G:ENESIS

The National Sustainable Housing Facility Business and Investment Plan

Genesis Analytics Climate Change Practice

24 June 2008

24/06/2008 **VERSION 15**

Authors: Emily Tyler, Michelle du Toit, Shelly Vosse

Genesis Analytics (Pty) Ltd
Suite 211, Dunkley House, 32 Barnet Street, Gardens, Cape Town, 8001
Tel: +27 21 465 6923, Fax: +27 21 465 4455
www.genesis-analytics.com

Contents

EXECUTIVE SUMMARY

Introduction

South Africa has a low income housing stock which is predominantly of poor quality, particularly with regard to energy service delivery. The need to continue to deliver houses within tight timeframes and budget constraints means that this status quo is likely to be perpetuated into the future, with negative consequences for occupant health and living standards, fuelling socio-economic unrest.

From another perspective, adding demand for electricity through the construction of energy inefficient houses reliant solely on the grid for their energy service needs presents particular problems in the current context of the South African electricity supply crisis and ongoing future supply shortfall. The cost of building additional capacity presents a substantial burden to the fiscus through its financial support of Eskom, and to the economy through tariff increases. In addition, South Africa's grid electricity currently has one of the highest carbon intensities in the world, a status which is unlikely to change substantially over the next decade. This represents an economy-wide competitive disadvantage as the world moves towards a carbon constrained future, penalising the embodied carbon emissions in products and services. The government has acknowledged the need to reduce South Africa's emissions pathway substantially by 2050, with residential energy efficiency and renewable energy interventions identified as representing some of the most cost efficient ways to achieve this.

Whilst both housing and energy policy is in place to support the inclusion of sustainable energy interventions in low income housing, implementation of this policy is hindered by lack of financing and market support. A catalyst is required to leverage the necessary finance and to provide the focus and support structures required to realise the opportunity to both the national economy and low income homeowners.

Carbon Finance and the Clean Development Mechanism

Carbon finance through the Clean Development Mechanism (CDM) of the Kyoto Protocol presents such a catalyst. In Khayelitsha, Cape Town, the City is currently retrofitting low income subsidised housing with solar water heaters, energy efficient lighting and insulated ceilings with the assistance of carbon finance. This project, the Kuyasa Project, was the first registered CDM project in Africa, and successfully pioneered an approach to crediting the 'suppressed demand' for energy services of low income housing beneficiaries which yields a substantially higher carbon credit volume, and therefore carbon finance flow, than through a conventional approach.

Registering emission reduction activities for carbon credits on a project-by-project basis is both time and cost inefficient. In recognition of this particular barrier for projects where emissions sources are small and numerous, but sustainable development benefits are substantial, the concept of a Programme of Activities was approved under the Kyoto Protocol in 2007. Methodologies for a CDM Programme of Activities in low income housing in South Africa are currently under development, using the suppressed demand methodology, with the intention being to incorporate these into a nation-wide program, enabling all low income project developers and communities to access carbon finance utilising economies of scale to bring down development costs and boost terms and prices obtainable in the carbon market.

The National Sustainable Housing Facility

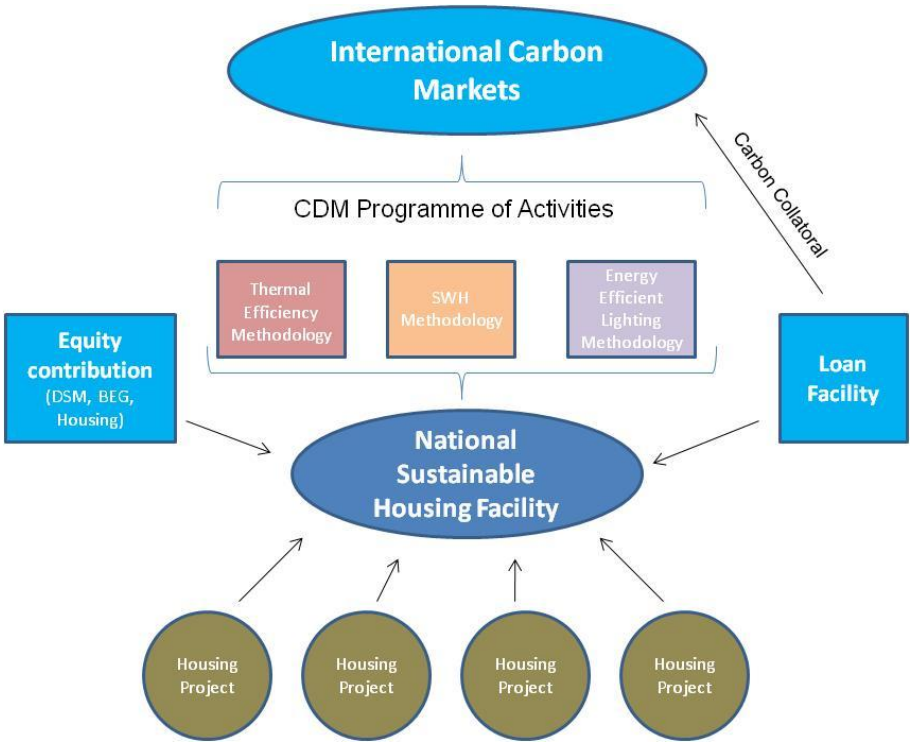
The establishment of a National Sustainable Housing Facility (NSHF) is proposed to facilitate one-stop-shop access to international carbon financing for the incremental cost of sustainable energy interventions in existing and new low income housing projects throughout South Africa, in support of existing National Housing and Energy Policy objectives.

Operating on a not-for-profit basis, the Facility will pass carbon revenues (net of administration costs) directly to housing project developers, potentially in the form of upfront financing, in return for the inclusion of sustainable energy interventions in housing developments. The Facility's administrative capacity and infrastructure is designed to complement carbon financing with fast track application of appropriate existing and future domestic financing sources which are required to provide upfront finance for the incremental capital costs of the sustainable energy interventions, particularly in the early years. Through this financing mechanism, substantial future energy economic efficiencies will be realised in the South African residential sector, of particular importance in the light of South Africa's current energy crisis and its probable future carbon emissions reduction obligations.

In order to further develop the NSHF concept, a Drafting Group was established at the end of 2006. Chaired by Kevin Nassiep of the National Energy Research Institute (SANERI), the Drafting Group is comprised of key public stakeholders in the South African energy and housing sectors including the National Department of Housing, the Department of Minerals and Energy, the Development Bank of South Africa, the National Housing Finance Corporation, the NEEA, Eskom, SouthSouthNorth, the regional REEEP Secretariat, the National Home Builders Regulatory Council, the Central Energy Fund, the South African Designated National Authority of the CDM, major metros and an ESCO representative. This Drafting Group will continue to guide the implementation and operation of the NSHF to ensure it achieves its objectives. To date the Group has held four meetings and it was through its activity that the writing of a business plan was prioritized as a next step. This business plan is owned by the Drafting

Group, and will be used by it to secure the financial and institutional support required for the instigation of the NSHF.

Figure i: The National Sustainable Housing Facility



The core activities of the NSHF are:

- To co-ordinate access requirements to carbon finance and additional financing streams
- Optimizing the net returns from the carbon market through specialized carbon transactions and an ability to price risk
- Promoting access to economies of scale for professional services (baseline development, monitoring, verification, legal contractual advice) through the co-ordination of this service provision, thereby reducing costs and increasing the net return to the projects
- To promote the Facility to project developers, and raise awareness of the available funding and interventions
- To keep abreast of new developments and opportunities for financing, and to actively participate and provide input to their development

Determining a financial structure for the NSHF, and identifying its most appropriate institutional home are interrelated challenges. The institutional location for the NSHF, whether in a stand-alone not-for-profit, or within a housing institution such as the newly established Housing Agency, is not a trivial matter to ensuring the Facility's success, particularly considering issues such as visibility, flexibility, efficiency, accountability and governance. How the establishment of the NSHF is financed, together with the financing of the shortfall of incremental capital costs of the sustainable energy interventions in low income housing may determine the 'ownership' of the Facility, and its obligations.

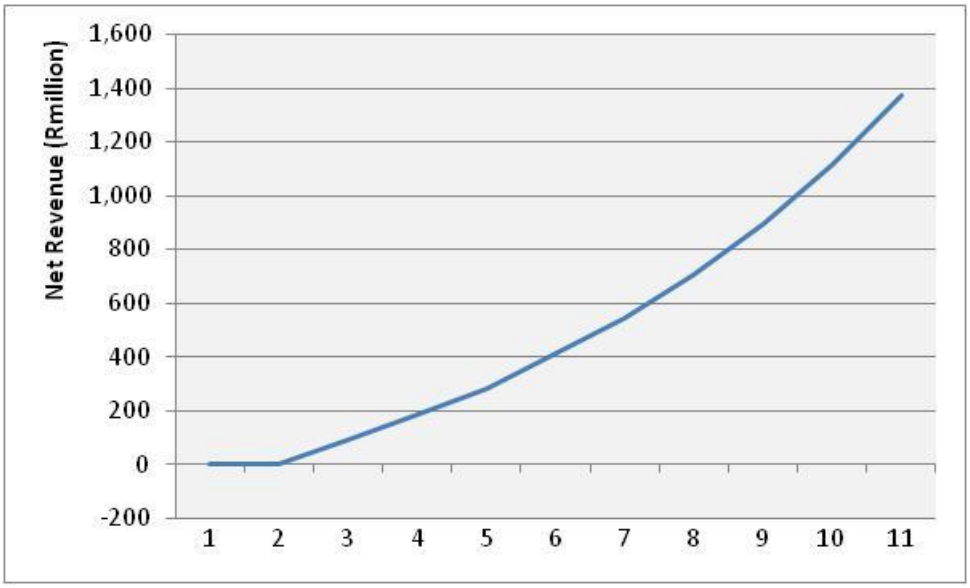
The Contribution of Carbon Finance

A programme of this nature is estimated to secure carbon revenues which will cover between 40% and 165% of the incremental capital costs of sustainable energy interventions in greenfield low income housing in South Africa (hereafter referred to as Greenfield Housing), net of the costs associated with development of the programme and transacting the credits. This range is defined by conservative assumptions on the carbon price, the number of houses in the programme, the rate of technological maturation, and the costs of the interventions themselves. The returns to retrofit projects are lower, as there is no access to no-cost interventions such as orientation or house colour, and there are additional project management costs associated with returning to an existing housing development, rather than including the sustainable development interventions when the houses are being built. Whilst a CDM programme enables the emission reduction activities to receive carbon credits for 28 years, the above

returns are based on cash flows over a ten year period only, considered from the viewpoint of an individual house, for reasons of conservativeness and to reflect the impact of the time value of money.

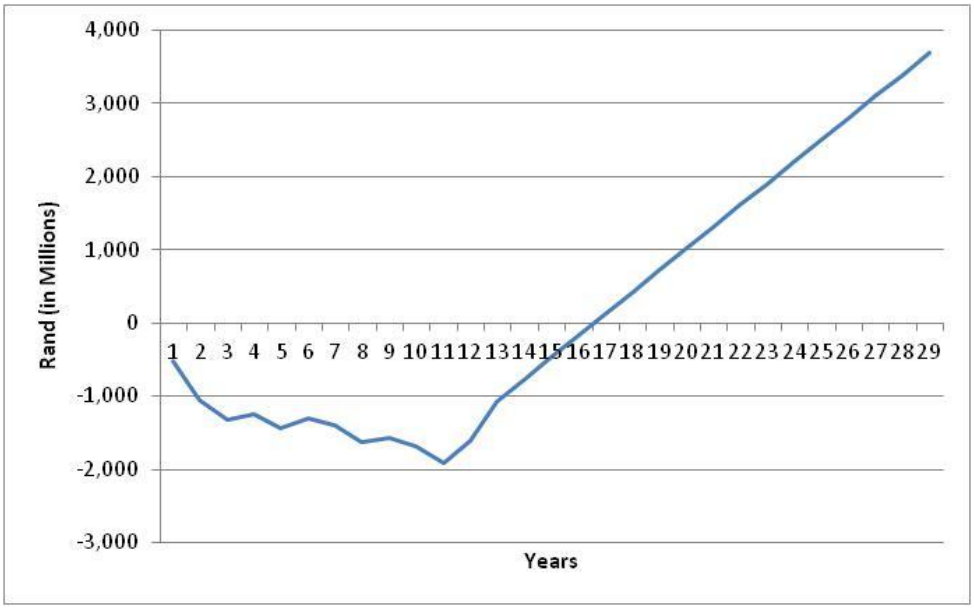
The financial impact of carbon revenues are also considered from a programme perspective, considering the incremental inclusion of housing projects over the life of the programme with a ramp up effect as the intervention technologies and supply structures develop, installation skills become more available, and awareness of the carbon revenue opportunity becomes more widespread. Excluding the incremental capital costs of the interventions, carbon finance returns revenues to the programme far in excess of the costs required to establish it. The graph below shows the programme carbon cash flows over the first ten years (the graph continues on its trajectory to year 28). The upfront costs of R8.4 million to establish the programme are easily financed, and ongoing costs insignificant against the carbon revenues. The analysis assumes a €10 price of carbon, in the current market a conservative consumption, particularly for Gold Standard carbon credit status, for which this programme would be eligible.

Figure ii: NSHF Base Case Scenario Cash Flows



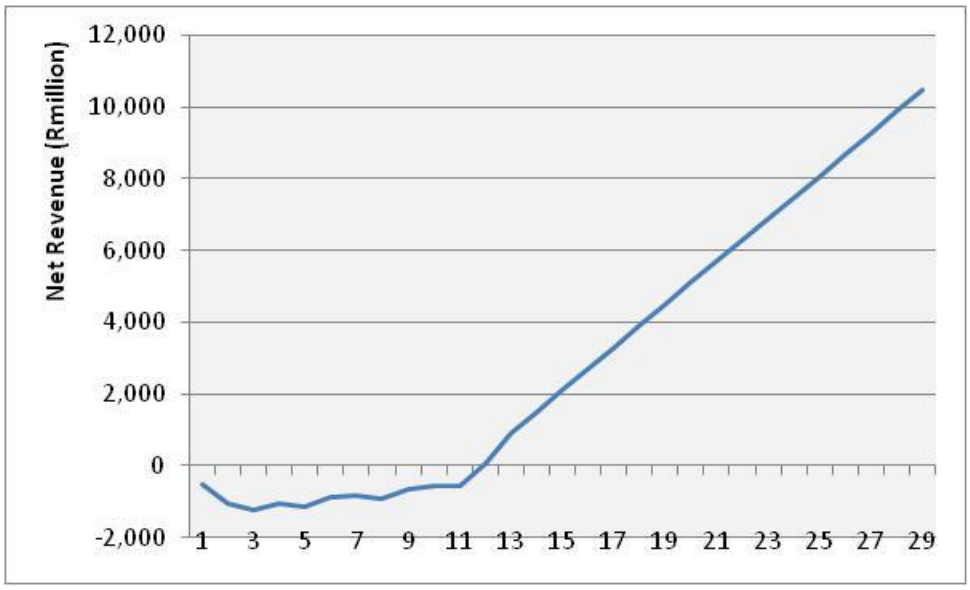
The picture changes significantly when the true cost of the emission reduction activities, the upfront, incremental capital costs of the interventions are included in the analysis, as in the graph below (Greenfield Housing only). Given the incremental inclusion of the individual housing projects into the programme, the programme only breaks even around year 16, but still has a substantial upside thereafter.

Figure iii: Base case programme cash flows including the intervention capital costs



A higher carbon price goes a long way to bringing this break-even point forward. The graph below shows the same curve for a carbon price of €20.

Figure iv: Base case programme cash flows including the intervention capital costs and an increased carbon price of €20



Meeting the Shortfall

The shortfall, after carbon finance, of financing for the upfront incremental capital costs of the sustainable energy interventions could be covered through a number of mechanisms. These include:

- Focussing existing energy sector subsidies (most pertinently the Demand Side Management fund, and the Basic Energy Grant) to apply to the interventions considered under the CDM programme. The CDM programme's institutional structures could be used to administer these subsidies at low additional transactional costs

- Identifying and leveraging additional fiscal budgets, particularly to address the issues of sustainable housing provision, and the electricity supply crisis and need for new generation plant build

- Requiring a contribution from the housing beneficiaries to reduce the upfront shortfall. This may be important to transfer a sense of value and ownership over the interventions to the house owners

- Financial engineering to bring the long term 'tail' in the cash flows further forward. This could be achieved through the involvement of local commercial banks, linking the initiative to their obligations to the low income housing sector under the Banking Charter. Players in the carbon market can loan against carbon as a collateral, and long term patient capital may be identified to assist

- Large corporations may consider involvement from a joint corporate social responsibility and climate change perspective

NSHF Risk Analysis

The realisation of the carbon finance opportunity enabled by the NSHF depends on four primary factors:

- The successful establishment of a central co-ordinating entity to manage the CDM programme and access carbon revenues (the NSHF);

- the successful registration of the CDM Program of Activities with the United Nations CDM Executive Board;

- the implementation of sustainable energy interventions in low income housing in South Africa by project developers; and

- the continuation and value appreciation of the international carbon market.

On balance, whilst the establishment of an innovative and world leading programme such as that envisaged under the NSHF involves overcoming a number of hurdles, its benefits in terms of low cost financing, leverage and momentum far outweigh the risks. The programme is fully consistent with both national and international policy priorities around climate change, poverty alleviation and sustainable economic development, and its Gold Standard credits are anticipated to be highly sought after on the international carbon market. This combination results in pressure from diverse actors to overcome hurdles and ensure the programme's success.

Activities and Timeframes

The establishment of the NSHF is envisaged as occurring over two phases. The first is titled 'Proving the Concept' and is designed to keep the financial exposure to a minimum whilst a number of key risk hurdles are overcome. After this stage, a 'Full Scale Start Up' will begin. Altogether the establishment of the programme is anticipated to take just over three years, depending largely on the speed of the programme through the CDM Executive Board's processes. Fully described budgets and activities indicate an eventual staff component of a project manager, senior legal / financial / carbon trading specialist, two senior energy technical specialists, a junior project assistant, and two administrators. During the establishment phases the programme will rely on outsourced expertise.

Conclusion and Recommended Next Steps

The NSHF is identified and detailed in this Business Plan as a mechanism to access financing for the incremental cost of sustainable energy interventions in existing and new low income housing projects throughout South Africa, in support of existing national housing and energy policy objectives. Operating on a not-for-profit basis, the Facility will pass carbon revenues (net of administration costs) directly to housing project developers, potentially in the form of upfront financing, in return for the inclusion of sustainable energy interventions in housing developments. Whilst carbon finance is the catalyst for the establishment of the Facility, the NSHF's administrative capacity and infrastructure is designed to complement carbon financing with the necessary fast track application of additional appropriate existing and future domestic financing sources to realise the programme's objectives.

The potential of carbon finance to fully cover the costs of the inclusion of sustainable energy interventions in low income housing in South Africa can be described as high, but long term. The upside value of the net carbon revenues occurring from midway through the programme is substantial, and efforts should be made to secure this benefit for the South African national economy and its people.

The NSHF Drafting Group has agreed to source finance for the institutional and technical development of this programme. The following actions are recommended for the Drafting Group to continue progress on securing this opportunity:

1) Achieve political endorsement of the NSHF

2) Identify the NSHF's appropriate institutional home

3) Confirm funding for the establishment of the NSHF

4) Develop and fund an Action Plan to leverage up-front financing for the incremental capital costs of the sustainable energy interventions (through inter alia allocation of fiscal budgets, loan finance, developer underwriting, Eskom guarantees, international carbon investment, donor investment, development finance assistance etc). This work falls outside the scope of activities identified for the establishment of the NSHF in this Business Plan and therefore requires separate funding and / or allocation of responsibilities

5) Secure funding for an ongoing secretariat function for the Drafting Group to enable the momentum and work of this valuable stakeholder forum to continue

1. BACKGROUND AND INTRODUCTION

This document sets out a business plan and investment case for the establishment of a National Sustainable Housing Facility (NSHF) for South Africa, to co-ordinate access to carbon finance and other financing sources for the inclusion of sustainable energy interventions in existing and new low income housing.

The business plan is funded by Danida, for the purpose of promoting the establishment of such a Facility to encourage sustainable energy technologies in the low income housing sector, and to progress the application of programmatic Clean Development Mechanism (CDM) to support the transition to low carbon development paths in countries identified as non-Annex 1 in the Kyoto Protocol. It is based on a concept developed by the climate change NGO, SouthSouthNorth[1], with Renewable Energy and Energy Efficiency Programme (REEEP)[2] funding (hereafter referred to as the 'REEEP Project'[3]).

The business plan is owned by the NSHF Drafting Group, chaired by the South African National Energy Research Institute (SANERI), and will be used to assist in identifying an appropriate institutional home for the NSHF, and to source the initial funding required to establish the NSHF.

[1] www.southsouthnorth.org

[2] www.reeep.org

[3] REEEP Project 10307023: Developing a financial model for renewable energy upgrade interventions in urban low income housing, South Africa

2. SUSTAINABLE ENERGY FOR LOW INCOME HOUSING: A NATIONAL ECONOMY IMPERATIVE

2.1. HOUSING POLICY: AN EMPHASIS ON SUSTAINABILITY

South Africa emerged from the Apartheid era with a substantial backlog in low income housing, and a pressing need for service delivery from its previously disenfranchised population. In order to deliver quickly, quantity has been prioritised over quality, leaving dissatisfied communities and a host of maintenance and social problems in its wake. Not least of these is substandard energy service delivery as low income houses offer poor insulation with high outflows from the households in heating and cooling. Fossil fuels such as paraffin continue to be used for cooking and heating inside houses, with negative health and safety impacts for the occupants, which in turn impact on the country's fiscal resources.

The dissatisfaction over poor building standards and pace of delivery in low income housing has risen up the National Department of Housing's agenda. The Department has responded by re-affirming its commitment to a vision of Sustainable Human Settlements, encapsulated in its policy, Breaking New Ground (2004). The revised Housing Code (2007)[4] includes recommendations[5] for no- and low-cost sustainable energy interventions in new low income housing developments. However, the uptake of these recommendations is constrained by a lack of funding and marketplace support. Meanwhile the need for new low income homes continues apace, with an objective of accommodating all those seeking homes within formally planned settlements by 2014[6]. This requires a build rate of between 350,000 and 500,000 new low income homes per annum[7], and there are still insufficient incentives to ensure that these include the sustainable energy considerations outlined in the Housing Code.

[4] The Housing Code, and its Technical Specifications Document have been approved as a working document by the Housing MINMEC (Joint ministerial and MEC Committee), and is awaiting a launch by the Housing Minister. See extracts of the sustainable energy inclusions in housing policy in Appendix One.

[5] For example, insulated ceilings, building materials, orientation and house design. These are given in Appendix One.

[6] Minister Tshabalala-Msimang at Social Cluster Briefing, February 2008

[7] Minister Tshabalala-Msimang at Social Cluster Briefing, February 2008

A gap clearly exists within the housing context to enable project developers and communities to create the sustainable living spaces demanded in Breaking New Ground.

2.2. THE LOW INCOME RESIDENTIAL SECTOR AND THE ENERGY SUPPLY CRISIS

South Africa is currently experiencing an electricity shortage crisis resulting in unprecedented levels of national load shedding, disrupting business and industry with severe implications for investment in the economy. This situation is anticipated to remain until at least 2013 should no immediate action be undertaken to mitigate it[8]. For decades the national utility, Eskom, has operated in a situation of excess capacity that has resulted in low electricity prices and aggressive electricity sales encouraging high energy use and a disregard for energy conservation. The current crisis is rapidly changing this situation with a proposed electricity tariff hike of up to 53% being assessed by the National Energy Regulator of South Africa (NERSA)[9], load-shedding an everyday occurrence and the mining sector operating at a reduced capacity of between 90 to 95%.

To satisfy demand with a targeted reserve margin of 15%, current estimations are that an additional 3,000MW capacity is needed until 2012 with an additional 5,000MW by 2020[10]. *Interventions to reduce demand for grid electricity will mitigate the need for a proportion of this new capacity, with off-grid renewable energy, energy efficiency and demand side management measures providing cost effective alternatives to new build generating plant.*

The residential sector consumes a small but growing percentage of the electricity supply, with a high level of inefficiency. The Department of Minerals and Energy's (DME) Energy Efficiency Strategy[11] acknowledges that building design is the major factor determining the energy use of a household[12], and hence the country's housing programme holds significant potential for low cost energy savings. The

[8] DME, National Response to South Africa's Electricity Shortage, January 2008

[9] NERSA, Eskom's Application for a Price Increase for 2008/9 Financial Year, April 2008

[10] DME,2008 and Bredenkamp, 2006

[11] DME, Energy Efficiency Strategy of the Republic of South Africa, March 2005

[12] DME, Forward, Energy Efficiency Strategy, March 2005

Building Energy Standards Code (SANS204)[13] is being developed to mandate a maximum energy usage per square meter in buildings. Renewable energy measures such as solar water heaters which have longer paybacks are still more cost effective than new build fossil generation[14].

The low income sector presents a significant source of future demand growth for residential energy services. As income levels rise, this sector is anticipated to require services such as stored hot water and an improved ambient temperature. Whilst this is not all peak demand, it nevertheless represents a significant contribution to meeting the national energy supply constraints. Many of these interventions have been piloted in projects around the country, with information available on energy savings, technical issues and costs[15], and demonstrating significant benefits to residents in the form of improvements in residents' health, energy access and poverty alleviation[16.]

The significance of energy in the low income sector is recognised in the technical guidelines to the Housing Code[17] "Energy consumption patterns of low income households in South Africa have emerged as one of the most important factors influencing the national electricity demand and the high levels of air pollution (mainly due to coal used for space heating) experienced in urban areas. If sound energy principles are not incorporated into the design of low cost housing, beneficiaries are condemned to a future of high energy consumption. This situation is exacerbated by local air quality problems, compromised family health and worker productivity, and increased greenhouse gas concentrations".

National energy policy supports sustainable energy interventions in low income housing from a number of angles. The Draft National Energy Bill[18] obligates the Minister to establish a programme addressing the access of appropriate households to energy[19.] Energy policy objectives as stated under the White Paper

---

[13] Parsons, International Building Energy Standards (Codes), Draft 2004

[14] Scenario Building Team, Long Term Mitigation Scenarios, October 2007

[15] See Appendix Two

[16] Cousins and Mahote, Assessment of the impact of energy efficiency interventions in a low income housing settlement Kuyasa Khayelitsha, 2003

[17] Department of Housing, The National Housing Code version 1, 2007: pg 23

[18] DME, Draft National Energy Bill, September 2004

[19] DME, Draft National Energy Bill, September 2004, Section 20.1

on Energy Policy[20] include that "government will promote access to basic energy services for poor households in order to ameliorate the negative health impacts arising from the use of certain fuels[21.] The White Paper also states that energy security for low income households can help reduce poverty, increase livelihoods and improve living standards. Building thermally efficient low cost housing presents an opportunity to promote energy efficiency and conservation[22]. Increasing access to affordable energy services, managing energy related environmental impacts and securing supply through diversity are included in the DME's five key energy policy objectives[23].

2.3. CLIMATE CHANGE AND FUTURE GREENHOUSE GAS EMISSIONS CONSTRAINTS

South Africa is in the top 20 absolute greenhouse gas emitting nations in the world[24]. Although currently exempt from binding greenhouse gas emission targets due to its developing country status, South Africa is being subjected to increasing pressure in the international climate change policy arena to take these on in the medium term (post 2020). The industrialized world will collectively have to reduce its carbon emissions 60% below 2000 emissions by 2050 to avoid dangerous climate change. South Africa's required contribution is anticipated to be in the region of a 40% reduction, despite ongoing economic growth[25].

The South African Department of Environmental Affairs and Tourism (DEAT) has undertaken a multi-stakeholder Long Term Mitigation Scenario (LTMS) project, which has used scenario analysis underpinned by economic and technological modelling to understand how the economy could reach a 40% by 2050 reduction. Amongst the various 'technology wedges' contributing to the target, solar water

[20] DME, White Paper on the Energy Policy of the Republic of South Africa, December 1998

[21] DME, White Paper on the Energy Policy of the Republic of South Africa, December 1998, Section 3.2.2.4

[22] DME, White Paper on the Energy Policy of the Republic of South Africa, December 1998, Section 3.3.1

[23] DME, White Paper on the Energy Policy of the Republic of South Africa, December 1998, Section 5.2

[24] 'Although the developed world in the Northern Hemisphere are the biggest contributors to climate change (Response p1) in 1990'SA was responsible for about 1.2% of total global warming effect, therefore in top ten contributing countries in world.' DEAT website

[25] Scenario Building Team, Long Term Mitigation Scenarios, October 2007

heaters and improving building efficiencies are negative cost options[26]. Cabinet is anticipated to endorse the 40% target mid-2008.

Looming medium to long term greenhouse gas emission reduction targets present an additional argument for responding to the energy supply crisis through renewable or energy efficiency measures. Off-grid sustainable energy interventions in South Africa's housing stock will permanently remove this source of greenhouse gas emissions liability from the country's emissions inventory.

2.4. POLICY SUPPORT BUT IMPLEMENTATION BARRIERS

South Africa's energy crisis, the political pressure for low income residential service delivery, and the longer term imperative for South Africa to make the transition to a low carbon economy, all present convincing national economic arguments for prioritising sustainable energy interventions in low income housing individually, and present an overwhelming argument when considered together. Avoided primary health care and fire disaster response costs contribute additional support to prioritising a sustainable energy approach to low income housing.

Whilst an obvious option in theory, a number of barriers exist to the implementation of these policy imperatives, the NSHF proposed in this business plan is designed to address the two most significant: financial and institutional. It is anticipated that this in turn will incentivise the removal of the remaining barriers (including technology supply, monitoring skills, awareness and promotion of interventions).

[26] Scenario Building Team, Long Term Mitigation Scenarios, October 2007

3. CARBON FINANCE: THE CATALYSING OPPORTUNITY

Through the Clean Development Mechanism (CDM) of the Kyoto Protocol, carbon finance is available for between 40% and 165% of the upfront incremental costs of sustainable energy interventions in Greenfield Housing[27].

This section outlines the CDM and the opportunity it offers.

3.1. THE CLEAN DEVELOPMENT MECHANISM

Being designated a 'developing country' under the Kyoto Protocol, South Africa can be rewarded for actions to reduce emissions through the CDM. The CDM incentivises projects and programmes which reduce greenhouse gas emissions beyond business as usual through the generation of emission reduction credits, or 'carbon credits'[28]. These credits can be bought by emitters in industrialised countries to comply with their Kyoto or voluntary targets. The economic rationale for the CDM is to expedite lower cost emission reduction opportunities wherever they occur internationally, given that greenhouse gas emissions mix uniformly in the atmosphere. The net environmental effect of the CDM is neutral, but the mechanism assists developed countries to achieve their targets, and also supports developing countries develop along clean paths, thus avoiding a multiplier effect of future emissions from these countries. Proceeds from the sale of carbon credits under the CDM can therefore assist in the financing of emission reduction programmes in South Africa, such as the topic of this document, the implementation of sustainable energy interventions in low income housing.

In order to register and sell carbon credits under the CDM, the project developer will pass through a number of steps. Firstly, a methodology which describes the emission reduction activity within the project must be approved by the United Nations CDM Executive Board Methodologies Panel. In some cases existing approved methodologies can be used or modified, decreasing risk and cost to the project developer. The approved methodology is then incorporated into a Project Design Document (PDD) which

[27] From updated REEEP Project model, see results in Appendix Four. The percentage for Retrofits is lower, but not insignificant

[28] Carbon credits from CDM projects are termed Certified Emission Reductions (CERs). However for ease of reading, they will be termed 'carbon credits' for the purposes of this document.

describes the project, details the anticipated emissions reduction the project will achieve over a specified timeframe, addresses environmental integrity through an 'additionality' argument[29], considers emissions leakage, and the project's contribution to sustainable development. This document is validated by a third party to confirm all assumptions, arguments and modelling contained within the document. After validation, the PDD is sent to the host country government's Designated National Authority (DNA)[30] for the CDM for approval that it is in line with the sustainable development of the country. Finally, having passed through all these steps, the Document applies for registration with the CDM Executive Board. If successful, the project has then achieved a 'licence' to generate carbon credits.

Carbon credit volumes are calculated according to the PDD lodged with the CDM Executive Board, and verified at regular intervals to have actually occurred by a third party auditor. This auditor will then apply to the Executive Board to issue the verified number of carbon credits from the project.

As with any other product or service generated on an ongoing basis by a project, there are a number of ways in which this revenue stream can be used in the project's financial structuring: carbon credits can be sold forward, and this contract used as collateral in loan financing; they can be sold only after they have been generated (risk free) over the spot carbon market at premium prices; buyers may wish to pay upfront for carbon project development costs with a right of first refusal over any credits generated. The use of carbon credit revenues in project financing has come to be known as 'carbon finance'.

Carbon finance can greatly assist emission reduction projects in overcoming financing hurdles, and in generating an ongoing and potentially appreciating source of income. If used strategically, it could play an important role in public financing of sustainable energy infrastructure, particularly in bringing sustainable energy services to the indigent. If undertaken through a government to government transaction, carbon finance presents a long term annuity from an investment grade counterparty to a project.

3.2. LOW INCOME HOUSING CDM PILOT: THE KUYASA CDM PILOT PROJECT

The Kuyasa CDM Pilot Project in Khayelitsha, Cape Town (hereafter referred to as the Kuyasa Project), confirms the eligibility of low income housing sustainable energy projects to generate carbon credits. This

[29] A CDM project must reduce emissions beyond what would have happened in the absence of the project. Proving this counterfactual is very difficult in reality, but can be achieved through considering technological or investment barriers.

[30] In South Africa the DNA is situated in the Department of Minerals and Energy.

project was registered with the United Nations in 2005, the first registered CDM project in Africa, and the first Gold Standard CDM project[31]. The Kuyasa Project demonstrates how sustainable energy interventions can effectively meet the energy service needs of low income communities, through energy efficient retrofit interventions in standard Reconstruction and Development Houses (RDP). The interventions are solar water heaters, energy efficient lighting and insulated ceilings. Ten pilot houses have already been retrofitted with the remaining 2,300 house retrofits to begin in June 2008, and planned for completion mid 2009[32]. The project was developed by the Cape Town City Council (CTCC), the Khayelitsha community and SouthSouthNorth[33],

The Kuyasa Project realises 2.8 carbon credits per 30m^2 house per year. At a carbon price of €15[34] this amounts to R450[35] annual income to the house. A second pilot project, the Westgate Project in Mitchells Plain (hereafter referred to as the Westgate Project), involving 48m^2 Greenfield Houses, show a potential of 10 carbon credits per house per annum, translating into R1,650 per annum per house[36]. Incorporating thermal efficiency measures and a higher hot water usage than retrofits, the costs of greenfield interventions are also lower than those of retrofits, as no-cost interventions can be utilised. Both the Kuyasa and the Westgate Project are based on an innovative CDM baseline approach piloted in the Kuyasa Project, and accepted by the United Nations CDM Executive Board, titled 'suppressed demand'[37]. This approach enables low income housing developments to generate carbon credits against a baseline of acceptable energy service levels, as opposed to the levels typically experienced. Suppressed demand baselines avoid sectors such as low income housing having to become emissions intensive before they can gain from reducing their emissions. Credits are generated for avoiding future emissions in the first place.

---

[31] The Gold Standard is a premium rating for carbon projects. See www.cdmgoldstandard.org and this document section 4.4.

[32] Carl Wesselink, EDC, Personal Communication, May 2008

[33] www.southsouthnorth.org

[34] The first two years worth of credits have been sold to the UK Department of Food, the Environment, and Rural Affairs at €15 per tonne.

[35] At a Euro/Rand exchange rate of 1:10

[36] Agama Energy, Mitchell's Plain Medium-Income Thermal and Solar Water Heating Performance Modelling, May 2006

[37] See http://cdm.unfccc.int/Projects/DB/DNV-CUK1121165382.34/view

The Kuyasa Project has proved that implementing sustainable energy interventions in low income housing in South Africa can generate carbon credits to assist with the project's financing, and has overcome significant hurdles in the CDM process to set this precedent. However, the net carbon revenue flowing to the project (after subtracting transaction costs) is relatively small, due to the fixed costs of designing the project, taking it through the CDM process and transacting the carbon credits. Purchasers of carbon credits from CDM projects are largely buying to be in compliance with targets, and therefore look for large volumes of credits with low transaction costs. The higher the volume, the more cost effective the mechanism becomes per credit, returning a greater revenue stream to the project.

3.3. ECONOMIES OF SCALE: PROGRAMMATIC CDM

Registering individual projects under the CDM limits access to economies of scale, which is particularly important for emissions from many small individual sources such as houses. In response to this problem, rules for CDM programmes were developed by the CDM Executive Board, enabling the crediting of emission reductions associated with a CDM "Programme of Activities"[38]. The potential types of emission reducing technologies which will be undertaken as part of the programme are registered once-off, with reference to a demonstration project typical of those which will occur under the programme. Future projects can then claim carbon credits through the programme, which has a crediting lifetime of 28 years. The concept of a Programme of Activities streamlines and reduces the cost and risk of taking individual projects through the CDM process. As long as the individual projects conform to key design elements of the programme, they will be eligible for carbon credits. The actual generation and delivery of the credits will still be a result of individual project monitoring and verification, but here again, economies of scale can be utilized through sampling.

SouthSouthNorth has begun work[39] on the approval of a large scale[40] programmatic CDM methodology for solar water heaters (SWH) in the South African residential sector, and plans are in place for the development of a second methodology crediting thermal efficiency[41], and potentially a third crediting

[38] See http://cdm.unfccc.int/ProgrammeOfActivities/index.html

[39] At the time of writing an opinion on this methodology is anticipated by the United Nations by the end of June 2008

[40] The CDM allows for small and large scale project types. Kuyasa registered as a small scale project, and its methodological approach will need to be interpreted and confirmed for the large scale and programmatic design.

[41] Technologies include: building houses from insulating materials, orientating a house optimally for coolness in summer and warmth in winter, or building overhangs to enhance the ambient temperature of the house. SSN has submitted a proposal for the development of this methodology to both the DBSA and SANERI. The proposal is appended to this business plan as Appendix Three.

energy efficient lighting. These methodologies will be combined in one programme which allows access to carbon credits for an array of sustainable energy technologies in housing across the country[42]. The methodologies and programme benefit from the experience and learning of the Kuyasa Project CDM precedent, reducing outstanding CDM project cycle risks, although programmatic CDM is still in its early stages. The methodologies incorporate suppressed demand concepts, enabling the low income sector to benefit from an increased credit volume, reflecting the diversion of low income housing stock off an emissions and fossil energy intensive path.

Programmatic CDM requires the identification of a 'Co-ordinating Entity' to manage the programme and undertake responsibility for the carbon credits. The NSHF is proposed in this role.

3.4. GOLD STANDARD CDM: ESTABLISHING SOUTH AFRICA AS A LEADER IN CLEAN, SUSTAINABLE, DEVELOPMENT ACTIVITIES

The Gold Standard (GS) label for emission reduction projects identifies those projects with high levels of environmental integrity and strong sustainable development characteristics, and has established itself as the premium carbon credit standard in the international carbon market, particularly for carbon purchasers buying for reasons beyond compliance of which corporate reputation is an important one. GS emission reduction credits are sought after by buyers to demonstrate a commitment to sustainable development and the highest standard of environmental and social integrity. Whilst maintaining ongoing interest in the CDM market, this brand has attracted major attention in the voluntary markets (those not driven by Kyoto targets). Most significant is the level of interest in the GS in the United States, a waking giant in carbon trading, representing substantial levels of demand.

Not all projects are eligible for the GS, but sustainable energy in low income housing is. GS credits are slightly more costly to develop, but have demonstrated an ability to secure a premium price in the market which far outweighs their cost. GS CDM credit premiums lie between 3-35% of non-GS CDM, and premiums of up to 100% can be obtained in the voluntary market[43]. The GS requires best practice project development, therefore reducing risk aspects such as stakeholder acceptance.

[42] Whilst the programmatic rules currently stipulate one methodology per programme, it is anticipated that the housing unit will be able to represent the technology, and therefore all sustainable energy interventions can be registered together. If this is not allowed, three programmes will be run simultaneously and by the same co-ordinating entity.

[43] Michael Schlup, Gold Standard, Personal Communication, April 2008

A GS programme of the scale and nature proposed under the NSHF will represent a groundbreaking initiative in international climate change policy, and will gain substantial reputational benefits for the programme co-ordinator and South Africa. It will position the country as a leader in activities which demonstrate the spirit of the Kyoto Protocol, and is anticipated to enhance its negotiating position in the ongoing global climate change negotiations.

3.5. CARBON FINANCE: QUANTIFYING THE OPPORTUNITY

The REEEP Project developed a model to quantify the net present value (NPV) of the first ten year cash flows associated with securing carbon finance through sustainable energy interventions in low income housing. The model output shows the NPV per individual house of both carbon costs and revenues, and the incremental costs of the sustainable energy interventions. Note that the corresponding energy savings are not quantified, given the low income status of the home-owners[44], but that these savings are substantial and important from a macro-economic perspective.

The individual house is modelled in order to identify returns to a generic unit, although project level costs (e.g. project management) and economies of scale associated with a programme managed by the NSHF are incorporated in the NPV calculations. The cash flows which are modelled include: the incremental capital and project costs of retrofitting existing homes (Retrofits) or including sustainable energy interventions in Greenfield Housing, the costs of designing and implementing a CDM programme, and the carbon finance returns.

Two housing typologies are modelled, a 30m2 retrofit (Retrofit), and a 45m2 (Greenfield House), both located in the Western Cape[45], and modelled on the Kuyasa and Westgate housing projects. The Greenfield House includes three no cost interventions (colour, orientation, shared walls), and three interventions realising incremental costs (roof overhang, insulating bricks and solar water heater). Only the incremental costs have been accounted for, so for example the cost of the insulating material is subtracted from the cost of the bricks which this material replaces. The Retrofit comprises solar water heaters and insulated ceilings. The upfront incremental cost of the Retrofit is assumed to total R12,339 per house, and for Greenfield Houses, R17,600. The assumptions used in the REEEP Model have been updated for the purposes of this business plan, and detailed information and references on these can be

[44] Low income homeowners are unlikely to prioritise investment in sustainable energy interventions above other investments such as additional space, and therefore the energy savings are not considered sufficiently bankable for inclusion in the model.

[45] Different climatic zones influence the emissions savings, and hence will be separately modelled in a national programme.

found in Appendix Four. Note that each NPV result is based on assumptions which are static over the ten year lifetime of the cash flows, so for example an appreciating carbon price is not accounted for.

The results show that, whilst sensitive to the different assumptions around carbon price, the potential exists for carbon finance to cover between 40% and 165% of the incremental costs of including sustainable energy interventions in Greenfield Housing. The percentage for Retrofits is lower, but not insignificant.

3.5.1. REEEP PROJECT MODEL RESULTS

The NPV figures in the scenarios below indicate the shortfall (-) or surplus (+) per house after investing in sustainable energy interventions, and securing carbon revenues over a ten year period through the NSHF. A number of scenarios are considered explaining various sensitivities in the assumptions.

The results reveal that the model is very sensitive to the carbon price, and that Greenfield Houses stand to benefit significantly given their higher carbon volume to technology cost ratio.

Scenario One: Base case scenario

This scenario incorporates assumptions considered most likely at the time of writing, and provides a base case from which to explore sensitivities.

Assumptions: 125,000 Retrofits and 2.2m Greenfield Houses; 33.3% economies of scale in programme and incremental sustainable energy capital costs achieved (based on Technology Learning Curve theory, assuming a 10% reduction in price with every doubling of capacity until the technology is mature. It is assumed that the sustainable energy technologies mature in the tenth year of the programme). Various carbon prices are explored.

Table 1: REEEP Model Scenario One Results

Housing Typology	Estimated Upfront Capital Cost	NPV of Cash Flows (per house, with different carbon prices)		
		€10	€20	€35
Retrofit	(R12,339)	R -8,354	R-6,803	R -4,478
Greenfield	(R17,600)	R -6,125	R -256	R 8,548

In this scenario the Greenfield House breaks even just above €20, whilst the Retrofit requires additional funding even at €35.

Scenario Two: Stages of technological learning

This scenario considers the impact of a 10% and a 40% economy of scale reduction over the ten years, demonstrating the sensitivity of the model to this driver.

Table 2: REEEP Model Scenario Two Results

Housing Typology and Estimated Upfront Capital Cost	% Economies of Scale	NPV of Cash Flows (per house, with different carbon prices)		
		€10	€20	€35
Retrofit (R12,339)	10%	R -10,853	R -9,303	R -6,977
	33%	R -8,354	R-6,803	R -4,478
	40%	R -7,663	R -6,112	R -3,787
Greenfield (R17,600)	10%	R -10,283	R -4,413	R 4,391
	33%	R -6,125	R -256	R 8,548
	40%	R -4,930	R 940	R 9,744

Technological learning and economies of scale achieved through this impacts the incremental costs, and therefore the extent to which carbon finance covers these costs, in a predictable manner; increasing / reducing relative costs and increasing / reducing returns on a base case scenario.

Scenario Three: Upside carbon prices

A broad spread of carbon prices is indicated in the base case scenario. However, some observers of the global carbon market indicate a price of at least €25 post 2012[46], with a premium for GS projects above that. This scenario uses base case assumptions to explore the implications of a higher carbon price.

[46] World Bank, State and Trends of the Carbon Market 2008, May 2008 and Stern, Ely Lecture, Jan 2008

Table 3: REEEP Model Scenario Three Results

Housing Typology	Estimated Upfront Capital Cost	NPV of Cash Flows (per house, with different carbon prices)		
		€25	€30	€40
Retrofit	(R12,339)	R -6,028	R -5,253	R -3,702
Greenfield	(R17,600)	R 2,679	R 5,614	R 11,483

The ability of the carbon price to drive returns is demonstrated with a significant upside for Greenfield Housing as carbon prices exceed €30.

Scenario Four: Upfront beneficiary contribution

Given that the inclusion of sustainable energy interventions in low income housing will reduce home-owners expenditure on energy during their occupancy of the house, it may be feasible to require a homeowner contribution to the interventions[47]. Research has also found it is important that the homeowner value the interventions, in order to ensure their use and therefore the access to carbon finance. Beneficiary payment is one way of transferring value.

A R1,000 upfront beneficiary payment augments the base case.

[47] Community consultation in the Kuyasa Project reveals a potential willingness to pay around R1,000 upfront.

Table 4: REEEP Model Scenario Four Results

Housing Typology	Estimated Upfront Capital Cost	NPV of Cash Flows (per house, with different carbon prices)		
		€10	€20	€35
Retrofit	(R12,339)	R -7,354	R -5,803	R -3,478
Greenfield	(R17,600)	R -5,125	R 744	R 9,548

Contributions by beneficiaries will lower the costs and increase the portion covered by carbon finance.

3.5.2. CARBON PRICES: DRIVING THE BENEFITS

It is clear from the scenarios above that carbon revenues drive the benefits to both typologies, but to Greenfield Houses in particularly. In the base case scenario, Greenfield Houses break even at a carbon price of just above €20. With a R1,000 beneficiary contribution, this break even occurs just under €20. The upside carbon price scenario demonstrates the ability of Greenfield Houses to 'earn' revenues above the costs on an NPV basis over ten years. In some cases this income source is substantial (R11,000 per house). Retrofits will, even at a carbon price of €40, require additional financing to cover costs. Finance to cover 70% of up-front incremental capital costs enables Retrofits to break even at a carbon price of €20. At low levels of technology maturation, Greenfield Housing and Retrofits struggle to break even, particularly at low carbon prices. High carbon prices mitigate this effect.

Cross subsidization between the two typologies may be one way of managing the carbon revenues, depending on the objectives of the programme developer. In the base case, should carbon prices rise to €35, a Greenfield House will theoretically be able to subsidize the costs of two Retrofits. With a 30% upfront subsidy and a R1,000 beneficiary contribution, a Greenfield House will easily subsidize a Retrofit at a €20 carbon price.

Note that energy savings over the life of the interventions are not included in this model, but in and of themselves present a very strong argument for the application of additional financing for these

interventions, even in the absence of carbon finance. Carbon revenues will continue to accrue to the houses after the ten year lifetime modelled above, significantly strengthening the opportunity over the long term.

The updated REEEP Model is found in Appendix Four in excel format, and can be used by the reader to explore different scenarios and underlying assumptions.

4. INTRODUCING THE NATIONAL SUSTAINABLE HOUSING FACILITY

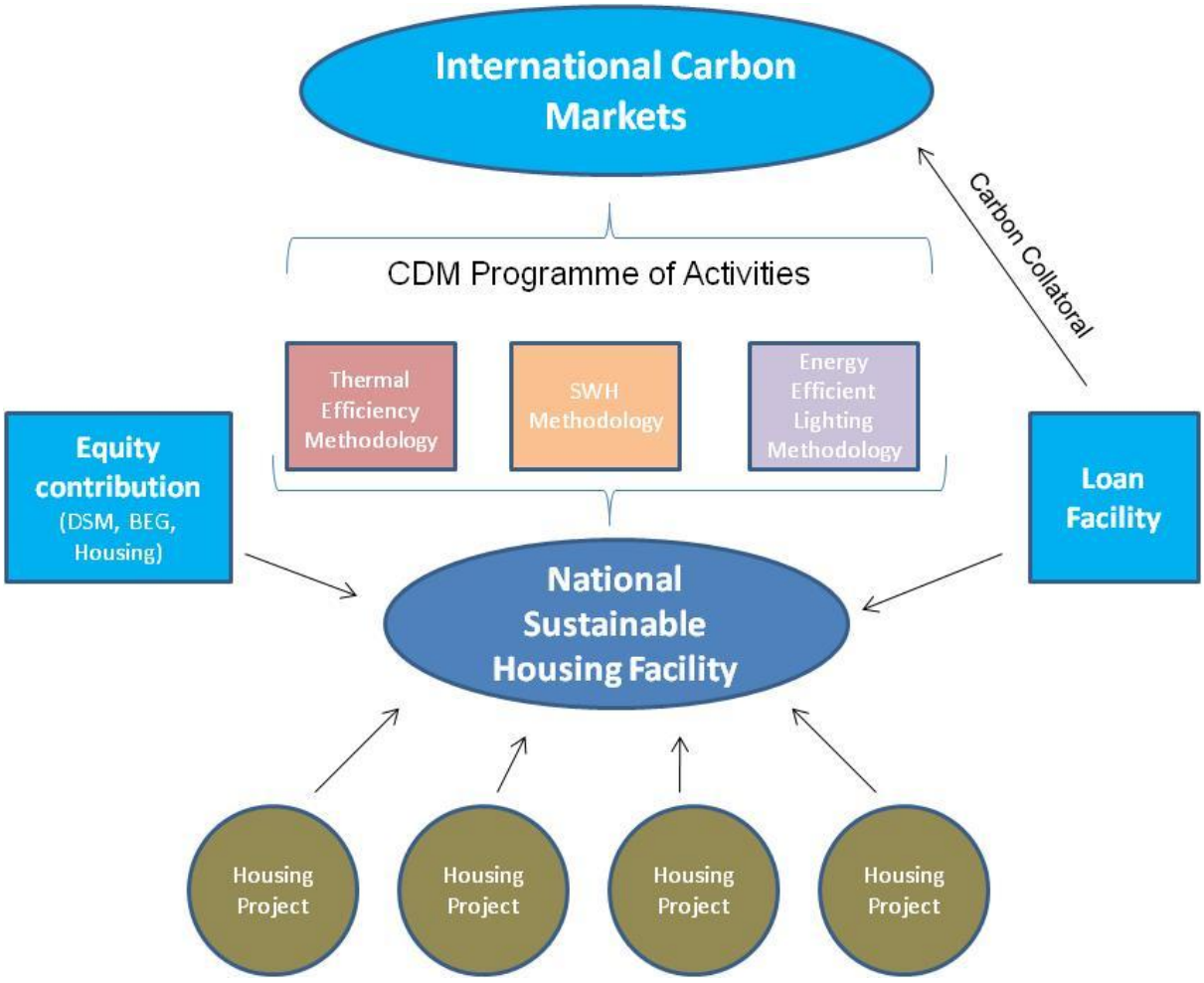
The potential of carbon finance to return a positive NPV or break-even NPV on an individual house basis motivates for the establishment of a CDM programme to secure these revenue flows. The concept of the National Sustainable Housing Facility has been developed for this purpose.

The NSHF is envisaged as a central co-ordinating agency that will act on behalf of housing projects of a required minimum size. The projects will contract with the NSHF to provide items such as a specified set of data, monitoring, labour and implementation guarantees in return for financial support for the incremental costs of a sustainable energy interventions being included in the project. The projects will identify the appropriate interventions for their particular circumstances from a specified list managed by the NSHF.

The NSHF will co-ordinate and streamline data requirements to access carbon finance for the interventions through programmatic CDM. Employing carbon trading expertise and operating from economies of scale, the NSHF will optimise the net return of the international carbon finance to projects. Additional domestic sources of finance could be managed by the NSHF to complement carbon finance. Loan facilities to extend credit to the projects to cover the upfront incremental capital requirements of the interventions could also potentially be offered by the Facility, in conjunction with commercial and development banks, and utilising carbon credits as collateral.

The NSHF is represented diagrammatically in Figure 1 overleaf:

Figure 1: The National Sustainable Housing Facility



The core activities of the NSHF will be:

- To co-ordinate access requirements to carbon finance and additional financing streams
- Optimize the net returns from the carbon market through specialized carbon transactions and an ability to price risk
- Promote access to economies of scale for professional services (baseline development, monitoring, verification, legal contractual advice) through the co-ordination of this service provision, thereby reducing costs and increasing the net return to the projects
- To promote the Facility to project developers, and raise awareness of the available funding and interventions
- To keep abreast of new developments and opportunities for financing, and to actively participate and provide input to their development

It is anticipated that the NSHF programme will be able to cope with a number of different typologies, including levels of attachment, walk-ups, differences in size, location and building materials. The programme will refer to a housing unit, and will identify emission reductions per square meter.

4.1. AN INFRASTRUCTURE TO DISBURSE COMPLEMENTARY FUNDING SOURCES

Following from the analysis in Section 4 above, the NSHF will enable access to carbon finance for between 40% and 165% of the incremental costs of sustainable energy interventions in Greenfield Housing over a ten year period.

These returns are driven by carbon finance, but carbon finance flows to the project annually, and the significant outflows occur in year zero, as the house is built or retrofitted. This is particularly acute in that factors which drive the upside of the range indicated above will only be realised over time, as the programme gathers momentum, tapping into technology economies of scale, and the carbon price meets or exceeds €25 as is currently anticipated post 2012[48].

[48] World Bank, State and Trends of the Carbon Market 2008, May 2008 and Stern, Ely Lecture, Jan 2008

Additional financing is therefore required to meet the upfront capital costs of the sustainable energy interventions in the early years of the programme. Whilst opportunities to bring carbon finance forward to assist with this upfront investment do exist (and will be discussed in section 11), existing domestic fiscal financial sources with objectives aligned with delivery of sustainable energy services to the low income housing sector may be applied for this purpose. An additional scenario to those explored in section 4 above is considered to explore the impact of a technology capital cost subsidy for the programme. The subsidy is a percentage of the upfront capital costs of the houses (excluding CDM costs). The subsidy percentage is indicated in the results below, all other assumptions are maintained as per the base case.

Table 5: REEEP Model Subsidy Scenario Results

Housing Typology and Upfront Capital Cost	Subsidy %	NPV of Cash Flows (per house, with different carbon prices)		
		€10	€20	€35
Retrofit (R12,339)	30%	R -5,447	R -3,897	R -1,571
	50%	R -3,510	R -1,959	R 366
	70%	R -1,572	R -22	R 2,304
Greenfield (R17,600)	30%	R -2,604	R 3,266	R 12,070
	50%	R -256	R 5,614	R 14,418
	70%	R 2,092	R 7,962	R 16,766

A subsidy lowers the upfront costs and increases the total return from the carbon finance for each house. The greater the subsidy, the more likely a retrofit is to cover its costs (at just below €35 carbon price with a 50% subsidy, or over €20 with a 75% subsidy.) and Greenfield Housing to accrue substantial revenues in later years.

Based on the REEEP Project findings, the NSHF has been designed to co-ordinate access to additional financing sources, such as subsidies, to complement carbon financing. There are significant synergies and transaction cost savings to be realised through utilising similar measuring and monitoring data to access multiple financing sources. The most immediate and likely sources have been taken into account when designing the NSHF[49]. Consideration of these opportunities means that the structure required for fast-track access of a low income housing sustainable energy programme to these sources will already

[49] The REEEP Project specifically identified the Demand Side Management Fund as a source of financing.

be in place in the form of the NSHF, significantly reducing the financial, time and institutional barriers required to allocate this financing.

Three of the most immediate existing fiscal financing sources are considered in this section. However, it is likely that there are more which may be relevant, and should also be explored, such as those linked to the health benefits resulting from better air quality inside the houses and ambient temperature control, contribution to Sustainable Human Settlements and poverty alleviation, employment creation and generation of renewable, or green energy.

It should be noted that the NSHF is not intended to replace the ongoing development of policy or fiscal allocation of funds for sustainable energy interventions in low income houses. The longer term objective of mainstreaming sustainable energy interventions in the housing delivery process is identified as a key reference point. As such, the NSHF has been designed to be flexible and compatible with emerging funding sources, whilst operationalising more immediate opportunities. It is therefore hoped that the Facility will evolve over time to access additional funds, or progress past subsidisation as technology costs are reduced, and as the carbon market matures. In the interim, the Facility represents a mechanism to leverage the financing of existing political commitments which does not necessarily demand immediate allocation of new public funds.

4.1.1. THE DEMAND SIDE MANAGEMENT FUND

A Demand Side Management Fund (DSM)[50] has been established in South Africa, funded through a levy on national electricity sales. The Fund is currently administered by Eskom, and funding is available to cover 50% of the capital expenditure of energy efficiency projects and 100% of the capital expenditure of load management projects. Projects are required to meet a minimum demonstrable energy savings level, and are evaluated on the basis of the cost per kWh savings (currently set at 100kWh per project, reduced from 500kWh[51]). The DSM fund uses Energy Service Companies (ESCOs) as key partners in the projects for project implementation, ongoing maintenance and operation, as well as for assistance in navigation through the funding criteria.

[50] www.eskomdsm.co.za

[51] Bayanda Nyasheng, Eskom DSM, Personal Communication, March 2008

Renewable energy interventions are currently not included in the Fund per se, however since the second half of 2007 Solar Water Heaters (SWH) are eligible through a separate DSM activity whereby discounts are realized by consumers directly at registered retailers, with the retailers then being reimbursed by Eskom. The percentage discount depends on the size of the SWH and only high pressure systems installed in conjunction with a timer or load management device are currently eligible for financing.

New construction is currently excluded from the fund as existing baselines are used to calculate kWh savings. Negotiations are however in place to include this in the future. To date the focus has been on extracting least cost electricity savings from low risk projects, with the result that most of the DSM finance has largely been spent in industry.

There has been movement to reallocate some of the Fund's activities, predominantly energy efficiency outside Eskom to the National Energy Efficiency Agency (NEEA) located within the Central Energy Fund. Deliberations regarding the extent and nature of this reallocation are ongoing between Eskom, the National Energy Regulator of South Africa, the DME and the Central Energy Fund with the NEEA currently only managing DSM in public entities. The electricity crisis has exacerbated uncertainty surrounding the future form of the DSM, but has also opened up new thinking in this area.

What is clear is that:

- A window of opportunity exists at the moment for a different interpretation of the mandate of the DSM fund, its criteria and scope, favourable to sustainable energy interventions in low income housing

- The Fund will in principle support new builds (Greenfield) as well as retrofits

- Some form of baseline development, monitoring and verification will be required by the project developer to prove the energy savings

- The Fund is likely to continue to use ESCOs for the project implementation

- Donor funds may be sought to augment the current capitalization from the electricity levy

The CDM requires ongoing monitoring of the energy interventions in order to receive carbon credits. This monitoring system and information gathering can be designed in such a way that it achieves the monitoring and verification requirements of the DSM as well. The use of a suppressed demand baseline in the CDM may complicate this, if not accepted under the DSM system. However it has met with a

favourable initial response in discussions with the NEEA. A fast tracked system to access DSM funding for sustainable energy interventions in low income housing is a possibility which has been discussed with both Eskom and the NEEA[52].

4.1.2. THE FREE BASIC ELECTRICITY AND ALTERNATIVE ENERGY GRANTS

The DME has implemented two minimum energy related grants: the Free Basic Electricity Grant (FBE) and the Free Basic Alternative Energy Grant (FBAE). Both these funds fall under the greater umbrella of the National Electrification Fund (NEF). The funds for the FBE are allocated to municipalities and dispersed by the department of Provincial and Local Government through the Equitable Share grant, to cover the usage of 50kWh of electricity per household per month for grid connected poor households which will be identified through self-targeting[53]. In areas where no electricity infrastructure exists or is planned to be implemented in the future due to rural location (i.e. too far away from the national grid), the funds are channelled to finance FBAE. The FBAE is a subsidy of up to 80% of the monthly service fee[54] charged to indigent, non-grid households for the provision of official non-grid systems[55].

The FBE is granted for all energy uses of a household, while the FBAE is granted for non-electrical uses of a household (mainly the solar home systems) and so approval of the homeowner would need to be obtained to use a portion of the grant for specific sustainable energy services. On like-for-like terms the application of the FBE grant to hot water service provision alone would result in between R10 and R15 per month subsidy, depending on whether the house was in a rural or urban area. A total of R25 is available for electricity[56].

Whilst there are no specific conditions attached to the FBE grant, there is a significant amount of bureaucracy and policy uncertainty surrounding the Grant. The Grant is allocated through a local or

[52] Andrew Etzinger, previously of Eskom DSM, and Barry Bredenkamp of the NEEA.

[53] Self-targeting has been found to be a more efficient allocation method than a broad based method. Danie Potgieter, Implementation of EBSST or FBE, 2003.

[54] The monthly fee is currently R58 per household per month and the subsidy therefore R46.40 (Potgieter, 2003).

[55] Currently the only official implementation being Solar Home Systems.

[56] Douglas Banks, Restio Energy, Personal Communication, 2006

district municipality or metro ultimately, and Department of Provincial and Local Government (DPLG). One of the main problems with the Grant is that the allocation is only for one year and there is speculation that the FBAE may be discontinued[57]. This significantly reduces its use as a guarantee, or as a component of a longer term financing plan, such as the NSHF. A second would be whether hot water would be considered a basic enough energy need to be covered by the FBE, with some arguing that the FBE subsidy should be kept for energy for cooking and lighting which are considered more critical[58]. As mentioned above, the FBE policy environment is in flux and this potentially presents a window of opportunity for the incorporation of the subsidies into a mechanism such as the NSHF.

4.1.3. THE HOUSING SUBSIDY AND OTHER POTENTIAL FINANCIAL SOURCES

The National Housing Subsidy currently barely covers the costs of building the houses to the specifications contained in the National Housing Code. However, Housing Policy recommends the inclusion of sustainable energy technologies in the provision of low income housing.

Were the Housing Subsidy to be extended to allow for a range of sustainable energy technologies, this additional funding could be channelled through the NSFH, which would contain the necessary infrastructure to monitor and manage the incremental subsidy, ensuring its efficient application.

The National Department of Health has indicated an interest in determining the actual health benefits of the Kuyasa Project once it is implemented, with a view to motivating for an increase in the housing subsidy through Treasury. The basis for this motivation would be that the expected health benefits could save the fiscus significant amounts currently being spent on primary health care. An inter-departmental budget re-allocation (from primary healthcare to housing) would link the expenditure on ceilings to the anticipated benefits of reduced tuberculosis, and reduced spending on primary healthcare. The residents in the Kuyasa Project's pilot houses have experienced a significant improvement in their respiratory health[59], such that the community as requested that the insulated ceilings are prioritised during implementation.

---

[57] Lloyd, Cowan & Mohlakoana, Improving access to electricity, 2004

[58] Douglas Banks, Restio Energy, Personal Communication, 2006

[59] Mr Qwili, Kuyasa Resident, Personal Communication, 2006

Employment creation is a priority of the National Government, with skills development grants available on a project basis, which could be applied to the installation of sustainable energy interventions in low income housing.

The benefits of renewable energy can be monetized through the generation of Tradable Renewable Energy Certificates (TRECs), and sold to organisations wishing to show their commitment to these energy attributes. A TREC market has been established in South Africa, but is in its infancy with unresolved issues regarding the sale of TRECs and CERs from the same project[60].

In his 2008 Budget Speech, the South African Finance Minister indicated that a form of greenhouse gas emissions regulation was under consideration by the government, and that a levy has been raised on non-renewable electricity generation, which will result in R4 billion to the fiscus per year after the 2008/9 fiscal year. The government could consider the application of this revenue stream to the inclusion of sustainable energy interventions in low income housing, with carbon credits viewed as a return to the fiscus on this investment.

[60] REEEP Project 10307023: Developing a financial model for renewable energy upgrade interventions in urban low income housing, South Africa

5. DESCRIBING THE NATIONAL SUSTAINABLE HOUSING FACILITY (NSHF)

5.1. THE NSHF VISION

The National Sustainable Housing Facility will facilitate one-stop-shop access to international carbon financing for the incremental cost of sustainable energy interventions in existing and new low income housing projects throughout South Africa, in support of existing National Housing and Energy Policy objectives.

Operating on a not-for-profit basis, the Facility will be financially self-sustainable from its third year, passing carbon revenues (net of administration costs) directly to housing project developers, potentially in the form of upfront financing, in return for the inclusion of sustainable energy interventions in housing developments. The Facility's administrative capacity and infrastructure is designed to complement carbon financing with fast track application of appropriate existing and future domestic financing sources. Through this financing mechanism, substantial future energy economic efficiencies will be realised in the South African residential sector, of particular importance in the light of South Africa's current energy crisis and its probable future carbon emissions reduction obligations.

5.2. THE REEEP PROJECT: ORIGINS OF THE NSHF

The SouthSouthNorth team leading the work on the Kuyasa Project identified relatively early on that carbon finance would not cover the incremental capital costs of the sustainable energy interventions. The challenge was therefore to source financing for the funds to implement the project, and met through once-off funding made available by the Department of Environment and Tourism (DEAT) in the form of a Poverty Alleviation Grant. Securing this funding was time and administration intensive[61], and highlighted the need for a sustainable financing source to enable replication of this and similar project types.

The Kuyasa Project also drew attention to both the need for upfront financing whereas carbon finance typically accrues to the project over its lifetime, and the lengthy and costly administration process associated with the CDM. Project developers in the low-income housing sector already face a number of

[61] Kuyasa was registered with the CDM Executive Board in 2005, and is still experiencing delays relating to the transfer of the grant funding to enable implementation, three years later.

substantial challenges related to financing, and combined with the low awareness of sustainable energy interventions within the broader marketplace, and negligible historical support from the South African energy sector, sustainable energy projects have been unable to move past pilot phase. The REEEP Project considered the use of the CDM and carbon financing focusing on programmatic CDM as central to sustainable access to carbon finance for emission reduction sources of this type, and explored other potential domestic funding sources. The Project involved consultation with a wide range of stakeholders, and the development of the NHSF Drafting Group to endorse and guide the progress of the NSHF.

Work on the REEEP Project led to the concept of a central facility, the NSHF, which would co-ordinate the administration of, and financing for, sustainable energy interventions using the economies of scale made available by programmatic CDM. It was hoped that by providing this service to project developers and by using the Facility to lobby government and promote sustainable energy interventions in low-income housing, these kinds of projects would be more attractive to developers, municipalities and local government.

5.3. THE NSHF DRAFTING GROUP

In order to further develop the NSHF concept, a Drafting Group was established at the end of 2006. Chaired by Kevin Nassiep of the National Energy Research Institute (SANERI), the Group is comprised of key public stakeholders in the South African energy and housing sectors, including the National Department of Housing, the Department of Minerals and Energy, the Development Bank of South Africa, the National Housing Finance Corporation, the NEEA, Eskom, SouthSouthNorth, the regional REEEP Secretariat, the National Home Builders Regulatory Council, the Central Energy Fund, the South African Designated National Authority of the CDM, major metros and an ESCO representative. The full list of members is contained in Appendix Five. This Drafting Group will continue to guide the implementation and operation of the NSHF to ensure it achieves its objectives. To date the Group has held four meetings[62] and it was through its activity that the writing of a business plan was prioritized as a next step. This business plan is owned by the Drafting Group, and will be used by it to secure the financial and institutional support required for the instigation of the NSHF.

[62] Minutes of this Drafting Group are available from Cindy de Haan (cindy@southsouthnorth.org)

5.4. HOUSING PROJECT AGENTS: UTILISING EXISTING STRUCTURES

It is envisaged that the NSHF will engage with project agents acting on behalf of the housing developments they represent. These agents could be housing developers, municipalities, provincial housing proponents, financiers, micro-financiers and community organisations. A possible type of project agent which may prove particularly a particularly effective model, particularly in retrofit projects, is that of the ESCO. An ESCO would act as an intermediary between project owners and the Facility, managing the project's application process to the NSHF as well as implementation of the energy interventions. The percentage and scope of involvement within a particular project would be contractually arranged between the ESCO and the project owner. One reason for the effectiveness of this model is that it could utilise the network of existing ESCOs established under the DSM which house energy specific expertise, uncommon amongst housing project developers or communities.

ESCOs currently play an integral role in the operation of the DSM fund and carry the risk of delivery of the energy reductions. However, in order for them to successfully implement sustainable energy projects at scale, additional capacity will be required, both in terms of the number of ESCOs (particularly in those areas outside of Gauteng where currently 62% of ESCOs operate), and in their internal capacity[63]. These constraints present an opportunity for ESCOs to be created within local communities, and for them to play a role in employment creation and community ownership over the interventions, which would work towards management of risk and further build on their role as SMMEs and contributors to BEE.

The NSHF could also engage the DSM network to monitor and verify the energy and emissions savings utilising the universities currently involved in the M&V for the DSM fund. However, a greater number of verifiers would be required under a large scale roll-out of sustainable energy interventions. Some local auditing firms are building capacity in energy and CDM auditing and it is hoped that they would be able to take on these services[64].

5.5. HOME-OWNER BUY-IN AND FINANCIAL CONTRIBUTION

It is essential to ensure homeowner ownership is taken of the sustainable energy interventions. This has proved to be a pivotal aspect in the success or failure of community based renewable energy projects,

[63] Jako Volschenk, The use of ESCOs to facilitate sustainable energy interventions in the low income housing sector, 2007

[64] For example Price Waterhouse Coopers.

and ongoing use of the interventions is required for the generation of carbon credits. One way of achieving this is through requiring a financial contribution from homeowners.

Whilst beneficiaries may be able to pay an amount equal to their current expenditure on energy services they are unlikely to be able to commit to a larger amount.[65] Research for the Kuyasa Project reveals that payment of between R30 – R50 p/month[66] combined with an upfront payment of R1,000 is feasible[67]. Micro-financiers have confirmed the ability of low income homeowners to access an upfront payment in the region of R1,000 and successfully repay this amount through a micro-finance scheme[68]

Other innovative vehicles of securing this revenue stream could be through the use of sweat equity in the installation of the interventions, or through accessing the Basic Energy Grant as a form of guarantee. ESCOs could be involved in collecting this finance on an ongoing basis as payment for energy services by the community. The Kuyasa Project implementers are exploring the use of community labour for the project's implementation[69].

5.6. MARKETING AND AWARENESS

As it becomes established, the NSHF could benefit from undertaking a level of marketing and awareness-raising in order to raise its visibility to low income communities and housing developers. The NSHF team will ensure that they are well networked with relevant organisations in the housing process and establish referrals and profile raising where relevant.

The ESCO model, or utilisation of a similar incentive based model will encourage agents to seek out opportunities for retrofits or for the incorporation of sustainable energy technologies in new builds. It is anticipated that building in this margin of return for intermediaries will encourage a speedy uptake of the

[65] Research by Cousins and Mahote (2003) ascertained that low income households are known to be good savers and would be able to save the required amounts for an intervention such as a SWH if this asset was prioritized in the hierarchy of their needs. However demand for this ranks below items such as home extensions and even television in some cases.

[66] Cousins and Mahote, Assessment of the impact of energy efficiency interventions in a low-income housing settlement Kuyasa Khayelitsha, 2003

[67] More recent research (Wesselink, 2008) indicates that current monthly energy expenditure of low income households is in the region of R300.

[68] Olivia van Rooyen, Director, Kuyasa Fund, Personal Communication, 2006

[69] Carl Wesselink, EDM, Personal Communication, May 2008

NSHF opportunities, required for obtaining economies of scale, and too that it will bridge the current lack of linkages between the housing and energy sectors.

5.7. CATALYZING FUTURE PROJECTS AND ADD ONS

Given the need to access additional financing sources, subsidy and incentive based sources will be constantly monitored. Approaching carbon finance in a similar manner for medium and high income housing may prove to be beneficial. This business plan focuses on the low income sector because of its public good component, and because low income groups have a more immediate need for subsidization for these types of interventions. However, other projects are looking to combine access for low, medium and high income housing because of cross-subsidisation benefits. This may be a route to follow in the future.

The NSHF model may be used in other countries in housing projects, or in other sectors where a large number of small point sources of emissions exist.

5.8. NATIONAL SUSTAINABLE HOUSING FACILITY OBJECTIVES

- To facilitate and co-ordinate access to carbon financing for sustainable energy interventions in low income housing throughout South Africa

- To act as a mechanism for distributing environmental market and subsidy based financing to low income housing projects, and to fast-track the application of existing relevant financing sources to complement the contribution of carbon finance

- To provide a contribution to the incremental capital costs of sustainable energy interventions in Greenfield and Retrofit Housing Projects in a manner which enables this contribution to increase over time to capture the rise in value of the international carbon finance contribution

- To provide a financial incentive for including sustainable energy interventions in low income houses, and / or to provide the financial means to comply with government regulations regarding building standards and energy service provision in the low income housing sector

- To be visible to housing project developers, and to offer a cost, time and resource efficient means to access additional financing for sustainable energy interventions

- To become financially self-sustaining

- To promote the inclusion of sustainable energy interventions in all housing in South Africa
- To act as a model for the strategic utilisation of the international carbon markets for sustainable development of the country

6. FINANCING THE NSHF: THE INVESTMENT OPPORTUNITY

This business plan has demonstrated the ability of carbon finance, accessed through an entity such as the NSHF, to meet, contribute to or exceed the incremental capital costs of sustainable energy interventions in low income housing in South Africa.

This section considers the NSHF as an investment asset. It separates the investment required for the incremental capital costs of the interventions themselves from the investment required to establish the CDM programme and access carbon finance. Through a cash flow model with sensitivity analysis, it demonstrates how the NSHF will recoup its start up costs by year three, and be in a position to pass through significant financial flows as contributions to the incremental capital costs of the underlying interventions.

6.1. THE NSHF CASH FLOWS

The costs of developing a CDM programme of activities for sustainable energy interventions in low income housing in South Africa are calculated to be in the region of R8.4 million (a full budget and description of activities appears in section 9 below). These costs, together with the programme's ongoing operational costs, administrative and carbon-related, are modelled using discounted cash flow analysis, to show the real net cash flows over a ten year time period for various scenarios. The model excludes the incremental capital costs of the sustainable energy interventions themselves, which are considered to be more appropriately dealt with at a project developer (Greenfield Housing) or community (Retrofits) level. An analysis of the portion of these incremental costs covered by carbon financing has been considered in section 4 above, and in one of the scenarios below.

The cash flow model is a real model, excluding inflation or exchange rate appreciation. It includes a financing option for the upfront costs of establishing the NSHF (R8.4 million), repaid in equal annual instalments over five years, with repayments starting in the second year of operation, and an interest rate of 12%. This is an ex-tax model, given the uncertainty surrounding taxation of carbon revenues, and whether this programme will be situated in the private or public sectors.

The cash flows to the programme are found to be most significantly determined by the following factors:

- Number of houses included in the programme
- Split between Retrofits and Greenfield Housing typologies
- Carbon price

A base case scenario is defined, utilising the most likely assumptions at the time of writing. Sensitivities are then explored in a number of alternative scenarios. The following economic data is assumed: A Rand / Euro exchange rate of 10:1 for carbon credit revenues, and a Rand / US Dollar exchange rate for carbon costs of 7:1. The model, together with a full and detailed set of assumptions is given in Appendix Six, and the excel file accompanying this business plan.

The scenarios are presented below, followed by a discussion on the investment opportunity from a fiscal perspective in section 8.2 below.

6.1.1. BASE CASE SCENARIO

The base case scenario assumes that 300,000[70] houses are built each year over the next ten years[71], and that an existing housing stock of 235,591[72]. Assumptions are then made around the percentage of these houses, Retrofit and Greenfield that include sustainable energy interventions. These assumptions are shown in the table below. The carbon price is modelled at €10, and financing is employed to cover the initial development costs of the NSHF.

[70] The housing code refers to 360,000. 300,000 is therefore a conservative figure.

[71] The Housing Department estimates the need to deliver between 360,000 and 500,000 houses per year in order to have provided housing for all by 2014. Assuming a slower build rate of 300,000 per year, it has been assumed that there will be demand at this rate for the next ten years.

[72] www housing.gov.za, accessed first quarter 2008

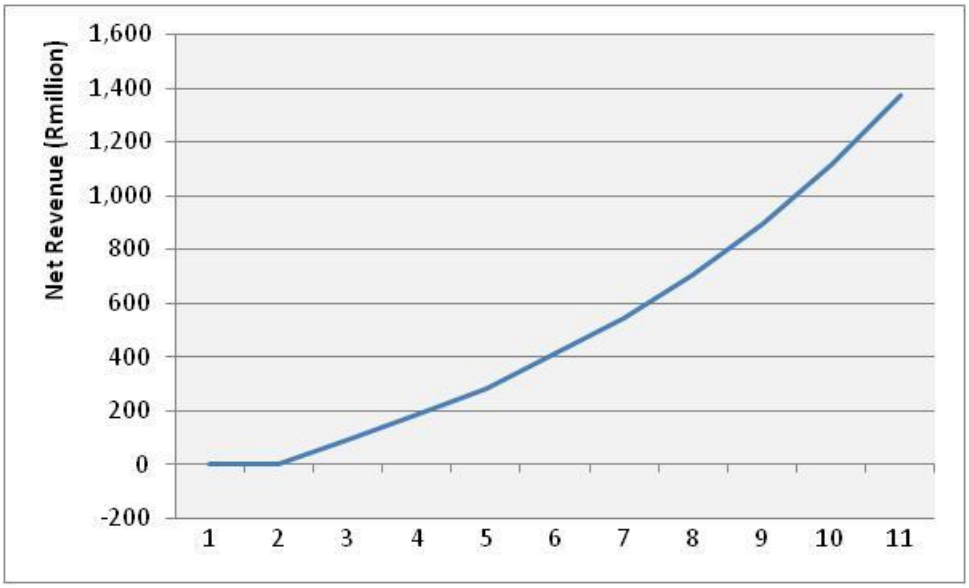
Table 6: Annual base case scenario assumptions

Years	0	1	2	3	4	5	6	7	8	9	10
Rate of uptake of sustainable energy measures in Greenfield	10%	20%	30%	30%	40%	40%	50%	60%	70%	80%	95%
Rate of uptake of sustainable energy measures in Retrofit	1%	2%	4%	4%	6%	6%	6%	6%	6%	6%	6%

The base case scenario demonstrates that an up-front investment of R8.4 million over two years (0;1), will yield net revenue inflows of R90 million in year two (2), escalating to R1.4 billion in year ten.

This is depicted in the graph below, showing the net revenue flow over the first ten years of the programme.

Figure 2: NSHF Base Case Scenario Cash Flows



6.1.2. 'LOW INTERVENTION UPTAKE' SCENARIO

This scenario deviates from the base case scenario in its assumptions around the percentage of new and retrofit houses which will incorporate sustainable energy interventions. Financing of the upfront development costs is not included. These changes are shown in the table below. All other assumptions remain the same.

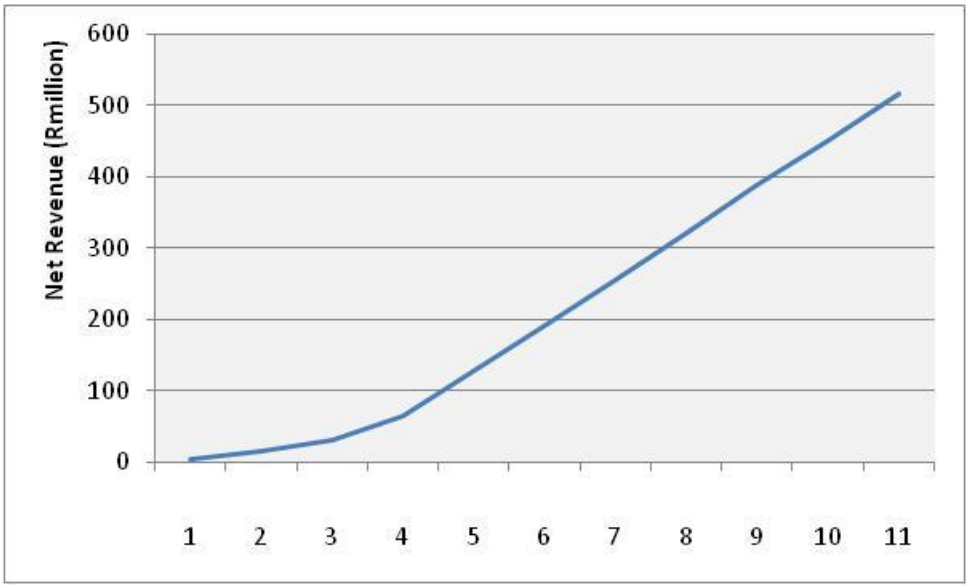
Table 7: Annual 'Low Intervention Uptake' scenario

Years	0	1	2	3	4	5	6	7	8	9	10
Rate of uptake of sustainable energy measures in Greenfield	1%	5%	5%	10%	20%	20%	20%	20%	20%	20%	20%
Rate of uptake of sustainable energy measures in Retrofit	1%	1%	1%	2%	2%	2%	2%	2%	3%	3%	3%

The ‘Low Intervention Uptake’ scenario demonstrates that an up-front investment of R8.4 million over two years (0;1), will yield net revenue inflows of R14 million in year two (2), escalating to R450 million in year ten.

The more houses included in the programme, the greater the value of the carbon finance opportunity.

Figure 3: NSHF ‘Low Intervention Uptake’ Scenario Cash Flows



6.1.3. ‘GREENFIELD’ OR ‘RETROFIT’ SCENARIOS

The scenarios below do not assume that the start up outflow is financed. The ‘Greenfield Only’ scenario, assuming base case Greenfield delivery figures, demonstrates that an up-front investment of R8.4 million over two years (0;1), will yield net revenue inflows of R88 million in year two (2), escalating to R1.3 billion in year ten. Greenfield projects offer particularly cost effective emission reduction opportunities largely due to no-cost design features such as housing orientation, colour and shared walls as well as savings on management, labour and community consultation costs.

The ‘Retrofit Only’ scenario demonstrates that an up-front investment of R8.4 million over two years (0;1), will yield net outflow of –R4million in year two (2), escalating to R25 million in year ten. These scenarios are depicted in the graphs below. The outflow of the retrofit graph in year two is a result of the graph’s scale demonstrating the start up cost outflows. (The scale of the Greenfield graph disguises this).

Figure 4: NSHF 'Greenfield Only' scenario

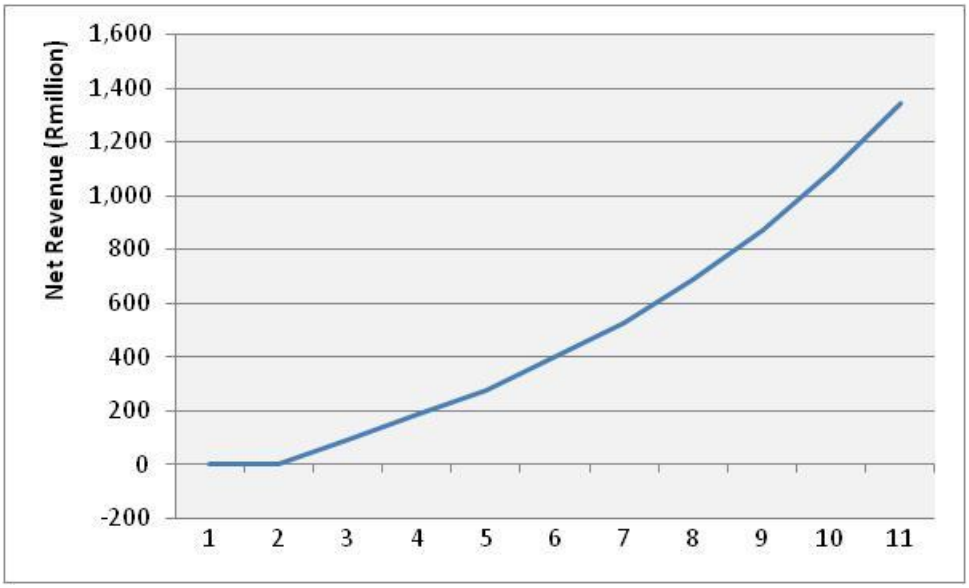
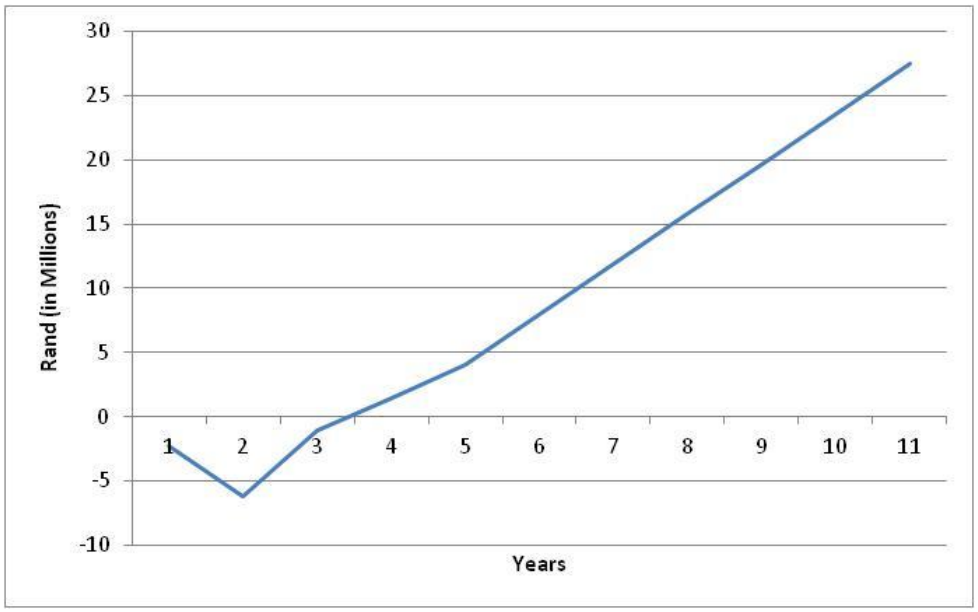


Figure 5: NSHF 'Retrofit Only' Scenario



6.1.4. 'LOW AND HIGH CARBON PRICE' SCENARIOS

Assuming a carbon price of €5, an up-front investment of R8.4 million over two years (0;1), will yield net revenue inflows of R41 million in year two (2), escalating to R673 million in year ten. Assuming a carbon price of €25, an up-front investment of R8.4 million over two years (0;1), will yield net revenue inflows of R236 million in year two (2), escalating to R3.4 billion in year ten.

6.1.5. 'REDUCED CARBON VOLUMES' SCENARIOS

This scenario explores the possibility of fewer carbon credits per house being realized than currently anticipated (based on Kuyasa and Westgate models). Assuming a worst case scenario of 1.4 credits per year per Retrofit, and 5.3 credits per year per Greenfield, the net annual revenue flows will begin at R42 million and escalate to R684 million.

In line with the analysis of individual houses, the cash flow model for the NSHF as an investment opportunity confirms that Greenfield Houses yield better carbon finance returns than Retrofits, that scale drives value, and that the carbon price is the most significant variable. It is also clear that a relatively small amount of up-front financing will enable substantial carbon finance flows, far in excess of their costs.

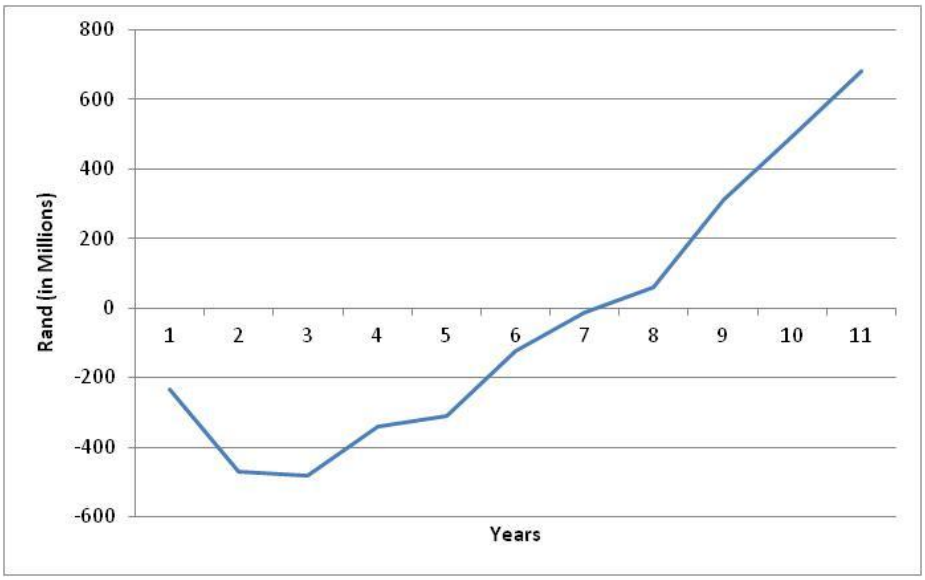
6.2. CONSIDERING THE INCREMENTAL CAPITAL COST SHORTFALL

What the cash flow scenarios analysed above do not show is the impact of the incremental costs of the underlying sustainable energy interventions. This has been left in the domain of the individual project developers, but is of relevance to the NSHF which relies on housing project developers to participate in the programme. The need to finance the incremental capital cost shortfall is a priority for the NSHF, to ensure the programme attains the scale required. The role of upfront financing, potentially through subsidies, and a contribution by the homeowners has been discussed. The following scenario outputs from the model (which has been designed to consider the incremental capital costs), demonstrate how the NSHF could act as a vehicle for investment in the incremental costs of sustainable energy interventions in low income housing, to access annuity returns for the carbon markets which deliver a return in the long run. The investment requires a long term view on returns, or a national economy perspective, and may be most appropriately the role of national government.

Upfront financing equivalent to a portion of the incremental capital costs of sustainable energy interventions in low income housing is included in the scenario, together with a R1,000 home-owner

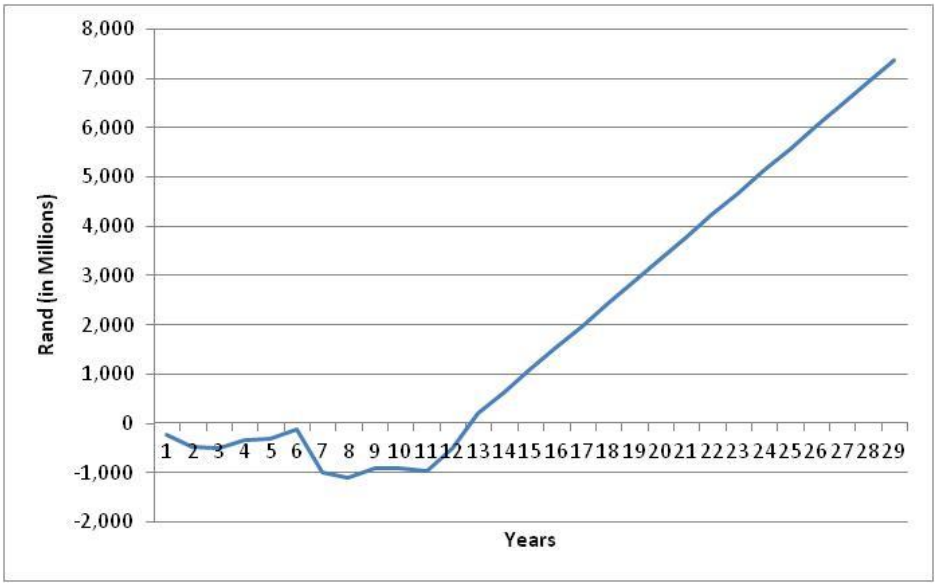
contribution. The upfront costs are incurred as the house is built and enters the programme. The results are shown below.

Figure 6: Greenfields only plus incremental capital costs, upfront financing of 50% of these per house, and a home-owner contribution, €15 carbon price, no programme financing



If the upfront financing is phased out completely after year five, the returns over 28 years look as per the graph below. The net present value (using a 12% public sector discount rate) of the five year subsidy is R4 billion[73].

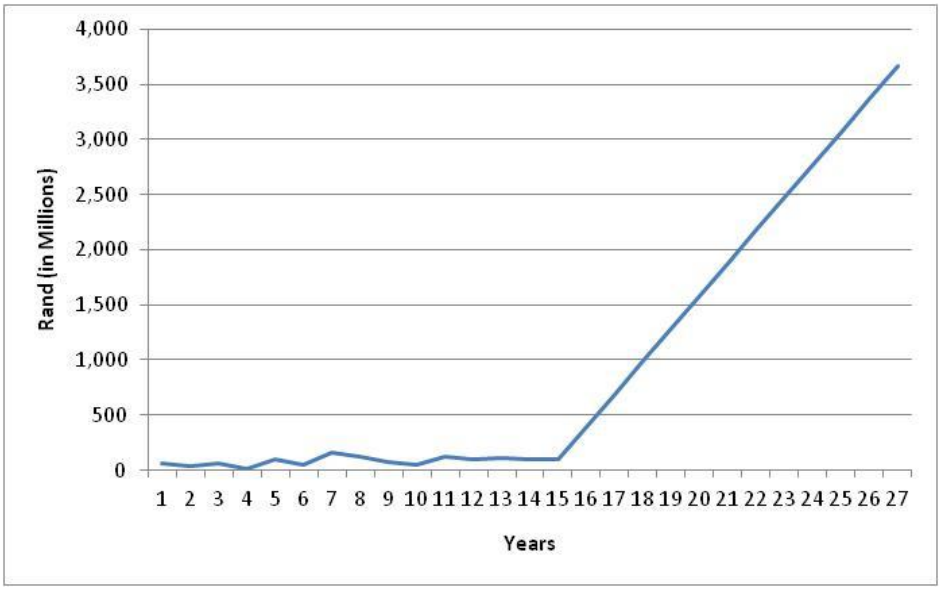
Figure 7: Greenfields only plus incremental capital costs, upfront financing of 50% of these per house, phased out after year 5, and home-owner contribution, €15 carbon price, no programme financing



[73] Equivalent to one year's worth of the carbon levy on fossil electricity generation.

A further scenario, considering a declining capital finance contribution is demonstrated below.

Figure 8: Greenfields only, plus incremental capital costs, upfront financing declining from 100% to 0% in year 14 of these per house, R2,000 home-owner contribution, €10 carbon price, no financing.



The importance of a long term view is emphasised, but equally is the ability of carbon finance to reimburse a long term investment to meet current policy objectives. Should this be taken up by the government, directing current budget allocations into the provision of sustainable energy interventions in low cost housing will enhance the potential to return revenues to the fiscus over time.

7. NSHF RISK ANALYSIS

The opportunity analysis in section 4 demonstrated the potential of carbon finance to contribute between 40% and 165% of the upfront capital costs of sustainable energy interventions in Greenfield Housing. The realisation of this opportunity depends on four primary factors: 1) the establishment of a central co-ordinating entity to manage the CDM programme and access carbon revenues (the NSHF), 2) the successful registration of the CDM Program of Activities with the United Nations CDM Executive Board, 3) the implementation of sustainable energy interventions in low income housing in South Africa by project developers, and 4) the continuation and value appreciation of the international carbon market.

On balance, whilst the establishment of an innovative and world leading programme such as that envisaged under the NSHF involves overcoming a number of hurdles, its benefits in terms of low cost financing, leverage and momentum far outweigh the risks. The programme is fully consistent with both national and international policy priorities around climate change, poverty alleviation and sustainable economic development, and its credits are anticipated to be highly sought after on the international carbon market. This combination results in pressure from diverse actors to overcome hurdles and ensure the programme's success.

These risks are described below, together with possible risk mitigation measures. A summary of these appears in the table at the end of this section.

7.1. RISKS TO THE SUCCESSFUL NSHF ESTABLISHMENT

The motivation for the establishment of the NSHF, as opposed to individual projects or smaller scale programmes accessing the carbon market separately, is based on the NSHF's ability to access economies of scale and efficiencies in carbon trading and programme development costs, and to attract and motivate for the application of subsidies to cover the outstanding incremental capital costs of the sustainable energy interventions. Whilst the concept of the NSHF has been extensively consulted, there are players in this space in South Africa which may prefer to remain outside a centralised approach.

This risk can be mitigated by 1) ensuring that the NSHF is established as quickly and positively as possible 2) understanding the reasons why project developers may wish to remain outside the NSHF programme and trying to incorporate their concerns or requirements and 3) enabling access to complementary subsidy finance as a priority, to increase the efficiencies of the NSHF as a one-stop-shop for sustainable energy finance for low income residential developments. The Drafting Group has also been established to reduce this risk, and provide a forum for considering various stakeholder concerns.

The establishment of the NSHF may be hampered without an active champion with the necessary connections and influence to promote and sustain interest in the establishment of the Facility until it gains a momentum of its own. Securing start up funding may also be at risk without the dedicated attention of this champion or champions.

This risk can be mitigated by ensuring that start up financing is sourced quickly, to enable a project manager to be appointed to act as, or support this champion (s). The optimal outcome would be to incubate the NSHF in an institution which is itself incentivised to ensure the successful establishment of the NSHF.

Related to this is the risk of the NSHF being established in a theoretical vacuum, and developing processes which are out of sync with the reality of housing development and financing. The concept of a Developer Working Group is identified as a way of mitigating this risk, ensuring that large low income housing project developers are brought into the establishment process early on which is a requirement of the GS.

7.2. CDM PROCESS RISKS

The CDM is up and running, with over 1,000 projects currently registered to generate carbon credits with the United Nations Executive Board[74]. Of these, a number have progressed throughout the project cycle, and are having credits issued to them on a quarterly or annual basis.

Whilst bottlenecks and delays are still a reality within the process, the risks are by now far more easily measured and quantified, and a suite of risk management financial and other instruments have emerged to support project developers. Programmatic CDM, however, does present a higher risk level than conventional CDM projects. A programmatic CDM project is currently under validation with the Designated Operational Entity (DOE) DNV, but none have yet been registered. The lack of successful precedent presents a risk which will decline as programmes are accepted and start to generate credits over time.

The risk of the being amongst the first to test a new form of mechanism is mitigated due to the close fit between the proposed low income housing CDM program and the reasons why programmatic CDM was designed by the Executive Board. The main purposes of programmatic CDM are firstly to incentivise

[74] www.unfccc.int

policy implementation, and secondly to offer structural procedures and income for sectors which struggle to receive carbon finance under conventional CDM[75]. The inclusion of sustainable energy interventions in low income housing is recommended under the technical appendix to the most recent version of the housing code. For reasons related to financing, these have remained as recommendations, and have not been made mandatory. There are very few instances of low income housing projects in the CDM in a project form, with size barriers a real disincentive.

Some additional specific risks related to the CDM are detailed below.

7.2.1. DESIGNATED OPERATIONAL ENTITY RISK

The major risk to programmatic CDM is DOEs, who under the current programmatic CDM rules are liable to replace from the market the credits from any projects included in the programme erroneously. Some DOEs have identified this as being above their risk threshold, but given that DNV currently has a programme under validation, it appears that this is not insurmountable.

A second issue which may present a risk to validation is that relating to the current slow passage of projects through the DOEs, given the high demand for validation and verification services. This risk can be mitigated through careful planning, securing the services of a DOE early on, and moving as fast as possible to validation. The innovative elements of the low income housing programme may also attract DOEs wishing to stay abreast of new developments within the CDM.

7.2.2. SEVEN YEAR BASELINE REVISIONS

The programme is anticipated to request a seven year crediting period, renewable four times. This is necessary to allow the carbon finance to provide sufficient incentive for the application of upfront finance for the interventions to ensure the inclusion of these at scale. There is a risk of the baseline being revised downward in terms of carbon emissions at each baseline renewal point, resulting in the programme being able to claim fewer credits than originally calculated. However, given current energy sector planning in South Africa this is not considered a high risk, and credit volumes are relatively safeguarded at least over the first 14 years of the programme.

7.2.3. CDM METHODOLOGY RISK

[75] Christiana Figueres, ex CDM Executive Board Member, Presentation at the 2008 Cologne Carbon Expo

The carbon credit volumes in the programme are attributed to the suppressed demand methodological approach. This approach has been proved successfully in the Kuyasa Project, which uses the CDM small scale rules[76]. The proposed programme will use large scale methodologies, requiring the suppressed demand approach to be proved in the large scale form.

This is not anticipated to be present a significant risk due to a number of factors. The suppressed demand approach is independent of the small / large scale division, and has been accepted in a small scale project. There is strong support within the United Nations CDM Methodologies Panel for the suppressed demand approach, and this is augmented by political support within climate circles internationally for the CDM to scale up and deliver on its second objective of contributing to the sustainable development of the host country.

The programmatic CDM rules currently only allow one methodology per programme. The proposed programme will require at least two methodologies (solar water heaters and thermal efficiency), with the potential of additional methodologies to incorporate other interventions such as lighting or appliances in the future. An approach will be attempted to register the sustainable energy house as the technology, and thereby combine a number of methodologies into one Programme of Activities. If this is unsuccessful, it may result in some delay and additional cost as a number of Programmes of Activities are registered, managed by the same co-ordinating entity, the NSHF. The methodology developer[77] describes the solar water heating methodology as being at low risk of approval (this methodology has already undergone one round of assessment by the methodologies panel). The thermal efficiency methodology is higher risk, but the realisation of this risk is more likely to be delays in approval than approval failure.

Methodological risk has been mitigated against in the phased design of the activities of the NSHF. Work will only commence on the second phase of activities once the methodologies have been approved.

[76] DNV validated the Kuyasa project, and may therefore present a lower risk choice to validate a programme based on a suppressed demand methodology, given that they are familiar with, and have accepted this approach previously.

[77] Steve Thorne, SouthSouthNorth, Personal Communication, May 2008

7.3. UNDERLYING PROJECT RISKS

Arguably, one of the benefits of carbon finance to development oriented projects is that the finance is only received if technologies or behaviour changes are sustained, thereby necessitating the continuation of the project or programme. This also presents a risk should the interventions fail, or technologies be removed. Similarly, whilst the development costs of the CDM programme and the NSHF are fixed upfront, carbon revenues only accrue to the programme as each house incorporates the sustainable energy interventions.

Therefore all factors which are risks to the successful inclusion of sustainable energy interventions in low income housing projects across South Africa also present risks to the success of the NSHF and CDM programme. It is beyond the scope of this business plan to consider all such risks, which include sourcing of the technologies at scale, implementation expertise, technological receptivity on behalf of the communities, ensuring solar water heaters remain on houses, and identifying appropriate versions of the technologies for the six different climatic zones experienced in the country. These are not insubstantial, but with appropriate support and incentivisation are likely to be surmountable, and in and of themselves present the opportunity of significant benefits to the country. Using large scale procurement of sustainable energy technologies could enable the development of a strong local manufacturing sector, and new source of economic competitive advantage for the country as a whole, with job creation potential.

New housing delivery is also a risk to the scale of the project. The slower the delivery rate, the lower the total volume of carbon credits and therefore carbon finance return to the programme. However, given the prioritisation on housing delivery within South Africa at the moment this is not considered to present a high risk in the medium term.

7.4. CARBON MARKET RISKS

The longevity of the carbon market, and the recognition of credits developed under CDM programmes is a key risk to the low income housing sustainable energy programme, especially given the sensitivity of programme revenue to the carbon price.

At the time of writing, there is only guaranteed carbon market recognition of CDM credits until the end of 2012, when the First Commitment Period of the Kyoto Protocol comes to an end. However, the majority of carbon market players are confident that the CDM will be recognised in the post 2012 regime in some form. Of all carbon project types, GS CDM is held to be the type with the lowest risk attached. A number of buyers are already willing to contract forward carbon credits into this period.

Amongst policy makers and international thought leaders on international climate change mitigation, there is a recognition of the need to scale up mitigation activities as a priority. The mechanisms for this currently under discussion include programmatic, sectoral or policy CDM, and sustainable development policies and measures (SD-PAMS). A low income housing programme of the nature envisaged in this business plan would equally receive recognition as an SD-PAM, attracting international climate mitigation in that form. Further clarity on this is anticipated after the 2009 Copenhagen Conference of the Parties to the Kyoto Protocol.

Whilst carbon market prices for GS CDM credits are upwards of €12 at the time of writing[78], future carbon prices are dependent on numerous factors, not least of which is the international climate change policy environment post 2012. This is difficult to predict, but there seems to be a level of consensus around the use of market mechanisms to tackle international greenhouse gas emissions. Stern discusses carbon prices or costs in the region of between $30 to €30 per tonne of CO2 equivalent[79], supporting the carbon price assumptions used in this business plan, and justifying the investment to capture this value.

The development of a low income housing sustainable development programme as a GS CDM programme mitigates the risk of the carbon credits not being recognised post 2012, as these would present top quality, government endorsed credits, and would therefore receive recognition in the policy negotiation process. The GS CDM label also mitigates against price risk.

A second mitigation measure would be to forward sell a portion of the credits to a purchaser willing to commit to post 2012 sales, or to secure a guarantee to purchase post 2012 credits from a credible counterparty, with the inclusion of a price floor. Contracting with a counterparty which has objectives beyond the carbon credits may facilitate the inclusion of such a guarantee. For example, an Annex One government may wish to support a market for the export of technologies, or achieve aid objectives.

[78] Dependent on the type of sale, nature of counterparties and other transaction specific aspects.

[79] Stern, Ely Lecture, January 2008

Table 8: Overview of Risks to the success of the NSHF

Risk	Level	Mitigation
Risks to the Establishment of the NSHF		
Players in this space may prefer a decentralised approach	Medium	-Establish quickly, effectively -Prioritise leveraging subsidies -Utilise financial benefits of scale -Consult stakeholders
No active champion or funding to establish NSHF and retain momentum	High	-Prioritise initial funding -Incubate NSHF in incentivised institution
NSHF established in theoretical vacuum	Low	-Concept of Developer Working Group
Risks to the Registration of the CDM Programme		
Lack of successful programmatic precedent	Medium (time delay)	-Alignment of low income housing programme with CDM objectives -Political support within EB and without
DOE legal risk and bottleneck	Low (time delay)	-Use of DOEs which are moving ahead with

		validating Programmes of Activities -Moving quickly, good planning -Political support for programme
7 year baseline revision	Low	-First 14 years fairly guaranteed
Suppressed demand approach and meth risk	Medium and Low	-Methpanel support -Kuyasa precedent -Phased approach to NSHF start up
Underlying Project Risks		
Include: sourcing technologies at scale, implementation expertise, technological receptivity on behalf of the communities, ensuring solar water implementation expertise, technological receptivity on behalf of the communities, ensuring solar water heaters remain on houses, and identifying appropriate versions of the technologies for the different climatic zones experienced in the country; pace of housing delivery	Medium (mostly regarding time delays)	-Incentivisation of NSHF -Sufficient complementary financing to make attractive

Carbon market risks		
Recognition of credits post 2012	Low	-GS Credits -CDM government recognised -similarity of programmatic with SD PAM
CER price risk	Low	-GS premium -Forward sale or guarantee

8. INCUBATING AND ESTABLISHING THE NSHF

This section outlines what is required to establish the NSHF, including details of activities, timeframes, expertise, staffing and budgets. The information in this section is drawn from, and summarised in the spreadsheet included in Appendix Six. The SSN proposal for methodology development, submitted in May 2008 to SANERI and the DBSA, has been considered in arriving at the costing, and the two are generally aligned.

Establishing the NSHF involves two streams of activities. The first is the development of the CDM programme, and its registration with the United Nations CDM Executive Board. The second stream is the establishing of the NSHF as an entity, together with systems and processes which will enable it to manage the CDM programme, and other potential financial sources.

The activities associated with the two streams are grouped into three phases. Phase one is termed 'Proving the Concept'. During this phase the most significant risks associated with the CDM programme and the functioning of the NSHF will be resolved, thereby limiting the total funds at risk. Phase two is the 'Full Scale Start Up', and involves taking the CDM programme to registration, staffing the NSHF, and setting in place the contractual and systems elements to enable the NSHF to function.

Phase three provides for the ongoing operational phase of the NSHF.

8.1. PHASE ONE: PROVING THE CONCEPT

The table below outlines the activities of the first phase, together with an indicative timeframe. The outputs of this phase include:

The establishment of a Developer Working Group (DWG), of interested housing project developers who wish to pursue the CDM for the financing of sustainable energy interventions in low income housing developments. It is envisaged that these developers will be at various stages in the CDM process, some pursuing the registration of projects independent of the programme. This will not impact the programme, and to as large an extent possible an attempt should be made to incorporate projects into the programme without imposing additional restrictions or delays on projects. The DWG will provide important pilot data

and modelling opportunities, and will provide a project developer perspective. A number of projects exist which could be considered for involvement in the DWG[80].

- A minimum of two programmatic methodologies approved by the United Nations CDM Executive Board
- A Gold Standard CDM Programme of Activities Project Idea Note
- A letter of no objection to the CDM programme secured from the South African Designated National Authority
- A feasibility assessment of the programme, covering technology, process and financial feasibility
- A proposed financing plan for the NSHF, if not already concluded

These outputs are held to reduce key risks associated with operational acceptability to project developers, DNA approval, carbon credit volume (methodologies), and feasibility. If positive, these outputs should secure investment for the second phase.

This first phase is anticipated to take a maximum of 15 months, depending on how quickly the programmatic methodologies can be approved and developed. It may be much shorter, and phase two can be started in the interim, should financing be sourced.

[80] The Drafting Group members are involved in projects, together with a number of others under early stage consideration. See Appendix Two for current pilots.

Table 9: Description and Timeframe of Phase One Activities

	Phase 1: Proving the Concept (Months 1-15)	YEAR ONE												YEAR TWO		
	Activities															
1	Identify pilot projects and establish a mutually beneficial working relationship with these. Pilot projects are required to provide input into the activities in both the CDM and institutional stream. Project developers to form a Developer Working Group (DWG) to discuss and think through aspects of the NSHF as it evolves. Pilot projects agree to pursue the NSHF concept with the intention of becoming the first CPAs to register under the programme.															
2	2x Programmatic methodologies (SWH and thermal efficiencies) developed and approved by UN CDM methpanel.															
3	Understand requirements for achieving GS accreditation. Embark on stakeholder consultations. Incorporate GS elements into CDM programme PIN.															
4	GS CDM-PoA- feasibility / PIN finalised.															
5	DNA letter of no objection achieved for PoA.															

	Phase 1: Proving the Concept (Months 1-15)	YEAR ONE												YEAR TWO		
	Activities															
6	Consider potential suite of initial technologies to be incorporated. Consider pilot project data, and interaction with CDM process.															
7	Assess model options for including CPAs in programme, covering: CPA project development, monitoring and verification, financing and contracting, interactive software. Include DWG workshop.															
8	Project feasibility assessment: financial, technical, operational.															
9	Present findings to Drafting Group for validation and decision to proceed.															

The budget for phase one is shown below, totalling R2.3 million. Potential funding sources for specific elements of this phase already identified include:

- SANERI and / or the DBSA for the programmatic methodologies
- Project developers for the DWG activities

Gold Standard carbon credit purchasers for the GS elements of the design, and / or methodology and PIN development costs and stakeholder consultations.

Table 10: Phase One Budget

	Phase 1: Proving the Concept (Months 1-15)	**Disbursements (in Rands)**	**Expenses**
	Activities		
1	Identify pilot projects and establish a mutually beneficial working relationship with these. Pilot projects are required to provide input into the activities in both the CDM and institutional stream. Project developers to form a Developer Working Group (DWG) to discuss and think through aspects of the NSHF as it develops. Pilot projects agree to pursue the NSHF concept with the intention of becoming the first CPAs to register under the programme.		100,000
2	2x Programmatic methodologies (SWH and thermal efficiencies) developed and approved by UN CDM methpanel.	1,232,000	
3	Understand requirements for achieving GS accreditation. Embark on stakeholder consultations. Incorporate GS elements into CDM programme PIN.		
4	GS CDM-PoA- feasibility / PIN finalised.	88,000	

5	DNA letter of no objection achieved for PoA.		
6	Consider potential suite of initial technologies to be incorporated. Consider pilot project data, and interaction with CDM process.	50,000	
7	Assess model options for including CPAs in programme, covering: CPA project development, monitoring and verification, financing and contracting, interactive software. Include DWG workshop.	50,000	
8	Project feasibility assessment: financial, technical, operational.	100,000	
9	Present findings to Drafting Group for validation and decision to proceed.		
	Part time Project manager and researcher (Drafting Group support) (outsourcing to sub-contractors).	440,000	200,000
		1,960,000	300,000
Phase sub-total			**2,260,000**

8.2. PHASE TWO: FULL SCALE START UP

The table below outlines the activities associated with the second implementation phase, the full scale start up. Outputs from this phase include:

- A validated, registered Gold Standard CDM programme of activities
- Procedures, software, contracting and documentation for the incremental inclusion of projects under the programme
- Financial procedures in place for the operation of the NSHF and disbursement of carbon finance to project developers
- NSHF fully enabled to trade programme carbon credits on behalf of project developers
- Carbon credit verifier contracted
- Once phase two is complete, the NSHF will be open for business. It is anticipated that this phase will take a year from the approval of the methodologies (in Phase 1). Note that some activities can proceed prior to the end of the first phase, if financing is available.

Table 11: Phase Two Activities and Timeframe

	Phase 2: Full scale start up (Months 4 – 29)	YEAR ONE											YEAR TWO											YEAR THREE					
	Activities																												
1	Develop GS CDM-PoA-DD																												
2	Complete one CDM-CPA-DD for submission with the CDM-PoA-DD for validation																												
3	Develop GS CDM-CPA-DD template																												
4	Gold Standard project development activities of CPAs: stakeholder consultations, sustainability assessments																												
5	Secure CDM PoA approval from the DNA																												
6	Validate PoA and pilot CPA (s)																												
7	Gold Standard validation																												

8	Register PoA with UN CDM Executive Board																						
9	Register PoA under the Gold Standard																						
10	Develop NSHF eligibility criteria and assessment procedures for homeowner involvement and job creation (based on size, structure, income levels). Through a workshop approach with experts																						
11	Develop operational financial model identifying basis for financial disbursement to project developers. (i.e. loan, lease, capital financing etc.)																						
12	Update and confirm NSHF financial model to check for feasibility																						
13	Confirm the final list of eligible technologies																						
14	Establish the financing arrangements for the operation of the Facility and procedures for the ongoing management of the revenue flows. Ensure appropriate risk mitigation procedures in place																						

15	Confirm the mandate for sale of credits with the Steering Group: will the Facility be able to take a principle position, are certain buyers prefered? Will purchasers be able to track to individual projects? Depending on the institutional home there may be restrictions. What is the legal position of individual homeowners?																									
16	Develop any contracting forms required to cede credit rights																									
17	Develop software for CPAs access to assess eligibility and benefit of going NSHF route. (Emissions and subsidy calculator). Develop software to manage the collection of monitoring and verification data. Ensure this data is in a compatible format for CDM access																									
18	Develop procedures for project registration under the programme (process through software, notification of relevant CDM authorities)																									
19	Contract PoA verifier																									

The budget for phase two is shown below, totalling R3.5 million. Foreign donor funding may be able to assist with the costs of the development of the CDM programme (in the region of R1.5 million), given its innovative nature and high social good component. Carbon purchasers may provide upfront financing for some of the remainder, although this may prove expensive if it involves a discount to the credit price over the long term.

Table 12: Phase Two Budget

	Phase 2: Full scale start up (Months 4 – 29)	Disbursements (in Rands)	Expenses
	Activities		
1	Develop GS CDM-PoA-DD	300,000	
2	Complete one CDM-CPA-DD for submission with the CDM-PoA-DD for validation	100,000	
3	Develop GS CDM-CPA-DD template	20,000	
4	Gold Standard project development activities of CPAs: stakeholder consultations, sustainability assessments		
5	Secure CDM PoA approval from the DNA		
6	Validate PoA and pilot CPA (s)	250,000	
7	Gold Standard validation	30,000	

8	Register PoA with UN CDM Executive Board	210,000	
9	Register PoA under the Gold Standard		
10	Develop NSHF eligibility criteria and assessment procedures for homeowner involvement and job creation (based on size, structure, income levels). Through a workshop approach with experts	100,000	20,000
11	Develop operational financial model identifying basis for financial disbursement to project developers. (Ie loan, lease, capital financing etc.)	30,000	
12	Update and confirm NSHF financial model to check for feasibility	30,000	
13	Confirm the final list of eligible technologies	50,000	
14	Establish the financing arrangements for the operation of the Facility and procedures for the ongoing management of the revenue flows. Ensure appropriate risk mitigation procedures in place	100,000	20,000
15	Confirm the mandate for sale of credits with the Drafting Group: will the Facility be able to take a principle position, are certain buyers prefered? Will purchasers be able to track to individual projects? Depending on the institutional home there may be restrictions. What is the legal position of individual homeowners?	100,000	

16	Develop any contracting forms required to cede credit rights.	30,000	
17	Develop software for CPAs access to assess eligibility and benefit of going NSHF route. (Emissions and subsidy calculator). Develop software to manage the collection of monitoring and verification data. Ensure this data is in a compatible format for CDM access	400,000	
18	Develop procedures for project registration under the programme (process through software, notification of relevant CDM authorities)		
19	Contract PoA verifier		
	Project manager, legal and financial project assistant (senior), junior project assistant, administrator. (Drafting Group support) (outsourcing to sub-contractors)	1,428,000	250,000
		3,178,000	290,000
	Phase sub-total		**3,468,000**

8.3. PHASE THREE: OPERATION

Activities required to enable operation of the NSHF are detailed in the table below, and are anticipated to cost in the region of R2.7million per annum. This has been shown in the prior investment analysis section to be insignificant compared to the carbon revenue returns.

Table 13: Phase Three Activities and Budget

	Phase 3: Operation	Disbursements (in Rands)	Expenses
	Activities		
1	Manage monitoring and certification of emissions reduction data.		100,000
2	Screen CPAs for eligibility to the programme. Manage CPA development and inclusion.		100,000
3	Maintain methodologies and programme from CDM perspective (new rules, opportunities, queries).		
4	Achieve optimal carbon revenues, manage contracts, manage carbon portfolio.		
5	Manage monitoring and submission of CDM data.		40,000

6	Manage the disbursement of funding to project developers		
7	Once every 7 years prepare a revised CDM-PoA-DD and CDM-CPA-DD.	28,571	
8	Prepare revised CDM-CPA-DDs as they expire after seven years.		
	Senior finance / legal carbon specialist, project manager, junior project assistant (with experience), 2x administrators.	2,400,000	15,000
		2,428,571	255,000
	Phase sub-total		**2,683,571**

8.4. SKILLS AND EXPERTISE

The NSHF team will grow in size and expertise over each of the three phases. The Drafting Group is anticipated to guide the NSHF's implementation, and preside over policy decisions. This governance role may evolve depending on the nature of the anchor investor in NSHF. As the NSHF evolves, it will rely less on external contractors, and will retain most of its skills requirements in-house.

8.4.1. IN-HOUSE SKILLS

The NSHF skills requirements over all three phases is depicted in the table below.

Table 14: NSHF Skills Requirements

Phase One	Phase Two	Phase Three
(Part-time) Project manager with relevant background	(1x) Project manager (with relevant background)	(1x) Project manager (with relevant background)
(Part-time) Researcher		
	(1x) Senior legal / financial / carbon trading specialist	(1x) Senior legal / financial / carbon trading specialist
	(1x) Junior project assistant	(1x) Junior project assistant + experience
	(1x) Adminstrator	(2x) Adminstrator
		(2x) Senior energy technical specialist

8.4.2. OUTSOURCED SKILLS

- SouthSouthNorth is anticipated to play a major role in the methodology development, given their expertise in the suppressed demand methodology and experience in housing CDM in South

Africa[81]. Energy modelling skills will be required for the methodology and Programme of Activities Design Document, and the required skills are available within the country. Technical CDM expertise will be required in the first two phases, after which it is envisaged that these skills will be transferred in-house.

- A software developer will be required to design the online programme interface, and to maintain this software over the lifetime of the programme.

- Additional specialist legal assistance will be required, particularly for drafting the contract templates between the project developers and the NSHF, and for the carbon contracts (Emission Reduction Purchase Agreements).

- The South African Gold Standard partners may be required to assist with the Gold Standard elements of the programme design.

- Financial modelling, technical feasibility studies will require external review in the first two phases.

[81] See Appendix Three of this proposal

9. CONSIDERING FINANCING OPTIONS AND THE NSHF INSTITUTIONAL HOME

Determining a financial structure for the NSHF, and identifying its most appropriate institutional home are interrelated challenges. The institutional location for the NSHF, whether in a stand-alone not-for-profit, or within a housing institution such as the newly established Housing Agency, is not a trivial matter to ensuring the Facility's success, particularly considering issues such as visibility, flexibility, efficiency, accountability and governance. How the establishment of the NSHF is financed, together with the financing of the shortfall of incremental capital costs of the sustainable energy interventions in low income housing may determine the 'ownership' of the Facility, and its obligations.

9.1. INSTITUTIONAL CONSIDERATIONS

This business plan describes an investment opportunity with a long term (ten year plus) view, which is intimately connected with public service delivery, management of the energy crisis, and a reduction in South Africa's greenhouse gas emissions. The business plan quantifies the value of one of these 'externalities', greenhouse gas mitigation, given that the price of carbon is now being internalised through the CDM and future greenhouse gas regulation. A similar analysis could be undertaken for energy savings, avoided investment in electricity generation capacity, avoided expenditure on primary healthcare and employment creation through the corresponding additional tax revenues, with the returns to a low income housing sustainable energy programme likely to far exceed its costs. However, at this point, the analysis is left at the point that financing additional to that related to carbon finance is required in order to realise the opportunity, particularly in the early years of the programme. This financing could be sourced from a number of possible sources, not least of which is the public sector. This further informs the type of institutional home most appropriate for the NSHF. There may be opportunities for profit generation and therefore a private sector approach which should not be disregarded, particularly when issues of the capacity and speed required to establish the programme are considered.

At a minimum, a government endorsement of the NSHF is considered to be important to reduce political risk, and assist the Facility in raising loan finance.

A number of housing projects are considering the use of the CDM currently. These include those being developed by large housing project developers, financial institutions, municipalities and companies which may have access to sufficient scale to justify the establishment of a large scale CDM project or

programme, using the methodologies currently under development[82]. Any of these players may be interested in investing in the NSHF, or a similar facility. The basis for carbon credit ownership may need to be revised in order to meet the needs of these players should they assist in the financing. Financial institutions may have an important role to play in loan finance or guarantees for the incremental capital costs of the interventions.

In order for the carbon finance opportunity to be realised, sustainable energy interventions must be included in low income houses at scale. The incentivising and enabling role of the NSHF must therefore operate effectively, and it is important that the NSHF is well connected with the current procedures of low income housing financing and delivery.

The home of the NSHF would need to have, or be empowered with, some or all of the following characteristics:

- The ability to manage a diversity of funds and revenue inflows
- Easily accessibility to project developers (ideally able to work closely with other sources of housing finance, e.g. National Urban Reconstruction and Housing Agency (NURCHA), the National Housing Finance Corporation (NHFC))
- Knowledge of housing regulations pertinent to financing, including tax issues
- Ability to take a principle position in carbon sales
- Ability to manage the development of baselines, baseline verifiers and ESCOs
- Ability to promote the Facility, and run an awareness campaign to increase engagement with the Facility by project developers
- Ability to ensure that sectoral role players such as the provincial housing departments, housing developers and housing sections of Municipalities and similar structures in the DME assist in marketing the services of the NSHF

[82] CDM methodologies, once approved, are made publicly available on the United Nations Framework Convention on Climate Change website, for use by project developers in Project Design Documents.

- To be relatively unconstrained by bureaucratic procedures in order to expedite the inclusion of sustainable energy interventions in low income housing

It is highly recommended that further, dedicated attention be paid to the issue of the institutional home of the NSHF. A researcher from the Tyndall Centre in the United Kingdom has offered his services to undertake a study of this, which would inform the process of identifying an appropriate institutional home[83].

9.2. FINANCING THE NSHF

The following financial considerations are described as a point of departure. This is not a comprehensive description, but is intended to provide a basis for further discussion. The optimal structure is likely to be a mixture of many financing sources, given public / private interests and characteristics of the opportunity, carbon market and international political interest in the concept, and multiple local stakeholders. If funding is sourced piecemeal, for specific activities in the first two phases, it will be important to identify and fund a project manager to start to co-ordinate the various building blocks, and give cohesion to the work activities.

9.2.1. EQUITY INVESTMENT

An equity investment in the establishment costs of the NSHF is anticipated to be attractive to those interested in either the carbon revenue flows, or the sustainable development benefits of the programme, or the avoidance of energy infrastructure costs.

A carbon purchaser may invest in the NSHF to secure a stream of GS carbon credits from the programme. It is likely that the GS status of the programme, the innovativeness of the suppressed demand methodology, and the sustainable development 'story' of the housing developments will be attractive to purchasers, over and above the value of the credits as Kyoto compliance instruments. Purchasers may be private companies, carbon funds, intermediaries retailing offset credits or developed country governments wishing to invest in high quality compliance credits. Up-front development finance from purchasers may be specified for individual items such as the Programme of Activities PDD, validation or registration costs. This type of financing may require a right of first refusal over the carbon credits, potentially at a pre-determined price.

[83] Esteve Corbera, http://www.tyndall.ac.uk/, e.corbera@uea.ac.uk

The South African government may wish to invest in the establishment of the NSHF to gain access to the carbon revenue stream to finance the inclusion of sustainable energy interventions in the country's low income housing stock over the long term.

A consortium of local financial institutions with obligations to invest in low income housing under the banking Charter[84] may wish to gain access to the carbon revenues to assist in the delivery of their obligations. The four large South African banks have already committed to spread the risk of low income lending amongst themselves, and have a target of R42 billion in lending to the affordable housing sector to meet[85].

International organisations and donor countries interested in the promotion of the Gold Standard CDM, or the suppressed demand methodology, or programmatic CDM applied to sectors with high social returns may fund a portion of the initial start up costs of the NSHF.

9.2.2. LOAN FINANCE OPPORTUNITIES

A number of international financial institutions, such as the World Bank and the International Finance Corporation will lend against carbon credits as collateral. This would be one way of financing the establishment costs, and may be the least expensive option given the need of a financier to understand the specific CDM related risks.

Local commercial banks may also wish to become involved as lenders in alignment with their banking Charter obligations. There is also the potential to lend upstream to technology suppliers, gaining exposure to a manufacturing sector with high growth potential in the country.

9.2.3. OTHER FINANCIAL COMMITMENTS

Guarantees offered by the South African government, development banks, or commitments to purchase the credits at a certain price will assist in lowering the risk profile of the programme, thereby increasing its ability to attract low cost financing.

---

[84] Signed in 2005 between the South African housing minister and the CEOs of the four big South African banks, committing the banks to deepening their lending for housing purposes and to transfer housing finance products and services available to the poor.

[85] Maya, 1995:75 in Radikeledi, An analysis of the South African government low cost housing provision strategy, 2005

Public sector institutions such as the Development Banks of Southern Africa and the National Housing Finance Corporation could be approached to provide in-kind support for the first phase of the NSHF activities, such as office space and secretarial support.

10. NSHF COSTS VS BENEFITS

This final section considers, in broad terms, the costs versus benefits of investing in the establishment of the NSHF.

10.1. COSTS

- Upfront investment costs for the NSHF in the region of R8.4m
- The incremental capital costs of the sustainable energy interventions, in the region of R17,600 per Greenfield House. If 300,000 houses are constructed per annum, this is a potential annual net present value cost of R5.2 billion.
- Investment in manufacturing capacity, employment creation and skills development to support the programme

10.2. BENEFITS

- Annual greenhouse gas emission reductions escalating from one to 68 million tonnes of CO2e over the programme lifetime.
- 74 million Gold Standard CDM carbon credits (cumulatively) made available to the carbon market over the first ten years of the programme.
- Substantial future energy demand removed from the South African economy, freeing up much needed capacity on the grid, and buying time needed to install additional capacity.
- Savings to home-owners of up to R3,600 per annum[86], over R1 billion per annum in the first year of the programme, rising to R5.7 billion per annum in the tenth year of the programme (from Greenfield Housing).

[86] Carl Wesselink, current monthly spend on energy by Kuyasa beneficiaries, Personal Communication, May 2008

- The programme leverages the application of existing subsidies to reduce energy demand and alleviate poverty, enabling early action at a large scale, and leading policy in this area.

- The programme will be an international first, and a leading example of combining emission reductions with sustainable development which speaks directly to the objectives of the CDM and the Kyoto Protocol.

- The programme will provide demonstrated action for South African climate policy negotiators, potentially assisting in negotiating a favourable post 2012 position for the country.

- Sustainable energy interventions in low income housing contributes to the creation of sustainable communities, addressing the government's priority of service delivery and political mandate.

- Access to international finance for a local development necessity, contributing to fiscal sustainability.

- Reduction of primary healthcare costs to the fiscus as low income housing beneficiaries have reduced exposure to the conditions favourable to respiratory disease.

- Employment creation and skills development, as local plumbers, electricians and builders will learn to install and maintain renewable and efficient technologies (not yet quantified), and a contribution to human and institutional capacity (including empowerment, education, involvement, gender).

11. CONCLUSION AND RECOMMENDATIONS

The inclusion of sustainable energy interventions in new and existing low income housing in South Africa offers significant returns to the national economy, low income homeowners and the international carbon market.

The national economy will benefit from:

- Current and future electricity and fuel savings in the context of a national supply crisis
- Avoiding the costs of building new energy generation capacity
- Avoiding the costs of additional energy related greenhouse gas emissions, and ensuring a low cost contribution to the identified target for the country of 40% reduction in emissions by 2050
- Energy and other poverty alleviation in the low income housing sector, currently a significant source of unrest and political instability
- Implementation of national policies relating to the provision of sustainable housing, energy efficiency and renewable energy
- Health (avoidance of respiratory disease), safety (avoidance of fires) and employment creation
- Stimulation of demand for sustainable energy technologies, and therefore a local manufacturing sector and source of national competitive advantage
- Access to foreign exchange and international investment through carbon finance

Low income homeowners will benefit from energy service provision, poverty alleviation, health and employment benefits, and reduced energy costs into the future. The *international carbon market* will realise a substantial volume of Gold Standard CDM carbon credits over a long period, easing the supply constraints relating to quality carbon credits

The National Sustainable Housing Facility (NSHF) is identified and detailed in this Business Plan as a mechanism to access financing for the incremental cost of sustainable energy interventions in existing and new low income housing projects throughout South Africa, in support of existing national housing and

energy policy objectives. Operating on a not-for-profit basis, the Facility will pass carbon revenues (net of administration costs) directly to housing project developers, potentially in the form of upfront financing, in return for the inclusion of sustainable energy interventions in housing developments. Whilst carbon finance is the catalyst for the establishment of the Facility, the NSHF's administrative capacity and infrastructure is designed to complement carbon financing with the necessary fast track application of additional appropriate existing and future domestic financing sources to realise the programme's objectives.

The NSHF Drafting Group has agreed to source finance for the institutional and technical development of this programme[87]. The following actions are recommended for the Drafting Group to continue progress on securing this opportunity:

1) Achieve political endorsement of the NSHF

2) Identify the NSHF's appropriate institutional home

3) Confirm funding for the establishment of the NSHF

4) Develop and fund an Action Plan to leverage up-front financing for the incremental capital costs of the sustainable energy interventions (through inter alia allocation of fiscal budgets, loan finance, developer underwriting, Eskom guarantees, international carbon investment, donor investment, development finance assistance etc). This work falls outside the scope of activities identified for the establishment of the NSHF in this Business Plan and therefore requires separate funding and / or allocation of responsibilities

5) Secure funding for an ongoing secretariat function for the Drafting Group to enable the momentum and work of this valuable stakeholder forum to continue

[87] See action points from Drafting Group meeting 4 June 2008 in Appendix Seven

12. GLOSSARY

BBBEE	Broad Based Black Economic Empowerment
BEE	Black Economic Empowerment
BEG	Basic Energy Grant
CDM	Clean Development Mechanism
CEF	Central Energy Fund
CER	Certified Emission Reduction
COP	Conference of Parties
CoT	City of Tshwane
CPA	CDM Programme Activity
CTCC	Cape Town City Council
DBSA	Development Bank of South Africa
DEAT	Department of Environment and Tourism
DME	Department of Minerals and Energy
DNA	Designated National Authority
DNV	Det Norske Veritas

DOE	Designated Operational Entity
DoH	Department of Housing
DPLG	Department of Provincial and Local Government
DSM	Demand Side Management
DWG	Developer Working Group
EB	Executive Board
EBSST	Electricity Basic Services Support Tariff
EDC	Export Development Capital
EE	Energy Efficiency
EEA	Energy Efficiency Agency
ESCO	Energy Service Company
FBAE	Free Basic Alternative Energy Grant
FBE	Free Basic Electricity Grant
FSC	Financial Services Charter
GEF	Global Environment Fund
GS	Gold Standard

LTMS	Long Term Mitigation Scenario
M&V	Monitoring and Verification
MFIs	Microfinance Institutions
MFMA	Municipal Finance Management Act
NEEA	National Energy Efficiency Agency
NEF	National Electrification Fund
NERSA	National Energy Regulator of South Africa
NHFC	National Housing Finance Corporation
NMBM	Nelson Mandela Bay Municipality
NPV	Net Present Value
NSHF	National Sustainable Housing Facility
NURCHA	National Urban Reconstruction and Housing Agency
PDD	Project Design Document
PIN	Project Identification Note
PoA	Programme of Activities
PV	Photovoltaic

RDP	Reconstruction and Development Programme
RE	Renewable Energy
REEEP	Renewable Energy and Energy Efficiency Partnership
RET	Renewable Energy Technology
SANERI	South African National Energy Research Institute
SD-PAMS	Sustainable Development Policies and Measures
SEA	Sustainable Energy Africa
SMMEs	Small, Medium and Micro Enterprises
SRI	Socially Responsible Investment
SSN	SouthSouthNorth
SWH	Solar Water Heaters
TREC	Tradable Renewable Energy Certificate
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
VER	Voluntary Emission Reductions
VC	Venture Capital

13. APPENDICES

13.1. APPENDIX ONE: DETAILS ON DOH POLICY

13.1.1. HOUSING SUBSIDY GRANT

In a recent move to streamline the housing subsidy application process and promote the participation of the private sector in housing construction, the previously existing subsidy bands have been collapsed to allow households with a gross monthly income not exceeding R3,500 p/month to access a uniform subsidy amount[88]. A suite of subsidy schemes are available to qualifying households to the value of R38,984 (beneficiaries whose monthly income falls between R1,501 and R3,500 will be required to contribute R2,479 to the subsidy amount[89]). Grants are not paid in cash to beneficiaries but either to a seller of a house, or in new developments the grant is used to construct the house which is then transferred to the beneficiary.

In addition to those households earning below R3,500 p/month assistance has been made available to households earning between R3,500 – R7,500 p/month, in the form of an Affordable Housing Initiative between banks and the Department of Housing.

13.1.2. SUSTAINABLE ENERGY RECOMMENDATIONS IN THE HOUSING CODE

The following recommendations are outlined in the Technical and General Guidelines – Specified National Housing Programmes, V1 P3 (of the National Housing Code), 2007

[88] Department of Housing, Breaking New Ground, 2004

[89] Recipients of the Consolidation Subsidy receive benefits to the total value of R46,484 due to the inclusion of serviced stands (value R7,500) acquired under the previous dispensation.

Table 15: Summary of Sustainable Energy Recommendations and Cost Implications[90]:

Recommendation	Benefit	Cost	Responsibility
The longer axis of dwelling units should be orientated as near to East-West as possible, and the most window surface should be on the North side.	Energy Savings to Beneficiaries	No direct cost	DOH - Incentives Planners - Concept Developers- Implementation
North walls and roofs of new housing units must not be shaded by neighbouring buildings or landforms.	Energy Savings to Beneficiaries	No direct cost	DOH - Incentives Planners - Concept Developers- Implementation
Local climatic conditions such as prevailing winds should be considered when planning a housing development.	Energy Savings to Beneficiaries	Possible marginal Design costs	DOH - Incentives Planners - Concept Developers- Implementation
Housing units should be designed, so that the smallest area is exposed to the outside. In other words, units should be as close to square as possible, with rooms where people spend most of their waking hours located on the Northern side of the unit.	Energy Savings to Beneficiaries	No direct cost	DOH - Incentives Designers - Concept Developers- Implementation

[90] The recommendations focus on the product being delivered through the National Housing Programme, with emphasis on no-cost or very low-cost options. Recommended interventions are also limited to the individual housing sites and structures, as communal services are generally beyond the scope of the housing developers.

All housing units should be well insulated in order to ensure energy efficiency.	Significant Energy Savings to Beneficiaries	Cost of material and installation	DOH - Incentive Designers - Concept Contractors - Implementation
North-facing windows should be shaded in Summer and sunny in Winter.	Energy Savings to Beneficiaries	Additional building cost (overhang)	DOH - Incentive Designers - Concept Contractors- Implementation
Designers should ensure that housing is able to safely accommodate the use of fuels and appliances, and advise households on appropriate and safe fuel use.	Health benefits and reduced cost of fuel	None	DME - Incentives and Awareness

13.1.3. THERMAL EFFICIENCY (TECHNICAL GUIDELINES TO THE HOUSING CODE)

Designs for affordable housing must take cognisance of the need for the resultant dwellings to be thermally efficient.

The cost constraints imposed by the subsidy scheme make it difficult to meet this requirement. However, there are several principles that, if followed, will enhance the thermal efficiency of the dwelling at minimal cost. These are:

The longer axis of the dwelling should be orientated so that it runs as near east/west as possible

The dwelling should be compact in plan with the rooms that are used most and the major areas of glazing placed on the northern side of the building to allow solar heat to penetrate the glazing during the winter months

The roof overhang to the northern wall should be sufficient to shade the windows from midday summer sunshine

Windows facing east and west should be limited in number and confined in area to the minimum required for daylight and ventilation

13.2. APPENDIX TWO: PILOT SUSTAINABLE ENERGY LOW INCOME HOUSING PROJECTS IN SOUTH AFRICA

There are a number of pilot projects in South Africa at various stages of development and testing various technologies, in both the private and public sectors and for the range of low, medium and high income housing. A number are envisaging using carbon finance and potentially also DSM, but only the Kuyasa project has registered as a CDM project. There is significant interest in taking a programmatic approach from many of the project developers and financiers.

Some early learnings from these projects include:

- An emphasis on the importance of close stakeholder process to ensure that the technologies considered are the choice of the community (Stone House Project)

- That the appropriate technology specification is installed to minimise the risk of technology failure, which would lead to non-acceptance by the beneficiaries (SWH in Stone Houses)

- That sufficient provision is made for the maintenance of the interventions to ensure their continued working over the lifetime of the project. (Lwandle). The CDM addresses this in that the continued operation of the technologies is linked to the payment for carbon credits

- That it is easier to include these interventions in the construction phase, than to do so retrospectively (Randburg)

- That once off grant financing for these interventions is extremely difficult to manage (Kuyasa), and an ongoing financing mechanism is required

Work undertaken through the Project has attempted to introduce all these players to the concept of the NSHF and ensure that their concerns and intentions are considered. The intention of the Facility is to offer a service which is best done at scale than attempted individually. This model is therefore not envisaged to be in conflict with any of the work streams indicated above

A number of the pilot projects are described below.

13.2.1. STONE HOUSE PROJECT, MBEKWENI, WESTERN CAPE

The project set out to construct low-cost, energy efficient houses using recycled material and sweat equity in 766 erven in the Mbekweni village, situated between Paarl and Wellington in the Western Cape. It was initiated by the Provincial Government in 2005 and was allocated housing subsidy funds to the value of R26 600 per house. Aside from sweat equity, these were the only funds available for the project. The reality was that only 13 of the houses were completed, the last being in 2007 due mainly to beneficiaries preferring the new RDP houses (40m2) over the stone houses. Difficulties in visualising the architectural plans led to disappointment upon house completion particularly with the small size of rooms. This was compounded by a lack of knowledge and experience of the concept and methods. Although Solar Water Heaters were promised, only 1 was installed unsuccessfully which resulted in the adoption of conventional geysers[91].

For more information contact:

Similo Pshali, Assistant Housing Co-ordinator, Drakenstein Municipality, similopshali@drakenstein.gov.za

13.2.2. LWANDLE SOLAR WATER HEATER PROJECT, SOMERSET WEST, WESTERN CAPE

The Lwandle SWH project is the largest SWH installation in low income housing to date, involving the installation of 305 SWHs (without electrical back-up). Financing was obtained through a low interest loan from the Development Bank of Southern Africa to the local authority with residents paying a fixed rate for hot water to service the loan (increased from an original R17.5 0 to R23 in 2003). Although the project was initially well received, a 2003 survey showed dissatisfaction with heating levels during winter months and a lack of maintenance of the systems[92].

13.2.3. HOUSING DEVELOPMENT, RANDBURG, GAUTENG

190 litre evacuated tube, non-electrical back-up SWH systems were included in a 52 two bedroomed unit housing development aimed at small, mid-income families. Implementation of this intervention at construction phase resulted in acceptable levels of additional bond repayments. Typical electricity savings per unit are expected to be 93 600kWh per year[93].

---

[91] Similo Pshali, Drakenstein Municipality, Personal Communication, April 2008

[92] Sustainable Energy Africa, How to Implement Renewable Energy and Energy Efficiency Options, 2007

[93] Sustainable Energy Africa, How to Implement Renewable Energy and Energy Efficiency Options, 2007

13.2.4. GRABOUW SUSTAINABLE DEVELOPMENT INITIATIVE

This project is undertaken by the Theewaterskloof Municipality as part of the DBSA's Sustainable Communities Programme which seeks to facilitate sustainable development at the community level through the identification and implementation of innovative approaches. It aims to create towns which meet basic human needs fairly, provide equitable economic growth opportunities, create a greater sense of community and ensure environmental integrity. Part of this project is the construction of low, middle and high-income housing, which would incorporate sustainable energy interventions in the form of orientation, insulated ceilings and walls as well as SWHs. The project is currently at community consultation and design stage but envisages building approximately 2,000 low-income and 1,000 middle to high units[94].

For more information please contact:Shane Chandaka, DBSA, preshanec@dbsa.org

13.2.5. ANGLO AMERICAN HOUSING PROJECT FOR MINEWORKERS

Anglo American is working with the Chamber of Mines on an initiative to include sustainable energy interventions in mining housing. Programmatic CDM is being considered, and a minimum of 15,000 Anglo American mining houses have been identified at the construction stage. The proposal is currently at the Chamber of Mines for consideration[95].

For more information please contact: Ciska Terblanche, Anglo America, cterblanche@anglotechnical.co.za

13.2.6. NELSON MANDELA BAY SOLAR WATER HEATER PROJECT, EASTERN CAPE

CEF Sustainability and Nelson Mandela Bay Municipality (NMBM) have collaborated to begin an innovative solar water heating program. CEF Sustainability will offer solar water heaters to the public and NMBM will include the monthly cost to the homeowners municipality account. This project will be financed by a number of partners in public and private sector[96].

---

[94] Shane Chandaka, DBSA, Personal Communication, April 2008

[95] Ciska Terblanche, Anglo American, Personal Communication, May 2008

[96] Carmen Armstrong, CEF Sustainability, Personal Communication, May 2008

For more information contact:

Carmen Armstrong, CEF Sustainability, carmena@cefsustainability.org.za

13.2.7. SWH PROJECT FOR LOW INCOME HOUSING GROUPS WITHIN THE CITY OF TSHWANE

The City of Tshwane is working, together with the NGO Sustainable Rural Developments and Livelihoods and Eskom, on a project to manufacture and install 300 SWHs (100 litre capacity with no electrical back-up) to an under-served community within the CoT metropolitan area. Financing of the project is through a combination of public and private sources as well as through a R500 contribution by beneficiaries. The SWHs will be manufactured locally[97].

For more information contact:

Ben Kriel, City of Tshwane, benkr@tshwane.gov.za

13.2.8. KUYASA CDM PROJECT, KHAYELITSHA

The Kuyasa CDM Project is a low-cost urban housing energy upgrade project in Khayelitsha, Cape Town. It is owned by the Cape Town City Council (CTCC) and was enabled through the development of the Cape Town Energy Strategy, a CTCC initiative.

The project involves the installation of the following sustainable energy interventions: solar water heaters (SWH), energy efficient lighting and insulated ceilings. The pilot phase of 10 houses has been completed with the remaining 2,300 house retrofits planned for implementation during 2008. The project has been financed through a once-off grant by the Department of Environment and Tourism (DEAT), CDM financing and a beneficiary contribution. Export Development Capital has underwritten the project and is implementing it on behalf of the CTCC[98].

[97] Ben Kriel, City of Tshwane, Personal Communication, May 2008

[98] Carl Wesselink, Export Development Capital, Personal Communication, May 2008

For more information please contact: Carl Wesselink, Export Development Capital, kuyasacdm@telkomsa.net

13.3. APPENDIX THREE: SSN PROGRAMMATIC METHODOLOGY DEVELOPMENT PROPOSAL

Please see accompanying word document

13.4. APPENDIX FOUR: UPDATES ON THE REEEP MODEL ASSUMPTIONS

Please see accompanying excel file for the updated REEEP model, entitled 'NSHF Individual House Cash Flow Final'

13.4.1. TECHNOLOGY COST ASSUMPTIONS

For the purposes of this Business Plan, an attempt was made to update the cost data and assumptions made for the REEEP Model. Little progress appears to have been made on cost information since the REEEP Model was finalised in 2007[99], and similar difficulties were experienced in accessing comparable data. The methodology employed was to collect a number of data points per intervention, and from these, a conservative, appropriate estimate used in the model, as indicated in Table 16. Each data point has been described qualitatively in the text below, and many are estimates. Given the indicative nature of the analysis, the reader is encouraged to look at trends, rather than focus on individual data points. It is emphasised that these are ballpark figures, aimed at highlighting trends rather than establishing specific costs or promoting particular technologies. In all cases, the principle of conservativeness was applied, particularly given the low level of comparative accuracy in the data. The work of getting to accurate figures, and understanding the most appropriate technologies from a cost perspective, remains to be undertaken, and should happen through the use of pilots.

Sensitivities have been explored through scenarios in the analysis, and the model can be updated to incorporate new data as it emerges and is refined. Of particular interest to the authors is the cost data arising from the implementation of the Kuyasa CDM Project, anticipated by June 2008.

The REEEP Model assumed a portion of community labour content for retrofits, with the remainder being included in the costs of the interventions. The updated figures conform to this assumption. All intervention figures are ex VAT.

[99] REEEP Project Report , 2006, Appendix 6. Model Mechanics, data and assumptions.

Table 16: Summary of Intervention Costs and Cost Ranges

Intervention	Cost	Range
Solar water heater	R6,000	R3,550 – R6,000
Insulated Ceilings	R2,500	R2,100 – R3,000
Insulated Materials	R8,000	R6,600 – R8,255
Roof Overhangs	R2,000	R788 – R3,615
Orientation, colour, shared walls	Zero	

13.4.2. SOLAR WATER HEATERS

Technology Costs

Solar water heater costs differ according to the technology and service level provided. In all instances, acceptable levels of energy service need to be balanced with the challenge of keeping costs contained.

System type: Integral systems involve the collection tank being separate from the solar panel, and are therefore less efficient. The close coupled system is more efficient, keeping water hotter for longer. This is more appropriate for domestic use. Evacuated tube technology is cheaper, but is not suitable for a frost or hard water area.

Pressure: Low pressure systems are less expensive than high pressure systems.

Water capacity: This ranges from 80 litres upwards. The City of Cape Town[100] estimates a minimum of 25 litres of hot water per person per day in low income households, therefore between 110 and 150 litres is deemed optimal for a low income home.

Electrical back-up: For reasons of affordability, no electricity backup is required for low income housing solar water heating. Debate exists around this, polarised by issues of affordability on the one hand, and adequate service provision on the other. In the Kuyasa Project, it was found that the households do not use this function and therefore the additional cost can be avoided. The provision of an electrical backup is not anticipated to affect the ability to claim carbon credits through the programmatic methodology which is under development.

Installation costs and guarantees: Some data points included installation, others excluded this cost. Existence of a guarantee varied, as did guarantee length.

Local vs imported: Whilst local is preferable for employment creation and domestic economy reasons, quality and affordability together with the capacity of the local industry to supply sufficient quantity need to be considered.

Data points:

(1) R6,000, 80 litre locally manufactured, low pressure system with no electricity backup. Includes installation and 6 months maintenance, retrofit fitting[101].

(2) R5,000, as per 1, greenfield fitting[102].

(3) R4,000[103], 90 litre, low pressure, evacuated tube system with no electricity backup. Includes installation and two year guarantee[104].

---

[100] City of Cape Town, Solar Water Heater By-Law, 2007

[101] DEAT, Sustainable Energy Strategy Western Cape, Draft Summary, May 2007. This cost was endorsed by Andrew Janisch from SEA.

[102] Andrew Janisch, SEA, Personal Communication, May 2008

[103] It is anticipated that the cost will be less than R4,000 per unit, awaiting final costs from Kuyasa CDM Project in June 2008.

(4) R4,200, 80 litre imported evacuated tube system with electrical backup. Installation not included.

(5) R5,500, 80 litre imported system with electrical backup. Installation not included[105].

(6) R5,200, 100 litre locally manufactured system[106].

(7) R3,550 to R4,880, 100 litre locally manufactured flat panel systems. Installation and timer not included[107].

Emission Reductions

Solar Water Heaters deliver 1.28 tonnes of emission reductions per annum in a Retrofit [108], and 2.1 tonnes in a Greenfield House[109].

13.4.3. INSULATED CEILINGS

Technology Costs

This intervention is intended solely for Retrofits, as all Greenfield Houses within 50km of the Southern Cape coastline have recently had this intervention included under the Southern Cape Condensation Fund. For reasons of conservativeness, ceilings are not modelled in the Greenfield House.

---

[104] Carl Wesselink, Kuyasa CDM Project, Personal Communication, March 2008

[105] Frank Spencer, Alt-E, Personal Communication, May 2008. These costs are direct from manufacturers and do not include any supplier mark-up.

[106] Ben Kriel, City of Tshwane, Personal Communication April 2008.

[107] Frank Spencer, Alt-E, Personal Communication, May 2008. This cost is for quantities of 500 and over and are direct from manufacturer, therefore not including any supplier mark-up. Concerns have been raised about the longevity and quality of these systems.

[108] Kuyasa Housing Project PDD, http://cdm.unfccc.int/UserManagement/FileStorage/FS_292989657

[109] Greg Austin, Personal Communication, 2006

Data points:

R2,800. This cost is estimated from the cost of R3,832 for a 40m2 house. No cost of maintenance was included due to the low likelihood of this having to take place[110].

R2,100. This cost was calculated on a 30m2 house based on a ceiling cost of R40 per m2 together with glass wool type insulation @ R30 per m2 [111]

R3,000 including installation for a 30m2 house, based on high quality polystyrene type board with excellent thermal qualities and solid mechanism for installation [112].

R2,700 Cost for 30m2 house based on ceiling cost of R60 per m2 including an estimation for labour, and a cost of R30 per m2 for glass wool type insulation including labour[113].

Emission Reductions

Insulated ceilings deliver 1.33 tonnes of emission reductions per annum[114].

13.4.4. INSULATED WALLS

Technology Costs

Note that only the cost of the material less the cost of conventional bricks is considered in the analysis. Given that the emissions reduction modelling was specific to the Texalite© material, which has high insulation properties, it has been difficult to update this figure. There may be local products with similar interventions, an example which has delivered good thermal insulation properties is Styrox. It is

[110] Johan Gerber, Nelson Mandela Bay Municipality, Personal Communication, April 2008

[111] Andrew Janisch, SEA, Personal Communication, May 2008

[112] Carl Wesselink, Export Development Capital, Personal Communication, May 2008

[113] Andrew Janisch, SEA, Personal Communication, May 2008.

[114] Kuyasa CDM Project PDD, http://cdm.unfccc.int/UserManagement/FileStorage/FS_292989657

anticipated that there are significant labour cost differentials between building a conventional block wall and using thermally efficient materials. These have not been considered.

Data points:

R8,255 Texalite© incremental costs[115].

R6,600 Styrox 2004 figure, less costs for a 90mm conventional block wall[116], based on a 75.9m2 wall area[117].

Emission Reductions

A number of technologies contribute simultaneously to thermal efficiency, and it is not easy to identify the contribution of each one individually. Based on modelling undertaken for the Westgate Project in Mitchells Plain[118]. The effect of the combination of the Greenfield House thermal efficiency interventions is 8.4 tonnes / annum[119].

13.4.5. ROOF OVERHANG

Data points:

R3,615[120]

[115] Agama Energy, Mitchell's Plain Medium-Income Thermal and Solar Water Heating Performance Modelling, 2006

[116] Alastair Simpson, ShevelSimpson Quantity Surveyors, May 2008

[117] Note that whilst 90mm is not an optimal wall thickness, the lowest specification has been used for reasons of conservativism of the calculation.

[118] Agama Energy, Mitchell's Plain Medium-Income Thermal and Solar Water Heating Performance Modelling, 2006

[119] Greg Austin, Personal Communication, 2006

[120] Agama Energy, Mitchell's Plain Medium-Income Thermal and Solar Water Heating Performance Modelling, 2006

R741 – R1,248 excluding labour (not much additional), Based on a 600mm overhang at a cost of between R95 to R160 per m2[121].

R788 excluding labour, when only including the overhang on the north facing roof of the building: Using a roofing cost of R210 per m2, with an overhang of 0.5m and assuming the width of the overhang is 7.5m (1/4 of the perimeter of a north facing 50m2 house)[122].

R1,638 (2) above, but considering a R210 roofing cost per m2.

Emissions Reductions

A number of technologies contribute simultaneously to thermal efficiency, and it is not easy to identify the contribution of each one individually. The effect of the combination of the Greenfield House thermal efficiency interventions is 8.4 tonnes / annum[123].

13.4.6. ORIENTATION, COLOUR, SHARED WALLS

These interventions are assumed to be no cost for reasons of conservativeness. Cost savings may be available to the project developer in reality.

13.4.7. ENERGY EFFICIENT LIGHTING

Energy efficient lighting achieves relatively low cost carbon credits when included in a suite of technologies in a low income housing development. Two energy efficient lights were included in the Kuyasa Project, one an external light which required additional wiring to be included, increasing the costs.

Energy efficient lighting presents a potential complexity and barrier around issues of additionality in the current South African context. Therefore, in order to concentrate on achieving a positive outcome in the first instance, lighting has not been included in the updated REEEP Model. However, it remains an option

[121] Andrew Janisch, SEA, Personal Communication, May 2008

[122] Frank Spencer, Alt-E, Personal Communication, May 2008

[123] Agama Energy, 2006

for including in the actual programme if appropriate. Estimated emission reduction credits from energy efficient lighting are 0.2 tonnes / annum per house[124].

13.4.8. ADDITIONAL MODEL UPDATES

The Retrofit project management fee has been increased to 18% of the project capital costs, to account for project design costs[125].

The annual monitoring and verification costs have been increased to $50,000 for reasons of conservativeness. Whilst this figure will inevitably be linked to the number of projects in the programme, it will also decrease with experience over time. The accuracy of this cost will be improved once the methodologies are approved.

There is no year one verification premium, as this cost is absorbed in the increased annual cost.

The Gold Standard issuance costs of $0.01 for the first 15,000 GS CERs and $0.02 for the remaining GS CERs have been added to the CDM issuance costs.

Further information on the assumptions in the original REEEP Model can be found in Appendix Six of the REEEP Model Report[126].

[124] UNFCCC, Kuyasa PDD

[125] Alastair Simpson, ShevelSimpson Quantity Surveyors, Personal Communication, May 2008

[126] REEEP Project 10307023: Developing a financial model for renewable energy upgrade interventions in urban low income housing, South Africa

13.5. APPENDIX FIVE: NSHF DRAFTING GROUP MEMBERS

Draft Group Members			Organisations	Cell Number	Work Number	E-mail Address
Ms	Namso	Baliso	Department of Housing	082 333 0337	012 421 1443	namso@housing.gov.za
Dr	Elsa	du Toit	Department of Minerals and Energy	082 494 5133	012 317 8216	elsa.dutoit@dme.gov.za
Ms	Salome	Sengani	National Housing Finance Corporation		011 644 9800	salomes@nhfc.co.za
Mr	Yaw	Afrane-Okese	National Energy Regulator of South Africa		012 401 4721	yaw.afrane-okese@nersa.org.za
Ms	Christina	Golino	Development Bank of Southern Africa		011 313 3159	christinag@dbsa.org
Mr	Kevin	Nassiep	Saneri		011 280 0300	kadrin@saneri.org.za
Mr	Barry	Bredenkamp	National Energy Efficiency Agency	083 655 6891	011 280 0300	barryb@cef.org.za
Ms	Emily	Tyler	Genesis Analytics	072 225 5619	021 465 6923	emily@tyler.co.za
Mr	Lester	Malgas	SouthSouthNorth	072 299 0270	021 425 1464/5	lester@southsouthnorth.org
Ms	Cindy	de Haan	SouthSouthNorth	084 202 5654	021 424 1464/5	cindy@southsouthnorth.org

Mr	Glynn	Morris	REEEP Southern Africa	083 780 9460	021 701 3364	glynn.morris@reeep.org
Mr	Sam	Mutswari	City of Tshwane	082 494 2761	012 358 3596	mutswarins@tshwane.gov.za
Mr	Wouter	Roggen	Cape Town City Council	083 630 7375	021 487 2058	wouter.roggen@capetown.gov.za
Mr	Cori	Schmidt	Nelson Mandela Bay Municipality	082 711 2612	041 392 4206	cschmidt@mandelametro.gov.za
Mr	Charles	Marthinus	ESCO Representative	083 232 1779	021 685 2837	charles.inep@telkomsa.net
Mr	Mark	Tanton	CEF			markt@cefsustainability.org.za
Mr	Thabo	Mathibeli	NHBRC		011 317 0000	ThaboM@nhbrc.org.za
Draft Group Guests						
Mr	Mohato	Mokhobo	Eskom		011 8002041	Mohato.Mokhobo@eskom.co.za
Ms	Carmen	Armstrong	CEF Sustainability	082 492 8654		carmena@cefsustainability.org.za
Ms	Anne-Kathrine	Scharling	The Royal Danish Embassy	072 956 2406	012 430 9340/53	ankasc@um.dk
Ms	Ciska	Terblanche	Anglo American	082 898 5750		cterblanche@angloamerican.co.za

13.6. APPENDIX SIX: NSHF ACTIVITIES, BUDGET AND TIMEFRAME

See accompanying excel file entitled 'NSHF Programme Cash Flow Final'

13.7. APPENDIX SEVEN: ACTION POINTS FROM DRAFTING GROUP MEETING 4 JUNE 2008, DBSA

1. Christina Golino to circulate her draft text for a submission to the housing minister for urgent input and comment by the Drafting Group (by Monday 9 June). The objective of the text is to provide the minister with information to promote inter-departmental consideration of these issues, particularly given the energy and housing bills currently going through parliament.

2. Emily Tyler and Steve Thorne to engage with Esteve Corbera of the Tyndall Institute regarding a study on consideration surrounding the institutional home for the Sustainable Housing Facility, as soon as possible.

3. DBSA agreed to allocate R1.6m towards the development of a thermal efficiency methodology for programmatic CDM, against Steve Thorne's submitted proposal.

4. SANERI agreed to identify funding for the remaining R1m required for the first phase of the establishment of the NSHF, and look to include applications for the financing for the remaining phases simultaneously

14. REFERENCES

Agama Energy (2006) Mitchell's Plain Medium-Income Thermal and Solar Water Heating Performance Modelling. Cape Town, May 2006

Ambrosi, P. and Capoor, K., (2008). *State and Trends of the Carbon Market 2008.* World Bank, Washington DC.

City of Cape Town., (2007). *Solar Water Heater By-Law. Draft 10.* 12 March 2007

City of Cape Town., (2005). N2 Gateway Launch: City's Integrated Human Settlements Plan has Many Milestones. 17 May 2005. www.capegateway.gov.za

Cousins, T. and Mahote, F., (2003). Assessment of the impact of energy efficiency interventions in a low-income housing settlement Kuyasa Khayelitsha. SouthSouthNorth, Cape Town.

Department of Environmental Affairs and Toursim website http://www.environment.gov.za/ClimateChange2005/What_does_it_mean_for_South_Africa.htm. accessed June 2008.

Department of Environmental Affairs and Development Planning., (2007), *Sustainable Energy Strategy for the Western Cape, Draft Summary Document*. May 2007

Department of Minerals and Energy (2008). *National Response to South Africa's Electricity Shortage*. January 2008

Department of Minerals and Energy (2005). Energy Efficiency Strategy of the Republic of South Africa. March 2005

Department of Minerals and Energy (2004). *Draft National Energy Bill* September 2004

Department of Minerals & Energy (2003) *Guidelines for the Introduction of Free Basic Electricity Service*, Pretoria, 5 May 2003 www.dme.gov.za/energy

Department of Minerals and Energy (1998). White Paper on the Energy Policy of the Republic of South Africa. December 1998

Department of Housing website www.housing.gov.za accessed 1 April 2008

Department of Housing (2007). Technical and General Guidelines – Specified National Housing Programmes, Part 3 of The National Housing Code, Version 1

Department of Housing (2004). *Breaking New Ground*

Lloyd, P., Cowan, B., Mohlakoana, N., (2004). *Improving access to electricity and stimulation of economic growth and social upliftment.* Energy Research Centre, University of Cape Town, Cape Town. July 2004.

Lovemore, A., *Councillor's Newsletter Solar Water Heaters*. 29 July 2007 www.mype.co.za

Mendel, V., Austin, G., (May 2006). Mitchell's Plain Medium-Income Thermal and Solar Water Heating Performance Modelling, Agama Energy, Stellenbosch.

Moss, Vuyisani., (2005). Evaluation of Housing Finance Mechanisms

NERSA Draft Consultation Paper (2008), Eskom's Application for a Price Increase for 2008/9 Financial Year. April 2008.

Parsons, S., (20040. International Building Energy Standards (Codes); Their relevance for the proposed SA National Energy Efficiency Standard SANS 0204. Draft for External Review, CSIR, August 2004.

Potgieter, D., (2003). *Implementation of EBSST or FBE.* Paper presented at the Association of Municipal Electricity Undertakings Southern Africa, Convention 2003.

Radikeledi., (2005) An analysis of the South African government low cost housing provision strategy. JEL code 057 Paper presented at Essa Conference 2005.

Scenario Building Team 2007. *Long Term Mitigation Scenarios: Technical Summary*, Department of Environment Affairs and Tourism, Pretoria, October 2007. CONFIDENTIAL

Sisulu, L., (2006). Media Briefing Remarks by Housing Minister Lindiwe Sisulu on the Occasion of the 2006/2007 Budget Vote Statement May 24 2006. Imbizo Media Briefing Room, Parliament, Cape Town.

Stern, N., (2008). Economics of Climate Change. Richard T. Ely Lecture, AEA Meetings, New Orleans, January 4th 2008.

Sustainable Energy Africa., (2007) How to implement Renewable Energy and Energy Efficiency Options, Cape Town, 2007.

Tshabalala-Msimang, M. (2008). Speech by Minister of Health at the Social Cluster Briefing, 14 February 2008, http://www.info.gov.za/speeches/2008/08021411451001.htm

Tyler, Emily., (2006). REEEP Project 10307023 Report: Creating a National Financial Facility for Sustainable Energy Upgrades in Low Income Housing in South Africa. SouthSouthNorth supported by the Renewable Energy and Energy Efficiency Partnership (REEEP), Cape Town, December 2006.

Tyler, Emily., (2006). Appendix 6, Model Mechanics, data and assumptions. Creating a National Financial Facility for Sustainable Energy Upgrades in Low Income Housing in South Africa. SouthSouthNorth supported by the Renewable Energy and Energy Efficiency Partnership (REEEP)

United Nations CDM Executive Board http://cdm.unfccc.int/Projects/DB/DNV-CUK1121165382.34/view

United Nations CDM Executive Board http://cdm.unfccc.int/ProgrammeOfActivities/index.html

United Nations CDM Executive Board. *Project 0079: Kuyasa low-cost urban housing energy upgrade project* http://cdm.unfccc.int/Projects/DB/DNV-CUK1121165382.34/view

Volschenk, Jako., (2007). The use of the ESCOs to facilitate sustainable energy interventions in the low income housing sector

14.1. PERSONAL COMMUNICATIONS

Armstrong, Carmen: CEF Sustainability, (May 2008)

Austin, Greg: Agama Energy, (2006)

Baliso, Namso: Department of Housing, (April 2008)

Banks, Douglas: Restio Energy, (2006)

Bazir, Rhoda: Project Facilitation Officer, Thubelisha, (April 2008)

Bredenkamp, Barry: Energy Efficiency Agency, (2006)

Chandaka, Shane: DBSA, (April 2008)

Cloete, Helene: Mettle Property Solutions, (March 2008)

Corbera, Esteve: Tyndall Institute, (May 2008)

Figueres, Christiana: ex CDM Executive Board Member (May 2008)

Fortyn, Gavin: Thubelisha, (April 2008)

Gerber, Johan: Nelson Mandela Bay Municipality, (April 2008)

Kriel, Ben: City of Tshwane, (April 2008)

Lululama: Peoples Housing Process Office, (March 2008)

Nyasheng, Bayanda: Eskom DSM, (March 2008)

Pshali, Similo: Assistant Housing Co-ordinator, Drakenstein Municipality, (April, 2008)

Rajkumar, Victor: Management Information Services, Department of Housing, (April 2008)

Schlup, Michael: Director, The Gold Standard, (May 2008)

Simpson, Alastair: ShevelSimpson Quantity Surveyors, (May 2008)

Smidt, Corrie: Nelson Mandela Bay Municipality, (April 2008)

Spencer, Frank: Alt-E, (May 2008)

Stern, N. (2008) *Economics of Climate Change*. Richard T. Ely Lecture, January 2008

Tanton, Mark: CEF Sustainability, (March 2008)

Thorne, Steve: SouthSouthNorth, (May 2008)

Qwili: Kuyasa Resident (2006)

Roelofse, Joos: Provincial Government of the Western Cape, (March 2008)

Terblanche, Ciska: Anglo American, (May 2008)

Wesselink, Carl: Export Development Capital, (May 2008)

Wesselink, Pieter: Export Development Capital, (April 2008)