8 Conclusion and future energy-efficiency protocols

Chapter 8 summarises the research of all the previous chapters and concludes the results of Chapter 7 within the energy-efficiency-investment-decision model framework. This chapter also takes a look at the dynamics of the carbon market during the development of this thesis.

8.1 Summary

The technologies developed by ESCos for DSM energy efficiency projects can be applied directly to generate Certified Emission Reduction units (CERs) or carbon credits under the CDM business model. These groups of technologies are lined out in Figure 93 and support REMS-CARBON which ultimately strives to save energy.

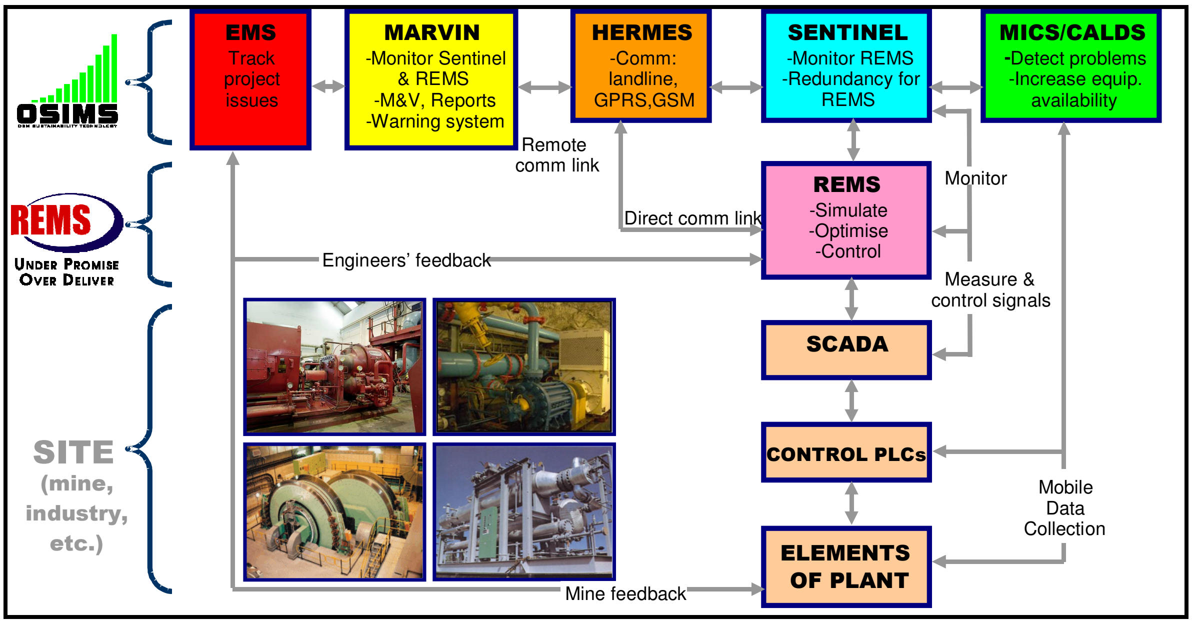

Figure 93: ESCo technologies and REMS-CARBON

ESCo executives must decide which option will be more profitable; a once-off Rand/MW value from Eskom-DSM or an annual ROI from selling CERs over an extended crediting period. The various options of carbon contracts and the Eskom-DSM funding with their expected value are shown in Figure 94 in a decision tree format. With a volatile CER price and bureaucratic registration procedures, it is very important that managers are well informed before making decisions.

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Figure 94: DSM and CDM decision tree

A unique energy-efficiency-investment-decision model has been developed that incorporates cost-benefit analysis based on the ESCo's chosen risk profile. Characteristics of the model of both DSM and CDM are defined, discussed and quantified into a decision analysis framework that will minimise risk and maximise profit. These characteristics include life cycle analysis, technology transfer, cash flow, future CER prices, associated project and political risks. The onset to the development of an optimal ESCo business strategy with decision analysis can be seen in Figure 95.

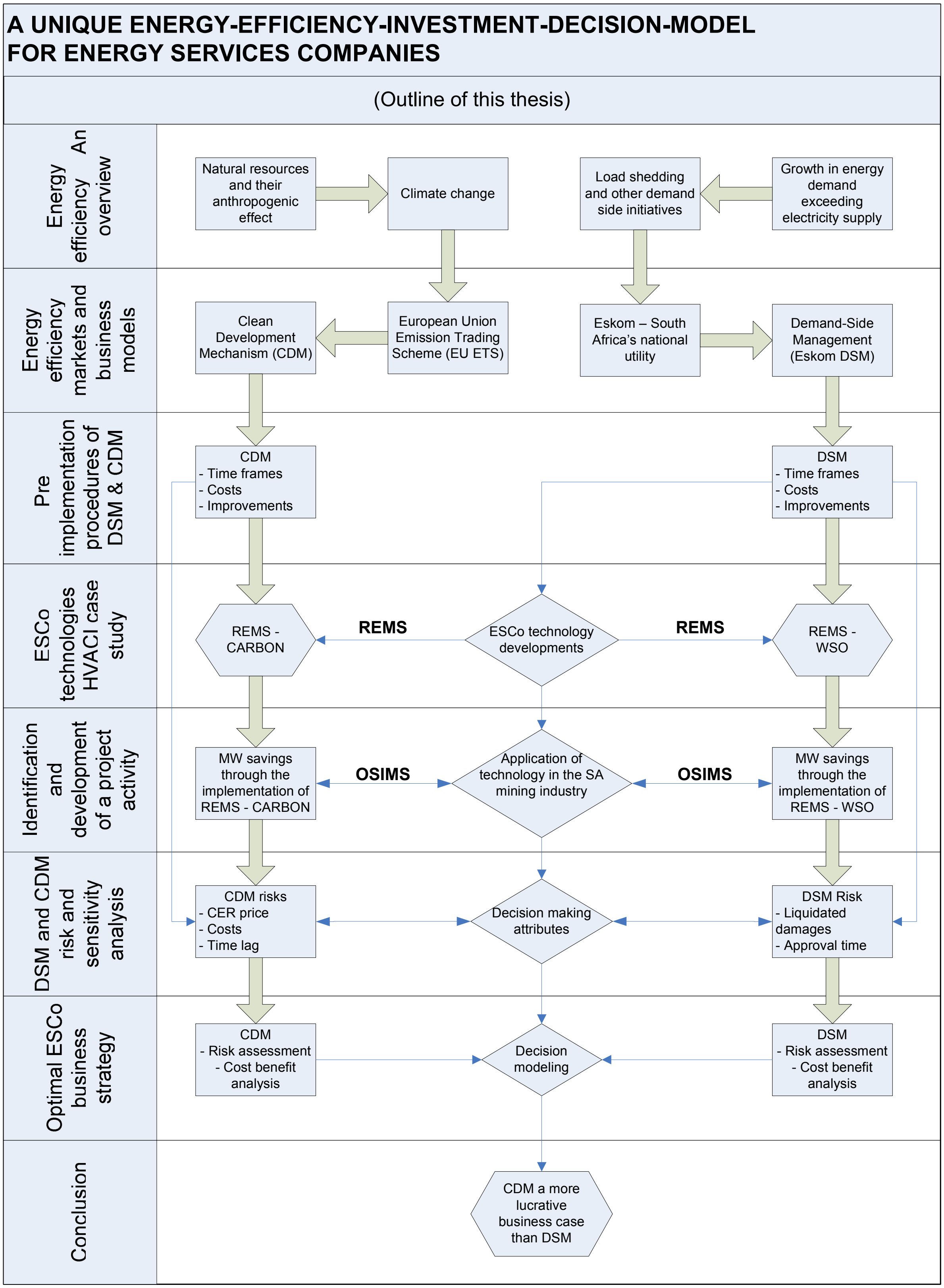

Figure 95: Investment decision model

For the purpose of this study the project activity is initially developed to ensure that energy-efficiency savings are viable and open to critical scrutiny for investment analysis. A retrospective approach was followed on both the DSM and CDM projects. These project activities involved the optimisation of the clear water supply at Kopanang gold mine by implementing the newly developed REMS-CARBON control system. The REMS-CARBON user interface is shown in Figure 96.

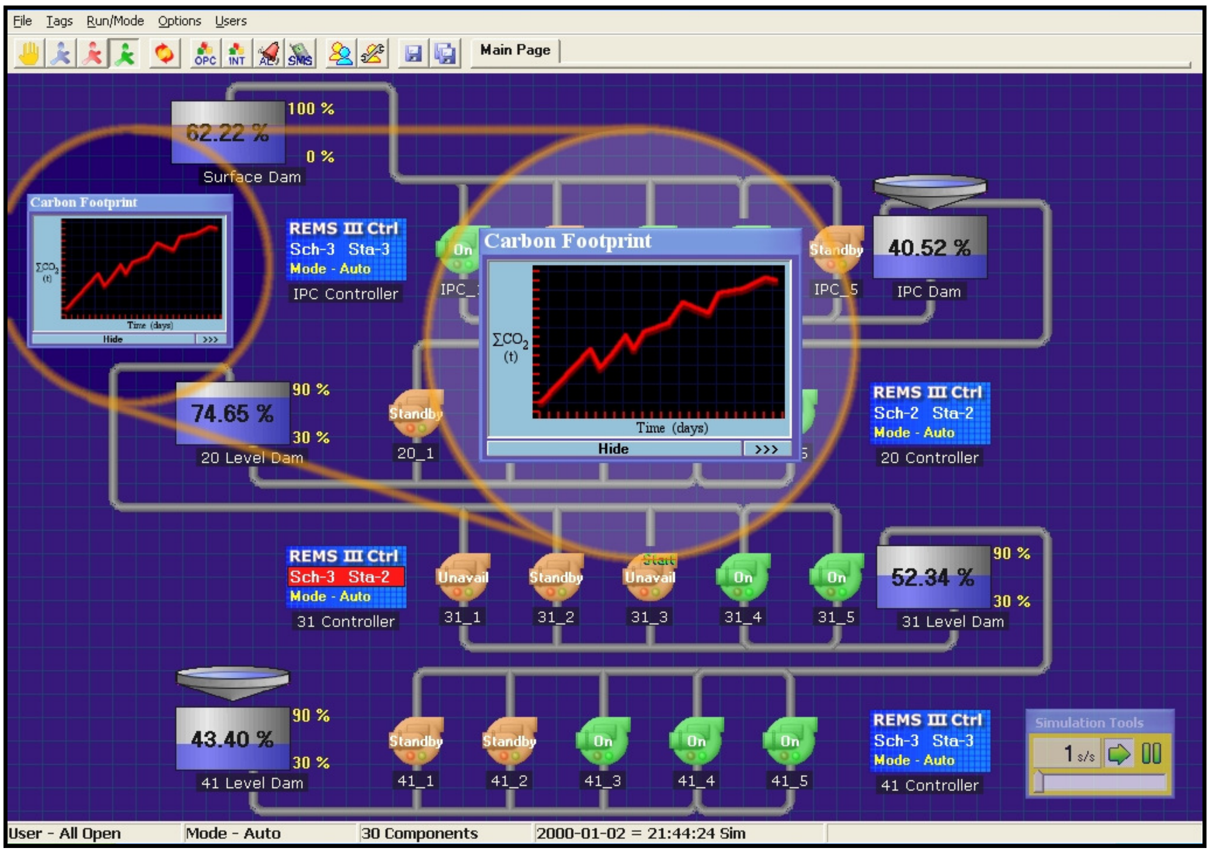

Figure 96: REMS-CARBON at Kopanang gold mine

There are clearly many variables involved when an ESCo has the technology available to develop a project activity as either a DSM or a CDM. This clearly justifies the need for a decision-making model that would incorporate cost benefit analysis and certain risk profiles.

A lower risk portfolio would require either DSM funding or a bilateral CDM project, transferring more risk towards the buyer. This scenario will, however, result in a lower CER price and lower ROI.

A high-risk option would be to act unilaterally, without accepting any technology transfer or investment capital from Annex I countries. CERs can then be sold at a maximum price on the spot market.

This unique energy-efficiency-investment-decision model is a powerful tool for analysing and managing ESCo risks when taking advantage of various funding opportunities.

8.2 Carbon market position and outlook

8.2.1 Global carbon market

The global carbon market doubled between 2006 and 2007 to US$64 billion, according to "States and trends of the carbon market" from the World Bank. The EU ETS doubled in both value and number of allowances transacted to the amount of US$50 billion. The CDM however, saw a levelling of the market volumes transacted - from 537 million tons of $MtCO_2e$ in 2006 to 551 $MtCO_2e$ in 2007. This resulted in the questioning of the prospect of developing countries benefiting from the carbon market [1].

The success of the CDM is weighed down by procedural delays. For example: 2,000 of the 3,000 projects have not yet been processed under the CDM approval cycle. This places their eventual implementation into question [2]. For this reason the pre-implementation procedures of DSM and CDM discussed in Chapter 3 should be carefully analysed before the CDM registration process is started.

At the time of writing, the analysis was based on the existing market position on 17 September 2007. As discussed in Chapter 7 the spot prices for EUAs and CERs were €20.61 and €16.35 respectively. In reality there is no physical difference between an EUA and a secondary CER. They both represent the reduction of 1 $MtCO_2e$. For this reason the price difference between the two will tend to converge as 2012 approaches.

8.2.2 Recent carbon prices

The EU carbon market is influenced by energy prices and the actual daily fluctuations of gas, coal and electricity prices. 2008 has seen the carbon market coupled more directly to the daily spot price for oil. Gas prices follow the oil price closely. As oil prices increase, it becomes cheaper for power companies to switch to burning coal. This requires more carbon credits for every unit of power produced, thus raising demand for EUAs [3].

Record oil prices and a lower than expected supply of carbon credits from the CDM, increased the price of EUAs in the EU ETS. This resulted in an average price of €32 per ton for the second phase of the scheme, which will continue up to 2013. According to Kjersti Ulset, manager of Point Carbon's EU ETS team, emissions would rise as a result of the growing attractiveness of coal, compared to gas [4]. Figure 97 shows the rapid increase of oil prices from July 2007 to July 2008.

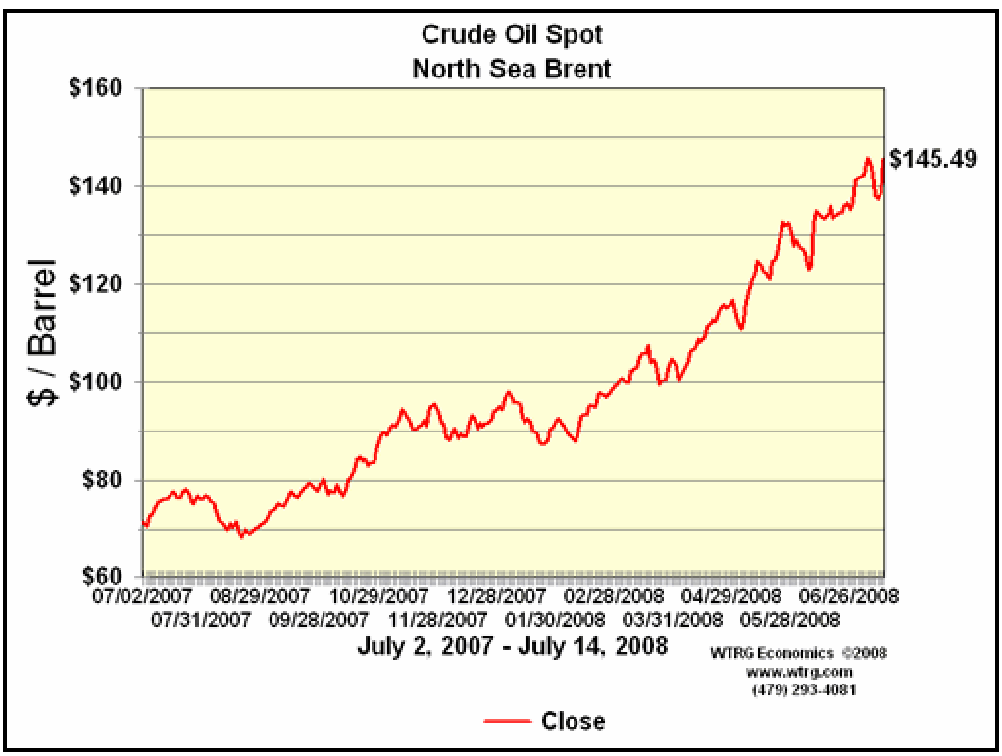

Figure 97: Rising oil prices

Figure 98 shows the increase of EUA prices from July 2007 to July 2008, the same period used in Figure 97 to show the correlation between the oil and carbon credit prices.

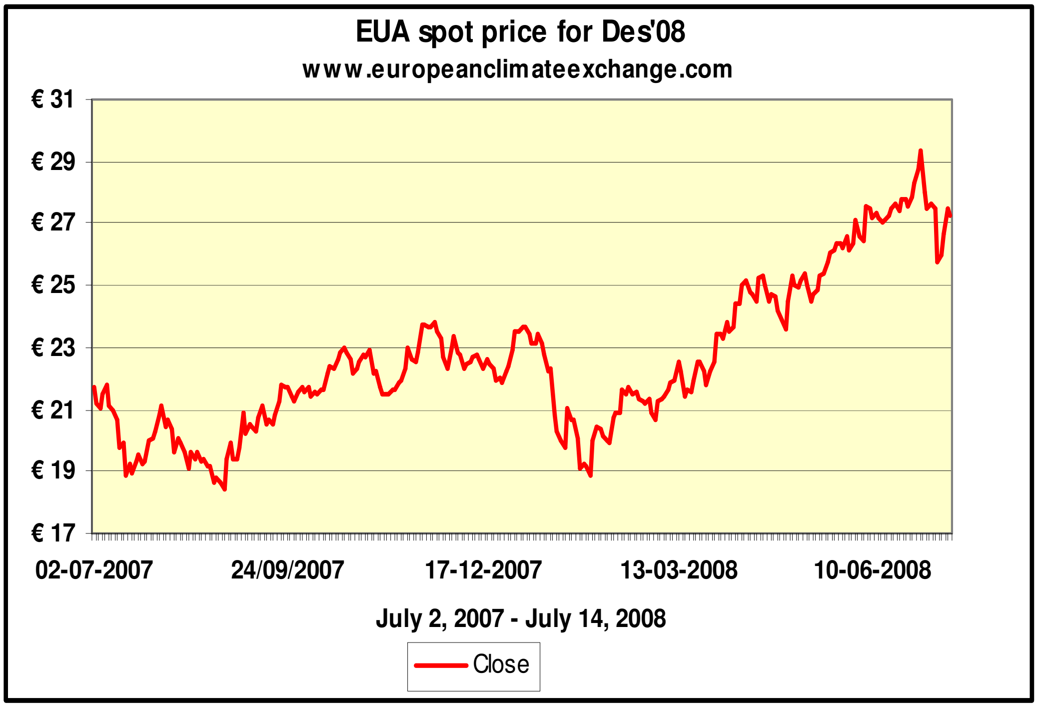

Figure 98: Rising EUA prices

The relationship between oil, coal and gas prices, which reflects in the electricity price, compared to CO_2 emissions, which in turns affects the carbon credit price, is shown in Figure 99. A lower coal price, compared to oil and gas, will result in utilities relying more on coal as an energy source. CO_2 emissions will rise, resulting in an increased demand for carbon credits. This will raise the price for carbon credits until it is subsequently necessary to revert back to gas, increasing the electricity cost, but reducing the need for carbon credits.

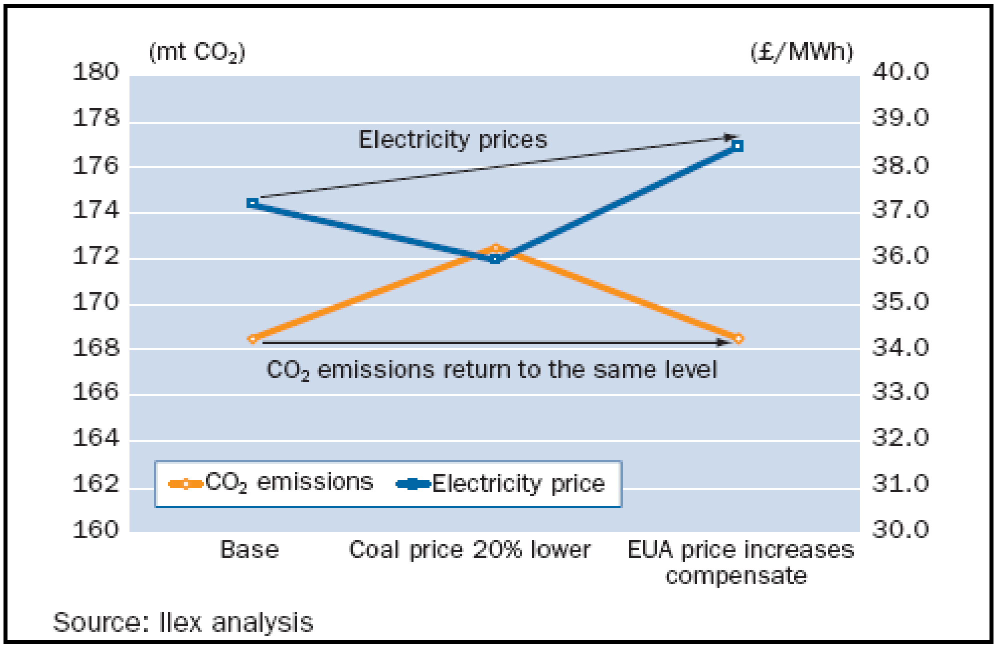

Figure 99: Impact of coal prices on CO_2 and electricity [5].

Point Carbon's analysis suggests that 2.372 billion offset credits from the Kyoto mechanisms would be issued up to, and including, the first quarter of 2013 - a fall of 158 million credits since the last update. The introduction of a carbon emission trading scheme in the US could push the total global carbon market value up to €2 trillion by 2020. A federal US carbon market has the potential to trade emission allowances worth €1.25 trillion or 67% of the total market value by the end of 2020, assuming a carbon price of €50 per ton.

A new summary draft of the leading Lierberman-Warner climate change bill in Congress, included a provision for the use of CERs, potentially creating a US demand of 288.75 million credits in 2012. According to Mark Lewis, director of global carbon research at Deutsche Bank, the extra 290 million CERs a year is positive in the context of the EC proposal earlier this year. It proposed that a restriction be placed on the use of CERs in Phase III of the EU ETS, particularly if the EU takes a 20% cap, post 2012 [6].

8.3 Conclusion

According to the UN IPCC, ACEEE, McKinsey and other experts, energy efficiency is generally acknowledged to be the cheapest, and fastest to deploy, resource to slow the growth of CO_2 emissions, with positive economic impacts. “Cost effective energy efficiency is known as a ‘no-regret’ climate policy, because it makes economic sense regardless of its climate mitigation impacts.” [7].

Carbon contracts from clean energy projects (energy efficiency and renewable energy) account for nearly two-thirds of the transacted volume in the project-based CDM market. These project types typically use sound, road-tested technology, are operated by utilities or experienced operators, and perform predictably, resulting in CER issuances yielding 70-90% of the expected PDD volumes [1].

The above two paragraphs were the criteria this thesis had to comply with. An energy efficiency project activity was identified at Kopanang gold mine and the potential energy saving was calculated. This saving would be realised by the design, development and implementation of REMS-CARBON, in conjunction with HVAC International (Pty) Ltd, the project developer. The REMS-CARBON technology would yield 100% of the PDD volumes with the help of OSIMS (On-site Information Management System).

With the savings guaranteed by the sound engineering of REMS-CARBON the next step for HVAC International was to decide on the type of energy-efficiency funding mechanism. DSM and CDM were identified as suitable sources of funding for the project activity and were analysed according to various inherent risks and rewards of each. It became clear that an energy-efficiency-investment-decision model would be necessary to hedge HVAC International’s risk against a wrong decision.

The maximax criterion for selling secondary CERs from a 1MW energy efficiency project in the spot market yields an expected value of R32,986,350 over 10 years compared to R6,515,680 from Eskom DSM funding. The DSM funding or certainty equivalent can now be used to test various CDM scenarios against a HVAC International utility function and chosen risk profile. The existing market environment appears to be very favourable for CDM projects,with CER price steady at €16 at the time of writing Chapter 7.

The CDM's biggest risk is caused, perversely, by the absence of market continuity beyond 2012 and this can only be provided by policy makers and regulators. This will require increased efforts well beyond what is envisaged by the existing policies and major world emitters.

8.4 Reconmendations for further work

In order to recommend future work related to CDM the areas of uncertainty should first be addressed starting with technology. Technology transfer from developed countries is not always necessary and locally developed technologies like REMS could be applied directly to CDM project activities. Technological constraints can thus be excluded as a reason for South Africa to lack behind the rest of world with the number of CDM projects.

On the other hand the CDM qualification criteria with specific reference to additionality are not always well defined. The CDM clearly states "National and/or sectoral policies or regulations that give comparative advantages to less emission-intensive technologies over more emission-intensive technologies that have been implemented since 11 November 2001 need not be taken in account in developing a baseline scenario". The baseline scenario could refer to a hypothetical situation without the national and/or sectoral policies or regulations being in place.

If the Eskom PCP programme is supported by NERSA it would become national policy and exempted from the baseline scenario. The same question could be asked about Eskom DSM. Should DSM projects also be exempted from the baseline scenario? If this is possible then the project activity could have three possible sources of financing: Eskom DSM, the client and carbon/CDM finance. The next question that arises from this scenario is what an acceptable IRR or ROI would be to still be additional according to the CDM EB.

There is limited incentives for developers to invest in methodologies for energy efficiency because private investors expect higher returns from electricity cost savings. A lack of guidance on how end-use efficiency methodologies must be designed to receive approval also creates uncertainty. There is no common understanding of what constitutes a good or best practice CDM methodology, and almost no one is willing to pay for this.

Programmatic CDM could also hold huge potential in the energy sector specifically in the South African mining industry. Programmatic CDM or Programs of Activity (PoA) under the CDM allow for the registering of several project activities at many locations applying the same approved methodology. The program provides the organisational, financial, and methodological framework for the emission reductions to occur, but the program does not actually achieve the reductions. The emission reductions are attained at the level of the CDM program activities (CPAs), the specific measures through which the emissions reductions are actually achieved.

The following would be recommended to increase the South African CDM portfolio:

- Use existing small-scale methodologies for example AMS II.C., AMS II.D. or AMS II.E.;
- Exploit programmatic CDM opportunities where similar methodologies are applicable to many sites;
- Develop PDD's or PoA DD's (Program of Activities Design Documents) in conjunction with experienced developers or consultants; and
- Choose an ERPA carefully and inline with your company's experience. The later carbon finance is made available from potential buyers in the CDM life cycle the better price could be negotiated for your CER's.

The following is recommended for future work within the CDM academic context:

- NGO's or the DNA should develop a tool for assessing additionality with specific reference to South Africa. If such a code of good practice could be presented and accepted by the CDM EB all new CDM project from South Africa could reference to this code and therefore assist in successful registration. This should typically address all national policies within the rules of CDM;
- The majority of the CDM projects are on the supply side of electricity. If national utilities like Eskom, with the financial backing, could assist developers with methodologies and project activities the potential of CDM demand side projects could be unlocked; and
- If a successful protocol is negotiated post Kyoto it will only be a matter of time before not only major industries will be targeted but also smaller ones and eventually individuals. Each individual's carbon footprint could be calculated based on his commodity consumption. This will only be possible if all commodities have a known carbon footprint themselves. New protocols could be developed which could include individual carbon tax or unique offset solutions with the ultimate goal to emit less carbon.

8.5 References

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