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Energy efficiency and the CDM in South Africa: constraints and opportunities

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Abstract

Energy-efficiency projects were expected to constitute an important project type under the Clean Development Mechanism (CDM). In South Africa, there is significant potential for energy savings in several sectors. The savings possible in industry have been demonstrated through plant-level energy audits, measurement and verification of Eskom's Demand Side Management (DSM) programme and national energy modelling.

Enabling policy for energy efficiency and demand-side management has been adopted by government and the utility, Eskom. A dedicated National Energy Efficiency Agency (NEEA) was established in 2006. Yet, energy-efficiency still fails to realise its potential.

The paper seeks to dispel the misconception that energy efficiency projects might not be 'additional' under the CDM. Analysis of barriers, which is well understood by those dealing with energy efficiency, can be used to demonstrate additionality. A standard tool for demonstrating additionality is now available, as are baseline methodologies for both large and small-scale CDM projects. It should, therefore, be clear that energy efficiency projects are not a priori ruled out as non-additional. Each project has to demonstrate additionality, as for any other project type.

Finances are available from various sources, and the CDM can offer further funding for initial costs, or in removing the barriers to energy-efficiency projects. Internationally, energy efficiency initially did not account for large numbers of CDM projects, nor a major share of carbon credits. With the recent growth in CDM projects, however, the numbers of energy-efficiency projects are increasing internationally. In South Africa, analysis of the emerging CDM portfolio shows that energy-efficiency projects are much better represented at the concept stage than in fully designed CDM projects.

The major elements for implementing energy-efficiency projects exist – dedicated institutions, enabling policy frameworks, approved methodologies and even an electricity crisis to raise awareness. Funding is available from various sources, and the CDM can offer further funding for initial costs or in removing the barriers to energy-efficiency projects. The CDM rules should soon allow for registration of entire programmes, which could include energy-efficiency standards or demand-side management. Innovative financing solutions such as clean energy lending can assist as well.

All that seems to be needed is a concerted effort to realise the potential. Such efforts could be driven by the Designated National Authority or the National Energy Efficiency Agency. Together with initiatives from the private sector, a dedicated effort might help South Africa find a clear route for energy-efficiency projects under the CDM in South Africa.

Keywords: clean development mechanism, energy-efficiency projects, additionality, demand side management

1. Introduction

The Clean Development Mechanism (CDM) was established under the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC). CDM projects allow investment by entities from industrialised countries in projects in developing countries. In return for this investment, carbon credits (in this case, Certified Emission Reductions or CERs) are received by the investor in the industrialised country. This enables the industrialised country to meet its emission reduction targets under Kyoto more cost-effectively, while promoting sustainable development in developing countries.

CDM projects may also be unilateral, i.e., they take place in the developing country without a project partner from an industrialized country.

Energy-efficiency projects were expected to constitute an important project type for CDM investment. Such projects provide highly cost-effective emission reductions through saving energy locally – a combination which would appear ideal for the CDM. However, the project pipeline to date – both internationally and nationally – shows relatively few energy-efficiency projects. It seems that simple opportunities are often overlooked.

2. Key elements for implementing energy-efficiency projects

2.1 Large potential for demand-side energy efficiency in South Africa

2.1.1 Industrial energy-efficiency

In 2000 industry consumed approximately 41% of the total final energy used in South Africa (DME 2005). South Africa has relatively high energy intensity – in 2001 we had the 26th largest Gross Domestic Product (GDP) in the World but were the 16th largest consumer of energy (DME 2005). Energy savings are possible, as illustrated by plant-level energy audits, data from Demand-Side Management (DSM) programmes and national energy modelling.

An audit carried out by the then Energy Research Institute (ERI), in conjunction with Volkswagen, South Africa, at their Uitenhage plant, indicated a saving potential of 16% of their energy costs and a payback of less than one year. If only the low cost measures were considered, the annual energy cost saving would have been R2 million, and the payback period would have been one month. These improvements alone would have saved over 15 000 tonnes of CO_2 per year (ERI, University of Cape Town 2000).

It is salutary to note that key performance indicators are set to relate product output to the number of people employed, for example. Taken in isolation, such an assessment may be seen to be counter to good business practice, that is, the maximization of profit. It is very clear that financial benefits resulting from energy efficient practices can be missed because employees are encouraged to concentrate on a narrow set of business 'drivers'.

More than 60 000 MWh have been saved under the Eskom DSM programme for industrial energy efficiency over the past twelve months to mid-2006. This figure could undoubtedly be improved upon, given the slow start to the programme. These are nearly all improvements to lighting. The energy saving corresponds to a reduction of more than 57 000 tonnes of CO_2 per year.

The Department of Minerals & Energy (DME) has set a target of a 15% reduction in final energy use in 2015, compared with the business-as-usual case (DME 2005). A recent study showed that a moderate penetration of energy efficiency could result in a reduction of 30 million tonnes of CO_2 in 2015. The figure for 2006 is similar (van Es, Howells & Winkler 2006).

2.1.2 The potential for energy efficiency in the commercial sector

The DME's energy efficiency strategy (DME 2005) quotes the commercial sector as consuming 4% of the final energy used in South Africa. The target for this sector is also 15% by 2015 (DME 2005). This may well be a modest target when seen in the light of the performance of the BP regional office building in Cape Town, which is consuming less than half the energy of a typical South African office building. Typically, commercial buildings in South Africa would consume up to 304 kWh/m^2 per year, while calculations show that the BP building is expected to consume only 105 kWh/m^2 per year (Morris 2005). The annual emission saving would amount to 2 474 t CO_2. Admittedly, the BP office is a recent construction and was able to benefit from progressive energy efficiency thinking, while the majority of the national building stock was erected some time ago. However, the country is currently undergoing record growth in the building sector and efficiency measures introduced now are likely to be significant in future.

Evidence from the Eskom DSM programme is that efficiency gains for retrofits in this sector are enormous – believed to be significantly over 55 000 MWh to date, resulting in a CO_2 emission reduction of over 52 000 tons.

2.1.3 Opportunities in the residential sector

The residential sector consumes 17% of the final energy used in South Africa (DME 2005). The sheer number of houses means that the energy consumed per house is relatively small. An added complication is the difference between socio-economic groups which leads to a wide range of energy consumption per house, as well as a significant difference in appliances – and hence, energy carrier employed.

Eskom has distributed millions of compact fluorescent light bulbs (CFLs) throughout South Africa, over five million in the Western Cape alone (ELI 2005). A wider range of energy-efficient and renewable energy interventions have been demonstrated in a CDM project in Kuyasa.

A relatively small additional investment in housing for poor communities creates more comfort, reduces household energy costs, as well as cutting emissions from the residential sector. An extension of this policy could improve the energy efficiency and save households money. Energy efficiency in RDP housing is an area where a policy of direct state financial support to promote energy efficiency seems warranted (Winkler 2006).

South Africa's first registered CDM project at Kuyasa in Khayelitsha has combined insulated ceilings, Solar Water Heaters (SWH) and CFLs (SSN 2004). Some 2 300 low-cost houses are to be built more efficiently, increasing the scale of implementation to some extent. Yet the challenge remains to scale up good demonstration projects through implementation of a broader policy – one that could apply to the two or three million new houses that need to be built (SSN 2004).

Other co-benefits of the project activity include a reduction in local air pollution with subsequent decreases in pulmonary pneumonia, carbon monoxide poisoning and other respiratory illnesses. A decrease in accidents and damage to property as a result of fire is also anticipated.

The emission reductions are relatively small, as shown in Table 1. The total emission reductions, based on 2.75 tCO_2 avoided per household per year, with a crediting period of 21 years (SSN), amount to less than 1 Mt CO_2 even assuming both phases are implemented.

Assuming a CER price of $10 / tCO_2, the first phase of the project would earn gross revenue of $1.3 million, not accounting for transaction costs. The World Bank has indicated that it would not invest in projects generating less than $3 million in carbon revenue in some instances.

Scaling up the Kuyasa project to encompass all new social housing in South Africa could multiply the local sustainable development benefits, and also increase the climate benefits to a level were larger carbon investors would become interested. Energy efficiency in RDP housing is an area where a policy of direct state financial support to promote energy efficiency seems warranted (Winkler 2006).

The housing backlog in South Africa is estimated at between two and three million houses. If 10% of all new social housing was built as in Kuyasa, this could earn – using the assumptions in – between $ 115 million and $173 million (for 200 – 300 000 efficient houses).

The total saving across all three sectors is estimated at more than 200 000 MWh over the past year. This is equivalent to a CO_2 reduction of 192 600 tonnes.

2.2 Barriers at the national level

While the more efficient use of electricity has great potential, achieving wide-spread implementation requires effort. Theoretical gains are not always realised in practice, for either technical or economic reasons. Removing key barriers – informational, institutional, social, financial and market, and technical – is critical to the full realisation of energy efficiency measures (EDRC 2003). Important success factors to implement efficiency measures include government policy (standards, incentives, recovery of programme costs), electricity pricing mechanisms that do not penalise efficiency, and the effectiveness of DSM delivery agencies (NER 2002).

DSM might be thought to impact negatively on the CDM. If a project already receives funding through a DSM programme, would it still be eligible for CDM? The answer probably turns on whether DSM is part of national policy. If the DSM project is implemented without reference to national policy, management may be seen as having already consented to implement the project in order to qualify for DSM, and hence, the project would not be eligible for CDM. However, the CDM Executive Board has given explicit guidance on 'national and/or sectoral policies'.[1] The intention of this guidance is to avoid 'perverse incentives' for countries not to adopt policies that would reduce emissions, simply for fear that this might disqualify projects from the CDM (Winkler 2004).

Energy efficiency is included as one of the national policies that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies. The examples cited include renewable energy policies or measures that 'finance energy efficiency programmes'. Clearly DSM would fall under the latter. In these cases, the policy need not be taken into account in developing a baseline scenario. For DSM, this implies that it is permissible to construct a baseline scenario with a hypothetical situation – as if the nationally-mandated DSM programme were not in place.

The DME's energy efficiency strategy identified some possible barriers to implementing energy-efficiency projects (DME 2005). The key barriers included:

- Energy pricing, with historically low unit prices of coal and electricity, and the perception that energy efficiency does not therefore make much financial sense, which still persists even in energy-intensive industries;
- Lack of knowledge and understanding of energy efficiency;
- Institutional barriers, and resistance to change,

Table 1: Emission reductions and carbon revenue for the Kuyasa project

	Households	*tCO_2 / yr*	*tCO_2 over 21 years*	*Carbon revenue @ $10 / tCO_2*
Phase 1	2 309	6 357	133 490	$1 334 902
Phase 2	4 000	11 012	231 252	$2 312 520
Total	6 309	17 369	364 742	$3 647 422

e.g. due to fears that energy efficiency might disrupt production processes;

- Lack of investment confidence, that the returns on the initial investment required will indeed materialize; and
- 'Bounded rationality', using imperfect, or incomplete, information and less than fully rational procedures.

To address these potential barriers, enabling policies have been passed by both the DME and the NER. Going further, a dedicated agency, the NEEA, was created in 2006 to provide an institutional home for energy efficiency.

2.3 Policy framework

To put the wide variety of energy-efficiency measures together in a policy framework, the DME recently published an 'energy efficiency strategy'. The strategy set a goal for an improvement in energy efficiency of 15% by 2015 (DME 2005). While the DME document covers all energy, the National Energy Regulator of South Africa (NERSA) has approved policy for efficiency in the electricity sector in particular, with an 'energy efficiency and demand side management policy' (NER). Although the policy document does not contain specific numerical targets, these are set for Eskom by NERSA. Its focus is on captive customers (i.e. small customers), under the assumption that large contestable customers will respond efficiently to price signals (NER 2004).

The National Electricity Regulator (NER) included estimates of potential future savings in its *Integrated Electricity Outlook* (2002) and Integrated Energy Plan (NER 2004). Savings from energy efficiency are expressed as equivalent cumulative electricity generation capacity (in MW) that would be avoided by efficiency programmes up to 2010 and 2020. Since the market penetration of energy efficiency is critical to the results, estimates reflecting different assumptions are summarised in Table 2.

Experience exists with innovative technologies and programmes for energy efficiency and demand-side management. Eskom's DSM programme has focused on three key areas: load management, industrial equipment and efficient lighting. Such interventions include both load management and energy efficiency improvements.

If the existence of institutional capacity is not sufficient to promote energy-efficiency projects, then a crisis may do the trick. The electricity crisis in the Western Cape during the first half of 2006 provided impetus for energy efficiency. A combination of factors led to Eskom looking for 400 MW savings over the winter. CFLs were handed out to households free; electric hotplates replaced with Liquid Petroleum Gas (LPG) cylinders and plates; and the media provided detailed information on energy-saving behaviour – from insulating your geyser to switching lights off in unused rooms. However, perhaps the greatest impact resulted from the television-based Power Alert, requesting consumers to conserve electricity by switching off specific appliances (Botha 2006). While questions might be raised whether these savings will be sustained once the immediate shortage is past, what is clear is that a supply crisis stimulated unprecedented interest in saving energy.

2.4 Institutional capacity

Energy efficiency techniques and technologies are generally not new. They have been successfully implemented in Northern Europe and North America since the early 1970s (Mills 1993, Nadel et al 1998), following the first massive oil price increase. South Africa has been extremely slow to adopt efficiency measures and many commentators have suggested that this is because of the low cost of electricity, the predominant energy carrier outside the transport sector. Despite the low cost of electricity, there is often a financially sound case for implementing savings measures and it is puzzling that more opportunities have not been exploited.

Energy efficiency projects usually require an initial capital out lay before returns can be generated from fuel cost savings. Many consumers and busi-

Table 2: Potential future savings from energy efficiency and demand side management (cumulative capacity equivalent in MW)
Source: NER (2002)

	Low penetration		*Moderate penetration*		*High penetration*	
	2010	*2020*	*2010*	*2020*	*2010*	*2020*
Industrial and commercial energy efficiency	567	878	889	1270	890	1270
Residential energy efficiency	171	514	537	930	537	930
Industrial and commercial load management	355	444	428	535	510	535
Residential load management	222	735	443	936	669	936
Total	1315	2571	2297	3671	2607	3671

nesses are not in a position to do this and even good proposals do not see the light of day. More than this, there has been a general lack of awareness that energy efficiency measures can make a positive contribution to many aspects of life – financial returns, emission reductions, and overall national economic benefit.

The DME received Danish funding and staff support for several years in order to build capacity within the Department and the country at large. This project ended in 2005 but the legacy continues and institutional capacity continues to grow from the very low base evident a few years ago. One of the recommendations was for an energy agency and the National Energy Efficiency Agency (NEEA) was formally established within the Central Energy Fund on 1 April 2006. The Agency is mandated to encourage and promote the development and implementation of energy efficiency measures throughout all sectors. The NEEA is linked with the South African National Energy Research Institute (SANERI), which gives it the opportunity to fund research and education in this area.

The universities have built up a significant body of knowledge and expertise in M & V, all of which is available to build capacity within a rapidly advancing energy efficiency industry. Energy Service Companies (ESCos) are a major part of this industry and have the potential to provide the specialist outputs needed to support energy efficiency implementation. Many ESCos have arisen in direct response to Eskom's requirements under their demand side management programme. The capabilities of these ESCos are often limited to specific technologies, such as lighting.

Eskom, the electric utility, has a demand-side management programme which it is implementing on behalf of the energy regulator. The implementation of the programme is outsourced to energy service companies (ESCOs), which assist clients in industry, commerce and the residential sectors. The ESCOs carry out specific interventions for companies in industry (the clients in Figure 1). Currently seven universities in South Africa are involved in measurement and verification (M&V) teams. These teams are employed by the utility to measure the savings, against an energy baseline established prior to the intervention. After the intervention, the teams measure energy consumption by once-off use of instrumentation, or long-term data recording. A conservative approach to energy savings is taken by the M&V teams, who only report energy savings that can be verified. Reports on the verified savings are submitted to all of the involved parties, including the National Energy Regulator (not shown in the figure).

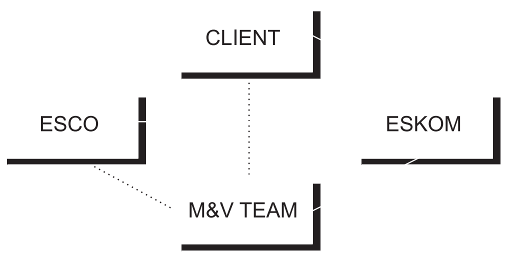


Figure 1: Institutions involved in measuring and verifying energy efficiency savings in South Africa

The solid lines in Figure 1 indicate contractual arrangements between the parties, while the dotted lines indicate that non-contracting parties need to liaise and communicate.

3. Innovative financing

Government could work together with international financial institutions and local banks to make available targeted technical assistance and partial risk guarantees for clean energy investment. The International Finance Corporation's 'clean energy lending programme' works with banks lending bonds on housing (Miller 2006). A capital sum is made available out of the bond for investment in energy-efficiency (or in some cases, renewable energy as well). Greater efficiency means the household is expected to have lower energy bills, and therefore, the risk of non-payment is lower. With this partial risk guarantee, the bank can offer the bond at a lower interest rate. This package can be offered either to home owners or housing project developers. South African banks should consider a similar approach.

4. Why are there not more energy-efficiency CDM projects?

In this context then, might the situation have shifted to a point where industries, offices and households start picking up the metaphorical $20 bill?[2] Is the time now ripe for the CDM to reach its full potential in the area of energy efficiency, or are there barriers in the mechanism itself?

Virtually all of the national barriers identified seem to have been addressed at least to some degree. Is there some blockage at the international level, in the design of the CDM system?

4.1 Additionality is not a barrier

The misconception that energy efficiency projects might not be 'additional' under the CDM needs to be dispelled. The concept of additionality goes back to the Kyoto Protocol, which in establishing the CDM, requires in Article 12.5(b) that emission reductions from CDM projects be 'real, measurable, and long-term benefits related to the mitigation of climate change' (UNFCCC 1997). In plain language, the project and its emission reductions should not have happened anyway. CDM investment should go to extra, 'additional' effort. The difficult part arises in that it is not simple to know what would have happened in the future, without the CDM project.

Hence the letter of the CDM 'law' defines additionalilty as follows:

> 43. A CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.
> 44. The baseline for a CDM project activity is the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity. A baseline shall cover emissions from all gases, sectors and source categories listed in Annex A within the project boundary. A baseline shall be deemed to reasonably represent the anthropogenic emissions by sources that would occur in the absence of the proposed project activity if it is derived using a baseline methodology referred to in paragraphs 37 and 38 above.
> (UNFCCC 2001)

There has been a long debate about the definition of additionality. The debate has tended to go around in circles and revert to the definitions adopted in Marrakech and cited above. In practical terms, additionality has now been translated into a tool. While use of the 'Tool for demonstrating and assessing additionality' is optional, it is becoming the standard approach for most CDM projects (UNFCCC 2005).

After preliminary screening relating to the starting date of the CDM project, the tool has the following steps. First, alternatives to the project activity are identified. Next, the project participants can choose between two ways of showing that the project is not the baseline scenario – either through investment analysis showing that the project activity is not the most economically or financially attractive, or through barriers analysis. No project participant is required to do investment analysis or show financial figures. The next step is an analysis of common practice that looks whether activities like the CDM project are usual. Finally, the impact of registration of the proposed project activity as a CDM project activity is considered.

For energy efficiency projects then, a set of clearly defined steps has been outlined to identify analysis. Energy efficiency projects typically *do* make financial sense. But as emphasized above, investment analysis is optional. Analysis of barriers, which is well understood by those dealing with energy efficiency, can be used to demonstrate additionality.

Moreover, the optional 'additionality tool'[3] provided by the Executive Board outlines barriers that may be applicable to energy-efficiency projects. Some of these are still financial, but do not have to form part of an investment analysis, i.e. used to calculate a rate of return or net present value. Other barriers to investment include lack of access to debt funding for innovative projects; and lack of access to international capital markets. Barriers might be technological, such as the lack of skilled and/or properly trained labour to operate and maintain energy efficiency technology. Prevailing practice is the third category listed, indicating that a project that is the 'first of its kind' in operational in the host country or region can be considered additional.

Energy efficiency projects are still relatively rare in South Africa and one or more of these barriers are perceived to exist by potential beneficiaries. Once the 'hurdle of disbelief' is overcome, the means for implementation can usually be readily found. We have seen that behavioural and organizational characteristics may force decisions away from implementation as in the case where the employment of an energy manager would worsen the employee per product ratio, despite the resulting significant contribution to overall company profitability.

Showing, perhaps by examples, how management or other barriers might be used to pass the additionality test when financial additionality cannot be used, is extremely important and will help developers achieve a greater rate of success.

It should, therefore, be clear that energy efficiency projects are not *a priori* ruled out as non-additional. Each project has to demonstrate additionality, as for any other project type. But the fact that energy efficiency projects can be registered under the CDM is borne out by experience.

Clearly, energy efficiency projects can demonstrate that they are additional. Furthermore, for potential projects in South Africa, a range of methodologies exist to calculate emission baselines.

4.2 Methodologies exist

The fact that the CDM expects energy efficiency to be an important project type is reflected in the inclusion of an entire category of methodologies under the rules for small-scale CDM projects. Under the Marrakech Accords, simplified rules are allowed for renewable energy projects less than 15 MW, energy efficiency improvements saving less than 15 GWh per year, and other project activities reducing less than 15 kt CO_2-equivalent annually (UNFCCC 2001).

In contrast to large-scale CDM projects, methodologies were developed upfront. For energy efficiency, simplified baseline and monitoring methodologies were established for supply-side efficiency (both generation and T&D); demand-side efficiency programmes; efficiency and fuel switching in industry, buildings and agricultural activities (UNFCCC 2002):

- Supply side energy efficiency improvements – transmission and distribution;
- Supply side energy efficiency improvements – generation;
- Demand-side energy efficiency programmes for specific technologies;
- Energy efficiency and fuel switching measures for industrial facilities;
- Energy efficiency and fuel switching measures for buildings;
- Energy efficiency and fuel switching measures for agricultural facilities and activities.[4]

Based on experience by the Energy Research Centre's M & V teams, most energy-efficiency projects in South Africa are likely to fall under the 15 GWh / year limit.

The M & V reporting requires an assessment of avoided emissions, which result from reduced electricity consumption. Both the baseline and post implementation conditions are calculated. The project boundary is well defined and the emission reductions are directly attributable to the DSM activities. After carefully measuring and verifying the actual energy savings, the associated emission reductions are reported.

5. Are there energy-efficiency projects in the CDM pipeline?

In the international CDM pipeline,[5] energy efficiency does not even show up when considering annual credits (Ellis & Karousakis 2006). Figure 2 shows that gases with high global warming potential (F-gases and N_20) make up the bulk of the annual credits.

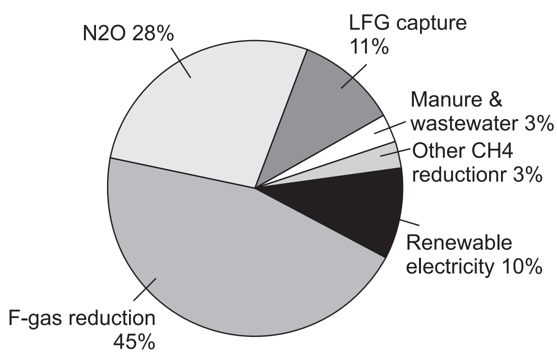


Figure 2: Global CDM portfolio, by share of annual credits for different project types, April 2006
Source: Ellis & Karousakis (2006)

However, the same author notes elsewhere that 'small renewable electricity and energy efficiency projects' are rapidly growing *by number of* projects (Ellis 2006). There are a fair number of small projects. Ellis (2006) attributes this to 'project developers do not shy[ing] away from projects that do not generate large GHG emission reductions'. The attraction for investors lies in other benefits such as improved regional and/or local economic development, reduced cost of production, introduction of new technologies and policies, and improvements in local air quality' (Ellis 2006).Other data paints a slightly brighter picture. The number of registered CDM projects has grown rapidly over the last few months. By 2 May 2006, 172 CDM projects had been registered, and a further 53 projects submitted for registration. It is estimated that GHG emission reductions from registered CDM projects will generate 364 million credits prior to 2012 (Ellis & Karousakis 2006). Of these, 9 were energy-efficiency projects.

Table 3: Energy efficiency projects in the CDM pipeline
Source: Fenhann (2006)

	No. of projects	*Annual CERs '000s*	*kCERs by 2012*
EE households	3	42	253
EE industry	82	6943	55230
EE service	2	15	94

Considering the longer CDM pipeline, that is, including projects at the PDD or validation stage, shows that there are even more energy-efficiency projects. shows a total of 87 energy-efficiency projects, most of them in the industrial sector.

Have these seemingly attractive features and international trends led to energy-efficiency CDM projects being submitted to South Africa's Designated National Authority (DNA, the official name of the 'CDM office')? The emerging CDM project portfolio shown in Figure 3 seems to suggest not.

Figure 3 shows the South African portfolio of CDM projects, counted by total emission reductions over the crediting period. This figure, however, is based both on Project Information Notes (PINs) as well as the fuller Project Design Documents (PDDs). Looking only at the more substantial PDDs, the share of energy efficiency projects shrinks from 38% in to 0% in Figure 4. As can be seen in the underlying data in Table 4, there is one single project in PDD format, but with very low total emission reductions. There is, hence, some intention to develop energy efficiency projects (based on the PINs), but almost none have gone further down the project cycle to PDDs, registration or issuance of CERs.

In other words, while there are four energy efficiency projects in the South African 'CDM pipeline', three of these are at the concept stage (PIN submitted).

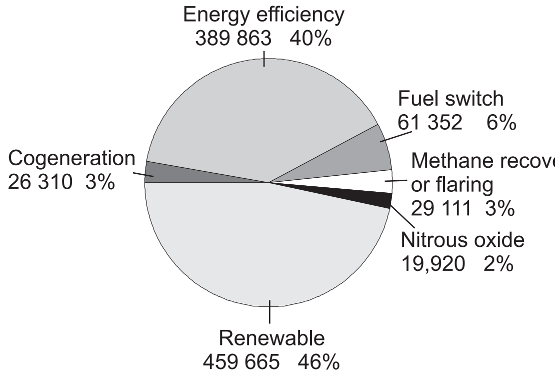
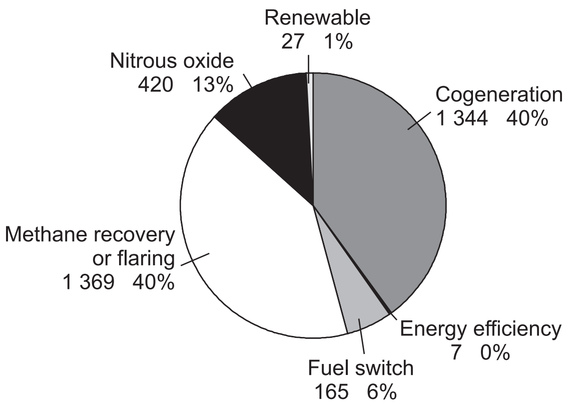


Figure 3: Total emission reductions over the life of CDM projects submitted to South Africa's Designated National Authority
Source: Authors' analysis of data provided by the DNA: Matooane (2006)



Note for Figures 3 and 4: The labels of the pie slices indicate project type, total reductions in kt CO_2-equivalent over the crediting period, and share of total PDDs plus PINs

Figure 4: Total reductions for PDDs only
Source: Authors' analysis of data provided by the DNA: Matooane (2006)

Analysis of Table 4 shows that virtually all (99.96%) of the total emission reductions would come from projects that still have not yet submitted their project design document. Despite the existence of large potential for energy efficiency, enabling policies, establishment of national institutions and international rules for the CDM, energy efficiency projects have not yet realised their potential in South Africa.

6. Possible ways forward

It seems puzzling to see the small number of energy-efficiency projects in the CDM, both globally and in South Africa. There is a large potential for increasing the efficiency of energy use. The major elements for implementing energy-efficiency projects exist – dedicated institutions, enabling policy frameworks and even an electricity crisis to raise awareness. Finances are available from various sources, and the CDM can offer further funding for initial costs or in removing the barriers to energy-efficiency projects. While individual projects have to prove their additionality, this is not *a priori* an obstacle to the project type itself. Most projects in South Africa would fall under the small-scale limit of 15 GWh of energy saved annually, so that approved methodologies are not a problem either.

The international rules appear to be moving towards allowing 'programmatic CDM'. In response to a proposal for energy-efficiency standards for air-conditioning in Ghana as a CDM project, climate negotiators agreed in 2005 that project activities under a programme of activities can be registered as a single CDM project activity. Methodological issues still need to be clarified, including appropriate boundaries, avoiding double-counting and leakage. The Executive Board has been asked to give utmost priority to finalizing its guidance on this issue, so that procedures should therefore be finalized soon. This will open the door for registering energy-efficiency programmes in a single CDM registration process.

So what's the problem? It would seem that despite these favourable circumstances, something more needs to be done to realise the potential of energy-efficiency under the CDM in South Africa. All that seems to be needed is a concerted effort to realise the potential. In conclusion, we offer some suggestions for how such a concerted effort could be undertaken.

The DNA might make a concerted effort to promote energy-efficiency CDM projects. The DNA has set up an Investment Promotion Sub-committee, which might assist in this regard. Alternatively, the DNA could approach project developers, particularly those that have already submitted PINs, to encourage them to submit full PDDs.

The NEEA is intended to provide an institutional home for energy-efficiency projects. The Agency is expected to promote projects that qualify for CDM funding.

Government might make energy-efficiency measures mandatory. An opportunity to do so seems to present itself in the forthcoming Energy Bill, which is likely to give the Minister the power to do so.

It is not only for Government to take action. Energy-efficiency is in the interest of the private sector. We see evidence that there is increasing interest in this sector.

The perceived financial risk to client companies can be removed by encouraging implementing companies to contract on a shared risk basis. We are aware that some banks are becoming more involved and could well form joint ventures with ESCos. Similarly, energy efficient product suppliers

Table 4: Project types submitted as PINs or PDDs, annual and total reductions
Source: Authors' analysis, based on data from the Designated National Authority, DME:

	PDDs			*PINs*			*All projects submitted, PDDs and PINs*		
	No of projects(PDDs)	*Total reductions, kt CO_2e over period*	*Annual reductions, kt CO_2e per year*	*No of projects (PINs)*	*Total reductions, kt CO_2e over period*	*Annual reductions, kt CO_2e per year*	*No of projects (PDDs and PINs)*	*Total reductions, kt CO_2e over period*	*Annual reductions, kt CO_2e per year*
Cogeneration	3	13 440	1 344	2	12 870	629	5	26 310	1 973
Energy efficiency	1	147	7	3	389 716	37 392	4	389 863	37 399
Fuel switch	3	1 352	185	1	60 000	6 000	4	61 352	6 185
Methane recovery or flaring	2	19 983	1 369	2	9 128	528	4	29 111	1 897
Nitrous oxide	1	8 820	420	2	11 100	860	3	19 920	1 280
Renewable	1	540	27	8	459 125	16 382	9	459 665	16 409
	11	44 282	3 352	18	941 939	61 791	29	986 221	65 143

could consider sharing risks and rewards with their customers.

If all stakeholders were to come together in a concerted national effort, South Africa would find a clear route for energy-efficiency projects under the CDM in South Africa.

Notes

1. 'Clarifications on the consideration of national and/or sectoral policies and circumstances in baseline scenarios', report of the Executive Board's 22nd meeting – Annex 3.
2. The metaphor of a $20 bill lying on the ground, but no passers-by picking it up, has often been used when wondering why energy efficiency interventions, which are well-known to save money, are not more widely implemented.
3. 'Tool for the demonstration and assessment of additionality', available at http://unfccc.int/cdm
4. Methodologies for small-scale energy-efficiency CDM projects are listed in section II of the rules (UNFCCC 2002), so that the above list is numbered II.A to II.F.
5. Which projects are included in the CDM pipeline varies. The analysis here is based on Ellis & Karousakis (2006). A commonly cited pipeline is the one compiled by J Fenhann at the UNEP Riso Centre (Fenhann 2006).

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