3 Pre-implementation procedures of DSM and CDM

This chapter is a direct comparison between the pre-implementation procedures of DSM and CDM energy-efficiency funding mechanisms. Process-flow diagrams, timeframes and direct costs are compared. These attributes will later be used for decision modelling.


### 3.1 Introduction

Before an ESCo can commit to either a DSM or CDM mitigation strategy, it is very important to understand each of the pre-implementation procedures. Without a comprehensive understanding of the processes, costs and timeframes involved, an ESCo would not be able to properly manage the risks. This is particularly relevant to CDM projects, where the choice between unilateral and bilateral strategies could encounter cash flow problems during the project lifecycle.

The following chapter aims to guide project developers through the various DSM and CDM procedures and examine the pitfalls. All the steps in the DSM and CDM process are defined and mapped into flow diagrams with estimated costs and durations allocated to each stage of the project. The information supplied in this chapter is based on literature studies as well as data accumulated from the track record and experience of HVAC International. HVAC International will be used as a case study throughout the remainder of this thesis.

### 3.2 The DSM process

There are four energy sectors in which DSM EE initiatives can be employed [1]. These are:

- Residential Energy Efficiency (REE);
- Residential Load Management (RLM);
- Industrial and Commercial Energy Efficiency (ICEE) and Load Management (ICLM); and
- Demand Market Participation (DMP).

Next to arc furnaces and processing, pumping is the third largest maximum demand consumer, at 13% in the industrial sector, as can be seen in Figure 31. At a later stage it will
be shown that this sector holds the least technological risks based on HVAC International’s core competencies. This is where opportunities will be sought.

![Figure 31: Maximum demand in the industrial sector [1]](image)

### 3.2.1 Steps in the DSM process

The preceding activities to the actual DSM proposal or PDD are very similar in time and cost and will not be differentiated further in this chapter. The focus will be on the approval processes of Eskom and the CDM EB. The Eskom DSM approval process charts are shown in Figure 33, with the different steps explained in this section.

**Step 1: Develop and submit DSM proposal to Eskom**

Once the ESCo has the client’s consent and the Letter of Intent (LOI) have been signed to secure the project investigation, the development of the DSM Proposal will begin. The DSM Proposal is similar to the PDD in the CDM context. Eskom DSM will consider any EE or LM project that is rated at 500 kW or higher [2].
Step 2: Assign project reference number
The ESCo and Project Registration Officer will allocate a Project Number for tracking purposes and will also allocate the proposal to one of the available Project Co-ordinators.

Step 3: Project Technical Evaluation
In the review process, the proposal must pass three important hurdles. The first two (the technical and financial reviews) are within the Eskom DSM department. The third (the Investment Review) is carried out by the Commercial Department of Eskom.

Step 4: Project Financial Evaluation
Once the Project Evaluation Committee (PEC) have completed their assessment, the project will be submitted by one of the Eskom DSM staff members to one of three Investment Committees based on the project cost. These three are:

- CIC: Corporate Investment Committee - up to R35M projects;
- ISC: Investment Sub-Committee of the Board - up to R75M projects; or
- IFC: Investment Finance Committee - up to R350M projects.

Step 5: Financial Evaluation of ESCo
Eskom will assess an ESCo, not only on their technological capability, but also on their financial capacity to implement and sustain projects with a long development life cycle. This is of particular importance where a long procurement process could result in cash flow problems for the ESCo.

The latest initiative by Eskom is the mandatory registration of ESCos at the Construction Industry Development Board (CIDB). The Register of Contractors was established by the Construction Industry Development Board in terms of the CIDB Act 38 of 2000 and Construction Industry Development Regulations as published in Government Gazette number 26427 of June 2004. The Act makes it mandatory for public sector clients to apply this register when reviewing tenders [3].
Any enterprise that tenders for or enters into a contract for construction work with the public sector must be registered with the appropriate authority. Once-off joint ventures do not have to register, provided that each partner of the joint venture is separately registered.

Contractors are assessed in terms of their capacity and ability to perform specific classes of construction work and within certain contract value ranges. Registration means that it:

- qualifies contractors to tender for public sector work;
- promotes contractor development and sustainability;
- builds a track record for contractors with a credible institution;
- reduces tendering costs to clients and contractors; and
- provides clients with an opportunity to identify potentially emerging contractors for targeted development support.

The annual fees payable by the ESCo to the CIDB depend on the ESCo’s grading, listed in Table 6. (Refer to [www.cidb.co.za](http://www.cidb.co.za) for the grading criteria).

<table>
<thead>
<tr>
<th>Contractor Grading Designation</th>
<th>Upper limit of Tender Value Range designation</th>
<th>Administration / Renewal Fee in respect of each grade applied for</th>
<th>Annual Fees Payable in Respect of the Highest Contractor Grading Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R 200 000</td>
<td>R 250</td>
<td>R 200</td>
</tr>
<tr>
<td>2</td>
<td>R 500 000</td>
<td>R 250</td>
<td>R 250</td>
</tr>
<tr>
<td>3</td>
<td>R 1 500 000</td>
<td>R 750</td>
<td>R 300</td>
</tr>
<tr>
<td>4</td>
<td>R 3 000 000</td>
<td>R 750</td>
<td>R 800</td>
</tr>
<tr>
<td>5</td>
<td>R 5 000 000</td>
<td>R 750</td>
<td>R 1 500</td>
</tr>
<tr>
<td>6</td>
<td>R 10 000 000</td>
<td>R 750</td>
<td>R 3 000</td>
</tr>
<tr>
<td>7</td>
<td>R 30 000 000</td>
<td>R 750</td>
<td>R 8 000</td>
</tr>
<tr>
<td>8</td>
<td>R 100 000 000</td>
<td>R 750</td>
<td>R 25 000</td>
</tr>
<tr>
<td>9</td>
<td>No Limit</td>
<td>R 750</td>
<td>R 40 000</td>
</tr>
</tbody>
</table>

*Table 6: CIDB registration costs [3]*

**Step 6 & 9: M & V initial assessment**

In every DSM project there are three stakeholders: the Client, the ESCo and Eskom, as shown in Figure 32. The quantification and assessment of the savings must remain impartial and the complete process transparent. For this reason an external party should be included in
the assessment process to determine and verify the project savings. M&V provides all the DSM project stakeholders with an impartial reflection on the savings.

**Step 7: Eskom Procurement Process**

When the committee has approved the project, it is returned to Eskom DSM where qualified staff prepares the presentation for the Procurement Committee. Only after this committee has approved the project, will it go to the Legal Department for the drawing up of the contracts. Cumbersome bureaucratic procedures have resulted in an average lead time of 443 days before DSM approval is obtained [5].

**Step 8: Contract placement**

Although the DSM contract is negotiated first, the NEC contract is arguably the most important for the ESCo. It defines its relationship with Eskom DSM and determines performance, payment and penalties in case of underperformance. Whilst the DSM contract is handled by Eskom DSM, the NEC contract is handled by Procurement.

![Figure 32: Parties involved in the DSM process [6]](image)

Once M&V approval has been obtained, the client will accept liability for maintaining the project at design performance. For this reason, in order to protect the client, a Maintenance Contract is usually drawn up between the client and the ESCo.
**Step 10, 11 and 12** in Figure 33 are valid for the CDM project life cycle. The sustainability steps for both DSM and CDM are of equal importance. Eskom could impose penalties on the client for underperformance and negligence, damaging the relationship with the ESCo. There will also be less CERs to sell in case of an underperforming CDM project.

![DSM PROJECT APPROVAL PROCESS CHART](image-url)

*Figure 33: DSM project process chart [4]*
3.2.2 Summary of pre-implementation costs and timeframes

Unlike the steps in the CDM registration process, Eskom does not commit to certain timeframes in the DSM registration process. The timeframes of the various steps as explained by the DSM process chart were calculated and based on the average values of 72 project proposals submitted by HVAC International to Eskom over a period of 4 years [5].

Figure 34 shows a Gantt chart for a typical DSM project - from the initial investigation of the project activity, to performance assessment. Projects can take up to 864 days before the DSM life-cycle has been completed. Eskom Procurement is responsible for more than half of this delay. This is clearly a big risk that ESCos need to take into account when opting for DSM projects.

The purpose of this chapter is only to compare the registration processes of the two energy efficiency funding mechanisms. The project identification and implementation processes are, for all practical purposes, the same and will be discussed in later chapters.
Chapter 3: Pre-implementation procedures of DSM and CDM

A unique energy-efficiency-investment-decision-model for ESCos

---

Figure 34: DSM approval process

---

<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DSM approval process</td>
<td>364 days</td>
</tr>
<tr>
<td>2</td>
<td>Project identification</td>
<td>51 days</td>
</tr>
<tr>
<td>3</td>
<td>Introduction of concept to client</td>
<td>5 days</td>
</tr>
<tr>
<td>4</td>
<td>Perform preliminary test and experiments</td>
<td>19 days</td>
</tr>
<tr>
<td>5</td>
<td>Complete hardware design of new system</td>
<td>19 days</td>
</tr>
<tr>
<td>6</td>
<td>Complete costing and tender process for proposal</td>
<td>29 days</td>
</tr>
<tr>
<td>7</td>
<td>Project design and development</td>
<td>50 days</td>
</tr>
<tr>
<td>8</td>
<td>Design concept baseline methodology</td>
<td>5 days</td>
</tr>
<tr>
<td>9</td>
<td>Design concept monitoring methodology</td>
<td>5 days</td>
</tr>
<tr>
<td>10</td>
<td>Develop near baseline methodology</td>
<td>19 days</td>
</tr>
<tr>
<td>11</td>
<td>Develop near monitoring methodology</td>
<td>19 days</td>
</tr>
<tr>
<td>12</td>
<td>Complete DSM proposal</td>
<td>29 days</td>
</tr>
<tr>
<td>13</td>
<td>DSM approval</td>
<td>443 days</td>
</tr>
<tr>
<td>14</td>
<td>Submit letter of intent and proposal</td>
<td>1 day</td>
</tr>
<tr>
<td>15</td>
<td>Assign project reference number</td>
<td>6 days</td>
</tr>
<tr>
<td>16</td>
<td>Project evaluation committee (PEC)</td>
<td>90 days</td>
</tr>
<tr>
<td>17</td>
<td>Corporate Investment Committee (CIC) Step 4 and 5</td>
<td>36 days</td>
</tr>
<tr>
<td>18</td>
<td>Procurement process</td>
<td>366 days</td>
</tr>
<tr>
<td>19</td>
<td>Contract placement</td>
<td>60 days</td>
</tr>
<tr>
<td>20</td>
<td>Implementation and operation</td>
<td>320 days</td>
</tr>
<tr>
<td>21</td>
<td>Project implementation</td>
<td>269 days</td>
</tr>
<tr>
<td>22</td>
<td>MSV performance assessment</td>
<td>69 days</td>
</tr>
</tbody>
</table>
3.2.3 Improvements to the DSM process

The DSM approval process takes a long time. HVAC International experienced an average delay of 443 days in obtaining approval for its 20 projects. By the time financial approval was obtained, the infrastructure tenders were outdated. Most of the automation equipment is linked to the international exchange rates in the sub-contractors’ tenders. This leaves the ESCo with two options; either accept a lower profit margin or resubmit the tender.

Another problem with the existing DSM mechanism is that of sustainability. In the Western Cape, Eskom achieved, with notable success, the implementation of energy savings programmes. These savings have been reduced to approximately 125MW, which is only 31% of what was initially achieved [7]. This unwelcome deterioration in savings potential is a result of the limited sustainability of the project after implementation by the ESCo.

One solution to address these problems could be to develop a business model where ESCos generate MW savings and then sell them to Eskom at a fixed or negotiable rate, as seen in Figure 35. The benefit of such a business model is that seven bureaucratic steps are removed from the original approval process, resulting in a reduced lead time. To address the sustainability issue, it is suggested that the ESCo should be held responsible and liable for continuous savings.

The flowchart shown in Figure 35 shows a proposed business model for the DSM mechanism to be employed. Eskom will enjoy the advantage of fewer resources required for the approval process and consequently a quicker turnaround of new projects, resulting in more savings. If the projects are not sustainable the ESCo will not have MW hours to sell to Eskom. This concept will force the ESCos to ensure that both the projects and the savings are sustainable.

Unlike the existing DSM process, the biggest advantage for the ESCo with this new model will be that any over-performance in MW savings of individual projects, can be sold to Eskom. The disadvantage will be a low return on investment if the projects under-perform.
Where a high CAPEX is necessary to realize savings, this could be detrimental to the ESCo. This risk can be minimized if the ESCo employs sound engineering practices and sufficient safety margins.

Placing a fixed price on the value of a MW saving for Eskom, might not be the most viable solution. ESCos will obviously scramble for the “low hanging fruit” projects that will generate extra MWs at very little cost. This will serve its purpose, considering the current crisis Eskom is experiencing. In the long-term, creating MW savings will become more expensive and Eskom will have to adapt their pricing structure.
The following should be taken into consideration when Eskom buys MW savings to ensure these projects are coherent with Eskom’s and South Africa’s sustainability criteria:

- Are the MWs generated from renewable resources (wind, solar and hydro energy)?
- Are the MWs sustainable and how does the project contribute to job creation and transfer of knowledge in South Africa?
- What are the infrastructure requirements and costs and does the project employ local or international technologies?
- What is the carbon footprint of the technologies employed in generating MW savings?

3.3 The CDM process

The CDM process is a lengthy and bureaucratic process that could cost project developers dearly if they neglect thorough project planning. This planning should include development costs and timeframe analysis. The purpose of this section is to properly define the CDM project lifecycle and to keep track of associated cost and timeframes of each step.

3.3.1 Steps in the CDM process

Step 1: Project Identification and Design
The project owner identifies an opportunity for a CDM project and develops a Project Design Document (PDD) that includes a baseline estimate and an analysis of the net carbon emissions reductions. With the focus on industrial energy efficiency, three types of projects could be submitted based on the amount of emission reductions:

- Small-scale CDM projects (CDM-SSC-PDD);
- Large-scale CDM projects (CDM-PDD); and
- Bundles of small-scale CDM projects (CDM-SSC-BUNDLE).
Chapter 3: Pre-implementation procedures of DSM and CDM

Small-scale CDM energy-efficiency improvement project activities, is defined as an activity which reduces energy consumption on the supply and/or demand-side, by up to the equivalent of 15 gigawatt hours per year. [8] 15GWh relates to continuous power consumption of 1.71MW lower than the business as usual baseline depending on the EF.

Large-scale CDM projects exceed 15GWh per year and have more stringent baseline and monitoring methods to comply with, in the PDD, and EB registration cost could be 50% or more than small-scale projects.

Bundle is defined as: “Bringing together of several small-scale CDM project activities, to form a single CDM project activity or portfolio without the loss of distinctive characteristics of each project activity”. Project activities within a bundle can be arranged according to characteristics that include technology/measure, location and application of simplified baseline methods. The sum of the output capacity of project activities within a sub-bundle should not exceed the maximum output capacity limit for its type.[9]

If a bundle goes beyond the limits for the selected small-scale CDM project activities type, the emission reduction that can be claimed for this particular year will be capped at the maximum emission reduction level. The maximum is 60 kt $CO_2e/yr$ for methane and 15 MW output capacities for electricity production [11].

**Step 2: Host country approval**

Project approval by the host country is one of the pre-requisites of a potential CDM project with the UNFCCC and the Kyoto Protocol. This is carried out by the Designated National Authority (DNA) which falls under the Department of Minerals and Energy (DME). The scope of this approval is limited to assessing the voluntary participation of South Africa in the CDM and the contribution of projects to sustainability [12].

Voluntary screening is done via the submission of a Project Identification Note (PIN) and provides the DNA with the opportunity to give feedback to the developer on the performance of the project against approval criteria. The DNA will inform the developer of results within
30 days of submission. The PIN reduces the risk of carrying the PDD developing costs and not receiving a Letter of No Objection from the DNA.

The submission of the PDD is mandatory in order to receive a letter of approval from the DNA. The process for host country approval can take place in parallel with the validation process. However, approval must first be obtained before a project can be submitted for registration to the Executive Board. The DNA will post the submitted PDD on its website for public consultation for a period of 30 days.

The period between submission of the PDD and receipt of a decision from the DNA, should not exceed 45 working days. The Minister will verify the decision taken by the DNA within 60 days as seen in Figure 36. Project participants have the right to appeal before the Administrative Courts of South Africa in case of rejection. [12].

Figure 36: DNA project approval procedure [12]
Step 3: Third-party validation of the Project Design Document

The Designated Operational Entity (DOE) is either a domestic legal entity or an international organization accredited and designated on a provisional basis, until confirmed by the COP/MOP and by the Executive Board (EB). The DOE has two key functions:

- It validates and subsequently requests registration of a proposed CDM project activity which will be considered valid after 8 weeks if no request for review was made; and
- It verifies the emission reduction of a registered CDM project activity and requests the Board to issue Certified Emission Reductions accordingly. Unless a request for review is made, the issuance CERs will be considered final 15 days after the request is made.

PriceWaterhouseCoopers (PWC), was one of the first DOEs in South Africa and developed the following diagram as an overview of the validation process [13].

![Figure 37: Validation procedure](image)
**Step 4: Registration**

In accordance with paragraph 40 (f) of the CDM modalities and procedures (CDM M&P), the request for registration of a proposed CDM project activity, shall be in the form of a validation report from the DOE. This report should include the project design document, the written approval of the host Party and an explanation of how the DOE has taken due account of public comments received on the CDM-PDD [16]. See Figure 38.

Unless there is a request for review, registration request shall, after 8 weeks, be marked in the UNFCCC CDM website as: “registration completed”. The corresponding proposed CDM project activity and related public documents will be recorded or displayed, as registered.

**Step 5: Financial structuring**

The investors provide capital investment in the form of debt or equity. These investors may or may not be the carbon buyers who will pay for certified credits on delivery. Two financing options exist for CDM projects depending on the risk/reward trade-off that the ESCo is willing to take.

Unilateral projects occur when the developer - ESCo in this case - carries all the risk by financing the project with their own capital. The advantage of this approach is that the developer will get the highest possible price for its CERs. The developer could engage into a future contract to sell its CERs at a fixed price, securing a ROI.

A bilateral approach spreads the risk more evenly between developers and investors. The developers and investors could enter into a future contract at any stage of CDM lifecycle. The closer the project is from EB approval the higher the future price will be. Investors can also supply capital up front for the project activity, but will insist on a reduced CER price due to the risk of non-delivery. The terms and conditions of a unilateral agreement are stipulated in an Emission Reduction Purchase Agreement (ERPA).

The price of CERs plays a very important role in the development of an optimal ESCo business strategy and is discussed in Chapter 5.
Figure 38: CDM EB procedures for approving methodologies
Step 6: Implementation and operation
The implementation of the project activity or energy-efficiency intervention will be the same regardless of whether the ESCo/developer decides on DSM funding or the CDM alternative. Chapter 6 pursues the question of how the ESCos technologies are put into practice.

Step 7: Monitoring
Project performance, including changing baseline conditions (business as usual), is measured by the project developer in the commissioning process and during on-going project operation. The technologies described in Chapter 6 will address the monitoring of the project activity.

Step 8: Third-party verification of project performance
The DOE verifies project performance against the validated design specification and baseline, in order to approve certification. Verification must be done by a different DOE than validation. Each project requires a monitoring and verification protocol as put forth within the PDD. Carbon reductions generated are verified and certified. On successful completion of this procedure, CERs can be issued by the Executive Board. This process can be seen in Figure 39.

![Figure 39: Third party verification [14]]
Step 9: Certification and issuance

A DOE shall submit its verification and certification report/request for issuance of CERs using the form: “CDM form to submit verification and certification reports and to request issuance”. After the 15 day request period, or upon conclusion of the review process, the Executive Board shall instruct the CDM Registry administrator to issue the specified amount of CERs for the specified time period.[16].

Figure 40 gives a comprehensive CDM project cycle:
Chapter 3: Pre-implementation procedures of DSM and CDM

Figure 40: CDM project cycle [18]
3.3.2 Summary of costs and timeframes

Carbon transaction costs can be divided into two categories: the costs associated with the project preparation phase and those associated with the project implementation phase. From a financial perspective, it could be said that costs at the project preparation phase represent the risk capital (because it may not be recouped if the project fails), whereas the project implementation phase represents operational costs. The principal activities that result in transaction costs for CDM projects are illustrated in Table 7.

The Executive Board shall bear the costs for reviewing a proposed project activity. If the Executive Board decides to reject the registration of a proposed project activity and if a DOE is found to be guilty of official misconduct or incompetence, the DOE shall reimburse the Board for the expenses incurred as a result of the review. This provision is subject to review as experience accrues [23].

HVAC International has been quoted R100 710 for validation by PWC for their proposed small-scale project activity. This project activity will be reviewed in later chapters. The costs in Table 7 will be used in further calculations:

<table>
<thead>
<tr>
<th>Activities</th>
<th>Cost (ZAR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Validation</td>
<td>R 100,710.00</td>
</tr>
<tr>
<td>PDD registration</td>
<td>R 39,100.00</td>
</tr>
<tr>
<td>Verification (annual)</td>
<td>R 46,530.00</td>
</tr>
<tr>
<td>Issuance cost per CER</td>
<td>R 0.78</td>
</tr>
</tbody>
</table>

R15.51/pound and R7.82/USD were used

Table 7: Small-scale CDM costs for HVACI

Figure 42 represents a Gantt chart for a typical CDM project from the initial investigation of the project activity to performance assessment. Projects can take up to 798 days before the CDM lifecycle has been completed and the first CERs are issued.
Chapter 3: Pre-implementation procedures of DSM and CDM

A unique energy-efficiency-investment-decision-model for ESCos

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**Figure 41: Summary of CDM registration costs [15]**

<table>
<thead>
<tr>
<th>CDM Project Preparation Activities</th>
<th>Large-Scale</th>
<th>Small-Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project assessment</td>
<td>£5,000 - £15,000</td>
<td>£3,000 - £4,000</td>
</tr>
<tr>
<td>Completion of project documentation</td>
<td>£15,000 - £54,000</td>
<td>£6,000 - £12,500</td>
</tr>
<tr>
<td>Validation</td>
<td>£4,000 - £18,000</td>
<td>£3,500 - £5,500</td>
</tr>
<tr>
<td>Development of carbon credits sales agreement</td>
<td>£3,000 - £35,000</td>
<td>£1,500 - £5,000</td>
</tr>
<tr>
<td>Registration fee (see box)</td>
<td>£6,000 - £10,000</td>
<td>£3,000</td>
</tr>
<tr>
<td><strong>Total - Project Development Costs (CDM)</strong></td>
<td><strong>£33,000 - £140,000</strong></td>
<td><strong>£17,000 - £30,000</strong></td>
</tr>
</tbody>
</table>

Source: EcoSecurities 2004

<table>
<thead>
<tr>
<th>Average tCO₂e Per Annum</th>
<th>US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less or equal to 15,000 (small-scale projects)</td>
<td>$5,000</td>
</tr>
<tr>
<td>More than 15,000 and less or equal to 50,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>More than 50,000 and less or equal to 100,000</td>
<td>$15,000</td>
</tr>
<tr>
<td>More than 100,000 and less or equal to 200,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>More than 200,000</td>
<td>$30,000</td>
</tr>
</tbody>
</table>

Source: 6th Meeting CDM Executive Board; October 2002

---

**CDM Project Implementation Activities**

<table>
<thead>
<tr>
<th></th>
<th>Estimated Costs</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring and verification</td>
<td>£3,000 - £10,000 (per audit)</td>
<td>Yearly or every two years</td>
</tr>
<tr>
<td>Sale of carbon credits</td>
<td>5% - 20%</td>
<td>Yearly; only if an intermediary is involved</td>
</tr>
<tr>
<td>&quot;Share of proceeds&quot;: registration</td>
<td>N/a</td>
<td>Will eventually replace current registration fees; will be based on percentage of CERs</td>
</tr>
<tr>
<td>Adaptation fees</td>
<td>2%</td>
<td>Applies only to CDM projects. Does not apply to CDM projects in the least developed countries and will probably not apply to small-scale projects.</td>
</tr>
</tbody>
</table>
Chapter 3: Pre-implementation procedures of DSM and CDM

Figure 42: The CDM approval process
3.3.3 Improvements to the CDM process

DNA assistance

For a project developer like HVAC International to obtain approval for a CDM project, it must either make use of existing methodologies or design a new methodology which will have to be approved by the EB. The high development cost of a new methodology makes the feasibility of such an approach very unattractive. The first mover advantage is very short and the ROI low in comparison to another developer using the same methodology, right after it has been approved by the EB six months later.

<table>
<thead>
<tr>
<th>Executive Board (EB)</th>
<th>Methodology Panel (MP) / AR Working Group (AR-WG)</th>
<th>Designated Operational Entity (OE)/Applicant Entity (AE)</th>
<th>Project Participant(s) (PP)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1) Submit new methodology</td>
<td>2) Check completeness and Submission to MP</td>
<td>1) Takes decision at its next meeting (max. 4 months)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2) Takes decision at its next meeting (max. 4 months)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3) Takes decision at its next meeting (max. 4 months)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4) Performs validation and registration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5) Registration, if no request for review</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Validation only proceeds once the project participants have adjusted their documentation.</td>
</tr>
</tbody>
</table>

Figure 43: New methodology approval process

Two scenarios may arise after approval of a new baseline or monitoring methodology as seen in Figure 43;

- The proposed methodology is accepted without modification or
- The proposed methodology was modified (dotted line, no. 4 bis).
Most ESCos in South Africa fall into the small-to-medium size enterprise categories making the high costs of a new methodology a big barrier to the CDM opportunities. With financial support from the DNA, ESCos would be able to develop new methodologies. This will create a mutually beneficial commercial venture where ESCos can generate profit from selling the CERs and the DNA complies with its national strategy and policies.

With the DNA supporting a specific new methodology the EB will be more lenient to approve the methodology, because it already complies with the host country’s sustainability criteria. In section 3.5 a new generic energy efficiency methodology that could be used by many developers for various applications, is developed.

**DOE assistance**

The DOE could contribute much to the success rate of CDM projects at the EB if they also fulfil a consulting role to the developers. In a country like South Africa with only one DOE (PWC) it is very likely that the DOE will have more experience with methodologies, technicalities and CDM pitfalls than any “carbon consulting firm”.

### 3.4 New generic energy-efficiency methodology

Nearly all the demand-side energy efficiency for specific technology projects registered at the UNFCCC are small-scale projects [24]. The reason for this is that competitive companies already employ best practices and relatively high technologies to reduce production costs per unit. This allows only a small margin for improvement when implementing high technologies and engineering, to realise further saving for these companies.

Over and above the large capital investment that will be required to implement these energy efficiency technologies, the developer will not be guaranteed that a similar methodology already exists on the UNFCCC database. This implies that the developer should first register the new methodology and obtain approval from the EB. This will cost approximately $2,500
excluding developing costs. [20]. With less than 15,000 CERs to sell per annum the ROI and first mover advantage becomes very small.

To solve this problem, a new generic energy efficiency methodology that is applicable to various systems should be developed. The reason for using the word “generic” is because it does not focus on a specific electrically-operated unit such as a water pump, compressor, fridge plant or fan. This new methodology focuses on the more efficient utilization of the whole system through improved scheduling of the demand for large industrial equipment.

For example, simply improving the efficiency of a pump in a water scheme will result in the same amount of water being pumped, but more cost effectively. Applying this new generic methodology could also result in less water being pumped with the same “old” pump by re-adjusting the demand to a more accurately computed exact amount. Another example is strategic placing of valves in a compressed air system and controlling these valves to supply air only where and when it is needed.

The advantage of this methodology is that there is no need for the high costs of upgrading infrastructure. Installed equipment is utilized and made more cost-effective and sustainable. To improve these systems, automatic control is required together with the help of a real-time energy management system (REMS). The REMS technology will be discussed in further detail under ESCo technologies in Chapter 4.

From the Methodology Panel’s perspective of the CDM EB, it should be clear that the focal point of this methodology is not improvement of the equipment, but of the control system. This methodology can be applicable to any large industrial consumer of electricity where demand-side management reveals scope for energy efficiency. As part of this methodology it is proposed that the project developer is not required to do an EIA (Environmental Impact Assessment) since the existing system will still be functional, only more efficiently.

Should the EB approve this methodology it would mean that developers could use one methodology for various applications. This will make more projects financially viable.
because it eliminates the registration costs and time lost for developing a new methodology and an EIA.

ESCos in South Africa have become experts in utilizing existing equipment and creating more optimised scheduling solutions. For example, in a gold mine, clear water is gravity fed to the mining operations and then pumped back to the surface to prevent flooding. The ESCo would rather schedule the flow of water according to production times than replace the existing pumps with more efficient ones. This will result in the pumping of less water rather than pumping the same amount of water more efficiently.

Energy efficiency from demand scheduling is only measured from the electricity baseline and not directly from the equipment that uses the electricity. It is therefore not necessary to design a methodology for a pump, fan, compressor, or any form of industrial equipment. In the following section a generic energy efficiency methodology is designed to address demand energy efficiency.

This managing of demand is just another form of energy efficiency and reflects in the lower electricity baseline compared with business as usual. Normally this electricity saving alone does not merit a project. However, the additional revenue generated from selling CERs could make this a more lucrative proposition.

### 3.5 Existing baseline and monitoring methodology

#### 3.5.1 Applicability

At the time of writing, the threshold for small-scale Type II methodologies was 15 GWh per annum which relates to approximately 1.5 MW power saving. Although the Kopanang case study qualifies for Type II - “Energy efficiency improvement projects”, most projects under investigation at HVAC International average between 2 MW and 2.5 MW making them large-scale projects. It was then proposed to amend the approved baseline and monitoring
methodology “AM0020 - for water pumping efficiency improvements” for the new generic large-scale methodology.

This methodology (AM0020, Version 01) is applicable to project activities that:

- Seek to reduce GHG emissions by explicitly reducing the amount of energy required to deliver a unit of water to end-users in municipal water utilities;
- Improve energy efficiency in the overall water pumping system by reducing technical losses and leaks and improving energy efficiency of the pumping scheme, which consume electricity from the electricity grid, where:

The only difference is that the proposed methodology will reduce the “units” of water required to be pumped, and not pump the same amount of units more efficiently. This will be realised with a real-time energy management system (REMS) that will improve the overall control of the system.

This methodology focuses on improving the control system rather than on replacing old equipment, regardless of whether the unit delivered is water, air, heat or any other form of electricity consumer. This methodology will be applicable to pumping systems, compressed air systems, winding systems, fridge plants or any other system where the demand units could be reduced without affecting production or the operating environment.

However, on 15 December 2006 at the 28th EB meeting the threshold of small-scale Type II methodologies was increased from 15 GWh to 60 GWh. This will allow developers to do power saving projects in excess of 5.7 MW under the simplified modalities and procedures for Small-Scale CDM project activities. Approved baseline and monitoring methodology for Type II.C Demand-side energy efficiency activities for specific technologies will thus be used.
3.5.2 Baseline methodology

“This methodology comprises activities that encourage the adoption of energy-efficient equipment, lamps, ballasts, refrigerators, motors, fans, air conditioners, appliances, etc. at many sites. These technologies may replace existing equipment or be installed at new sites. In the case of new facilities, the determination of baseline scenario shall be as per the procedures described in the general guidance to SSC methodologies under the section ‘Type II and III Greenfield projects (new facilities)’. The aggregate energy savings by a single project may not exceed the equivalent of 60 GWh per year for electrical end use energy efficiency technologies.”

The emission baseline is determined as the product of the baseline energy consumption of the equipment and the emission factor for the electricity displaced:

\[
BE_y = E_{BL,y} \times EF_{CO2,ELEC,y}
\]

\[
E_{BL,y} = \sum_{i} (n_i \times p_i \times o_i) / (1 - l_y)
\]

Where:

- \(BE_y\) baseline emissions in year \(y\) (\(tCO_2\))
- \(E_{BL,y}\) annual energy baseline in kWh for year \(y\)
- \(EF_{CO2,ELEC,y}\) emission factor in year \(y\) (\(tCO_2 / MWh\))
- \(\sum_{i}\) the sum over the group of “\(i\)” devices (number of pump stations)
- \(n_i\) the number of devices of the group of “\(i\)” devices (number of pumps)
- \(p_i\) the rated power of the devices of group of “\(i\)” devices (kW install capacity)
- \(o_i\) the average daily operating hours of the devices of the group of “\(i\)” devices
- \(l_y\) average technical distribution losses for the grid serving the locations where the devices are installed, expressed as a fraction.
The project emissions consist of electricity used in the project equipment, determined as follows.

\[
PE_y = EP_{pj,y} \times EF_{CO2,y}
\]

Where:
- \(PE_y\) project emissions in year \(y\) (tCO\(_2\)e)
- \(EP_{pj,y}\) energy consumption in project activity in year \(y\)
- \(EF_{CO2,ELEC,y}\) emission factor in year \(y\) (tCO\(_2\) / MWh)

### 3.5.3 Monitoring methodology

The emission reduction achieved by the project activity shall be determined as the difference between the baseline emissions and the project emissions and leakage.

\[
ER_y = (BE_y - PE_y) - LE_y
\]

Where:
- \(ER_y\) emission reductions in year \(y\) (tCO\(_2\)e)
- \(LE\) leakage emissions in year \(y\) (tCO\(_2\)e)

The complete PDD can be seen in Appendix B.
3.6 Conclusion

The pre-implementation procedures of DSM and CDM are complicated and should be clearly understood by management. Although the project life cycle for CDM is slightly shorter than DSM, both require more than two years to develop and implement. This could impose cash flow problems that could jeopardize the liquidity of the ESCo. The total cost to register a Small-scale CDM project could reach R180 000, excluding the project development cost.

The selling of MW savings to Eskom in support of DSM, is proposed within a model that eliminates seven redundant steps in the existing DSM projects cycle. This model will enable the ESCo to take full advantage of over-performing projects by selling MWs to Eskom. Eskom will benefit by not having to fund projects that hold the risk of under-performance. CER prices are proposed as a benchmark for the MW value.

No suggestions are made to the international CDM process but the development of a generic energy efficiency methodology will make access easier to ESCos wanting to develop demand-side energy efficiency CDM projects.

This Chapter has sketched the environment within which ESCos could apply their technologies to either a DSM or CDM project. These ESCo technologies are briefly described in Chapter 4 where a new technology is developed specifically for CDM applications.
3.7 References


[7]. Adrew Etzinger, Eskom general manager for investment strategy, African Energy Journal, Aug 2007, Vol 9, no 4


Chapter 3: Pre-implementation procedures of DSM and CDM

[10]. CDM Executive Board, Guidance related to the sum of the sizes of Components of project activity, Extract of the report of the twenty-eighth meeting of the Executive Board, paragraph 56


[12]. The Department of Mineral and Energy, Designated National Authority for Clean Development Mechanism in South Africa, Private Bag x59, Pretoria, 0001, South Africa, Tel: +27 12 317 8227


[14]. Det Norske Veritas (DNV), Validation, Verification and Certification of CDM projects, presented by Ramesh Ramachandran, Ramesh.Ramachandran@dnv.com

[15]. Carbon Transaction Costs and Carbon Project Viability, Climate Change Projects Office (CCPO), Department of Trade & Industry, 4th Floor, 151 Buckingham Palace Road, London, SW1W 9SS, United Kingdom, Tel: +44 (0) 20 7215 1608


[17]. CDM Executive Board, Procedures relating to verification report and certification report/request for issuance of CERS, Version 01.1, 20 December 2006
[18]. PriceWaterhouseCoopers (Pty) Ltd, *A Possible Clean development Mechanism Project Cycle*, Alison Ramsden, Johannesburg, Tel: +27 11 797 4658

[19]. Article, Engineering News, 7 Sep 07, Terence Creamer

[20]. www.cdmgoldstandard.com

[21]. The latest version of the “consolidated methodology for grid-connected electricity generation from renewable sources” (ACM0002) is available on the UNFCCC CDM website:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html


[24]. J. Fenhann, *Guidance to the CDM and JI Pipelines*, February 2008, UNEP RisØ Centre Denmark, Tel: +45 46775 105, j.fenhann@risoe.dk