Targeted Research Medium-sized Project Brief – CSP Africa Study

Project Summary

Project Identifiers	
1. **Project Name:** Concentrating Solar Power for Africa (CSP-Africa) Study	2. **GEF Implementing Agency:** World Bank
3. **Country or countries in which the project is being implemented:** South Africa	4. **Country eligibility:** South Africa ratified the United Nations Framework Convention on Climate Change in 1997.
5. **GEF focal area(s):** Climate change	6. **Operational Programme:** Targeted research relevant to Operational Program 7 – *Reducing the long-term costs of low greenhouse gas-emitting energy technologies*
7. **Project linkage to national priorities, action plans, and programs:** The study supports South Africa's commitment to the United Nations Framework Convention on Climate Change (UNFCC). The study could further, in the long term, result in the creation of employment and industrial development and hence support the South African Government's Growth Employment and Redistribution (GEAR) program. The study realises the South African Government's policy on renewable energy as stated in the *White Paper on the Energy Policy of the Republic of South Africa 1999.*	
8. **GEF national operational focal point and date of country endorsement:** Department of Environmental Affairs and Tourism – Endorsed ***3 November 1998***	

Project Objectives and Activities

9. Project rationale and objectives: This study will evaluate the possibility of introducing solar thermal electric (STE) technologies as electricity generation options into Southern Africa. The possibility of decreasing the region's dependence on fossil fuels (predominantly coal) by employing a more environmentally preferred option will be quantified. The objectives will be achieved by evaluating a range of STE alternatives, including both current technologies and options that may become commercially available in the future. Specific study objectives are to: • Evaluate a broad range of commercial and emerging STE technology options with regards to their current and future regional and global potential, considering technical, economical, environmental and social aspects. • Identify preferred solar thermal electric (STE) system(s) for implementation in Southern Africa during the coming two decades. This includes identifying the best STE technology options for competing in a coal-based energy sector and the best strategy to achieve a competitive status.	**Indicators** Completion of the final report with acceptance by Eskom management and peer review by external experts and relevant agencies.
Project Rationale and Objectives (Continued)	
• Identify specific constraints that would need to be addressed to attain a sustainable deployment of solar thermal electric systems in South and Southern Africa	
10. Project outcomes (1) A detailed assessment of a broad range solar thermal technologies will be provided (2) A strategy to achieve a large scale market penetration of STE technologies into a coal-based energy system will be proposed (3) A new perspective on achieving sustainable technology deployment will be given.	**Indicators** Final report

11. **Project activities to achieve outcomes (including cost in US$ or local currency of each activity):**	**Indicators**
(1) Technology screening ($30,000);	(1) Evaluation of STE options according to certain criteria
(2) Generic site characterisation ($20,000);	(2) Reference site identified to provide information for technology assessment
(3) Development of conceptual designs ($50,000);	(3) Conceptual designs for promising technologies
(4) Performance evaluation ($80,000);	(4) Performance figures for simulated plant operation
(5) Economic, environmental and social-impact evaluation ($40,000);	(5) Capital cost estimates, O&M figures and life-cycle costs will be calculated The environmental and social impacts on the region, due to the implementation of STE technologies, will be assessed
(6) Cost/benefit analysis ($50,000);	(6) Evaluation of the viability of STE implementation
(7) Reporting ($20,000);	(7) Final report, presentations and publications

12. Estimated budget (in US$ or local currency):

Eskom:	$ 110,000
NREL:	$ 70,000
GEF:	$ 230,000
TOTAL:	$ 410,000

Information on Institution Submitting the Project Brief

13. Information on project proposer: Eskom is South Africa's electricity utility, with its head office in Sandton, Johannesburg.

14. Information on proposed executing agency (if different from above): As above

15. Date of initial submission of project concept: 5 January, 1999

Information to be Completed by Implementing Agency

16. Project identification number:

17. Implementing Agency contact person:

18. Project linkage to Implementing Agency program(s):

Project Description

Project rationale and objectives.

The objectives of the CSP-Africa study are to:

Evaluate a broad range of commercial and emerging solar thermal electric (STE) technology options with regards to their current and future regional and global potential, considering technical, economical, environmental and social aspects.

Identify preferred system(s) for implementation in Southern Africa during the coming two decades. This includes an evaluation of alternative strategies such as investing in current technologies (troughs), or by-passing trough deployment in favour of more advanced technologies.

- Identify the best STE technology options for competing in a coal-based energy sector and the best strategy to achieve a competitive status.

- Identify specific constraints that would need to be addressed to attain a sustainable deployment of solar thermal electric systems in South and Southern Africa

South African Perspective

Solar thermal electricity may be an attractive energy supply option for South Africa. Technologies exist today that allow electricity production without greenhouse gas emissions and developing technologies offer the promise for significant cost reductions. South Africa also has abundant solar resources, available land and a technical infrastructure that could support extensive deployment of the technology. However, there are many barriers that exist for deploying the technology. Solar thermal technology represents a radical departure from the current energy supply system of South Africa and given current cost structures, is not competitive with low-cost coal energy. While acknowledging these barriers, there are also several important reasons for Eskom and the GEF to support a systematic evaluation of solar thermal electric technologies:

- Solar thermal electric technologies can be made dispatchable through the use of either thermal storage or hybrid designs. This makes them ideal for accommodating the intermediate demand load growth faced by Eskom (and many other utilities) in the future.
- Siting flexibility (not being coincident with coal mining) and module size (30-200 MW) provide benefits to strengthening and extending the existing Eskom grid and serving specific loads that are currently far from generation resources.
- Eskom's capacity expansion needs (middle of the next decade) will correspond with the maturation of several new solar thermal technologies. These technologies could play an important role in achieving parity between the costs of solar thermal and fossil electricity and should be evaluated to assess their potential.
- Employment opportunities from the construction and operation of solar thermal systems tie to important national agendas that may offset some energy cost penalties for the technology.
- Eskom provides an ideal test case for assessing the feasibility of solar thermal electricity to offset environmental damage from coal-fired generation. Technologies that could be economically deployed at Eskom would likely have significant applications to other regions in the world.

Regional Perspective

The Southern African Development Community (SADC) was founded in 1980 and currently comprises twelve countries, including South Africa. The SADC Energy Sector has an important responsibility in identifying the complementarity of regional energy resources, to promote their development and to share the planning of their efficient use on a sustainable basis.

The general principles that guide the SADC Energy Protocol, include:

- Energy shall be used for economic development, alleviation of poverty and the improvement of the standard and quality of life throughout the region.
- Energy shall be used to promote collective self-reliance and interdependence among member States.
- Member States shall strive to ensure the provision of reliable continued energy supplies in a least cost but efficient manner.
- Member States shall ensure that the development and use of energy does not lead to environmental degradation.
- Member States shall cooperate in the development of energy development and in the advancement of the concept of Energy Pooling to ensure security and reliability of energy supply.

Further, the majority of the SADC population still relies on the use of wood fuel as their main source of energy. Wood fuel accounts for 75 percent of the total final demand in the region. This figure shows the imbalance on the use of the resources and the resultant quality of living of the different communities in SADC as a whole. Tremendous pressure is put on the forest and the consequences are well known. Increasing depletion of the forest resources, soil degradation, increasing emissions of carbon gases to the atmosphere, social and economic hardship, health hazards, increasing prices of the commodity in the peri-urban areas, are some of the immediate consequences.

The CSP-Africa study will evaluate the viability of introducing STE technologies not only to the South African energy sector, but also into the SADC region. The siting flexibility and module size (30-200 MW) will provide ideal solutions to the regions power needs, while simultaneously decreasing the reliance on wood fuel, resulting in a considerable environmental impact in the SADC region and offsetting several tonnes of CO_2 emissions, which will have a global impact. The study will also investigate the concept of solar power parks, which will give insight into the regional environmental, economical and social impact.

Global Environmental Facility (GEF) perspective

The guidelines for Operational Program No.7 identified the parabolic trough technology as the proven STE technology. However, it also states that other solar thermal technologies (central receivers or parabolic dishes)...may be considered for programmatic support in the future. It is the aim of the CSP-Africa study to, unlike the India, Egypt/Morocco or

Brazil studies aimed at either assessing the market and cost-reduction potential of STE technologies, or reducing the cost of the technology by the construction of a STE power plant, to conduct a complete evaluation of the identified STE technologies and to evaluate them in terms of their technological, economical, environmental and sociological aspects. The technological evaluation will go as far as to simulate possible plant operation as a series of time steps for a typical year. This will result in an extremely detailed, up-to-date evaluation of the candidate STE technologies and will indicate to the GEF the readiness of employing any of the other STE technologies in possible demonstration projects.

The CSP-Africa study will also investigate the integration of STE technologies into a coal-based energy sector, from a technical as well as an emission reduction perspective and will be able to provide valuable information to the GEF in this regard. This should be identified as an issue of the utmost importance, taking into account the associated negative environmental impacts of fossil fuel generation. Since the ultimate aim of the project will be to introduce STE technologies to South and Southern Africa, the study will also investigate the influence that the construction of regional power parks will have on the associated implementation cost of the technologies as well as other impacts such as environmental and social. A quantification of the possible economical and social benefits that the construction of such power parks may have on a developing region such as Southern Africa should also be of an international concern.

Linkage to Existing GEF Projects

The GEF is currently considering three projects regarding STE technologies. The most advanced of these, in Rajastan (India) is aimed at the construction of a parabolic trough plant, with cost reductions envisaged as a result of knowledge gained over the past years with this technology. A preparatory study in support of the Egypt and Morocco investment projects will provide an assessment of the market and cost-reduction potential of STE technologies and determine the investment required in the technology that will result in STE technologies becoming competitive with conventional technologies. An UNDP-implemented project in Brazil is investigating the application of STE in the context of Brazil's load characteristics, weather patterns and existing power systems (e.g. hydroelectric backup). The study will also investigate strategies for long-term cost reductions and attempt to analyse the impact of a large-scale manufacture of components throughout the world on the long-term cost reduction potential.

The CSP-Africa Study is uniquely different from the above projects, as it will provide a detailed evaluation of the current status of various STE technologies, by considering not only the most recent technological innovations, but the economic, environmental and social aspects as well. As such it will be able to recommend to the GEF the readiness of other STE technologies to be employed in pilot projects. The study will further investigate the process of integration of STE technologies into a coal-based energy sector, as well as the implications thereof and associated difficulties.

The CSP-Africa Study will, however, also be closely linked to the existing projects. The study will identify specific constraints that would need to be addressed to attain a sustainable deployment of solar thermal electric systems in South and Southern Africa. This will directly contribute to the Egypt/Morocco study. The project will also investigate the possibility of manufacturing components regionally, which will provide valuable information towards the Brazil study's global manufacturing impact. (In both regards, the CSP-Africa Study will also be able to learn from the methodologies followed and results obtained). The study will further support the existing projects by providing a new look and perspective at the issues around achieving sustainable technology deployment. Much of the thinking to date has focused on deployment of near-term technologies: parabolic troughs. This study will include a comprehensive look at more advanced strategies and also evaluate new collaboration strategies (regional, bilateral, multilateral, industry/government) that will be needed to reach sustainable deployment without project-specific subsidies.

Current Situation

Currently, 98% of South Africa's electricity requirements, which equals more than half of the electricity generated on the African continent, is provided by the electrical utility Eskom. Eskom has 20 power stations with a nominal capacity of 38 497 megawatts. In 1997, 91% of the electricity generated was generated by coal-fired power stations. This contributes to South Africa being the regions main emitter of carbon dioxide (89% of Southern Africa's carbon dioxide from energy-related activities comes from South Africa). Further, no utility scale, renewable energy generation projects exist in this region.

Internationally, the only STE technology being considered as commercial is the parabolic trough. The readiness or future applicability of the other existing STE technologies is unknown.

Expected Project Outcomes

The CSP-Africa study will have several specific outcomes that will be beneficial to South and Southern Africa, Eskom, and the GEF:

- Providing a detailed assessment of a broad range solar thermal technologies that will:
  Identify specific benefits (such as efficient energy storage) of advanced technologies and assessing the value of these benefits.
  Evaluate whether any of the advanced technologies are in a position to rapidly replace troughs as the preferred solar thermal technology and if so whether they would represent a better technology investment.
- Evaluate a market application of considerable interest to global climate change strategy: how to achieve large scale market penetration of solar thermal electricity into a coal-based energy system. Specific issues that will be addressed include:
  How close is the technology to being competitive in a coal-based energy system today?
  Identification of activities and funding that would be necessary to close the market gap for each of the technologies.
  Identifying the best solar technologies and plant designs to compete against coal-fired electricity.
  Evaluation of technology benefits that may be specific to coal-based systems, including distributed utility benefits provided by technology that is much more modular than coal plants.
- Providing a new look and perspective at the issues around achieving sustainable technology deployment. Much of the thinking to date has focused on deployment of near-term technologies: parabolic troughs. This study will include a comprehensive look at more advanced strategies and also evaluate new collaboration strategies (regional, bilateral, multilateral, industry/government) that will be needed to reach sustainable deployment without project-specific subsidies.

Activities and Financial Inputs

This project begins with a broad assessment of the candidate technologies that may be appropriate for commercial deployment during the next decade. The study will then use a screening process to quickly narrow the options down to those with the greatest near-term interest and then evaluate the preferred options in more detail. Specific tasks on the study are described below.

Task 1 Technology Screening ($30,000)

In studies to date Eskom has identified four basic solar thermal technologies which may be of interest for bulk electricity generation in Southern Africa: parabolic troughs, power towers, dish/engines and solar chimneys. There exists several design alternatives for many of these concepts including choices of alternate working fluids, hybrid or solar-only designs and alternative engines that could more than double the number of options to be considered. This task will conduct a simple yet thorough screening of the technologies to eliminate options from further study that would be unlikely to be highly ranked. This will reduce the effort of the overall study and allow the most detailed analysis to be focussed on the concepts with the highest likelihood of near-term success. The screening will also document technologies that may become important in the future as technology development proceeds. Assumptions and groundrules for the rest of the study will also be established as part of this task. These include definition of preferred plant sizes and capacity factors, operating hours and distributed utility benefits. This will provide a reference basis for the preferred plant design options, economic assumptions, as well as other related issues.

Task 2 Generic Site Characterization ($20,000)

This task will identify a generic site that can be used as a baseline for the performance and cost calculations in the study. Various locations in Southern Africa will be investigated to determine appropriate assumptions for infrastructure requirements (availability of water, proximity of transmission, etc.) as well as types of climate regimes. Existing sources of solar radiation and climatic data will be assembled and evaluated and used to create a data file that will allow annual performance simulations.

Task 3 Development of Conceptual Designs ($50,000)

This task will develop the conceptual designs for each of the solar concepts identified as most promising in Task 1. Conceptual designs for each of the technologies will be based on meeting the requirements (capacity, operating hours, etc.) defined in Task 1. This will ensure a more equitable comparison of the alternative options, since the level of energy services provided by each will be the same. The conceptual designs will be developed using available engineering data, results of operating commercial and pilot systems, and applicable systems studies.

Task 4 Performance Evaluation ($80,000)

An important parameter in the design and evaluation of the solar technologies is the amount of solar energy provided by the plant in a typical year. This evaluation will be performed using an analysis code that simulates plant operation as a series of time-steps (15 minute or one hour) for a typical year. This type of analysis captures the important variations in plant performance that occur due to solar insolation, solar position, and climatic conditions, as well as daily effects of plant start-up and shut-down. Already developed simulation models such as Solergy and SolWin will be used. The SolWin code is a new model being developed jointly by DLR of Germany and the U.S. Department of Energy under the SolarPACES program. SolWin is designed to be a 'user friendly' model that provides not only an analysis function

but also serves as a training aid for organisations investigating solar thermal systems. This project is expected to be the first application of SolWin, and should provide valuable feedback to the developers as well as potential users of the model.

Task 5 Economic, Environmental and Social-impact Evaluation ($40,000)

Capital cost estimates will be developed for both pilot-scale and commercial-scale plants. Construction scenarios will be developed that specify which components are likely to be ordered and imported, and which will be manufactured in Southern Africa. Much of the capital cost of the plants will be driven by the cost of solar collectors, which would be likely to be produced in Southern Africa using some imported components and perhaps with licensed designs. O&M requirements will be drawn from recent cost reduction studies with the commercial trough plants at Kramer Junction in the United States. Specific O&M cost estimates will be developed based on Eskom's experience with similar operations, including the local labour markets and skills available.

Life-cycle costs for the plant operation will be evaluated using a project cash-flow model.

The environmental impact on the region, due to the implementation of the STE technologies will be assessed. Attention will be given to the social impacts by evaluating the possibility of creating a local manufacturing industry, the provision of electricity to unelectrified or areas with a unstable supply as well as the impact on the standard of living due to the provision of a "clean" source of electricity.

Task 6 Cost/Benefit Analysis and Evaluation of Potential ($50,000)

This task will evaluate the desirability of a development and implementation program for solar thermal electric plants in South and Southern Africa. It is clear that the first initial plants would not compete with coal-fired electricity purely on the basis of price, and unlikely for plants in the reasonable future. This task will assess specific benefits of the solar plants that tie into both regional needs and the regions political objectives. These benefits include reduction of CO_2, improvement of air quality, creation of jobs in manufacturing and plant operations, providing distributed generation benefits, and creating products and services for potential export markets. As part of the evaluation there will be a significant involvement with South African governmental agencies and stakeholder groups to help assess the benefits and develop plans using existing or emerging government programs to help support project deployment. The feasibility of an initial plant will be assessed. In addition, issues surrounding replication of follow-on plants will be identified. The replication study will identify likely cost reductions and sources for the reductions. Options for achieving long-term parity from a cost/benefit standpoint with coal-fired electricity will be developed, and necessary investments characterised.

Task 7 Reporting ($20,000)

Eskom will provide a final report on the results and conclusions of the study. This report may contain information Eskom considers business sensitive and as such the distribution of the report and ability to protect proprietary information must be clarified with the GEF. In addition to the final report, Eskom will publish a summary of the study in at least one external conference forum and a journal publication or equivalent. These external publications will contain the key findings of the study but will not involve reporting of any data considered proprietary by Eskom.

Follow On Activities

The CSP-Africa study has a specific end point with clearly defined research goals, but it is important to realise that the investigation is a key part of Eskom's long-term goals to achieve environmental improvements under the SABRE-Gen program. Assuming that the CSP-Africa study identifies promising solar thermal options, Eskom would anticipate approaching institutions for project development funding that would support a detailed feasibility study and, eventually, construction of an initial plant. Eskom recognises that the GEF position on PDF funding could change in the future, and that funding of this targeted research grant does not represent a commitment by the GEF for future PDF funding.

Sustainability Analysis and Risk Assessment

The CSP-Africa study is a targeted research project aimed at providing information on specific research questions, through goal-oriented research. The issue of sustainability is hence not directly applicable, but on the other hand, should not be disregarded. The study will identify the path forward for STE technologies and will advise on the applicability in coal-based energy sectors as well as in the Southern African context.

If the information that the study will provide proves to be positive, it will be reasonable to expect that Eskom will move further on the path of implementation. Sustainability could further be addressed by ensuring that the study results provide the information required by the GEF to develop its strategy towards STE technologies.

The only risk to the project could be the inability of the executing agency to adequately complete the study, due to a lack of expertise. This issue has, however, been negated by the involvement of the STE research "laboratory" Sunlab in the study. Sunlab, constituted by the National Renewable Energy Laboratory (NREL) and Sandia National Laboratory in the USA, is a leader in the field of STE research.

Stakeholder Involvement and Social Assessment

During the CSP-Africa study, stakeholder contacts from this group will be with national and regional governments and NGO's. Regional contact will be by means of the SADC forum as well as the Southern African Power Pool. Regional utilities such as NamPower, Botswana Power Corporation and ZESA will also be approached. Contact with existing GEF supported activities will also be a priority. National departments that have been approached or will be are: The Department of Minerals and Energy (DME), Environmental Affairs and Tourism (DEAT), and the Department of Arts, Culture, Science and Technology. The Development Bank of Southern Africa (DBSA) has also been contacted in this regard.

Although the study will not involve selection of a specific site, a hypothetical site will be selected as a case study. Interviews will be conducted with local governments, industries, and communities for the case study to identify likely benefits and concerns of affected stakeholders if an actual project were to proceed. This effort would not provide detailed evaluations of stakeholder impacts, but could identify any unexpected findings and recommendations for future work if an actual plant construction were pursued.

Social assessments will analyse the impacts on the region by introducing STE technologies. This will be done by assessing the impact of providing electricity to unelectrified areas or areas with unstable supply, impact of clean energy production on the region and standard of living and the creation of a STE industry that will provide employment

Incremental Cost Assessment

Eskom is primarily a coal-based utility, with a current surplus generation capacity of approximately 5 GW. However, Eskom expects that this surplus capacity will soon be utilised and that additional capacity will be required by 2007. As such Eskom is looking at evaluating possible technologies for future implementation.

Project baseline:

Evaluation of technologies like fluidised-bed coal combustion, nuclear pebble-bed modular reactor, some renewable energy technologies. In a pure Eskom evaluation, one or at the most two renewable technologies would be evaluated. Further, they will only be assessed in terms of their application in South Africa.

Alternative:

A complete evaluation of a broad range of STE technologies in terms of technological and economical factors and social and environmental impacts.

Evaluation of the applicability not only in terms of Eskom and South Africa, but in terms of the Southern African region.

Evaluation of the regional environmental and social impacts due to the introduction of STE technologies.

Contribution to existing GEF supported studies and the evaluation of measures required for the long term cost reduction of STE technologies in terms of a regional and global perspective.

Incremental Cost Matrix

	Baseline	Alternative	Increment
Global Environmental benefit	Limited research regarding STE technologies in South Africa.	Complete evaluation of a broad range of technologies. Applicability not only in South Africa but regionally assessed	Increased knowledge of the status of STE technologies. Future prospects for implementation identified. Regional applicability quantified
Domestic benefits	Sector work and technology analysis to prepare for system	Sector work and technology analysis to prepare for system	Possible introduction of a "clean" generation technology for regional

	expansion, with the emphasis on the least cost technology (fossil fuels and nuclear)	expansion, with the emphasis on STE technologies	generation, reduction in regional harmful emissions
Costs (US$)	**Baseline Costs**	**Alternative Costs**	**Incremental Costs**
Task 1: Technology Screening	18,000	30,000	12,000
Task 2: Generic site characterisation	10,000	20,000	10,000
Task 3: Conceptual designs	17,000	50,000	33,000
Task 4: Performance evaluation	13,000	80,000	67,000
Task 5: Economic, environmental and social-impact evaluation	13,000	40,000	27,000
Task 6: Cost/benefit analysis	9,000	50,000	41,000
Task 7: Reporting	10,000	20,000	10,000

Budget

Component	GEF	Other Sources	Project Total
Preparation	0	25,000	25,000
Personnel*	210,000	120,000	330,000
Training	5,000	10,000	15,000
Travel	15,000	5,000	20,000
Miscellaneous	0	20,000	20,000
Total	230 000	180 000	410 000

* Personnel

Activities included under personnel are:

Component	GEF	Other Sources	Project Total
Technology Screening (Task 1)	12 000	18 000	30 000
Generic Site Characteristics (Task 2)	10 000	10 000	20 000
Technology Assessment			
Development of Conceptual Designs (Task 3)	33 000	17 000	50 000
Performance Evaluation (Task 4)	67 000	13 000	80 000
Economic Evaluation (Task 5)	27 000	13 000	40 000
Cost/Benefit Analysis (Task 6)	41 000	9 000	50 000
Reporting (Task 7)	10 000	10 000	20 000
Project Management and Administrative Costs	10 000	30 000	40 000

Project Implementation Plan

Duration of Project (in months): 12	
ACTIVITIES	DURATION OF ACTIVITIES
Technology Screening (Task 1)	1 Month
Generic Site Characteristics (Task 2)	1 Month
Development of Conceptual Designs (Task 3)	3 Months
Performance Evaluation (Task 4)	2 Months
Economic Evaluation (Task 5)	3 Months
Cost/Benefit Analysis (Task 6)	2 Months
Reporting (Task 7)	1 Month

Task 1 and 2 will be executed simultaneously, while Tasks 3, 4, 5, 6 and 7 will follow sequentially thereafter.

Public Involvement Plan

Stakeholder Identification

Aside from the GEF and the World Bank (Implementing Agency), the key stakeholders in the project are:
(a) Eskom as executing agency
(b) Sunlab (NREL and Sandia) as study partners
(c) South African national and local government
(d) Regional government departments
(e) Regional utilities
(f) Local communities

Information Dissemination and Consultation

Locally – Discussions are underway with the South African government to organise a discussion forum focusing upon STE technologies. The forum will also be used to disseminate information forthcoming from the study. Information will also be presented at the appropriate regional (SADC) venues.

Internationally – Eskom will be participating in SolarPACES, the Solar Power and Chemical Energy Systems Program of the International Energy Agency. As such, the study results will be presented to the international STE community.

Eskom will provide a final report on the results and conclusions of the study, or as required by the GEF. This report may contain information Eskom considers business sensitive and as such the distribution of the report and ability to protect proprietary information must be clarified with the GEF. In addition to the final report, Eskom will publish a summary of the study in at least one external conference forum and a journal publication or equivalent.

Social and Participation Issues

The study will identify a generic site to provide information for the technology assessment. Included with the assessment

will also be some public participation and an assessment of the attitude towards the implementation of the STE technology.

In terms of further assessments, the study will pay attention to three major social impacts that the introduction of STE technologies will have on South Africa and the region. They are:

Creation of employment
The study will investigate the possibility of the creation of a local/regional component manufacturing industry. Since the sites most suitable for the application of STE technologies are sparsely populated and underdeveloped, the creation of such a industry will have a positive socio-economic influence on the affected area.

Provision of electricity
Due to its modularity, STE technologies can be utilised in various scenarios. They include: Large scale generating facilities providing electricity to the grid to support peak demand periods or as smaller units that are either stand alone systems or used at the end of a long transmission network for grid strengthening. All the scenarios will have a sociological impact on the areas of implementation.

Impact on the environment

Wood fuel accounts for 75 percent of the total final demand in the SADC region. Increasing depletion of the forest resources, soil degradation, increasing emissions of carbon gases to the atmosphere, social and economic hardship, health hazards, increasing prices of the commodity in the peri-urban areas, are some of the immediate consequences. The introduction of modular STE technologies will provide a alternative and clean source of electricity, which will not only impact on the environment but also on the standard of living of the affected communities.

Monitoring and Evaluation Plan

The immediate project management will be done by the executing agency, Eskom. Any feedback or status reports as required by the implementing agency will be adhered to.

The success of the outputs of the study can be measured over the long term by the number of new STE projects proposed or implemented.

Technical

As required for targeted research proposals.

Project Checklist

Project Activity Categories			
BIODIVERSITY	CLIMATE CHANGE	INTERNATIONAL WATERS	OZONE DEPLETION
Prot. Area zoning/mgmt.:	Efficient prod. and distrib.:	Water body:	Monitoring:
Buffer zone development:	Efficient consumption:	Integrated land and water:	Country program:
Inventory/monitoring:	Solar: **x**	Contaminant:	ODS phaseout:
Ecotourism:	Biomass:	Other:	Production:
Agro-biodiversity:	Wind:		Other:
Trust fund(s):	Hydro:		
Benefit-sharing	Geothermal:		
Other:	Fuel cells:		
	Other:		
Technical Categories			
Institution building:			
Investments:			
Policy advise:			
Targeted research: **x**			

Technical/management advice:
Technology transfer: **x**
Awareness/information/training: **x**
Other: