEE, ARSEL, AES-SONEL, SIE and industrial organisations	MINEE, ARSEL, MINFI, SIE and building management associations	MINEE, ARSEL, SIE and consumer associations	MINEE, ARSEL, AES-SONEL, AER and IPPs (Independent Power Producers)
Developing a procedure for the regular collection of information and data	A statistical form is created to be completed and returned by companies on an annual basis	Energy managers for tertiary buildings sector send their data on an annual basis using an appropriate form	Data collection is undertaken on a regular basis by SIE	The list of data to be collected is pre-established and is provided by AES-SONEL on a regular basis.
Creating the legal and regulatory environment required for the collection process	The law on energy efficiency establishes the regulatory framework and specifies the conditions in which collection is undertaken (concerned bodies, size thresholds, frequency, confidentiality, eventual penalties for lack of non-compliance, etc.)			
Compiling and processing the data and information gathered according to international standards	The statistics are developed by industrial sub-sector and categorised	SIE interprets the data and processes them according to internationally adopted rules	ARSEL and SIE analyse household demand and its evolution on an annual basis	AES-SONEL, ARSEL and SIE establish a database on electricity supply and consumption sectors
Publishing the data and information gathered in an appropriate form on an annual basis	The law on energy efficiency also covers the transparency and/or confidentiality conditions governing the data collected and stipulates the conditions and forms in which these may be published or made accessible			

Table 10: Cross-sectorial measures - Information, training and awareness-raising

Action list	Information, training and awareness-raising			
	Industry	Buildings	Households	Electricity supply
Integrating teaching dedicated to energy and energy efficiency into school and university curricula	Programmes on the principles of energy efficiency in the industrial sector and on the suitable technologies	Programmes on the principles of energy efficiency in the construction sector and on the suitable technologies	Specific programmes covering the energy consumption of domestic appliances and the efficient use of energy in households	Teaching programmes put emphasis on techniques for energy generation and the improvement of production yields
Launching specific training programmes	Training programmes are developed for energy managers and energy auditors	Training programmes are developed for energy managers, energy auditors, architects, property developers and property managers, etc.		Ongoing training of engineers and company executives working in electricity generation
Organising information for different audiences through awareness-raising campaigns using the appropriate tools for each sector	Targeted technical information is disseminated to businesses through their professional organisations	Conferences are organised for architects and other stakeholders in the construction sector	Organisation of information for the general public through awareness-raising campaigns in urban centres and campaigns using the appropriate media	
Creating an energy efficiency information and documentation centre	This centre could be created within APRUE, for example, and would be open to everyone (businesses and private individuals), providing a wealth of technical, legal, institutional and economic information on energy efficiency			

Table 11: Cross-sectorial measures - Institutional and regulatory framework

Action list	Institutional and regulatory framework			
	Industry	Buildings	Households	Electricity supply
A law governing energy efficiency must be voted in, promulgated and implemented	See Part III for the different aspects that must be taken into account by the law on energy efficiency			
Legislation must be drafted and applied with regard to the energy standardisation of equipment and labelling	Minimum energy performance thresholds must be fixed for certain types of industrial equipment (electric engines, transformers, refrigeration units, etc.)	Building construction codes must be revised so as to incorporate the principles of bioclimatic architecture and to establish energy consumption thresholds	Minimum energy performance thresholds must be fixed for household appliances, air conditioning and lighting. Informative labelling regarding energy consumption must become compulsory	Regulatory provisions must be applied with regard to reactive energy management
Legislation must be drafted and applied with regard to auditor and energy manager certification	Procedures to check training and competency levels leading to a certification process must be created. Similarly, the activity of ESCOs must be supervised by specific legislation			
Legislation must lay down the conditions in which the established energy standards are respected	The implementing decrees of the law on energy efficiency will stipulate what needs to be put in place in order to enforce the energy consumption standards for equipment (setting up laboratories for testing, monitoring and approving; border controls and training of border officials, etc.)			Negotiations must commence with the electricity operator so as to verify how to reduce the level of technical and non-technical losses

Table 12: Cross-sectorial measures – Appropriate financing mechanisms

Action list	Appropriate financing mechanisms			
	Industry	Buildings	Households	Electricity supply
Establishing public incentives to encourage energy efficiency	Promoting Energy Service Companies (ESCOs) and supporting their development through the subsidy of energy audits. Conditions of eligibility yet to be determined Establishing a portfolio of bankable energy efficiency projects that satisfy the criteria of national and international lenders		Developing taxation and pricing approaches (tax credit for investments, pricing adapted to type of organisation and consumption, etc.)	
Raising private investment	Establishing credit lines that are devoted to energy efficiency, reserved for SMEs and enhanced by the Government or by bilateral cooperation.	Launching calls for tender among ESCOs for the energy retrofitting of public buildings within the framework of PPPs	Studying the possibility of having the electricity operator finance the introduction of compact fluorescent lamps under a third-party financing system	Launching investment programmes to significantly reduce the technical and non-technical losses to be financed by the banking sector

1.4 Action plan for electricity efficiency in the industrial sector

Industrial sector GOAL:	***Improving energy management in the industrial sector***
Initiative No. 1:	**Generating information on the energy situation in the industrial sector**
Background and description of the intervention	The SIE annual report assembles information on energy, where the level of aggregation provides an overall view of the energy sectors and end-uses. This initiative consists in extending the dissemination of information to industrial sub-sectors and business lines. 1. Developing a survey tool with a view to generating statistical data which target the business lines and all the sub-sectors in the industrial sector at an intermediate aggregation level; 2. Introducing and monitoring sector-based energy indicators linked to economic momentum (energy intensity, i.e. energy consumption in relation to income) and technical practices (specific consumption, i.e. consumption expressed as a physical amount that measures industrial activity); 3. Disseminating information on and assessments of the situation in the industrial sector on a regular basis, making a ranking of Cameroon industrial business lines in their national context, based on comparable data in an international or regional context, available to companies and public decision-makers (for major industrial sectors like cement production, drinks and food processing, metal products and textiles). These data will be gathered and processed by MINEE teams that are already involved in generating information on energy. This special survey will be circulated in the form of a supplementary booklet alongside existing annual reports; 4. Monitoring the implementation of the action plan, and directing energy efficiency policies using the indicators selected.
Expected results	A database of industrial energy consumption at an intermediate (sub-sector) aggregation level which directs EE policies, and supplies objective indicators for the industrial EE plan monitoring system.
Conditions required:	• Available and functional data collection tools (e.g. National energy consumption survey); • All industries must be required to disclose their data to the MINEE every year; • Communication campaigns aimed at industry and industrial organisations must be organised, to explain the benefit and the need for these data.
Implementation agency	MINEE
Stakeholders involved	MINEE, INS, MINMINDT, and industrial organisations
Target:	Industrial companies
Potential savings:	indirect saving 0.8 % of industrial electricity consumption (2.5 GWh / year)
Estimated budget:	€100,000 per year
Funding source:	Government budget lines
Implementation time frame:	2014/2015
Monitoring:	MINEE: Annual Publication Indicator.

Industrial sector ***GOAL:***	***Improving energy management in the industrial sector***
Intervention No. 2:	**Promoting energy audits and energy management systems in industry**
Background and description of the initiative	1. Raising industrial decision-makers' awareness of the need for energy efficiency and of the benefits they can achieve; 2. Raising awareness among the staff of the companies involved, and encouraging best practices when operating equipment and facilities; 3. Supporting companies by subsidising energy audits, and preliminary studies for projects that implement efficient technologies. The scheme primarily targets air compressors, cooling equipment, electric engines, and electronic variable speed drives. It has been designed so as to enable the emergence of projects that are sufficiently far advanced to be presented to banks or lenders; 4. Supporting the effective implementation of energy management systems based on ISO 50001 or equivalent guidelines.
Expected results	Improving energy performance in industrial companies, and realising the untapped EE, cost savings, environmental contribution and climate protection potential.
Conditions required:	The approach relies on the setting up of the APRUE, which would enable: • The dissemination of targeted information (sector-based studies and benchmarks, and technical handbooks, etc.); • The development of a training offer for industry; • Support for technical research; • Support for projects that implement structured energy efficiency plans for each geographical area (industrial zones for the Douala or Yaoundé areas) and are backed by professional groups (e.g. Professional Organisations).
Implementation agency	MINEE
Stakeholders involved	MINEE, INS, MINMINDT, ARSEL, and industrial organisations
Target:	Industrial companies
Potential savings:	3.3% of industrial electricity consumption (10,8 GWh/year)
Estimated budget:	€7,000,000
Funding source:	Donors programs
Implementation time frame:	2014 to 2019
Monitoring:	MINEE: number of companies implementing sound energy management practices

Industrial sector ***GOAL:***	***Developing efficient technologies***
Intervention No. 1:	**Encouraging the emergence of bankable energy efficiency projects**
Background and description of the initiative	Levels of awareness and organisation are not identical in all the country's industrial sectors, as the size and complexity of projects may vary from one business sector to another. Nonetheless, energy efficiency projects may emerge rapidly, if they can find the funding required. This intervention consists in developing appropriate approaches for encouraging the emergence of investment projects: 1. Implementing programmes for developing industrial EE projects, including technical assistance for the project initiators; 2. Organising a financing system that adopts quick and simple procedures for assessing less complex projects; 3. Setting up a programme to help banks assess complex projects; 4. Organising the bank financing system for large projects (co-generation and efficient production equipment) with borrowing conditions that will be especially favourable if the project is efficient; 5. Arranging lines of credit with banks. The project financing will be granted by national banking networks that refinance themselves via credit lines from lenders.
Expected results	Access to financing will be more flexible for small energy efficiency projects; borrowing conditions will be favourable for companies that do not have access to the international capital markets.
Conditions required:	Functional industrial EE programme
Implementation agency	AfDB (private sector)
Stakeholders involved	Industrial professional organisations and national and international financial institutions active in Cameroon
Target:	Industrial companies
Potential savings:	5.6% of industrial consumption (18,3 GWh/year))
Estimated budget:	€2,000,000 (Credit line of €20 million)
Funding source:	WB, AFD-Proparco and AfDB
Implementation time frame:	2015
Monitoring:	AfDB, indicators for the amount of the loans and the number of projects financed

Industrial sector ***GOAL:***	***Developing efficient technologies***
Intervention No. 2:	**Introducing an electricity pricing structure that encourages energy efficiency**
Background and description of the intervention	Altering the industrial pricing structure provides a strong signal for encouraging energy efficiency: increasing the demand charge helps to reduce the installed capacity and lower consumption in general. A pricing structure that includes heavy penalties for excessive overruns and/or other mechanisms such as progressive pricing influences the management of facilities (start-up management); while increasing the power factor influences the quality of electrical facilities and installations.
Expected results	Pricing signal that encourages energy efficiency in the industrial sector. Development of initiatives for limiting power consumption in the industrial sector
Implementation agency	ARSEL
Stakeholders involved	ARSEL, MINMINDT, MINFI, and AES-SONEL
Target:	Industrial companies
Potential savings:	Indirect savings 0.5 % of industrial consumption (1.7 GWh/year)
Estimated budget:	€100,000
Funding source:	Feasibility studies to be funded by the government and donors programs
Implementation time frame:	2014
Monitoring:	ARSEL; indicator: electricity consumption of the industrial sector

Industrial sector GOAL:	***Developing efficient technologies***
Intervention No. 3:	**Industrial retrofit programmes**
Background and description of the intervention	In some cases, companies have production tools that are obsolete, both in terms of their production performance and from an energy standpoint. Industrial retrofitting first and foremost involves working on the industrial organisational structure, manufacturing processes, and target markets. From this standpoint, retrofitting may also introduce an energy component and efforts to optimise companies' energy performance. 1 Developing the energy component in the already started Cameroon's industrial retrofit programme; 2 Identifying projects that combine industrial performance with energy performance; 3 Technical and financial support for projects, and specific additional assistance for the renewal of production equipment that leads to energy savings.
Expected results	The energy retrofit programme will be a driver for disseminating efficient technologies in the industrial sector.
Conditions required:	Launch of the industrial retrofit programme, development of energy efficiency skills within the pool of experts involved in the programme
Implementation agency	MINMINDT
Stakeholders involved	MINEE, and industrial organisations
Target:	Cameroon companies
Potential savings:	2 % of industrial consumption (7.5 GWh/year)
Estimated budget:	€750,000 (energy component of the industrial retrofit programme)
Funding source:	UNIDO and AFD Proparco
Implementation time frame:	2018 to 2025
Monitoring:	MINMINDT, indicator for the number of EE projects financed and energy savings realised.

Industrial sector GOAL:	***Developing efficient technologies***
Intervention No. 4:	**Developing a regulatory and standardised framework that promotes energy efficiency**
Background and description of the intervention	1. Introducing energy guidelines and standards • Establishing energy standards for Cameroon industry based on operational feedback (audits, grants and project launches) with the assistance of public authorities, and annual statistical surveys carried out in industrial business lines and sectors; • Setting guidelines for industrial equipment and facilities (engines, delivery platforms and lighting) that establish the energy performance applicable to the industrial sector; • Introducing a mandatory aspect via legal channels (mandatory guidelines, and a level of performance to be achieved for new projects under development). 2. Energy performance guidelines and standards applicable to imported equipment: • Establishing the guidelines and minimum standards applicable to imported equipment (primarily engines, transformers and lighting); • Rejecting equipment that does not satisfy minimum energy performance requirements (e.g. industrial lighting).
Expected results	The results from the first stage of the plan will be used to set standards (specific consumption target in a given industrial sector) and guidelines (performance required from equipment). The regulatory channel makes guidelines or standards mandatory. The risk of returning to a previous energy efficiency situation is limited.
Conditions required:	The tool for monitoring energy consumption must be functional and generate data regarding industrial performance. Introduction of monitoring and testing resources (certified laboratories) Introduction of incentive-based measures that promote effective products
Implementation agency	ANOR
Stakeholders involved	MINFI, MINEE, MINMINDT, and ANOR
Target:	Industrial equipment suppliers
Potential savings:	indirect impact 0.4 % of industrial consumption (1.3 GWh/year)
Estimated budget:	Between €250,000 and €2,500,000, depending on whether international guidelines that are already accepted are adopted, or Cameroon guidelines are developed
Funding source:	Government and EU
Implementation time frame:	2018
Monitoring:	MINEE; indicator: number of partnerships established with regional testing laboratories

Industrial sector ***GOAL:***	***Capacity building and skills development***
Intervention No. 1:	**Training and capacity building for professionals as well as industrial institutions on energy efficiency issues**
Background and description of the intervention	The purpose of this intervention is to structure a training and skills offer that meets the requirements of the action plan and of industry in general. 1. Creating a structured and qualified branch of professionals that is capable of recommending and implementing energy efficiency measures: • Raising consultancies' awareness and developing skills networks; • Additional training for professionals; 2. Increasing the skills of the administrative authorities in charge of energy efficiency through capacity buildings programs 3. Boosting the Cameroon education system at the level of professional and university education: • Training teachers • Creating new divisions or modules in existing divisions
Expected results	Increased capabilities at the institutional level, increased capabilities of energy consulting businesses and energy service companies
Implementation agency	MINEE
Stakeholders involved	MINEE, Ministry of Education
Target:	Students, professionals and public institution staff.
Potential savings:	indirect impact 0.4 % of industrial consumption (1,3 GWh/year)
Estimated budget:	€1,000,000
Funding source:	EU, Government, SE4All
Implementation time frame:	2015-2025
Monitoring:	MINEE; indicator: number of people trained in the various targeted categories

Industrial sector GOAL:	***Developing co-generation in the agricultural and forestry product industries***
Intervention No. 1:	**Developing the ability to generate power from biomass**
Background and description of the intervention	1. Identifying Cameroon industrial facilities that are capable of implementing co-generation projects. The forestry products and palm oil production industries are industries that are capable of implementing projects within a short time frame and are considered as priority areas; 2. Designing programmes where the goal is to achieve an additional power generation capacity of between 90 and 130 MW from co-generation by 2018 at the latest; 3. Financing the projects presented before 2018.
Expected results	An industrial power generation capacity that enables the elimination of some industries' grid-based power consumption and/or the rapid development of excess generation capacity that can be fed in to the grid without using fossil fuels.
Conditions required:	Creating the conditions for developing co-generation projects via drawing up purchase rates, a purchase obligation for the power operator, and assistance with investment.
Implementation agency	ARSEL
Stakeholders involved	MIMEE, ARSEL,AES- SONEL, and AER
Target:	Agricultural and wood processing industries
Potential savings:	16.5% of industrial electricity consumption(53.8 GWh/year)
Estimated budget:	€15 million (public investment) and €70 million in private investment. €625,000 per year (2018-2025)
Funding source:	AfDB, EMF, WB, and EU
Implementation timeframe:	2015 to 2017
Monitoring:	ARSEL; Indicator: installed capacity and resource used

1.5 Action plan for energy efficiency in the tertiary buildings sector

Tertiary buildings sector ***GOAL:***	***Improving the energy efficiency of existing buildings***
Intervention No. 1:	**Setting up an energy efficiency data collection and documentation centre in buildings**
Background and description of the intervention	1. Classifying buildings by business sector and according to their level of power consumption: gathering of buildings' power consumption data by ARSEL in order to classify them according to their consumption levels; 2. Gathering of information regarding the businesses and performances obtained from the surveys by Public Sector Energy Managers and building owners in the private sector. Using the results of energy audits; 3. Disseminating the information for the intention of Energy Managers in public buildings, benchmarking and feedback.
Expected results	Identifying the public buildings that require the implementation of an action plan; Generating data in order to raise awareness among building owners and building occupants
Conditions required:	Access to the power consumption data for public buildings and buildings in the private tertiary sector for the purpose of the survey; The results of the audits that receive direct or indirect assistance in EE programmes and projects must be gathered in a database.
Implementation agency	MINEE
Stakeholders involved	AES-SONEL, INS, MINEE, ARSEL, and building managers and developers
Target:	Public or private tertiary sector buildings
Potential savings:	indirect impact 0.9 % of tertiary buildings sector (0.8 GWh/year)
Estimated budget:	€750,000 over 10 years
Funding source:	MINFI (Government buildings)
Implementation time frame:	2015
Monitoring:	MINEE, Annual publication indicator

Tertiary buildings sector ***GOAL:***	***Improving the energy efficiency of existing buildings***
Intervention No. 2:	**Providing training on energy management to building managers in the private sector**
Background and description of the intervention	Providing training on: • Monitoring electricity bills and optimising the pricing structure applied; • Drawing up an EE programme for their building; • Raising consumers' awareness about using energy in a rational way; • Checking the efficiency of the building's equipment; • Overseeing maintenance programmes, and taking part in building management committees; • Introducing energy management tools and means of control.
Expected results	Building managers in the private sector are aware of, and receive training on energy management.
Implementation agency	APRUE
Stakeholders involved	ARSEL, AES-SONEL, and professional organisations
Target:	Private buildings
Potential savings:	5.3% of tertiary buildings sector electricity consumption(5 GWh/year)
Estimated budget:	€300,000
Funding source:	EU
Implementation time frame:	2015-2020
Monitoring:	APRUE; indicator: energy used before and after training (sample survey)

Tertiary buildings sector ***GOAL:***	***Improving the energy efficiency of existing buildings***
Intervention No. 3:	**Drawing up a programme to optimise the efficiency of lighting, air conditioning and miscellaneous equipment.**
Background and description of the intervention	1. Raising awareness about energy efficiency issues among building managers and identifying projects; 2. Drawing up implementation strategies: • forecast segmentation of private tertiary sector buildings; • EE targets to achieve and time frames; • support for projects operating in geographical areas (towns and districts); • establishing which technologies to promote. 3. Disseminating educational information and getting involved in setting up campaigns to raise awareness among building occupants; 4. Supporting energy audits through subsidising up to 70% of the cost of the study; 5. Supporting the preparation of financing applications for viable projects (bank financing, donations or recourse to a third party investor via the electricity company); 6. Assessing the programme's performance at the national level.
Expected results	Reduction of energy consumption in private buildings (up to 20 % of their energy consumption)
Conditions required:	Introduction of incentive-based mechanisms for financing projects; Targeted initiatives by the electricity company in order to promote operations that limit peak consumption (financial intervention for air conditioning systems and lighting); Improving the legal, institutional and regulatory frameworks for EE, and providing incentives for the purchase of efficient equipment; Setting up a body to monitor the equipment (certified laboratories).
Implementation agency	APRUE
Stakeholders involved	MINEE, ARSEL, AES-SONEL, AfDB, and national banking networks.
Target:	Building owners in the private sector
Potential savings:	10.2% of tertiary buildings sector electricity consumption(9.6)
Estimated budget:	€5,000,000 (public) €10,000,000 (private investment)
Funding source:	GEF, WB, and AFD
Implementation time frame:	2015-2025
Monitoring:	MINEE; indicators: savings generated and number of projects realised

Tertiary buildings sector ***GOAL:***	***Improving the energy efficiency of public buildings***
Intervention No. 1:	**Appointing Energy Managers in public buildings**
Background and description of the intervention	1. Determining the role of an energy manager for a public building: • Monitoring electricity bills and optimising the pricing structure applied; • Drawing up an EE programme for their building; • Raising consumer awareness about using energy in a rational way; • Checking the efficiency of the building's equipment; • Overseeing maintenance programmes, and taking part in building management committees; • Reporting on the building's performance to the unit responsible for the public building EE programme 2. Identifying the positions to be created or developed: drawing up lists of priority buildings based on an assessment of expenditure, and planning the appointment of managers; 3. Improving the capabilities of energy managers: • Technical training; • Energy management tools and means of monitoring; • Budget and finance issues.
Expected results	Energy managers in public buildings, at the Government and district level, improve and monitor energy efficiency.
Conditions required:	Creation of an energy manager position within public buildings.
Implementation agency	MINFI for Government buildings, committees or units formed by local authorities
Stakeholders involved	MINFI, Urban Districts, MINEE, ARSEL, and AES-SONEL
Target:	Public buildings
Potential savings:	1.8 % of tertiary buildings' consumption(1.7 GWh/year)
Estimated budget:	€600,000 (excluding personnel expenses)
Funding source:	Government
Implementation time frame:	2015
Monitoring:	MINFI, indicators: number of positions created and savings generated for each manager position. Successful cases to be published and used to create awaremess.

Tertiary buildings sector ***GOAL:***	***Improving the energy efficiency of public buildings***
Intervention No. 2:	**Optimising electricity bills**[6]
Background and description of the intervention	• Drawing up a full inventory of all public subscribers, and a database of information regarding electricity billing; • Creating a digital electricity billing database; • Classifying depending on the type of subscription (LV or MV); • Identifying and implementing initiatives to optimise billing: selecting a software tool that is appropriate for optimising electricity bills; • Drawing up and implementing the bill optimisation plan; • Preparing the applications required by the concession holder; • Establishing and monitoring monthly consumption targets for all public MV and LV subscribers; • Training energy managers to manage electricity contracts.
Expected results	Electricity billing data for each type of subscription; Optimised electricity bills and lower energy consumption; Energy Managers who are able to optimise electricity bills in their own buildings.
Conditions required:	Cooperation between AES-SONEL, INS, ARSEL, and the Ministries involved. Electricity bill optimisation software
Implementation agency	APRUE
Stakeholders involved	MINFI, ARSEL and AES-SONEL
Target:	Public buildings
Potential savings:	0.9 % of tertiary buildings' consumption(0.8 GWh/year)
Estimated budget:	€600,000
Monitoring:	MINFI; indicator: energy saved (KWh) and electricity bills reduction (FCFA)

[6] Optimising costs by arbitraging between rates and reducing physical electricity consumption.

Tertiary buildings sector ***GOAL:***	***Improving the energy efficiency of public buildings***
Intervention No. 3:	**Renovating electrical installations (lighting and air conditioning)**
Background and description of the intervention	• Technical studies aimed at upgrading internal electrical installations and separating air conditioning, lighting and utility networks. Specifying energy optimisation solutions for air conditioning and lighting systems; • Drawing up a financing plan (use of public or private financing mechanisms); • Launching the works; • Monitoring performance.
Expected results	Improved safety of electrical installations; Improved management of air-conditioning systems; Easier metering of lighting and air conditioning expenses.
Conditions required:	Appointing a Public Contracting Authority. Possibility to tap public budget lines.
Implementation agency	MINFI for Government buildings
Stakeholders involved	MINFI, ARSEL, EE Expert, Energy Managers, electricity consulting firms, and monitoring agencies.
Target:	Public buildings
Potential savings:	3.1 % of tertiary buildings' consumption(2.9 GWh/year)
Estimated budget:	€3,000,000 (investment for about 10 buildings of 120 offices each)
Funding source:	Government, GEF and EU
Implementation time frame:	2015-2020
Monitoring:	MINFI; indicator: energy savings realised (KWh) and electricity bill reduction (FCFA)

Tertiary buildings sector ***GOAL:***	***Improving the energy efficiency of public buildings***
Intervention No. 4:	Improving the performance of air conditioning systems through the introduction of energy performance standards
Background and description of the intervention	1. Systematic inspection of air-conditioned areas and cooling circuits: • Proper sealing of openings (doors and windows) in air-conditioned areas; • Condition of the refrigerant circuits for air conditioning units (split systems, and air conditioning cabinets, etc.); • Raising users' awareness about the proper use of refrigeration equipment; • Daily monitoring of the way openings are positioned in air-conditioned areas; 2. Drawing up plans to upgrade the installations; 3. Monitoring energy performance.
Expected results	Shortening periods when air conditioning units are in operation; Guaranteeing energy performance over time.
Conditions required:	Appointing a Public Contracting Authority; Possibility to tap public budget lines.
Implementation agency	MINFI
Stakeholders involved	MINFI, ARSEL, EE Expert, Energy Managers, and Donors.
Target:	Public buildings
Potential savings:	1.8 % of tertiary buildings' consumption(1.7 GWh/year)
Estimated budget:	€1,500,000 (investments for about 10 buildings of 120 offices each)
Funding source:	AfDB, GEF, WB, and AFD
Implementation time frame:	2015-2020
Monitoring:	MINFI; indicator: energy savings realised (KWh) and electricity bill reduction (FCFA)

Tertiary buildings sector ***GOAL:***	***Improving the energy efficiency of new buildings***
Intervention No. 1:	**Drawing up an energy efficiency building code for the construction of new buildings and national regulations for energy performance in existing buildings**
Background and description of the intervention	1. Studying the energy codes of other countries that have similar climatic conditions in Africa or Asia in order to use them as a guide for drawing up the code in Cameroon. 2. Drafting legislation regarding the energy performance of buildings (**commercial, tertiary and residential buildings. New constructions and existing buildings)** • Establishing the code's requirements in terms of: 1. The thermal performance of building materials; 2. The bioclimatic quality of the building (orientation, protection against the sun, and natural ventilation of the buildings); 3. Minimum energy performance of the equipment installed (air conditioning and regulation systems); 4. Regulatory calculation of forecast consumption, governed by benchmark consumptions; 5. Requirements for the quality of the equipment maintenance process. • Drawing up commitment agreements as part of the application of the Energy Efficiency Code to be adopted by all stakeholders in the construction project (architects, consultants, and contracting firms); 3. Drawing up strategies for checking the implementation of the Code's recommendations during the construction process; 4. Assessing the Code at regular intervals, and gradually increasing the energy performance requirements.
Expected results	Energy Efficiency Code for buildings Systematic application to public contracts: the Government sets the example; Construction processes for new public buildings are based on an efficient building model.
Conditions required:	Setting up a body to certify new buildings Designing a system to monitor the energy performance of facilities
Implementation agency	MINHDU
Stakeholders involved	MINHDU, MINEE, ARSEL, EE Expert, Energy Managers, and lenders.
Target:	Public and private building owner, managers and users
Potential savings:	1.8 % of tertiary buildings' consumption(1.7 GWh/year)and 7% of residential buildings' consumption (11.7 GWh / year)
Estimated budget:	Between €300,000 and €4,000,000 (depending on the level of adaptation required for international regulations that can be used as models) for drawing up the Code
Funding source:	EU, Government.
Implementation time frame:	2017
Monitoring:	MINHDU: Drawing up the Code

Tertiary buildings sector ***GOAL:***	***Improving the energy efficiency of new buildings***
Intervention No. 1:	**Creating or upgrading laboratories for testing and approving construction materials and developing a labelling scheme for such materials**
Background and description of the intervention	The laboratory for testing and approving all materials and equipment involved in buildings construction will make a full range of building materials and their heat transmission coefficients available at the national level. This means architects will have access to materials with the highest energy performance, thereby guaranteeing a better EPB level when designing buildings.
Expected results	Process for testing and approving construction materials; National construction materials database.
Requirements	Cooperation between various Ministries (Housing, Energy, Environment, etc.) and the Ecole Polytechnique; Involvement of ANOR; Involvement of the National Architects' and Civil Engineers' Association.
Implementation agency	Ministry for Urban Planning and Housing
Stakeholders involved	ARSEL, MINEE, ANOR, the Ministry for Urban Planning and Housing, Architects' Association, Civil Engineers' Association, and the Ecole Polytechnique
Target:	Architects and engineers Buildings construction decision-makers
Potential savings:	3,6 % of tertiary buildings' consumption(3.3 GWh/year)
Estimated budget:	€2,000,000
Funding source:	Donors programs
Implementation time frame:	2015 - 2020
Monitoring:	APRUE; indicator: energy consumption in the residential housing sector

Tertiary buildings sector ***GOAL:***	***Improving the energy efficiency of new buildings***
Intervention No. 2:	**Introducing EE into secondary and higher education programmes: Architects, urban planners and civil engineers**
Background and description of the intervention	• For secondary and higher education: – Defining specific EE targets; – Drawing up the training programme; – Producing syllabi; – Bringing trainers up to speed with teaching EE concepts; – Training educational inspectors; – Organising university conferences dedicated to EE, which boosts the awareness-raising process; • For professionals (architects, civil engineers, and urban planners, etc.): – Organising training seminars; – Energy Management Certification.
Expected results	Students are sufficiently aware of EE concepts; Professionals are aware of the EE challenge for Cameroon.
Conditions required:	Qualified trainers, who have experience in designing and implementing EE projects; Collaboration between MINEE, MINSEC, MINESUP, and the National Association of Engineers in all the professional sectors involved in buildings.
Implementation agency	MINESEC and MINESUP, universities and other training institutes
Stakeholders involved	MINEE, ARSEL, MINESEC, MINESUP, and public works organisations and professional associations
Target:	Architects, urban planners, civil engineers, consultants, architects' firms, students, etc.
Potential savings:	Indirect savings 1.3 % of tertiary buildings' consumption(1.3 GWh/year)
Estimated budget:	€100,000/ year
Funding source:	Government
Implementation timeframe:	2016- 2025
Monitoring:	MINSUP; indicator: number of students and professionals who have attended the training programmes created

1.6 Action plan for energy efficiency in the residential sector

Residential sector GOAL:	***Improving the energy efficiency of electrical appliances***
Intervention No. 1:	**Drawing up national regulations for the energy performance of household electrical appliances including standards and labels**
Background and description of the intervention	The energy performance of household electrical appliances covers any product that consumes energy or influences the consumption of energy. To enable end-users to choose appliances in view of their energy performance, it is important to draw up national regulations that establish: • Minimum energy performance thresholds for electrical appliances; • Obligations for suppliers (manufacturers and importers) of electrical appliances; • The labelling system for each category of electrical appliances. These regulations will apply to the following household appliances: • fridges, freezers, and combined appliances; • washing machines, dryers and combined appliances; • dishwashers; • electric ovens and hand-held mixers; • hot water heaters and hot water storage appliances; • televisions and audio systems; • lighting systems; • air conditioning appliances. The minimum energy performance thresholds for electrical appliances shall at least cover: • their maximum electricity consumption; • their electricity consumption in stand-by mode. Suppliers' obligations shall at least include: • the free supply of a label for each product; • the supply of the product fact sheet, together with all the available documentation relating to the product; • the provision of detailed and accurate information on the fact sheets and labels.
Expected results	Requirements on EE for supplied electrical goods; Labelling systems for electrical appliances;
Requirements:	Information campaigns.
Implementation agency	ANOR
Stakeholders involved	ARSEL, MINEE, ANOR, and the Ministry of Trade and Industry
Target:	Households or end-users; All suppliers of products that consume energy or influence the consumption of energy.
Potential savings:	4% of the residential sector consumption (6.7 GWh / year)
Estimated budget:	Between €350,000 and €3,500,000 depending on the degree to which similar international regulations are adapted
Funding source:	EUEI-PDF and EU
Implementation time frame:	2015 - 2017
Monitoring:	APRUE; indicator: number of standards elaborated; level of enforcement of the labelling practices

Residential sector ***GOAL:***	***Improving energy efficiency of electrical appliances***
Intervention No. 2:	**Developing a regional approach for testing and approving electrical appliances**
Background and description of the intervention	Technical means for testing and approving electrical appliances will make it possible to provide the necessary information on the energy performance of household appliances used in the country. This means that end-users will have access to the energy information for appliances when they buy them, and that engineers will be able to recommend household appliances with better energy performances to consumers Suppliers of electrical appliances will only be able to gain access to the Cameroon market if they obtain approval for the energy performance of their appliances. It would be useful to link the approach with others at regional level (through ECREEE for instance) as all targeted appliances are also used in other countries of the region. This regional approach can save costs and put pressure on suppliers to supply good equipment. National testing centres should focus on nationally produced appliances.
Expected results	Means for testing and approving electrical appliances made available nationally or regionally.
Requirements	The various measures will be drafted in French and English; Cooperation between various Ministries (Trade, Industry, Energy, Environment, etc.) and the Ecole Polytechnique; Involvement of ANOR.
Implementation agency	MINEE
Stakeholders involved	ARSEL, MINEE, ANOR, the Ministry of Trade and Industry, and the Ecole Polytechnique
Target:	Engineers & ANOR; Suppliers of electrical equipment.
Potential savings:	2% of the residential sector consumption (3.3 GWh)
Estimated budget:	€3,000,000
Funding source:	Donors programs
Implementation time frame:	2015 - 2020
Monitoring:	APRUE; indicators: list of appliances to be verified; number of tests made every year

Residential sector ***GOAL:***	***Improving the energy efficiency of electrical appliances***
Intervention No. 3:	**Setting up an information centre for the general public**
Background and description of the intervention	To ensure that consumers and professionals are properly informed, a team of experts will operate within a platform that needs to be set up within the ARSEL or any other public body responsible for energy management. This platform will provide answers to questions (EPB, electrical appliances with a high energy performance) asked by consumers via email, telephone or fax. The platform set up in this way will enable the teams of experts to provide consumers with information that is useful for their plans. The information center is also involved in the awareness raising process through the relaying of communication campaigns and the providing of document of case studies, newspaper and relevant links on its website.
Expected results	Experts available to answer questions from household and professionals (suppliers, engineers, and architects, etc.).
Requirements:	The Energy Desk will handle all the information in French and English; The experts will receive training on how to communicate with the public.
Implementation agency	APRUE
Stakeholders involved	ARSEL, MINEE, ANOR, and the Ministry of Trade and Industry
Target:	Households or end-users Suppliers, engineers and architects
Potential savings:	2% of the residential sector consumption (3.3 GWh/year)
Estimated budget:	€100,000 per year for 10 years
Funding source:	EU
Implementation timeframe:	2015
Monitoring:	MINEE; indicator: energy consumption of the residential sector

Residential sector ***GOAL:***	***Improving the energy efficiency of electrical appliances***
Intervention No. 4:	**Promoting compact fluorescent lamps or LEDs**
Background and description of the intervention	Lighting represents potential energy savings in the residential sector, so in the short term it is important to launch an extensive national programme for raising awareness of compact fluorescent lamps (CFLs) and LEDs which use still remains embryonic in many African countries. The programme will consist in: • Carrying out an information and awareness-raising campaign at the national level; • Setting up a system for supplying CFLs in rural areas in exchange for conventional lighting systems. Retail companies will be the channels for distributing CFLs in this initiative; • Reducing the investment made by households when changing their light bulbs in urban and suburban areas, by setting up an Energy Service Company (ESCO) financing mechanism; • Implementing incentive-based customs or tax mechanisms for suppliers; • Supporting the national market for CFLs over the long term. The electricity operator could set up a system for distributing these light bulbs to LV customers and districts, with an invoicing system scaled according to electricity payments.
Expected results	Information and awareness-raising campaign for consumers (TV, radio, internet, newspapers and events); CFLs largely used by households.
Requirements:	Ensuring quality and reliability of lighting through appropriate measures at the regulation level (standards and labelling) and the quality of networks' electrical current.
Implementation agency	APRUE
Stakeholders involved	ARSEL, MINEE, AER, AES-SONEL, and the Ministry of Trade and Industry
Target:	Households and end-users; Energy suppliers and decision-makers
Potential savings:	4% of the residential sector consumption (6.7 GWh/year)
Estimated budget:	€9,900,000 (10 years)
Funding source:	Lighting Africa, GEF, En.lighten programme.
Implementation time frame:	2015-2025
Monitoring:	APRUE and AER; indicator: number of efficient lamps distributed.

Residential sector ***GOAL:***	***Energy efficiency awareness raising***
Intervention No. 1:	**Campaign aimed at sensitizing households on EE issues**
Background and description of the intervention	The success of the national EE campaign depends on local authorities' ability to convey the right message to households and other stakeholders. In addition to other measures like "Energy Desks", the aim of this campaign will be to raise households' awareness of using the right processes and materials when renovating buildings or building new ones. This awareness-raising campaign will also extend to the choice of electrical appliances for households. The campaigns will be conducted on TV, in newspapers, via the Internet, and through organising events about EE for households over a period of around 10 years.
Expected results	Information and awareness-raising website; TV & radio campaigns; Newspaper advertising; Quarterly events (years 1 & 2), and annual events (years 3 to 10).
Requirements:	The information and awareness-raising campaigns must be conducted in French and English.
Implementation agency	APRUE
Stakeholders involved	ARSEL, MINEE, and the Ministry of Trade and Industry
Target:	Households or end-users; Engineers and architects
Potential savings:	1% of the residential sector consumption (1.7 GWh/year)
Estimated budget:	€150,000 per year
Funding source:	Government
Implementation time frame:	2015
Monitoring:	APRUE; indicator: households electricity consumption.

Residential sector ***GOAL:***	***Energy efficiency awareness raising***
Intervention No. 2:	**Campaign aimed at sensitizing professionals on EE issues**
Background and description of the intervention	The success of the national EE campaign depends on local authorities' ability to make suppliers and other stakeholders understand the importance of the EE programme for the country, and their responsibilities in connection with this programme. In addition to other measures like "Energy Desks", the aim of this campaign will be to raise suppliers' awareness of using the right processes when ordering or manufacturing electrical appliances. The campaigns will be conducted via a website dedicated to professionals, and through organising events about EE for professionals over a period of 5 years.
Expected results	Information and awareness-raising website; Annual events.
Requirements:	The information and awareness-raising campaigns will be conducted in French and English.
Implementation agency	APRUE
Stakeholders involved	ARSEL, MINEE, and the Ministry of Trade and Industry
Target:	Suppliers (manufacturers and importers)
Potential savings:	1% of the residential sector consumption (1.7 GWh/year)
Estimated budget:	€150,000 per year
Funding source:	Government
Implementation time frame:	2015
Monitoring:	APRUE; indicator: sales of efficient appliances

1.7 Action plan for energy efficiency in the electricity system

Electricity system GOAL:	*Reducing internal technical losses to a standard level*
Intervention No. 1:	**Reducing technical losses in the transmission network**
Background and description of the intervention	Technical losses in the transmission network are higher than the generally accepted standard level. A systematic review of active and reactive transmission schemes must be performed, as well as the identification of abnormal temperature increases at the stations and on the lines using an infrared method. The major reinforcements that will be recommended by PDSE 2030 (the energy sector development plan) should enable a substantial reduction in the rate of loss, however this is not specifically a DSM initiative.
Expected results	Reducing losses in the transmission network (less than 4%)
Implementation agency	ARSEL
Stakeholders involved	AES-SONEL
Target:	Transmission network
Potential savings:	Reducing theoretical and actual losses in the transmission network
Estimated budget:	Operating expenditure
Funding source:	AES-SONEL
Implementation time frame:	2015
Monitoring	ARSEL

Electricity system GOAL:	***Reducing internal technical losses to a standard level***
Intervention No. 2:	**Reducing technical losses in the distribution network**
Background and description of the intervention	Technical losses in the distribution network are higher than the generally accepted standard level. Normal operating measures may enable an improvement in the situation: improvement in the MV and LV access points in urban areas, balancing the LV phases, and introducing automatic compensation systems on the MV network. However, the results of these initiatives will be limited compared with the impact of a genuine campaign to reinforce the networks over the long term, the reasons for which will not specifically depend on DSM.
Expected results	Reducing the distribution loss rate (less than 6%)
Implementation agency	ARSEL
Stakeholders involved	AES-SONEL
Target:	Distribution networks
Potential savings:	250 GWh
Estimated budget:	Operating expenditure
Funding source:	AES-SONEL
Implementation time frame:	2015
Monitoring	ARSEL

Electricity system GOAL:	***Reducing internal technical losses to a standard level***
Intervention No. 3:	**Servicing the connected and isolated diesel generators (auxiliary and specific consumption)**
Background and description of the intervention	Excessive auxiliary and unit-based consumption has been recorded within certain interconnected or isolated AES-SONEL diesel generators.
Expected results	Auxiliary consumption of less than 5%, specific consumption of less than 235 g per kWh
Implementation agency	AES-SONEL
Stakeholders involved	AES-SONEL
Target:	Thermal power plants
Potential savings:	162 MWh & 1,000 tonnes of fuel oil per year
Estimated budget:	€1 million
Funding source:	Donor's Programmes
Implementation time frame:	2015
Monitoring	ARSEL

Electricity system GOAL:	***Reducing internal technical losses to a standard level***
Initiative N° 4	**Introducing an appropriate and reliable performance monitoring system that is independent of the operator, for the long term**
Background and description of the initiative	Operators' performance and their compliance with contractual clauses are currently not well monitored. ARSEL must urgently assemble tools and processes that enable it to fulfil its remit independently of the operators.
Expected results	Regular measurement of losses and of the service quality offered by the operators.
Implementation agency	ARSEL
Stakeholders involved	AES-SONEL and ARSEL
Target:	Operators involved in the electricity system
Estimated budget:	Assistance with implementation: €200,000
Funding source:	Donors' programmes
Implementation time frame:	2015
Monitoring	ARSEL. Indicator: technical losses

Electricity system GOAL:	***Developing demand management***
Intervention No. 1:	**Introducing incentive-based MV rates for DSM**
Background and description of the intervention	The reduction in professional demand at the height of the dry season could be encouraged by the introduction of dissuasive rates, which may potentially vary for each geographical area and be offset by attractive rates during the wet season and non-peak hours. The reduction in reactive losses for heavy and average consumers via the appropriate pricing of the power factor is also within the scope of the action plan.
Expected results	Reduction in demand at the height of the dry season
Implementation agency	ARSEL
Stakeholders involved	AES-SONEL and ARSEL
Target:	All MV consumers
Potential savings:	Reduction in diesel power stations' consumption
Estimated budget:	Operating expenditure
Funding source:	AES-SONEL
Implementation time frame:	2015
Monitoring	ARSEL

Electricity system GOAL:	***Developing demand management***
Intervention No. 2:	**Implementation of ESCO-type processes by the operator**
Background and description of the intervention	Introduction of technical assistance and supplier loans in order to introduce capitalistic DSM processes that will be amortised on the basis of MV customers' varying consumption.
Expected results	Reduction in demand according to AES-SONEL's requirements, and reduction in power cuts.
Implementation agency	AES-SONEL, MV customers, and banks
Stakeholders involved	AES-SONEL
Target:	Large MV consumers (industry, commercial and tertiary sectors)
Potential savings:	50 GW
Estimated budget:	€1 million per year over 5 years (private sector)
Funding source:	AES-SONEL and banks
Implementation time frame:	2016
Monitoring	ARSEL

Electricity system GOAL:	***Achieving a satisfactory service quality level for all electricity consumers***
Intervention No. 1:	**Appropriate maintenance of diesel generators ahead of the dry season in order to avoid power cuts**
Background and description of the intervention	The diesel generators must be maintained and repaired during the wet season so that they are available in the dry season. The filling of fuel tanks and the scheduling of deliveries will be organised with oil suppliers and transport companies.
Expected results	Reduction in power cuts during the dry season.
Implementation agency	AES-SONEL
Stakeholders involved	AES-SONEL, ARSEL, sub-contractors, oil companies, transport companies, and customers equipped with emergency generators
Target:	Eliminating power cuts during the dry season.
Potential savings:	Reduction in the use of emergency generators. Increase in industrial generation.
Estimated budget:	Operating expenditure
Funding source:	AES-SONEL
Implementation time frame:	2015
Monitoring	ARSEL

Electricity system GOAL:	***Achieving a satisfactory service quality level for all electricity consumers***
Intervention No. 2:	**Temporary and long-term reinforcement of the transmission network in the direction of Yaoundé**
Background and description of the intervention	The capacity of the transmission network between Edéa and Yaoundé does not enable a quality service to be guaranteed to Yaoundé and the neighbouring areas during peak periods. Palliative measures that enable an improvement in the situation can be implemented quickly (FACTS and peak capacitors), however a radical reinforcement of the system must be performed as soon as possible. Thus allowing to reduce technical losses on electricity system (see intervention 1&2 of the "Reducing internal technical losses to a standard level" goal).
Expected results	Reduction in power cuts during the dry season.
Implementation agency	AES-SONEL
Stakeholders involved	AES-SONEL
Target:	Elimination of power cuts during peak periods in Yaoundé, and reducing HV voltage drops to less than 10%.
Potential savings:	Reduction in the use of backup generator in the industry, tertiary and residential building sectors
Estimated budget:	€0.8 (short term), and €30 million for structural reinforcement
Funding source:	AfDB, Programmes donors
Implementation time frame:	2015 to 2017
Monitoring	ARSEL and MINEE

2 Estimated cost of the NEEAP

The Action Plan developed for each electricity consumption sector as well as for the supply sector (electricity generation, transmission and distribution) includes different kinds of measures, each of which is described in detail in the tables above.

To facilitate understanding of the potential impact of these measures and assess their viability (and therefore suitability) for both public and private stakeholders, it seems necessary to summarise them in the form of the table below:

Table 13: Electricity savings and costs of energy efficiency measures

Description	Energy saving (2014-2025)			Cost (2014-2025)	
	In GWh	As% of the sector's electricity consumption	In EURO	Public sector in EURO	Private sector in EURO
Industry sector					
Generating information on the energy situation in the industrial sector	30	0.8%	3 842 000	1 200 000	-
Promoting energy audits and energy management systems in industry	130	3.3%	16 647 000	7 000 000	-
Encouraging the emergence of bankable energy efficiency projects	220	5.6%	28 173 000	2 000 000	25 000 000
Introducing an electricity pricing structure that encourages energy efficiency	20	0.5%	2 561 000	100 000	1 000 000
Industrial retrofit programmes	90	2.3%	11 525 000	750 000	10 000 000
Developing a regulatory and standardised framework that promotes energy efficiency	15	0.4%	1 921 000	1 500 000	-
Training and capacity building for professionals as well as industrial institutions on energy efficiency issues	15	0.4%	1 921 000	1 000 000	-
Developing the ability to generate power from biomass	645	16.5%	82 597 000	20 000 000	70 000 000
Total industry	1165	29.7%	149 187 000	33 550 000	106 000 000
Tertiary buildings sector					
Setting up an energy efficiency data collection and documentation	10	0,9%	1 281 000	750 000	-

Description	Energy saving (2014-2025)			Cost (2014-2025)	
	In GWh	As% of the sector's electricity consumption	In EURO	Public sector in EURO	Private sector in EURO
center in buildings					
Providing training on energy management to building managers in the private sector	60	5,3%	7 683 000	300 000	-
Drawing up a program to optimize the efficiency of lighting, air conditioning and miscellaneous equipment	115	10,2%	14 727 000	5 000 000	10 000 000
Appointing energy managers in public buildings	20	1,8%	2 561 000	600 000	-
Optimizing electricity bills	10	0,9%	1 281 000	600 000	-
Renovating electrical installations (lighting and air conditioning)	35	3,1%	4 482 000	3 000 000	-
Improving the performance of air conditioning systems through the introduction of energy performance standards	20	1,8%	2 561 000	1 500 000	-
Drawing up an energy efficiency building code for the construction of new buildings and national regulations for energy performance in existing buildings	180	16,0%	23 050 000	4 000 000	-
Creating or upgrading laboratories for testing and approving construction materials and developing a labelling scheme for such materials	40	3,6%	5 122 000	2 000 000	-
Introducing EE into secondary and higher education programs: architects, urban planners and civil engineers	15	1,3%	1 921 000	1 200 000	-
Total buildings sector	505	45%	64 669 000	18 950 000	10 000 000
Residential and end-use					
Drawing up national regulations for the energy performance of household electrical appliances including standards and labels	80	4%	10 245 000	1 500 000	-
Developing a regional approach for testing and approving electrical appliances	40	2%	5 122 000	3 000 000	-
Setting up an information center for the general public	40	2%	5 122 000	1 000 000	-
Promoting compact fluorescent lamps or LEDs	100	5%	12 806 000	9 900 000	-

Description	Energy saving (2014-2025)			Cost (2014-2025)	
	In GWh	As% of the sector's electricity consumption	In EURO	Public sector in EURO	Private sector in EURO
Campaign aimed at sensitizing households on EE issues	20	1%	2 561 000	1 500 000	-
Campaign aimed at sensitizing professionals on EE issues	20	1,0%	2 561 000	1 500 000	-
Total residential and end-use	300	15%	38 417 000	18 400 000	-
Electricity system					
Reducing technical and commercial losses in distribution network	250	4%	32 014 000	31 000 000	(1)
Temporary and long-term reinforcement of the transmission network in the direction of Yaoundé					
Introducing an appropriate and reliable performance monitoring system that is independent of the operator, for the long term					
Servicing of connected and isolated diesel generators (auxiliary and specific consumption)	0.162	> 0,1%	21 000	-	1 000 000
Appropriate maintenance of diesel generators ahead of the dry season in order to avoid power cuts					
Introducing incentive-based MV rates for DSM	50	1%	6 403 000	-	5 000 000
Implementation of ESCO-type processes by the operator					
Total for the electricity system	300	4%	38 438 000	31 000 000	6 000 000
Total	**2 250**	**32%**	**288 149 000**	**101 900 000**	**122 000 000**
Public and private costs			***223 900 000***		

(1): Contribution of electricity system operator through operational expenditure

In 2025, the savings generated are 2,250 GWh, which represent **a reduction in consumption of 32 %** compared to the BAU scenario[7].

Public investment is estimated at € 101.900.000 for an energy saving of € 288.149.000.

3 Monitoring and assessment of the NEEAP

The monitoring and assessment of the NEEAP must be based on the following principles:

- Appointment of an organisation tasked with ensuring the overall management of the NEEAP;
- Precise definition of the respective responsibilities of the different Cameroonian stakeholders concerned, for each of the sectors under consideration;
- Propagation of measures with a view to obtaining maximum impact in the shortest term possible, as far as both sectorial measures and those of a cross-sectorial nature are concerned;
- Definition of the budgets necessary to implement each of the measures, and mobilisation of necessary resources;
- Determination of the goals to achieve and associated performance indicators for each of the recommended measures;
- Monitoring of these indicators through, if necessary, the collection of relevant information and data or the carrying out of impact studies. This has to be performed at least once a year.

[7] It should be reminded that the calculations presented in this report have been carried out for a period of time from 2014 to 2025. This does not mean however that the savings obtained will be limited to the 2025 horizon. On the contrary, given the nature of measures implemented and the expected lifetime of investments (usually in a range of 15 to 25 years), the savings obtained in 2025 will continue to be achieved beyond 2025, making the investments realized even more cost effective.

List of references

DSCE : « Document de Stratégie pour la Croissance de l'Emploi ».

Information Energy System of Cameroon Report, 2010 and 2011

ECAM 2 and ECAM 3 : Second and Third Survey regarding Cameroonian Household- INS

Etude de la consommation et de la conservation d'énergie électrique dans le secteur public. Rapport final.- Econoler International- Décembre 2003.

PDSE 2030 - Power Sector Development Master Plan - IDC/EDF/SOGREAH/BDS -2006

Updating the development plan of the electricity sector by 2030, Study of the demand- STUDI international-2012

ANNEX I

INTRODUCTION

1 General background

For over ten years, Cameroon has experienced strong economic growth, which has been accompanied by equally strong growth in electricity consumption. The electricity supplier AES-SONEL, which is responsible for the overall management of the electricity system (generation, transmission and distribution), is struggling to meet this demand and is not always capable of satisfying all needs, particularly during peak periods, either in terms of the quantity of electricity delivered or in the quality of the electric current supplied. Plans have been drawn up to increase the production capacity in the future, but the necessarily lengthy delays in implementing these investment programmes will certainly not provide rapid solutions for the current imbalance between electricity supply and demand.

Energy efficiency therefore appears to be a vital instrument to address consumer demand in the short and medium term until the new production units come into service, but also as a long-term objective enabling a reduction in energy consumption and limiting investment in electricity production. Energy efficiency does not mean rationing electricity; rather, it is the rational use of this energy form by increasing the efficiency of its production, transmission, distribution and final consumption. In other words, this means disconnecting economic growth (which should not be compromised on any account) from energy growth. The country will thus benefit from greater energy security and make significant savings in terms of fossil fuel imports. As a result, economic growth will also be reinforced, since manufacturing businesses are today complaining that their activities are restricted by the lack of electricity supply. Finally, the pressure on the electricity system will be reduced, allowing more time for the rational planning of the commissioning of new production capacities and thereby leading to substantial savings in investment costs.

The Ministry of Water Resources and Energy of Cameroon (MINEE) therefore requested the support of EUEI PDF to formulate a National Policy, Strategy and Action Plan for the development of energy efficiency in the country. To this end, EUEI PDF hired the services of a qualified consortium of companies and experts made up of IED, EED and NBT, in order to

undertake a study to analyse the current situation in Cameroon in terms of electricity production and management and to set out relevant proposals to initiate the implementation of a national energy efficiency policy.

The MINEE appointed the Electricity Sector Regulatory Agency (ARSEL) as the lead contracting authority for this study. Responsible for supervising the prices and costs of electricity supply, ARSEL, with 10 years of experience regulating the electricity sector, wishes to encourage the exploitation of the energy efficiency potential and the corresponding savings in terms of electivity supply. The other stakeholders involved in this study include the Ministry of Finances (MINFI), the Ministry of the Environment, Nature Protection and Sustainable Development (MINEPDED), the Ministry of Mines, Industry and Technological Development (MINMINDT), and the electricity supplier AES-SONEL.

2 Project goals

The main goal of the project is to rapidly put in place an action plan aiming to significantly increase the efficiency of electricity use in Cameroon, in order to reduce the pressure on demand and the imbalance between electricity supply and demand in the country in the short and medium term. More specifically, once implemented, the anticipated results of a national energy efficiency policy are as follows:

- Reduced energy bills in public buildings,
- Increased energy efficiency in the industrial sector,
- Increased energy efficiency in the household sector, particularly with regard to the management of peak periods, and
- The creation of an institutional and regulatory framework for the promotion of energy efficiency and energy saving measures in the electricity sector.

The National Energy Efficiency Action Plan (NEEAP) must establish the means to be implemented in order to achieve the ambitious yet realistic energy efficiency targets in each different sector of activity (industry, tertiary buildings, and households), as well as the institutional and regulatory framework necessary to enable the achievement of the expected results. The NEEAP must therefore consist of an action programme complete with a timetable for implementation, and of performance indicators to measure the Plan’s degree of completion.

3 Study description and conduct

The study undertaken aimed to confirm the hypothesis that Cameroon has considerable energy efficiency potential, and to define the goals and means of exploiting this as quickly as possible under the best possible economic and technical conditions. To this end, in terms of energy efficiency in the electricity sector, it is a question of setting out clear political goals that are consistent with the country's other existing policies, in the energy sector as well as in other areas: industry, development, etc.

In this context, the study included a review of the institutional, legal, regulatory, tax and financial aspects related to energy efficiency, along with an analysis of existing energy efficiency programmes and institutional responsibilities. At the same time, assessments were conducted to estimate the potential energy savings in the three main consumption sectors: industry, public buildings and households. Pilot energy audits were carried out in industrial companies and public and private buildings, so as to estimate and confirm the possibilities for improving energy efficiency. In public buildings, the concept of energy efficiency takes into account subscriptions to electricity supply contracts, billing and payment conditions, etc. in order to achieve not only a physical optimisation of consumption, but also an administrative optimisation of the energy management of these buildings and a stabilisation of their electricity expenses. Where households are concerned, consumption levels and the potential for savings in terms of power demand, energy used and total expenses were analysed.

The results of these assessments made it possible to establish the measures to be taken in order to increase energy efficiency in the different sectors targeted. These technical, economic or financial measures must of course be complemented by specific management programmes when it comes to implementation. So, for example, the consumption management programmes designed for households will have to include aspects linked to necessarily informing all involved and raising their awareness, promoting energy-saving equipment, price incentives, etc.

On this basis, possible energy efficiency scenarios in line with the project's overall goal have been established for each of the sectors of activity under consideration. The NEEAP proposed in this report is therefore a result of the analysis of potential energy savings as well as measures to be taken or incentives to set out, by showing the likely resulting benefits obtained by energy consumers in the different sectors. Finally, a national energy efficiency action plan has been developed, incorporating the selected priority actions.

3.1 Project stakeholders

MINEE and ARSEL are the appointed public bodies. The study has also been monitored by other public bodies such as the Ministry of Finances (MINFI), the Ministry of the Environment, Nature Protection and Sustainable Development (MINEPDED), the Ministry of Mines, Industry and Technological Development (MINMINDT), and AES-SONEL, which is the company responsible for electricity generation, transmission and distribution in Cameroon. All of these stakeholders designated a point of contact more specifically responsible for coordination with ARSEL and have been regularly updated on the progress of the study through workshops (see below). The other stakeholders include GICAM (an association of large industrial companies), technical and financial partners, local and international financial institutions, and bilateral donors.

3.2 Study conduct

The study was entrusted to a consortium of consultants made up of IED, EED and NBT (the Consultant), with ARSEL acting as the lead partner. The implementation of the project includes a process of ongoing consultation with all concerned parties. In this regard, the original plan was to create a steering committee composed of the points of contact designated by a number of public and private Cameroonian institutions in order to serve as a permanent reference with regard to the proposals and initiatives likely to be put forward by the Consultant. This steering committee was changed into a less formal group of resource people during the launch meeting.

In this context, the official occasions for consultation with Cameroonian and international stakeholders are the following:

1. Launch meeting with ARSEL and other concerned parties at Cameroonian government level — 14 February 2013
2. Launch workshop and discussion forum: — 27 March 2013
3. Scenario presentation workshop: — 24 October 2013
4. Results presentation workshop: — 05 December 2013

The study was then organised into three phases: launch and inception, scenario development, and national policy and strategy development.

The launch and assimilation phase was based on the collection of data, mainly through targeted visits to industrial companies, public buildings and households, and on the review of existing studies, notably those undertaken by STUDI and Econoler International[8]. It

[8] Econoler International. Etude / Audit de la consommation et de la conservation d'énergie électrique dans le secteur public. Rapport final. December 2003. (Study of consumption and conservation of electrical energy in public sector. Final report, December 2003).

resulted in the preparation and distribution of an inception report and was followed bya launch workshop and discussion forum, which took place over two days in Yaoundé, in order to enable a broad consultation with all the concerned parties.

The scenario development phase was undertaken by first establishing a reference situation calculated by extrapolating the trends revealed during the first phase of work. Hypotheses were then made with regard to the possible levels of energy efficiency to be achieved (an easy hypothesis and an ambitious hypothesis), in order to prepare corresponding scenarios to compare with the reference situation, so as to determine the measures to put into place within the framework of a national energy efficiency policy. This phase of detailed analysis was also the subject of a scenarios report whose conclusions were developed and discussed at a workshop held in Douala.

The final phase, involving the formulation of an appropriate policy, strategy and action plan, incorporated a series of both technical and non-technical aspects (institutional, promotional, legal, financial, regulatory, etc.), to enable the investment of energy savings and maximise the impact across all targeted sectors. The final goal was the development of a concrete action plan outlining the activities specific to each sector, complete with a work timetable, an estimation of necessary resources and a monitoring and assessment framework including carefully identified indicators of success. This final phase ended with a results presentation and NEEAP launch workshop held in Yaoundé.

4 The current state of the electricity sector in Cameroon

4.1 General background

Electricity demand in Cameroon still represents only a small part of the country's total energy consumption (around 7%). The majority of rural areas are not yet electrified and even so the balance between supply and demand is very fragile, particularly during the dry season when hydroelectric capacity drops, regularly leading to power outages and load shedding that severely affect the country's economic development. Any additional electricity demand therefore increases the pressure on the electricity system. In this regard, the analyses conducted by the Consultant as part of the study undertaken show that, based on past and current trends, and in the absence of corrective measures taken by the public sector and/or implemented by the private sector, Cameroon will consume around 7,040 GWh of electricity in 2025, which represents an increase of 90% compared to the consumption recorded for 2012.

STUDI International. *Mise à jour du plan de développement du secteur de l'électricité à l'horizon 2030. Etude de la demande*, Décembre 2012

The table below details this increased consumption sector by sector:

Table 14: Forecast electricity consumption growth by 2025 compared to 2012

Sector	Forecast growth in electricity demand by 2025 (GWh)	Forecast growth in electricity demand by 2025 (%)
Industry	2,050	109%
Tertiary buildings	400	55%
Households	880	79%
Total	3,330	90%

As indicated in the introduction, it should be noted that the current demand (3,710 GWh in 2012) already results in an annual deficit between the electric power demand and what the electricity system is currently capable of delivering, because of a very high rate of losses in electricity generation, transmission and distribution (losses from the transmission network are estimated at 6.3%, whereas technical and non-technical losses at a distribution level represent 29.3% of the power provided by the transmission network).
In order to meet the anticipated demand, and in the absence of the implementation of a pro-active policy to reduce electricity consumption growth rates in the country (also assuming that the loss rates of the electricity system remain constant), it would be necessary to create an additional electricity generation capacity of 1,500 MW by 2025. The corresponding investment costs would be 2,310 billion FCFA (3.5 billion euros)[9]. For the sake of comparison, the total capacity currently installed is 1,105 MW (720 MW hydro and 385 MW thermal); that means that the current capacity would have to be increased by 136% in order to satisfy future demand.

4.2 Situation on the supply side

The principal source of electricity generation in Cameroon is the hydroelectric system, which is however suffering from insufficient development. No significant installation has been put into service for thirty years even though Cameroon's resource potential is among the top three in Africa (with the DRC and Ethiopia).

Thermal power stations also have reliability and efficiency problems. Many units do not appear to be available in the dry season. Although the specific consumption of fuel is acceptable, consumption by auxiliary equipment is well above the norms in some stations and this needs corrective action. This is also the case for certain isolated systems.

The state of the transmission network (see map below) is a major cause of inefficiency. Because of the weakness and aging of the lines, the area of Yaoundé is subject to significant

[9] Already planned investment include Kribi 2(thermal), Lom pangar, Mekin, Menvé'ele , Bini Warak (hydroelectric) , and 2 diesel plants in the north connected grid

voltage drops, heavy losses and outages. Similar problems occur at the long 90 kV feeder line in Bafoussam. As the equipment intended for generation and transmission will not change these conditions, a very quick assessment of the feasibility of new 225 kV lines is necessary in order to supplement the future Edéa-Yaoundé-Kribi-Memve'ele loop. In the short term, only actions aiming to reduce and compensate reactive power transfers during peak hours and voluntary load shedding can ease some of the foreseeable pressure.

The distribution system is in a notoriously poor condition, in urban and rural areas alike. The insufficient data provided by AES-SONEL prevented an in-depth study of this issue. Technical and commercial losses remain high (30% in total and 12% for technical losses). 12% technical losses translate roughly (in 2012) to the equivalent of a power station of 65MW producing electricity full time but without reaching any consumer. In order to obtain a significant improvement on the distribution side, it is necessary to take the usual measures such as phase equilibrium, the choice of opening points and the creation of new HV/MV substations, in addition to demand management actions.

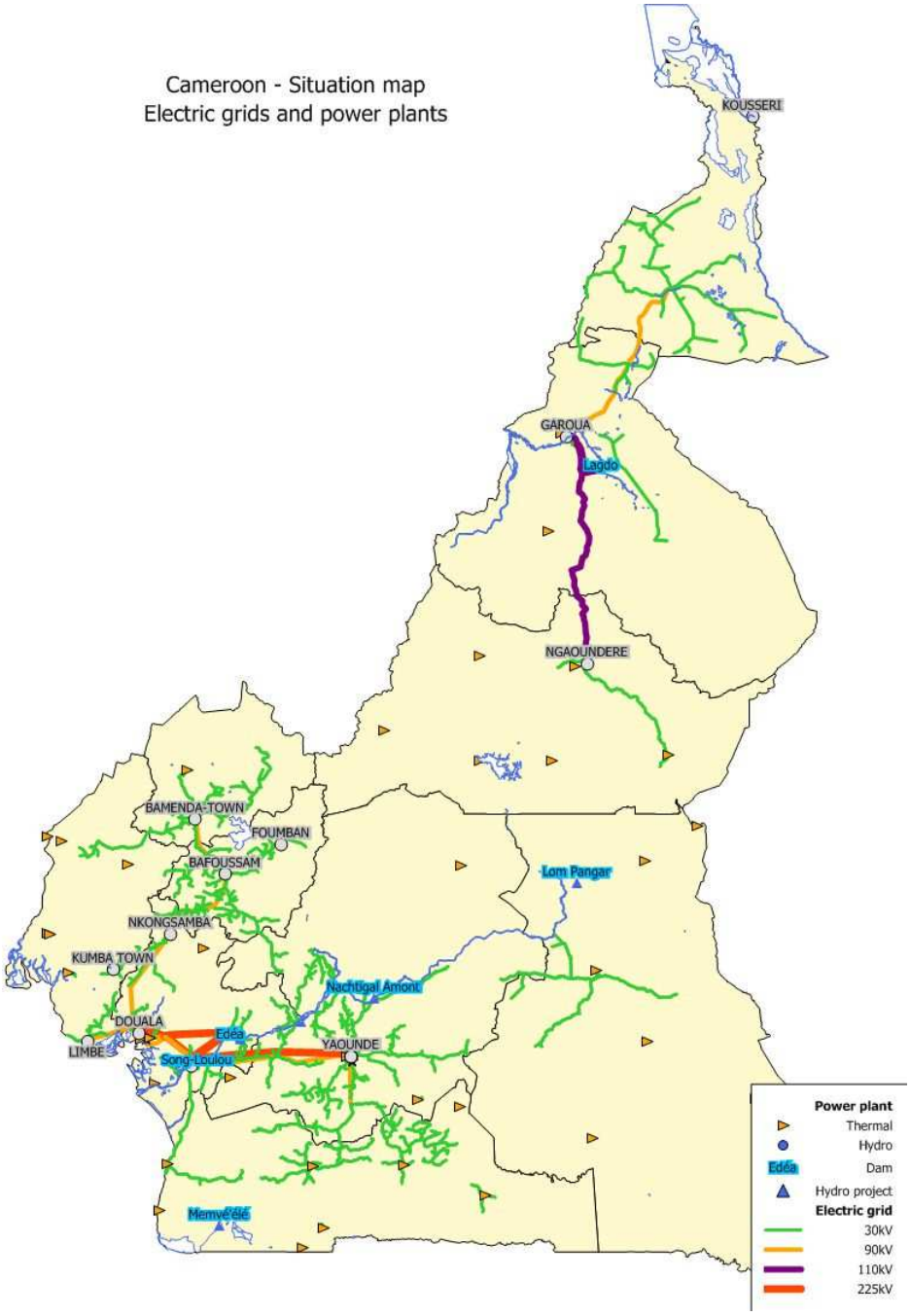

Figure 1 : Cameroon situation map- Electric grids and power plants

4.3 The situation on the demand side

As previously indicated, although is experiencing significant growth, electricity represented only 7.3% of Cameroon's energy consumption in 2012. One of the main reasons for this low ratio is the country's low electrification rate. This increased from 49.7% to 57% between 2005 and 2011, thanks to the Government's efforts to extend and increase the density of the electricity network. These efforts have had very positive effects in urban areas but poor results in the rural zones, where the majority of the population still does not have access to

the electricity network: the rate of rural electrification remains at around 19% and has even fallen slightly since 2005.

The industrial sector dominates the country's total electricity consumption, representing almost 80% of this; the highest-consuming sub-sectors are aluminium (48%) and the extractive industries (18%). However, due to regular load shedding, many companies have invested in diesel generators in order to generate their own electricity autonomously. The use of small diesel generators is also widespread at residential and household levels. The self-generation of power using non-fossil energy sources, such as biomass, represents around 20% of electricity use (556 GWh), specifically by the sugar and cotton industries.

For each of the selected sectors (industry, tertiary buildings, residential and households), an analysis of electricity consumption and its forecast evolution were carried out, based on the trends of the past ten years, in order to compare the projected electricity consumption with a so-called business as usual (BAU) situation : to construct such a BAU scenario, the assumption was that no pro-active policy would be implemented to reduce the growth in demand with a view to changing or altering these trends. Set out in the Scenario Report previously elaborated (attached as Annex 2) is the methodological approach used for each of these sectors in order to construct these BAU scenarios. The results are summarised in the figure below.

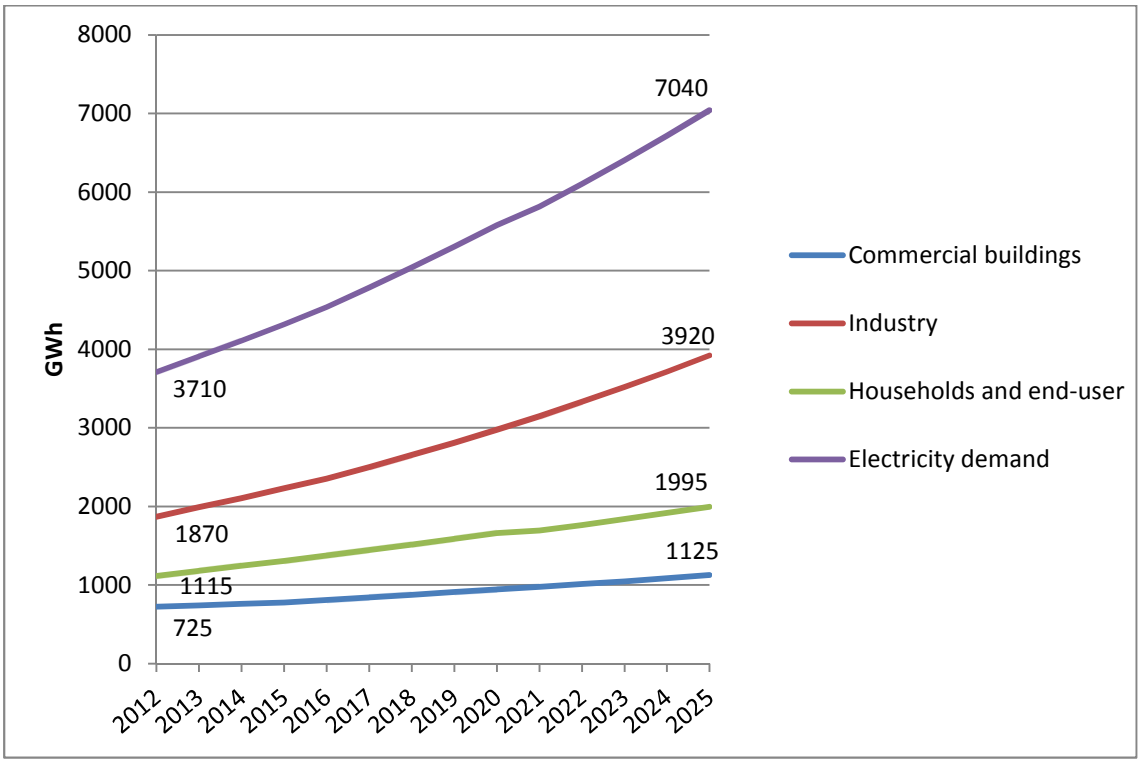

Figure 2: Electricity demand side BAU scenarios 2012- 2025

This figure shows that in the absence of any corrective energy efficiency action plan implemented in Cameroon, the electricity consumption would increase by 89 % at the 2025 horizon, mainly due to the growth of electricity consumption in the industrial sector (109 %).

ANNEX 2

.

REFER TO THE DOCUMENT TITLED:

National Energy Efficiency Policy, Strategy and Action Plan

in the electricity sector in Cameroon

ANNEX 2 of the final report: Scenarios Report

EUEI PDF is an instrument of the