

Department of Minerals and Energy, Pretoria

**Capacity Building in Energy
Efficiency & Renewable Energy**

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Abbreviations and Acronyms

BEE	Black Economic Empowerment
CaBEERE	Capacity Building in Energy Efficiency and Renewable Energy
CB	Capacity Building
CEF	Central Energy Fund
DANIDA	Danish International Development Assistance
DDG	Deputy Director-General
DEAT	Department of Environmental Affairs and Tourism
DK	Kingdom of Denmark
DKK	Danish Kroner
DME	Department of Minerals and Energy
DPW	Department of Public Works
DTI	Department of Trade and Industry
EE	Energy Efficiency
EMO	Energy Management Opportunity
ESCO	Energy Service Company
ESETA	Energy Sector Education Training Authority
FIDIC	Industrial Federation of Consulting Engineers
IDC	International Development Corporation of South Africa
NT	National Treasury
NER	National Energy Regulator
NGO	Non-Governmental Organisation
PDI	Previously Disadvantaged Individual
PM	Project Manager
PQ	Pre-Qualification
PSC	Project Steering Committee
PTT	Project Task Team
QA	Quality Assurance
RE	Renewable Energy
RSA	Republic of South Africa
SA	South Africa / South African
SALGA	South African Local Government Association
SANGOCO	South African Non-Governmental Organisations' Committee
SARS	South African Revenue Service
SMME	Small, Medium and Micro Enterprises
SP	Service Provider
ST	Short Term Adviser
TA	Technical Assistance
TOR	Terms of Reference
VAT	Value Added Tax
ZAR	South African Rand

1 Introduction

Department of Minerals and Energy has adopted a national target of energy efficiency improvement of 12% by 2014. As part of this target the CaBEERE project was launched with support of the Danish Government. This document covers the energy efficiency improvements for buildings that fall under the control of National Government, which is unique for South Africa because there has never been a single energy efficiency project targeting all buildings under the control of National Government.

Calculations have been made, using available energy index figures for South Africa and the asset register of buildings used by National Government. The preliminary potential energy savings were calculated to be approximately 1,000 GWh for abovementioned buildings, reducing the energy bill by R275 million per annum. This saving includes a calculated demand saving of approximately 250 MVA.

As the generation of electricity in South Africa is mainly utilising coal as a fuel source, the CO₂ production of electricity is high. By reducing the electricity consumption, the CO₂ emission can be reduced by 800,000 tons a year.

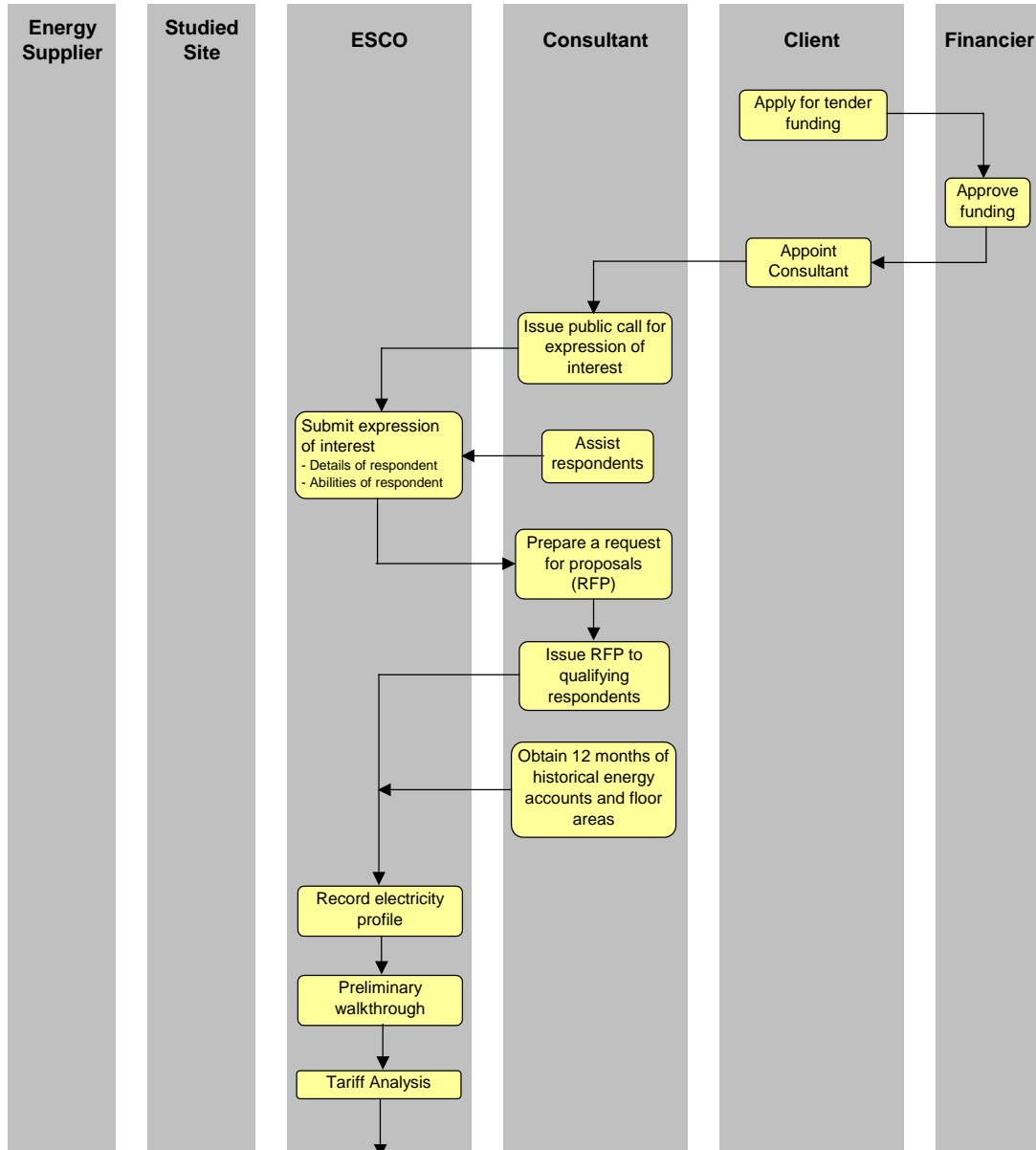
To achieve improved energy efficiency, capital investments will have to be made. Treasury and DME have put in place financing mechanisms for the rollout of this energy efficiency project. This budget will mainly be used for the implementation of Energy Management Opportunities (EMOs). In the proposed financing mechanism, the Client will pay for all equipment that needs to be installed. The energy savings are guaranteed by the ESCOs enabling National Government to take the benefits from reduced energy costs into account when budgeting.

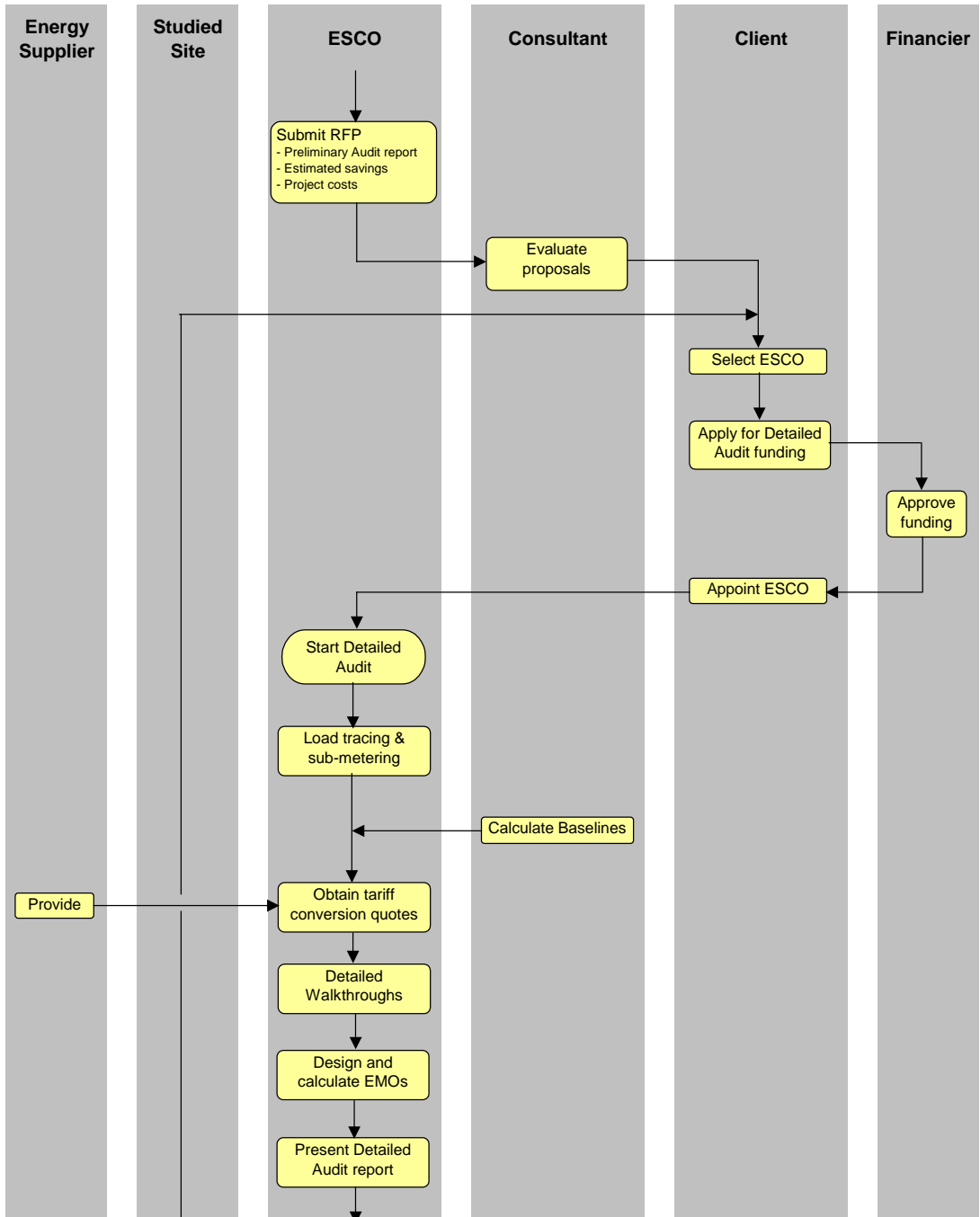
As the national capacity of ESCOs is currently insufficient, this project will develop further capacity within the ESCO market. To fill the initial gap, joint ventures between existing ESCOs and BEE companies will need to be created, transferring skills and adding to the job-creation policy of National Government. In the long run, a sustainable, well-balanced and highly skilled ESCO market will be the result.

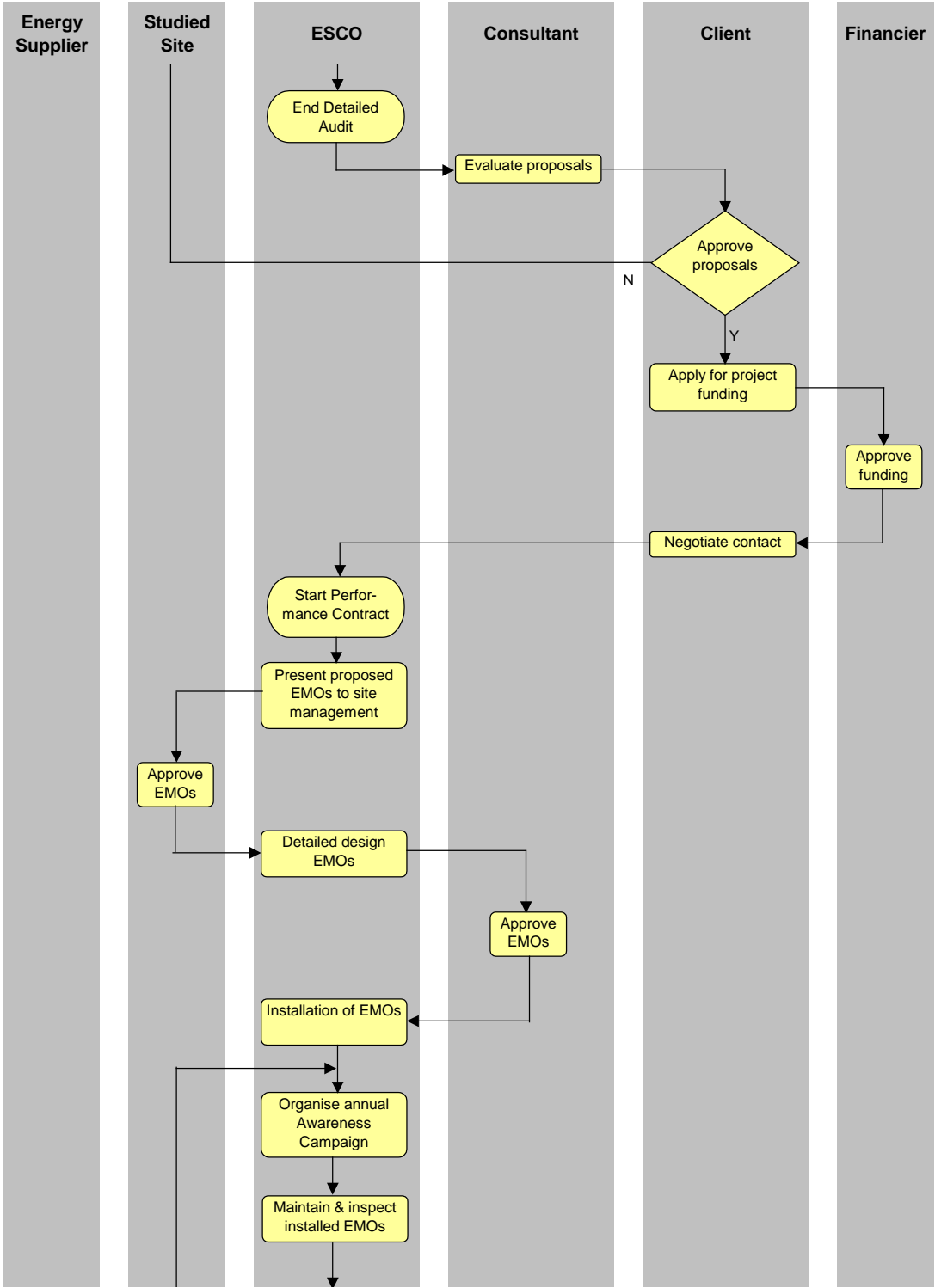
Ultimately, the User Departments that actually occupy the buildings should also benefit from the savings, which will encourage them to achieve higher savings through behavioural changes. Through the devolution of utility accounts from DPW to the User Departments, a percentage of the savings achieved is kept within the User Department and can be used for different purposes (e.g. further energy efficiency improvement or outstanding maintenance).

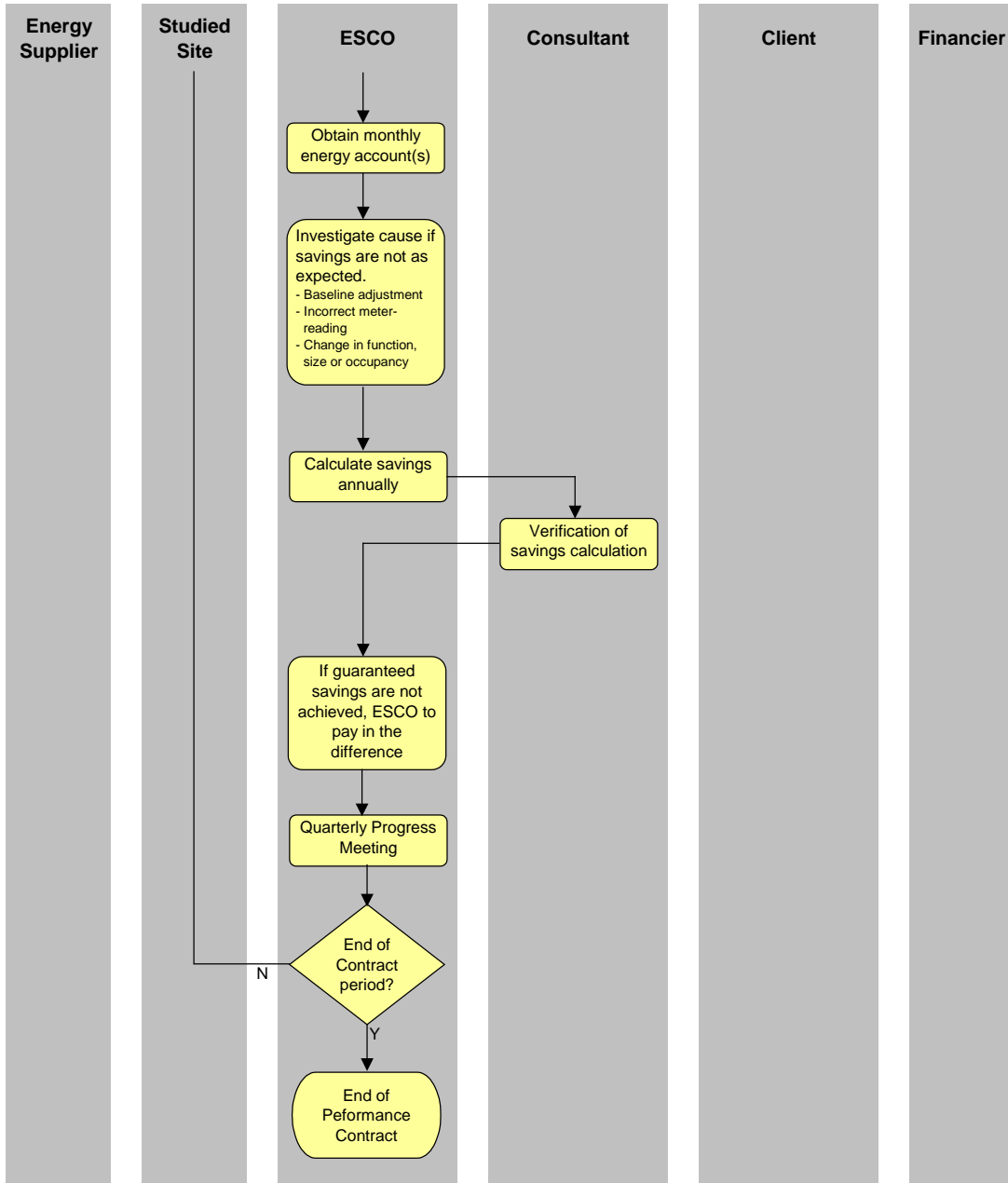
2 Flow Chart for entire process

The following Flow Chart summarises the rolling out of energy savings in buildings under the control of National Government.









3 Initiating the process

Once energy savings are obtained, the whole process of energy savings will become financially self-sustainable. The initial part, however, requires allocation of certain budgets within the Client's Department. The following steps are required to kick-start the effort to reduce energy consumption:

- Develop documentation with guidelines
- Obtain consensus from all stakeholders to commit themselves (Memorandum of Understanding)
- Call for tender to Consultants
- Select and appoint Consultant
- Call for tender to ESCOs
- Select Financing Mechanism
- Select and appoint ESCO – Start of Performance Contract*
- Implementation by ESCO

* Currently Performance Contracting is the preferred financing mechanism. This might change in the future due to changes in funding.

The first two steps are expected to be finalised mid 2005; the rest of the above steps are planned to be finalised before the end of 2005, forming a pilot study for 5 buildings. The pilot study will reveal unforeseen problems with the rollout, and the results will be used to fine-tune the processes and mechanisms described in these documents.

4 Auditing

The objective of Energy Auditing is to analyse thoroughly the energy consumption and demand of a building and determine if viable energy savings can be made.

In order to ascertain at an early stage whether the building is consuming above or below average energy usage, a Preliminary Audit is carried out. This first phase of the Auditing Process gathers a minimal amount of data and compares energy indices to benchmark figures. The comparison of these benchmark figures indicates if the building is already energy efficient, in which case no extra effort needs to be put in to determine if energy savings can be made.

As multiple ESCOs will carry out the Preliminary Audit, some of the required data will be obtained by the Consultant, who will supply the data to the ESCO's. The Consultant will obtain the following data:

- 12 months' historical energy consumption figures
- Floor areas
- Calculation of energy indices

The ESCO will gather the following data and will perform the required actions for the Preliminary Audit:

- Recording of electricity profile
- Brief (preliminary) walkthrough
- Tariff analysis
- Comparison with similar indices
- Report with findings, including substantiated recommendation to continue with a Detailed Audit.

The Consultant will check the correctness of the Preliminary report and recommend to the Client whether a Detailed Audit should be carried out. The Auditing process will only proceed to the second phase (Detailed Audit) if the Client gives the go-ahead.

During the Detailed Audit the ESCO investigates where the energy is used and, more important where the efficiency can be improved. The following steps should be followed:

- Load tracing & sub-metering
- Consultant to provide Baselines
- Obtain tariff conversion quotes from supply authority (if changing tariff is an option)
- Detailed walkthroughs
- Design and calculate the Energy Management Opportunities

The last step is difficult to standardise because every site and building is different. In the Auditing document standard forms for walkthroughs are shown to enable rapid and thorough inventory investigation.

5 Implementing

Once the Detailed Audit has been approved, the Performance Contract will start. The implementation and installation of EMOs can commence only if the following steps are followed:

- The proposed EMOs must be presented to site management.
- Detailed design of the EMOs, taking into account the comments received from the Consultant and site management. The Detailed design will be submitted to Consultant for approval.
- Installation and implementation of EMOs, after approval by the Consultant
- Annually organise Awareness Campaign

All maintenance is carried out or sub-contracted by the ESCO during the full period of the Performance Contract.

6 Financing

In 'Document 3; Financing and Agreements' the various options of energy saving contracts are described;

- Fixed Fee Contracting
- Shared Savings Contracting
- Performance Contracting

All contracts are preceded by Preliminary Audits that are carried out on-risk by various pre-selected ESCOs. The predicted potential in savings is the basis for awarding the performance of a Detailed Audit to the ESCO. The Detailed Audit involves much more work and will be financed by the Client. Once the Detailed Audit is completed, a contract can be negotiated.

Performance Contracting was found to be the optimal solution to obtain maximum energy savings with the lowest risk involved for the Client. At this moment Shared Savings Contracting exists in South Africa. The next logical step is Performance Contracting, which has been introduced in other countries, e.g. USA and Australia.

Performance Contracting has the following characteristics:

- After the Auditing Process, the ESCO guarantees a specific saving percentage.
- The Client will finance the proposed implementation and installation of viable EMOs.
- The ESCO will maintain the installed EMOs for the duration of the contract.
- If the savings achieved are higher than the guaranteed savings, no action is required as the ESCO has fulfilled its obligation to achieve the guaranteed savings.
- If the savings achieved are lower than the guaranteed savings, the ESCO will have to pay in the difference.
- The Client will keep all obtained savings for the full duration of the contract.
- An Engineering Consultant will be contracted by the Client to facilitate independent Quality Assurance.

ESCOs, and more specifically emerging ESCOs, are advised to be cautious when submitting their guaranteed savings percentage. Experience has shown that energy consumption creeps up during the contract period, sometimes reaching increases of up to 0.5% per annum. Beware of this slow increase, and build in a safety margin!

In order to accommodate smaller, more marginal buildings within the energy efficiency rollout, it is advised that a mix of bigger and smaller buildings be combined in one tender. The combined annual energy bill should be approximately R5 million.

7 Monitoring and Verification

Monitoring and Verification is a continuous process of checking the energy performance of a site or part thereof.

- Monthly savings calculation to be carried out by the ESCO.
- Monthly verification of calculated saving by Consultant.
- If the savings are not as expected, the ESCO will investigate the cause and take action. The ESCO will report back to the Consultant.
- The ESCO, Consultant and Client will have a Progress Meeting quarterly.

If the guaranteed energy savings are not achieved, the ESCO will have to pay in the difference. For the ESCO it is therefore most important to ensure that the savings are maintained.

Sometimes the energy consumption changes because of:

- Changes in occupancy numbers.
- Change in size of the site (floor areas).
- Change in function of (a part of) the site; buildings refurbished to cater for a different function.
- Upgrading of existing installations that use a different fuel source or have a different efficiency.

If one of the above occurs, the Baseline is no longer representative for that site and must be adjusted accordingly. In most cases the ESCO will submit a proposal to adjust the Baseline. The proposal will include proof of the changes and electricity profiles to compare the situations before and after. The Consultant will decide whether it is fair to change the Baseline as proposed and will recommend the change to all parties. Only when all parties agree on the proposed modification, will the new Baseline become official.

8 Quality Assurance

In order to make sure energy consumption is reduced in a sustainable manner, the decision was made to use Performance Contracting. This type of contract forces ESCOs to achieve the maximum amount of energy savings, as their income is directly related to the implementation of EMOs; having more EMOs requires a larger investment, so the income for the ESCO is larger as well. The qualifications of the ESCO must be recognised by the Skills and Development Programme, as launched by DME.

In addition to the contracting structure and minimal qualifications of the ESCO, a Consultant is appointed to oversee the claims and calculations made by the ESCO. The Consultant will have to be registered with SAACE or ECSA to assure that it is a neutral third party.

The Documentation, which includes all the guidelines, will have to be maintained by DME in order to strive constantly to improve the quality. A revision task team, within DME, will have to be appointed. The revision task team will perform the following:

- Send out documentation for comments to stakeholders.
- Request comments and feedback from the stakeholders.
- Evaluate comments and feedback during an annual meeting hosted by DME and represented by all parties (Treasury, DME, DPW, User Departments, ECSA, SAACE, SAAE, etc.). Difficult decisions will be taken by vote.
- Update the Documents.

9 Conclusions and findings

It is very exciting to see South Africa on the threshold of a new energy efficiency era. In the past, a few energy efficiency programmes were launched by the Department of Public Works, but the rollout never reached the full national potential. The rollout as launched by the Department of Minerals and Energy will include all buildings under the control of National Government.

During the process of compiling these Documents and at the Workshops that were held, the following was noted:

- Little knowledge has been shared between or within the Governmental Departments about energy efficiency programmes. Increased communication between Departments is required.
- All parties are convinced of the necessity of improving energy efficiency and the positive effect it would have on reducing the maintenance backlog in certain buildings
- ESCOs have expressed their concerns about the fact that additional savings achieved will only go to the Client, instead of sharing these additional savings between Client and ESCO. The pilot project will indicate whether this incentive bonus is necessary.
- Department of Minerals and Energy has to ensure that (a part of the) savings achieved will benefit both Client and User. A successful rollout of this project is only guaranteed if savings remain within the budgets for Clients and Users. If budgets are cut because spending has gone down due to energy savings, the incentive for improving energy efficiency is minimalised.

The overall conclusion is that informing all parties and commitment on the part of the initiators, are the two pillars on which a successful rollout is based. Although the Workshops have informed most parties, more Workshops, especially on local or provincial level, will need to be held. To initiate the rollout, much effort and commitment will have to be dedicated to this project by the Department of Minerals and Energy to ensure that these documents will serve the purpose for which they were written: improving energy efficiency and thus reducing costs and improving the environment.