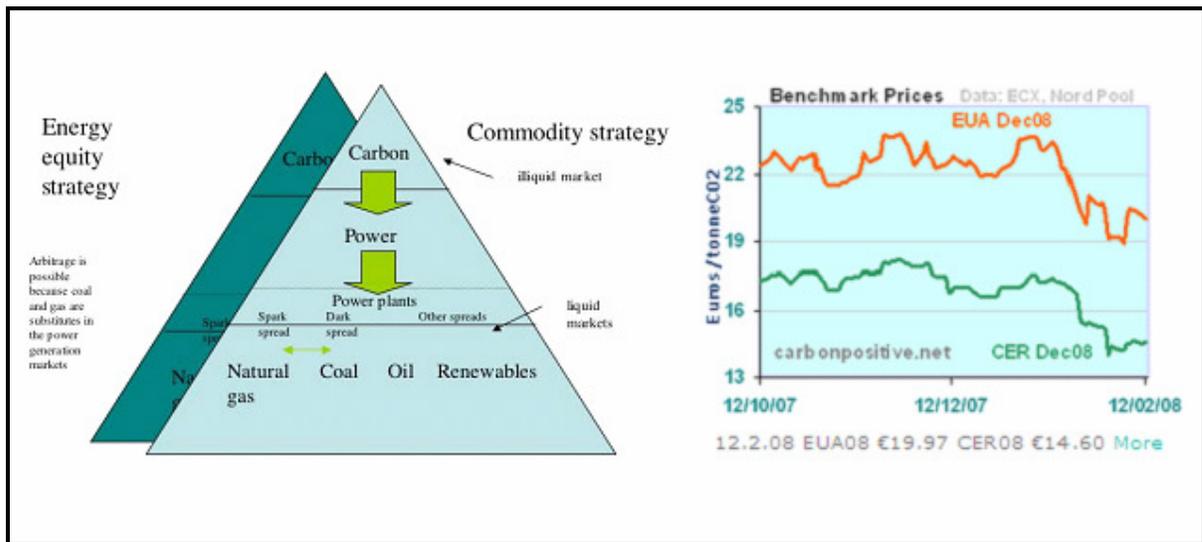

2 Energy-efficiency markets and business models



The goal of the IPCC is to assess the magnitude and timing of changes, estimate impacts and present strategies on how to respond. This has led to the development of cap-and-trade strategies under the guidance of the UNFCCC – the most universally supported international agreement in history. This chapter gives a brief overview of existing emission reduction markets and how the world has placed a price tag on the absence of carbon.

2.1 Introduction

DSM has been identified as a mechanism to solving Eskom's peak demand constraints, and carbon trading the solution to climate change. The perfect vehicle to drive these solutions is Energy Services Companies (ESCOs). This section gives the necessary background to the development of DSM, the advantages thereof and the realization of ESCOs.

The Kyoto Protocol to the United Nations Convention on Climate Change is described in order to understand where the allowance-based carbon mitigation markets originated from. This section further shows that project-based markets like JI and CDM could stimulate technology transfer to, and sustainability in, developing countries.

2.2 The Kyoto Protocol and the Clean Development Mechanism (CDM)

2.2.1 Summary of the Kyoto Protocol

"The Kyoto Protocol is an agreement under which industrialized countries will reduce their collective emissions of greenhouse gases by 5.2% compared to the year 1990 (but note that, compared to the emissions levels that would be expected by 2010 without the Protocol, this limitation represents a 29% cut). The goal is to lower overall emissions of six greenhouse gases - carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, HFCs, and PFCs - calculated as an average over the five-year period of 2008-12. National limitations range from 8% reductions for the European Union and some others, to 7% for the US, 6% for Japan, 0% for Russia, and permitted increases of 8% for Australia and 10% for Iceland."[8]

As of December 2006, a total of 169 countries and other governmental entities have ratified the agreement (representing over 61.6% of emissions from Annex I countries). Notable exceptions include the USA and Australia. Other countries, such as India and China, that

have ratified the Protocol, are not required to reduce carbon emissions under the present agreement.

Australia's new government, formed by the Australian Labour Party after the November 2007 election, fully supports the Protocol. Prime Minister Kevin Rudd signed the instrument of ratification immediately after assuming office on 3 December 2007, just before the meeting of the UN Framework Convention on Climate Change [5]

It is an agreement negotiated as an amendment to the UNFCCC, which was adopted at the Earth Summit in Rio de Janeiro in 1992. All parties to the UNFCCC can ratify the Kyoto Protocol, while non-parties to the UNFCCC cannot. The Kyoto Protocol was adopted at the third session of the Conference of Parties to the UNFCCC (COP3) in 1997 in Kyoto, Japan.

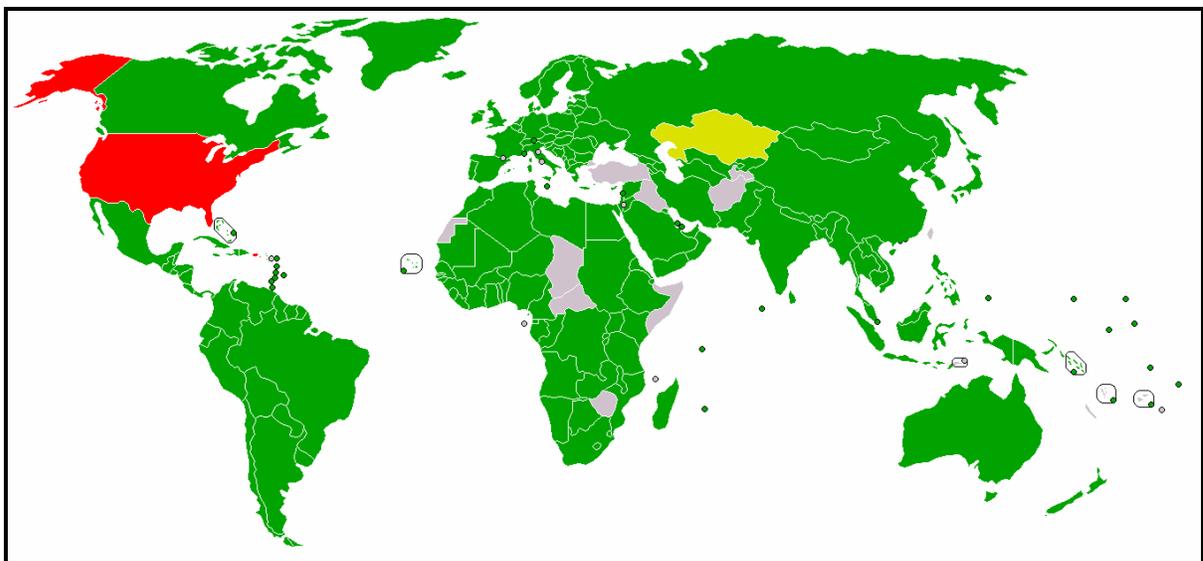


Figure 22: Kyoto Protocol participation - world map

The above world map (Figure 22) shows the Kyoto Protocol participation on December 2007 with the following statuses:

- Signed and ratified.
- Signed, ratification pending.
- Signed, ratification declined.
- No position.

Table 3 lists the Annex I countries and their emission targets set under the Kyoto Protocol:

Countries included in Annex B to the Kyoto Protocol and their emissions targets	
Country	Target (1990** - 2008/2012)
EU-15*, Bulgaria, Czech Republic, Estonia, Latvia, Liechtenstein, Lithuania, Monaco, Romania, Slovakia, Slovenia, Switzerland	-8%
US***	-7%
Canada, Hungary, Japan, Poland	-6%
Croatia	-5%
New Zealand, Russian Federation, Ukraine	0
Norway	+1%
Australia	+8%
Iceland	+10%

Table 3: Emission targets under the Kyoto Protocol

The EU’s 15 member States will redistribute their targets among themselves, taking advantage of a scheme under the Protocol known as a “bubble”. The EU has already reached agreement on how its targets will be redistributed and will be discussed in more detail later under European Union Emissions Trading Scheme (EU ETS). The geographical location of the 15 member states can be seen in Figure 23:



Figure 23: Members of the European Union [7]

The Kyoto Protocol establishes the following principles:

- Governments are separated into two general categories: developed countries, referred to as Annex I countries (who have accepted greenhouse gas emission reduction obligations and must submit an annual greenhouse gas inventory); and developing countries, referred to as Non-Annex I countries (who have no greenhouse gas emission reduction obligations but may participate in the CDM);
- Any Annex I country that fails to meet its Kyoto obligation will be penalized by having to submit 1.3 emission allowances in a second commitment period for every ton of greenhouse gas emissions they exceed their cap in the first commitment period (i.e. 2008-2012);
- While the average emissions reduction is 5%, national limitations range from 8% reductions for the EU to a 10% emissions increase for Iceland; but since the EU intends to meet its obligation by distributing different rates among its member states, much larger increases (up to 27%) are allowed for some of the less developed EU countries [2];
- Kyoto includes "flexible mechanisms" which allow Annex I economies to meet their greenhouse gas emission limitation by purchasing GHG emission reductions from elsewhere. These can be bought either from financial exchanges, from projects which reduce emissions in non-Annex I economies under the CDM, from other Annex 1 countries under the JI, or from Annex I countries with excess allowances.

What this means in practice is that Non-Annex I economies have no GHG emission restrictions, but when a GHG emission reduction project is implemented in these countries, that GHG project will receive carbon credits which can be sold to Annex I buyers. Government organizations are working closely with their major utility, energy, oil and gas and chemicals conglomerates to try to acquire as many GHG certificates as cheaply as possible.

2.2.2 European Union emissions trading scheme (EU ETS)

The EU emissions trading scheme (ETS) is based on recognition that creating a price for carbon through the establishment of a liquid market for emission reductions offers the most cost-effective way for EU Member States to meet their Kyoto obligations. The scheme should allow the EU to achieve its Kyoto target at a cost of between EUR 2.9 billion and EUR 3.7 billion annually. This is less than 0.1 % of the EU's GDP. Without the scheme, compliance costs could reach up to EUR 6.8 billion a year [11].

At the heart of the ETS is the common trading currency of emission allowances. One allowance represents the right to emit one ton of CO_2 , also known as EUA (European Union Allowance). Member States have drawn up national allocation plans for 2005–07 which give each installation in the scheme a certain number of allowances free of charge, allowing it to emit the corresponding amount of CO_2 without any cost. Decisions on the allocations are made public and can be seen in Table 4.

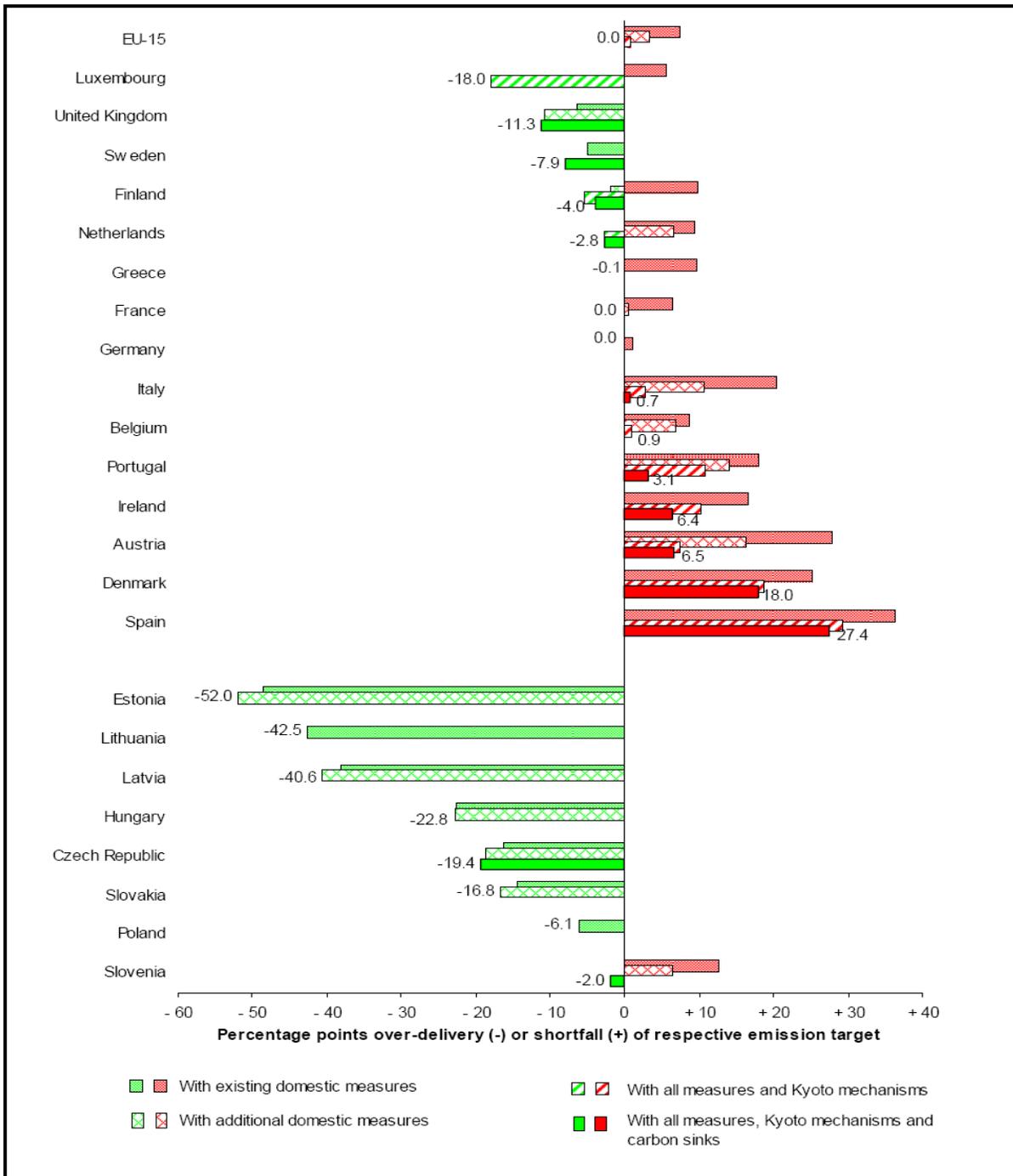


Table 4: Over-delivery and shortfall of emission targets [42]

The limit or ‘cap’ on the number of allowances allocated creates the scarcity needed for a trading market to emerge. Companies that keep their emissions below the level of their allowances are able to sell their excess allowances at a price determined by supply and demand at that time.

Organisations facing difficulty in remaining within their emissions limit have a choice between taking measures to reduce their emissions, such as investing in more efficient technology or using a less carbon-intensive energy source, buying the extra allowances they need at the market rate, or a combination of the two. This ensures that emissions are reduced in the most cost-effective way.

The ETS covers only CO_2 emissions from large emitters in the power and heat-generation industries like combustion plants, oil refineries, coke ovens, iron and steel plants and factories making cement, glass, lime, bricks, ceramics, pulp and paper. Individuals, institutions or non-governmental organisations are free to buy and sell in the market in the same way as companies.

Member States that have not produced enough allowances to cover their emissions will have to pay a dissuasive fine for each excess ton emitted. In the initial phase the penalty is EUR 40 per ton, but from 2008 it will rise to EUR 100. Operators also have to obtain allowances to make up the shortfall, in the following year after their names have been published.

2.2.3 The Clean Development Mechanism (CDM)

CDM is an arrangement under the Kyoto Protocol allowing industrialised countries (Annex 1) with a greenhouse gas reduction commitment to invest in projects that reduce emissions in developing countries as an alternative to more expensive emission reductions in their own countries. The flow of investment and certified emission reductions between Annex 1 and non-Annex 1 countries is shown in Figure 24.

The main drive behind the development of the CDM is the fact that the capital requirement across all sectors are 35% lower in developing countries than in developed countries. The cumulative cost for abating each QBTU energy demand in China's residential sector is 14 billion US\$ compared to 18 billion US\$ in the United States [10].

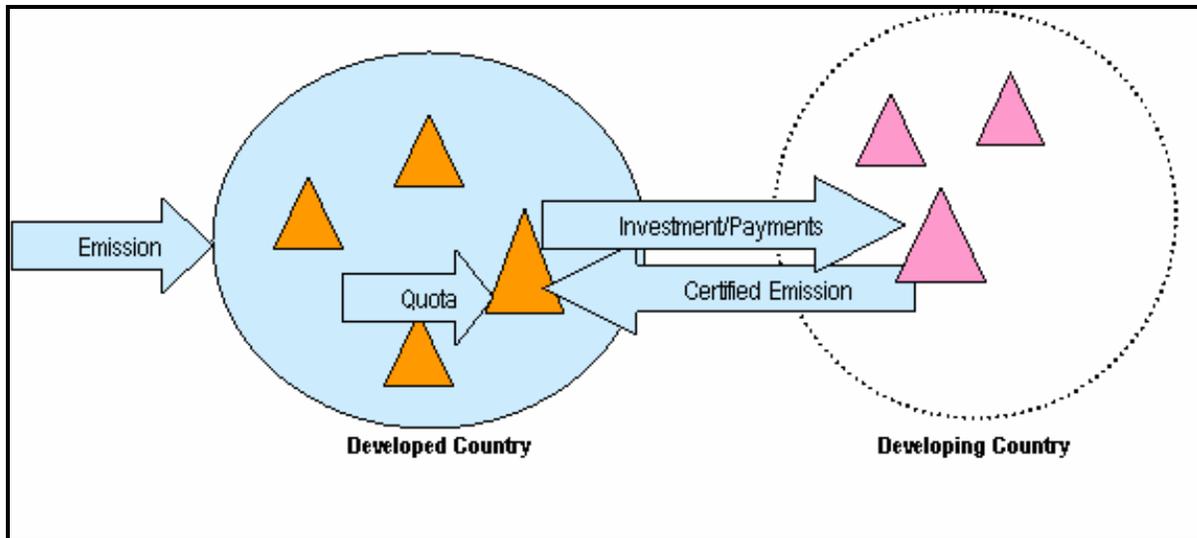


Figure 24: The Clean Development Mechanism

Many developing countries have experience in projects relevant to climate change mitigation such as energy efficiency, cleaner production, fuel switching, forestry and DSM. These projects typically use equity and debt to raise capital and produce financial returns for the investor. CDM projects are different because they include another type of input - carbon investment. The project generates carbon credits with a monetary value. Additional financial resources flow to the project to gain carbon credits.

An energy-efficiency project that realizes 1 MW saving can expect to generate in the region of 8760 certified emission reductions (CERs) assuming an emission factor of 1 ton CO_2 /MW generation capacity. The existing future price for delivery of CERs in December 2008 as taken on 10 April 2008, is €16.25, making this project worth approximately R1.7 million from additional financial resources. Figure 25 shows the various sectors and sizes of CDM projects in 2006.

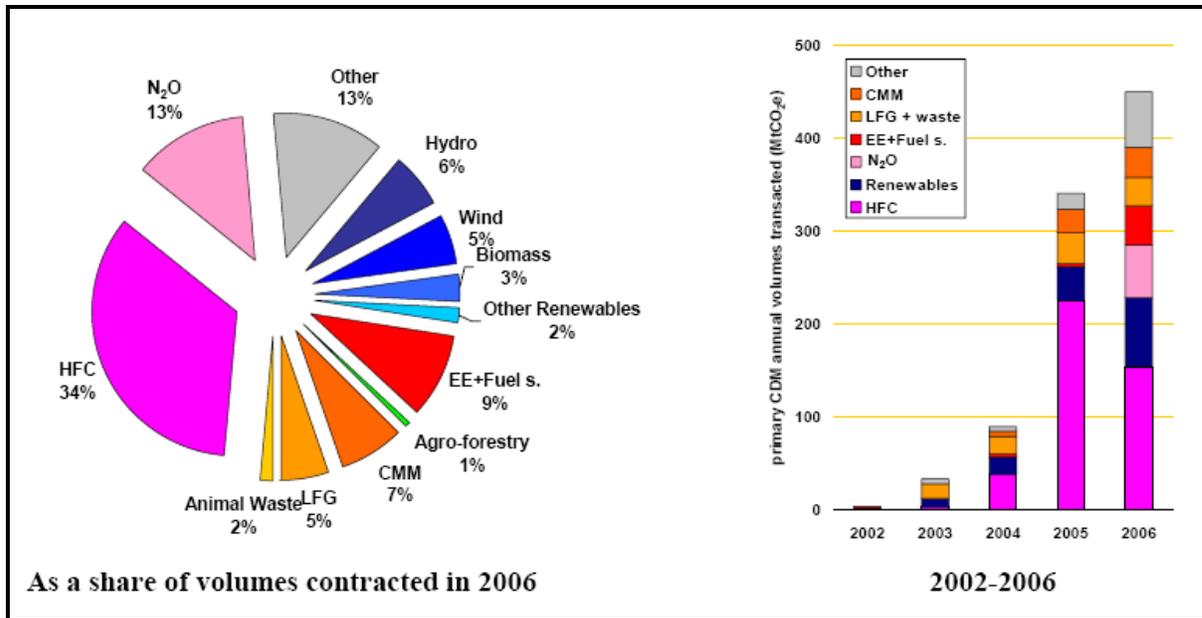


Figure 25: Asset classes of CDM projects [14]

South Africa ratified the Kyoto Protocol on 31 July 2002, coming into effect on 16 February 2005 [13]. The CDM has been identified as an alternative to DSM for energy-efficiency funding with ESCos having potential to bring CERs to the international market. The question ESCos have to answer, is whether the CDM makes more business sense compared to DSM. Chapter 3 will look deeper into the CDM procedures, pitfalls and ROI in comparison with DSM.

2.3 Other carbon markets

2.3.1 Joint implementations

Joint implementation (JI) is an arrangement under the Kyoto Protocol allowing industrialised countries with a greenhouse gas-reduction commitment (so-called Annex 1 countries) to invest in emission-reducing projects in another industrialised country as an alternative to emission reductions in their own countries [18].

A JI project might involve, for example, replacing a coal-fired power plant with a more efficient combined heat and power plant. Most JI projects are expected to take place in the Annex I Parties with economies in transition in Eastern Europe and the former Soviet Union, where the costs of reducing emissions are considerably lower.

Emission reductions achieved with JI projects are awarded credits called emission reduction units (ERUs), where one ERU signifies an emission reduction of one ton of CO₂ equivalent. Ukraine, Russia and Bulgaria accounted for 20% each of the ERUs supply traded through 2003-2006 (44 million tCO₂e transacted, or about 10% of the Primary CDM market in 2006).

The EU scheme is the first in the world that recognises most of these credits as equivalent to emission allowances (1 EUA = 1 CER = 1 ERU) and allows them to be traded under the scheme [12]. Credits from nuclear facilities and land use, land-use change and forestry activities are not accepted.

2.5.2 New South Wales Greenhouse Gas Abatement Scheme

Australia's New South Wales (NSW) has had an operational programme called the NSW Greenhouse Gas Abatement Scheme (GGAS) to reduce greenhouse gas emissions until 2012 from the power sector. Retailers and large electricity customers in NSW, and since 1 January 2005, also in the Australian Capital Territory (ACT), are required to meet mandatory intensity targets to offset the emissions of GHG arising from the production of electricity they supply or use [14].

Power suppliers can meet their targets by purchasing certificates (NSW Greenhouse Abatement Certificates or NGACs). NGACs are generated through low-emission generation of electricity and improved generator efficiency, activities that result in reduced consumption of electricity or on-site generation of electricity and carbon sequestration into biomass. Renewable Energy Certificates are also eligible. No other form of credit (e.g. JI or CDM) is eligible at this time. A buy-out penalty applies, set at AU\$11.50 for compliance year 2006.

2.5.3 United Kingdom Emission Trading Scheme

The UK had initiated an emissions trading scheme prior to the EU. Launched in March 2002, the UK ETS was, at that time, the first domestic economy-wide GHG trading scheme. Participation was on a voluntary basis for companies that took on absolute targets for reductions [19]. The Government had also negotiated Climate Change Agreements (CCA) with companies that set energy-related targets in exchange for an 80% rebate from the Climate Change Levy, a tax on the business use of energy.

Companies with CCA targets used the UK ETS either to buy allowances or to sell any over-compliance. Penalties for non-compliance included the withholding of the tax discount and contraction of allowances. Only domestic credits could be traded under the UK ETS.

2.5.4 Chicago Climate Exchange

Members of the Chicago Climate Exchange (CCX) made a voluntary but legally binding commitment to reduce GHG emissions. By the end of Phase I in December 2006, all members were to have reduced direct emissions 4% below a baseline period of 1998-2001. Phase II, which extends the CCX reduction programme through 2010, will require all Members to reduce, by 2010, GHG emissions 6% below baseline.

To date the exchange has more than 350 members ranging from corporations like Ford, DuPont, and Motorola, to state and municipalities such as Oakland and Chicago, to educational institutions such as University of California, San Diego etc.

In mid-March 2007, the CCX announced the formation of the New York Climate Exchange (NYCX) and the Northeast Climate Exchange (NECX) to develop financial instruments relevant to the Regional Greenhouse Gas Initiative (RGGI). Closer ties with the EU ETS were made known in May with a transaction of 1,000 EUAs from the EU ETS to the CCX by one multinational member.

2.4 Movement in the carbon market

2.4.1 Background

Understanding the history of the carbon market and why the market has been so volatile, is crucial before any investment decision can be made. The carbon price and the volumes that are being traded will be direct attributes to the risk analysis in the strategic model that this thesis aims to develop. The World Bank and Point Carbon have proven to be valuable sources of historic prices and market development .

The carbon market grew in value to an estimated US\$30 billion in 2006 (€23 billion), three times greater than the previous year (Table 5). The market was dominated by the sale and re-sale of European Union Allowances (EUAs) at a value of nearly \$25 billion under the EU ETS (€19 billion).

	2005		2006	
	Volume (MtCO ₂ e)	Value (MUS\$)	Volume (MtCO ₂ e)	Value (MUS\$)
Allowances				
EU ETS	321	7,908	1,101	24,357
New South Wales	6	59	20	225
Chicago Climate Exchange	1	3	10	38
UK-ETS	0	1	na	na
Sub total	328	7,971	1,131	24,620
Project-based transactions				
Primary CDM	341	2,417	450	4,813
Secondary CDM	10	221	25	444
J1	11	68	16	141
Other compliance	20	187	17	79
Sub total	382	2,894	508	5,477
TOTAL	710	10,864	1,639	30,098

Table 5: Carbon market growth in 2006 [47]

The carbon markets are a prominent part of the response to climate change and have an opportunity to demonstrate that they can be a credible and central tool for future climate mitigation. It is of utmost importance for an ESCo to understand the carbon market and compare the cost benefits and risk to other energy-efficiency initiatives before investing.

2.4.2 Market structure

Carbon transactions are defined as purchase contracts whereby one party pays another party in return for GHG emissions reductions or for the right to release a given amount of GHG emissions. Carbon transactions can be grouped into two main categories:

- **Allowance-based transactions**, in which the buyer purchases emission allowances created and allocated by regulators under cap-and-trade regimes, such as Assigned Amount Units (AAUs) under the Kyoto Protocol, or EUAs under the EU ETS. Such schemes combine environmental performance and flexibility, through trading, in order for mandated participants to meet compliance requirements at the lowest possible cost;
- **Project-based transactions**, in which the buyer purchases emission credits from a project that can verifiably demonstrate GHG emission reductions compared with what would have happened otherwise. The most notable examples of such activities are under the CDM and the JI mechanisms of the Kyoto Protocol, generating CERs and ERUs respectively.

The EU ETS is focused on CO_2 emissions from major energy-intensive installations. The Linking Directive allows for the import of CDM emission reduction credits from activities located in developing countries and tapping mitigation potential from the industry as seen in Figure 26.

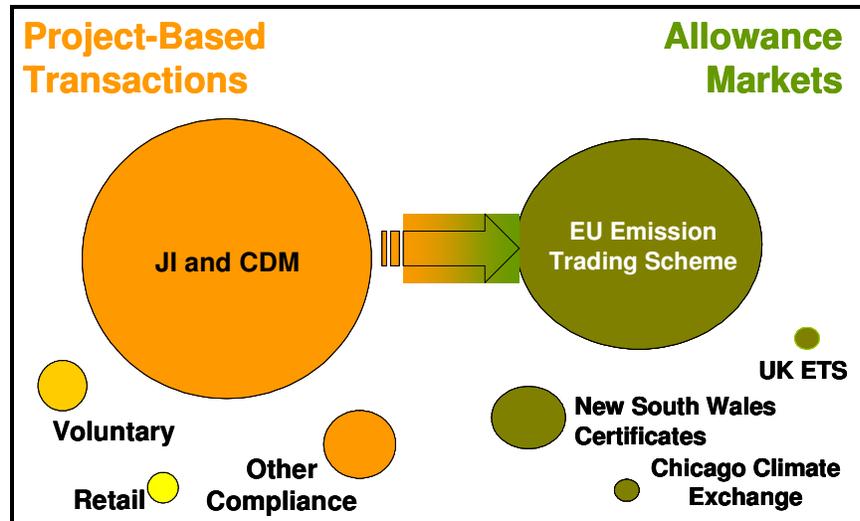


Figure 26: Project and allowance-based markets

There is also a growing retail carbon segment that sells emission reductions to individuals and companies seeking to offset their own carbon emission footprints. Banks, credit card issuers, private equity funds and others in this segment voluntarily purchase VERs (Verified Emission Reductions).

2.4.3 Allowance-based markets

The EU ETS continues to be the most prominent of these markets in terms of overall volume and financial value transacted, with compliance, risk management and arbitrage being its major drivers. The spill-over effects are being felt in project-based and other allowance markets. The total volume traded from 22 April 2005 to 14 November 2008 amounts to 1,766,740,000 EUAs on the European Climate Exchange alone with an average price of €21.06 per EUA as seen in Figure 27.

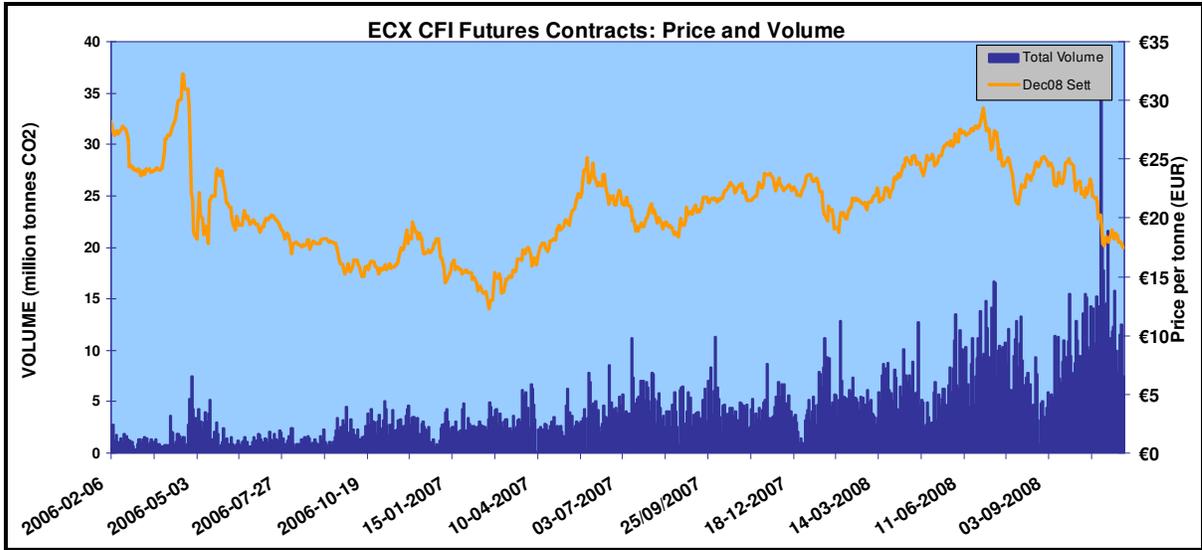


Figure 27: EUA prices from April 2005 to November 2008 [20]

2.4.4 Project-based markets

The CDM provided an effective vehicle for developing countries to participate in ongoing efforts to reduce carbon emissions. The ECX have transacted over 413,822,000 CERs during the period from April 2008 to November 2008 with an average price of €18.45 per CER.

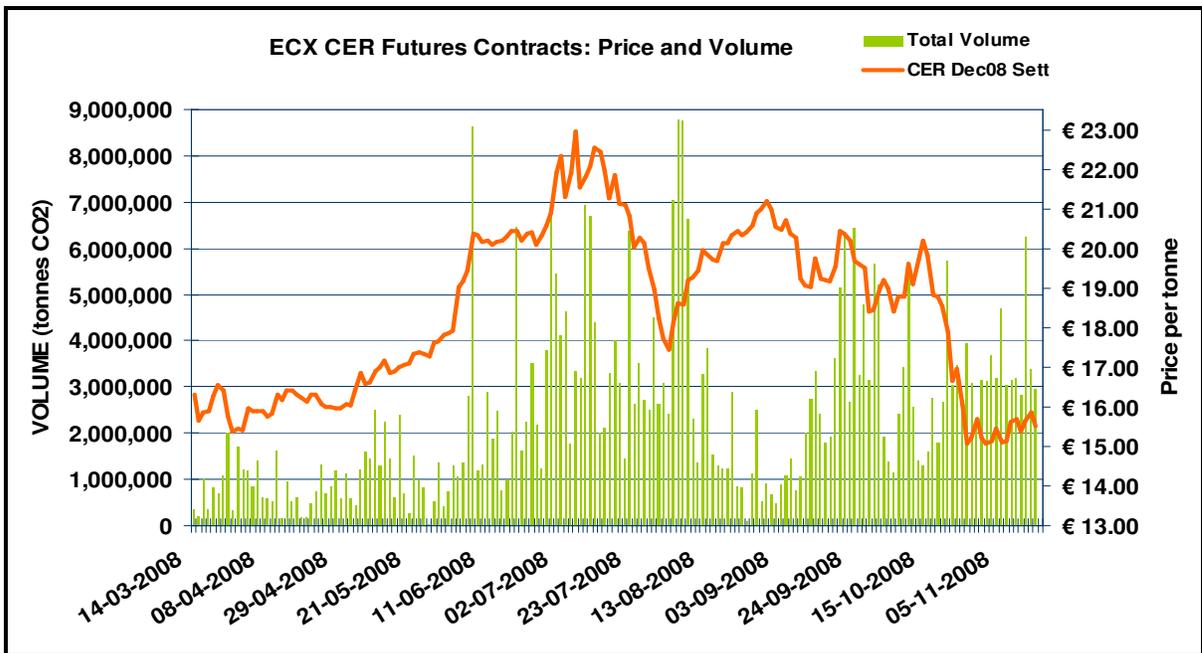


Figure 28: Growth in the CER market

2.5 Demand-side Management (DSM) in South Africa

DSM allows Eskom to influence electricity usage patterns of electricity consumers. Eskom is implementing DSM in South Africa in collaboration with the Department of Minerals and Energy (DME) and the National Electricity Regulator of South Africa (NERSA) as seen in Figure 29. Eskom’s DSM strategy comprises a dual approach: firstly to reduce electricity demand during peak periods i.e. 07:00-10:00 and 18:00-20:00, which is achieved by shifting loads to off-peak periods. The second approach is by overall reduction of electricity consumption by installing energy-efficient equipment and optimising industrial processes.

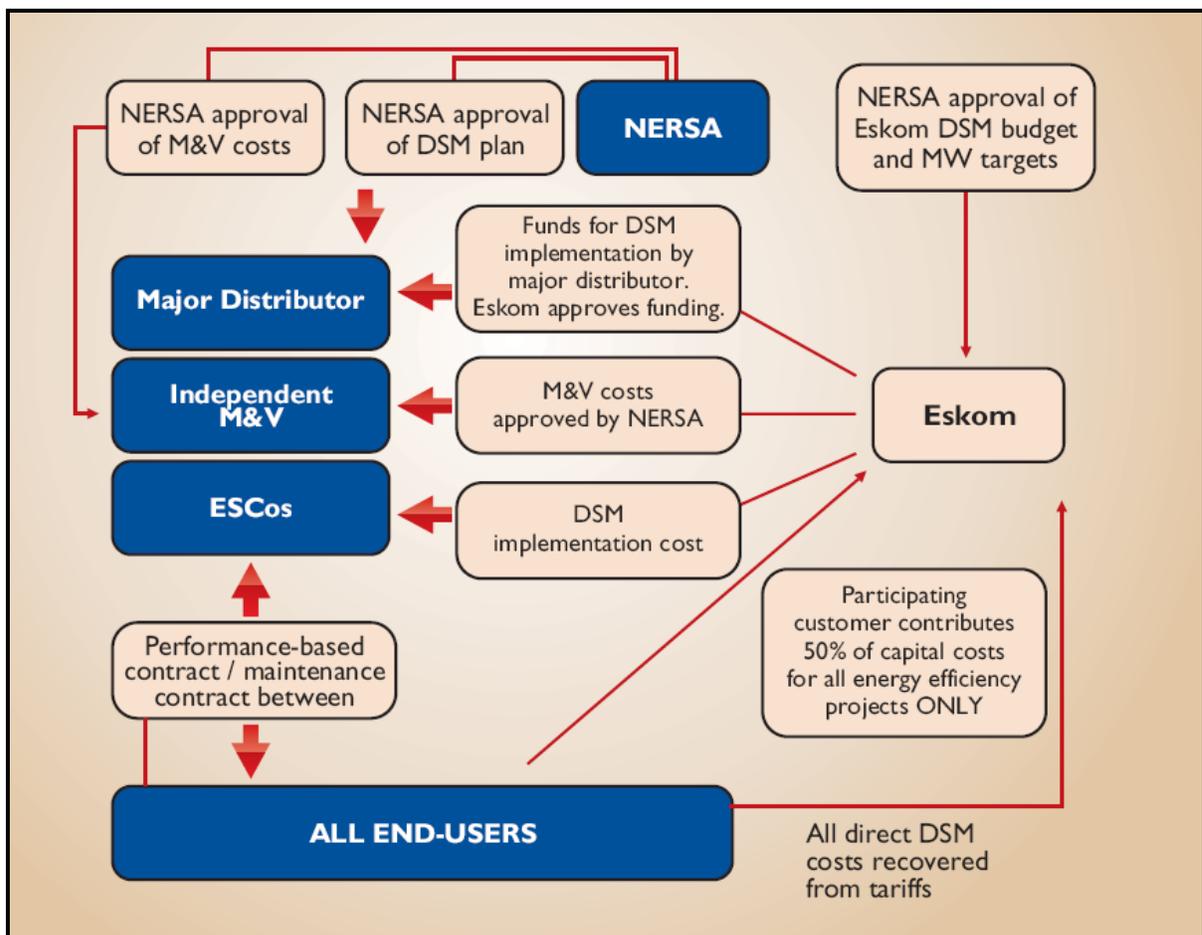


Figure 29: The DSM process model [16]

The major benefits of DSM are efficient use of electricity without influencing production, and maintaining customer satisfaction. Significant cost savings for the supplier and the consumer are achieved. The costs for DSM implementations, or contract price, are as follows:

- In the case of energy-efficiency projects, the customer shall be responsible for paying **50%** of the contract price of the DSM measures, as specified in the NEC (New Engineering Contract) between the ESCo and Eskom, or the actual amount invoiced by the ESCo up to a maximum of the total contract price.
- Eskom shall be responsible for **100%** of the contract price of the DSM measures in the case of load-shifting or load-clipping projects. Ownership of the DSM measures in the case of load-shifting or load-clipping projects, remains vested in the customer.

A summary of a typical DSM project life cycle, compiled by Prof. LJ Grobler and Dr. W.L.R den Heijer from the School for Mechanical and Materials Engineering, Potchefstroom Campus, North-West University, can be viewed in Appendix A.

The Energy Efficiency Strategy, as per the National Integrated Resource Plan (NIRP) compiled by the DME for South Africa, proposes the following energy efficiency targets:

- A final energy demand reduction of 12% by 2015.
- DSM long-term goal is to save 4 255 MW over a period of 20 years

There is currently an annual DSM target of 152 MW that will be increased to higher levels as the markets gain momentum in the DSM implementation. This annual target is divided into energy-efficiency and load-management targets for the residential, industrial and commercial sectors [1].

In January 2008 Eskom introduced "load-shedding", planned rolling blackouts based on a rotating schedule, in periods where short supply threatens the integrity of the grid. With a

reserve margin estimated at 8% or below, such "load-shedding" is implemented whenever generating units are taken offline for maintenance, repairs or refuelling (in the case of nuclear units).

Figure 30 shows all the supply projects that are required in the short-term to increase the reserve margin to 10%. It also illustrates the benefit of having a Power Conservation Programme (PCP) which includes DSM that will push up the reserve margin to 20%. The graph only includes projects which have cash flow impacts over the next 5 years [17].

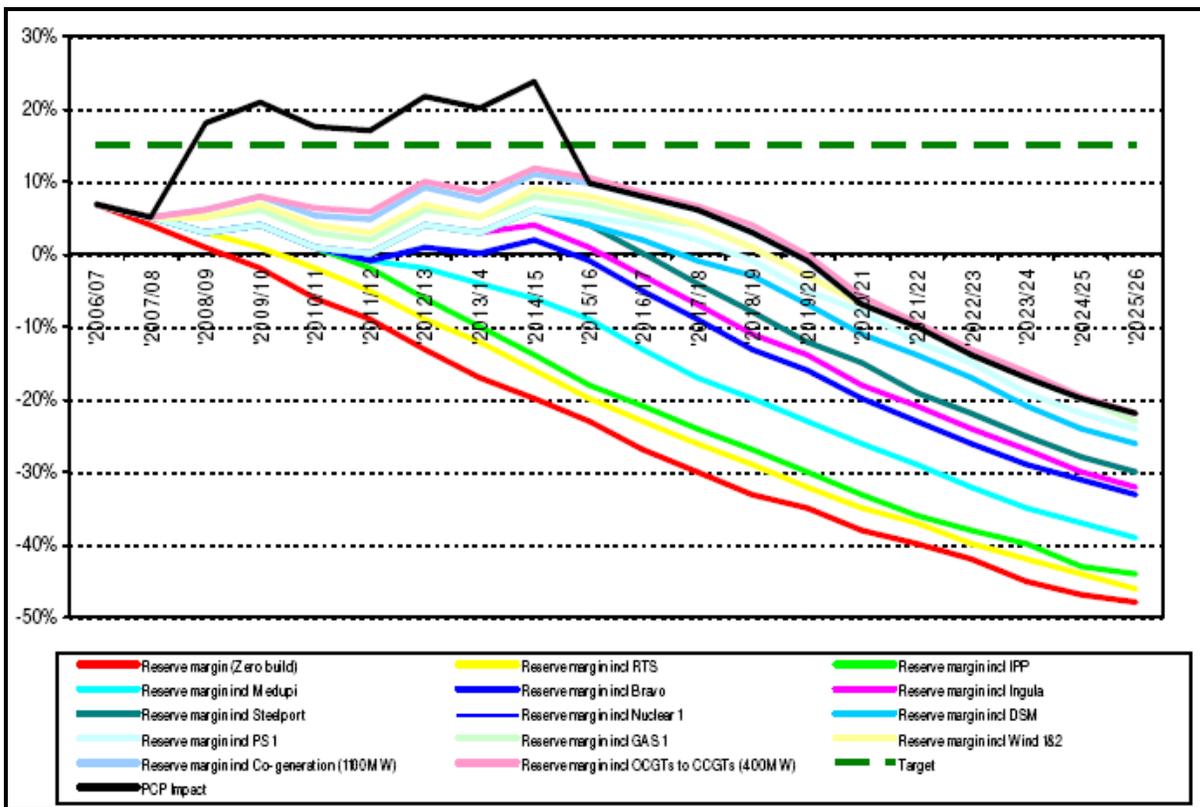


Figure 30: Eskom's capacity reserve margin [17]

Eskom made a public statement that no further foreign investment should be made until 2013 when Eskom should have sufficient electricity. Load-shedding, together with the already implemented 10% energy cut to the mining industry, has renewed the importance of demand-side management as the only short-term solution. ESCos and their energy-efficiency technologies would surely benefit from this supply constraint.

2.6 Energy-efficiency funding conflict

Perhaps the only benefit to arise from South Africa's critical electricity supply challenge, which is set to persist until at least 2012, is the realisation of the need to encourage research and development into energy efficiency and DSM initiatives. The proponents have set an audacious long-term target of saving 8 000 MW, the equivalent of two six-pack coal-fire power stations by 2025, with a more immediate ambition of 3 000 MW by 2012.

In the context of an extremely small reserve margin of between 7% and 10%, little conflict arises between supplying electricity for a profit and DSM funding in a supply constraint environment. This will change when Eskom ultimately overcomes its supply-side constraint and re-establishes a reserve margin of about 15%.

Eskom is setting aside R10-billion to support the initial 3 000-MW saving. Much of the future responsibility will vest with a body known as the National Energy Efficiency Agency (NEEA), established last year under the aegis of the State-owned Central Energy Fund (CEF). In monetary terms, the programme breaks down as follows: some R3-billion for efficient-lighting initiatives; another R3-billion to support the initiatives of ESCos; R2-billion for the development of the solar water-heating sector; and the balance directed towards dynamic market participation and public-awareness projects.

There are major economic benefits for Eskom and the country if 10% of the anticipated 80 000 MW needed to run the economy by 2025 can be saved. Fewer, new and increasingly expensive, power stations will have to be built representing massive financial benefits, given that the doubling up of the existing installed base is likely to cost about R1-trillion [19].

Eskom currently offers R3.5 million for every 1 MW saving under the NERSA formula. Assuming a grid emission factor of 1.2 and an existing CER price of €16, a developer could expect a return of R2 million per annum for 10 years. This assumes a maximum CER price at minimum risk and is not necessarily a reflection of the reality. This study will seek to find the most realistic DSM price based on the analysis of the carbon market.

Although DSM and CDM would have the exact same environmental benefit in reducing CO_2 emissions, ESCos could start focusing only on CDM, leaving Eskom with the difficult task of achieving its contractual targets as set out by the NERSA. This research's focal point will be exactly as described into the situation above. Which energy efficiency funding mechanism (CDM or DSM) will be the most cost beneficial to ESCos?

Other areas of uncertainty that will be addressed in this thesis include:

- Additionality of CDM within a DSM environment;
- The influence of the national policies like the PCP on DSM and CDM; and
- The use of DSM funding to develop CERs.

2.7 Conclusion

Unlike sulphur dioxide or low level ozone, carbon dioxide and other greenhouse gases have the same impact on climate everywhere in the world. This fact provides the economic justification for international cooperation on climate change projects and project-based emissions trading.

International cooperation makes economic sense because emissions reductions in developing countries generally cost less than in industrialized countries. The host country and the investor country can share the surplus so that both benefit - the investor by reducing emissions more cost effectively than could be done in the investor's home country, and the host by receiving additional finance that allows it to implement a greenhouse gas reduction project that would otherwise not be possible.

Demand-side management has focused on encouraging consumers to conserve power during peak periods in order to reduce the incidence of load-shedding. This is done by introducing the Eskom DSM fund which compensates the client 100% in the case of load management

and 50% in the case of energy efficiency interventions. ESCos use this fund to employ their technologies and experiences, to realize the above DSM measures.

Implementing energy efficiency projects is a single solution to two distinct problems in South Africa. On a local level it will solve the existing electricity problems as mentioned above and on an international level it would mitigate climate change. This could possibly create a conflict of interest between DSM and CDM, if CDM promises a better return on investment. Although both are beneficial to Eskom, CDM could interfere with DSM targets as set forth by NERSA.

2.8 References

- [1]. Eskom Demand-side Management webpage - www.Eskomdsm.co.za, Contact Industrial Sector manager Lawrence Padachi, +27 11 800 4744, lawrence.padachi@eskom.co.za

- [2]. United Nations Framework Convention on Climate Change (UNFCCC), *Kyoto Protocol – Background*, http://unfccc.int/kyoto_protocol/background/items/2879.php

- [3]. IPCC, Third Assessment Report, *Chapter 9: Projections of Future Climate Change work*, Climate Change 2001: The Scientific Basis, [url=http://www.grida.no/climate/ipcc_tar/wg1/339.htm](http://www.grida.no/climate/ipcc_tar/wg1/339.htm)

- [4]. United Nations Framework Convention on Climate Change, *Conference of the Parties, Fourth Session*, Buenos Aires, 2-13 November 1998, Item 4 (d) of the provisional agenda

- [5]. Reuters, James Grubel, *Australia's new government ratifies the Kyoto Protocol*, 3 Des 2007, <http://www.reuters.com/article/worldNews/idUSSYD3784520071203>

- [6]. United Nations press release, *Industrialized Countries to cut Greenhouse Gas Emissions by 5.2%*, 11 Dec 1997, <http://unfccc.int/cop3/fccc/info/indust.htm>

- [7]. European Commission, Candidate Countries: *Enlargement Countries*, 2006-03-23.

- [8]. United Nations, *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, 1998, <http://unfccc.int/resource/docs/convkp/kpeng.pdf>

- [9]. EEA, *Annual European Community Greenhouse Gas inventory 1990–2004 and inventory report 2006*

- [10]. McKinsey Global Institute, *The case for investing in Energy Productivity*, February 2008, San Francisco

- [11]. European Commission, EU action against climate change, *EU Emissions Trading — an open scheme promoting Global Innovation*, 2005, pg.6, iDirectorate-General for the Environment, Information Centre (BU-9 0/11), B-1049 Brussels, Fax (32-2) 29-96198, www.europa.eu.int

- [12]. Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance within the community, in respect of the Kyoto Protocol's project mechanisms.

- [13]. United Nations Framework Convention on Climate Change, *Kyoto Protocol – Status of ratification*, Updated 10 July 2006

- [14]. The World Bank, *States and trends of the Carbon Market 2007*, Washington, D.C, May 2007
- [15]. The art of engineering – Creates better products, *Dealing with Eskom's Load-shedding*, 29 January 2008,
<http://blog.engineersimplicity.com/2008/01/dealing-with-Eskom's-load-shedding.html>
- [16]. Nortje, T., *South Africa's DSM Programme: A Savings Opportunity*, Eskom DSM, International Pump User Conference, Johannesburg, June 2005
- [17]. Eskom, *Eskom's Draft Application to NERSA for Price Increase in 2008/9*, Submitted to NERSA on 17 March 2008, pg19
- [18]. United Nations Framework Convention on Climate Change (UNFCCC), *Kyoto Protocol, Mechanisms, Joint Implementation*,
http://unfccc.int/kyoto_protocol/mechanisms/joint_implementation/items/1674.php
- [19]. International Energy Agency (IEA), 9 rue de la Fédération, 75015 Paris, Tel: +33 1 40 57 65 00/01, Fax: +33 1 40 57 65 59,
<http://www.iea.org/textbase/work/2003/ghgem/uk.pdf>
- [20]. European Climate Exchange (ECX), *Historical Data – EUA Futures*, Tel: +44 (0)207 382 7800, Fax: +44 (0)207 382 7810, Hasilwood House 62, Bishopsgate, EC2N 4AW London UK