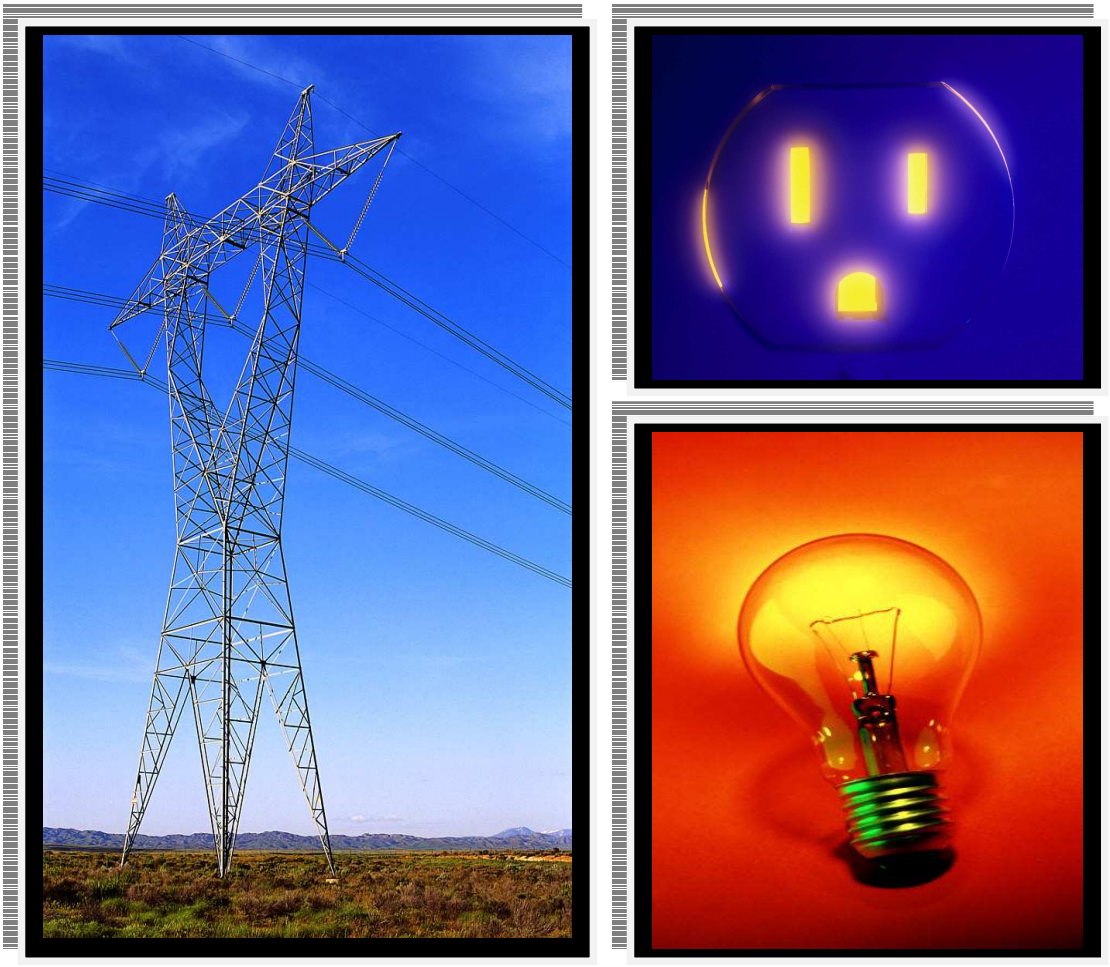
ESKOM HOLDINGS LIMITED
GENERATION DIVISION

NUCLEAR 1 ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME

SPECIALIST STUDY FOR SCOPING REPORT



SPECIALIST STUDY: AGRICULTURE

J27035

OCTOBER 2007

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CONTENTS

1 EXECUTIVE SUMMARY

1. Economic growth and social needs in South Africa are resulting in substantially greater energy demand, and there is a requirement for more than 40,000 megawatts (MW) of new electricity generating capacity over the next 20 years.

2. This study covers the construction and operation of a conventional nuclear power station and associated infrastructure in the Eastern, Northern or Western Cape areas.

3. Based on various social, economic and environmental criteria the following potential sites have been identified:
   - Thuyspunt (Eastern Cape, located west of Port Elizabeth near Cape St Francis)
   - Bantamsklip (Western Cape, located 10 km south-east of Pearly Beach)
   - Duynefontein (Western Cape, located adjacent to the existing Koeberg Power Station, Cape Town)
   - Brazil (Northern Cape, located in the Kleinsee/Port Nolloth area)
   - Schulpfontein (Northern Cape, located in the Hondeklipbaai/Kleinsee area)

4. The primary objective of this study is to measure the nature and magnitude of the impacts on agricultural activities in the above areas should the construction of such a nuclear facility be approved in any one area.

5. This report has been based on a limited desktop study, and no reconnaissance visits have been performed as yet. It has been compiled by evaluating available literature sources and performing a Google-Earth satellite view image analysis of recent agricultural activities. In the interest of accuracy, a 20 km extended radius from the proposed plant site has been studied.

6. Using a 20 km radius, the state of agriculture appears to be as follows:
   - Thuyspunt — significant extensive activity (dairying and centre-pivot irrigation).
   - Bantamsklip — little activity.
   - Duynefontein — wheat, fodder crops, vegetables, intensive greenhouse production, dairying, poultry.
   - Brazil — no observed activity.
   - Schulpfontein — no observed activity.

7. Possible negative impacts are:
   - Perceptions/fears of danger/accidents leading to a fall in land values and loss of organic certification;
   - Increased heavy-vehicle traffic servicing a power station generating dust with adverse effects on crops and animal health;
   - Increased competition from Eskom, leading to labour shortages and pushing up wages; and
   - social problems caused by influx of labour to the area.

8. Possible positive impacts are:
   - Improved roads leading to improved access to markets and inputs as well as to cheaper transport, thereby encouraging diversification and local processing;
   - Use of power station steam to heat greenhouses for winter production of high-value crops;

- Increased job creation; and
- growth of local market for farm produce.

9. Nuclear power stations situated close to existing agricultural land are more likely to have negative impacts on land values, disrupt existing labour relations/structures, and create unforeseen impacts/problems in the future than would be the case for those surrounded by very little agricultural activity.

10. A preliminary desktop view, bearing in mind the above impacts, would therefore point towards the Thyspunt, Bantamsklip and Duynefontein sites being somewhat less desirable as possible sites for establishing a nuclear facility than would be the case for the Brazil and Schulpfontein sites.

2 INTRODUCTION

2.1 Description of Proposed Project

Eskom Holdings Limited (Eskom) is responsible for the provision of reliable and affordable power to South Africa. The South African economy is currently experiencing greater than expected economic growth, resulting in a rapidly declining surplus of power. Demand for power in South Africa is expected to grow at around the same pace as that of gross domestic product (GDP), with long-term forecasts putting electricity demand on a growth path of 4.2%. It is estimated that this will amount to a requirement of more than 40,000 megawatts (MW) of new electricity generating capacity over the next 20 years. This additional generating capacity could come from a variety of energy sources, for example, coal, liquid fuels, gas turbines, natural gas, uranium (nuclear), hydro and pumped storage schemes, wind and solar energy. Eskom's current plant mix includes gas-fired stations (including open cycle) hydropower, pumped storage schemes, nuclear and coal-fired based-load stations, the latter making up the largest portion of the current power mix.

South Africa's existing nuclear power station at Koeberg has been safely supplying electricity for more than 20 years. Eskom has over the past ten years undertaken a number of studies aimed at identifying possible sites for additional nuclear power stations.

This EIA covers the construction and operation of a conventional nuclear power station and its associated infrastructure in the Eastern, Northern or Western Cape areas. The sites that are being investigated in this EIA have been identified on the basis of site investigations undertaken in the 1980s. Eskom proposes to construct a nuclear power station of the pressurised water reactor type which in many ways resembles the structure of that of a conventional thermal power plant. The difference between such plants is in the manner in which heat is produced. In a fossil plant, oil, gas or coal is fired in the boiler, which means that the chemical energy of the fuel is converted into heat, whereas in a nuclear power plant the energy from the fission chain reaction is utilised. The water required for cooling purposes within the nuclear power station can be obtained directly from the sea. Although a detailed design still needs to be completed, it is estimated that the entire development will require in the region of 31 ha as a primary nuclear plant zone, including all auxiliary infrastructure. The proposed nuclear power station will include a nuclear reactor, turbine complex, spent fuel, nuclear fuel storage facilities, waste-handling facilities, intake and outfall basin and various auxiliary service infrastructures. Should the proposed project be authorised, it is estimated that the construction of the nuclear power station could commence in 2009-10 with the first unit being commissioned in 2016.

The primary objective of this study will be to measure the nature and magnitude of the impacts on agriculture emanating from the increased production activities in the Eastern Cape, Northern Cape or Western Cape due to the construction of a nuclear power station.

2.2 Terms of Reference

The assessment of impacts will broadly be undertaken in accordance with the guidelines provided in the Guidelines Document: EIA Regulations (DEAT, 1998), the NEMA principles and Section 24(4) of NEMA (as amended), as appropriate to the specific field of study. In addition, the following General Terms of Reference apply to each of the specialist studies:

- Describe the baseline conditions that exist in the study area and identify any sensitive areas that would need special consideration;
- Ensure that all issues and concerns and potential environmental impacts relevant to the specific specialist study are addressed, and recommend the inclusion of any additional issues required in the Terms of Reference, based on professional expertise and experience. Also consider comments on the

previous specialist studies undertaken for the Nuclear Siting Investigation Programme (NSIP) during the 1980s-1990s;

- Provide a brief outline of the approach used in the study. Assumptions, sources of information and the difficulties with predictive models must also be clearly stated;
- Indicate the reliability of information used in the assessment, as well as any constraints/limitations applicable to the report (e.g., any areas of insufficient information or uncertainty);
- Identify the potential sources of risk to the affected environment during the construction and operational phases of the proposed project;
- Identify and list relevant legislative and permit requirements applicable to the potential impacts of the proposed project;
- Include an assessment of the "no go" alternative and identified feasible alternatives;
- Assess and evaluate potential direct and indirect impacts during both the construction and operational phase of the proposed project;
- Identify and assess any cumulative effects arising from the proposed project;
- Undertake field surveys, as appropriate to the requirements of the particular specialist study;
- Identify areas where impacts could combine or interact with impacts likely to be covered by other specialists, resulting in aggravated or enhanced impacts and assess potential effects;
- Apply the precautionary principle in the assessment of impacts, in particular where there is major uncertainty, low levels of confidence in predictions and poor data or information;
- Determine the significance of assessed impacts according to a Convention for assigning significance ratings to Impacts;
- Recommend practicable mitigation measures to minimise or eliminate negative impacts, enhance potential project benefits or to protect public and individual rights to compensation, and indicate how these can be implemented in the final design, construction and operation of the proposed project;
- Provide a revised significance rating of assessed impacts after the implementation of mitigation measures;
- Identify ways to ensure that recommended mitigation measures would be implemented, as appropriate; and
- Recommend an appropriate monitoring and review programme in order to track the effectiveness of proposed mitigation measures.

The ToR for the specialist study on **Agriculture** *a*re to assess by means of a desktop study:

- What agricultural activities are currently taking place in a 5 km and 20 km radius from the proposed nuclear plant sites;
- The envisaged estimated direct impacts of such a plant on identified agricultural activities, outlining any relevant mitigation options.

3 BACKGROUND

3.1 Legislative Framework

A thorough understanding of how such a project may affect agricultural activities as part of this EIA in the context of the legislative framework already in place is very important. In order to achieve this the following acts (amongst others) will have to be considered:

- Conservation of Agricultural Resources Act (43 of 1983)
- Environment Conservation Act (Act No. 73 of 1989)
- National Environmental Management Act of 1998
- National Environmental Management Air Quality Act (Act 39 of 2004)
- National Forest Act (Act 84 of 1998)
- National Heritage Resources Act (Act 25 of 1999)
- National Water Act (Act 36 of 1998)
- White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity (GN 1095, 28 July 1997)

3.2 Methodology

Scoping

This is the present phase in which the consultants follow a template provided by Arcus Gibb for the specialist studies, adapted for the particular circumstances of the agricultural study. This report below deals in broad terms with the issues, risks and sensitivities concerned with a nuclear power station from the agricultural impact point of view.

With an overlap of membership among the three specialist studies on economic impact, agriculture and tourism, benefits will be derived from the synergies that will be generated. There will be continuous interaction among the various team members.

The agricultural industry in the area affected by the site will be described and quantified where possible on the basis of an initial field visit to each site. This field visit will cater not only for the agriculture but also for the economic and tourism studies. The consultant will meet the main stakeholders in the affected area of each proposed sites, ascertain what public opinion is, and collect local reports, information and basic documents from the responsible authorities. This would enhance the quality of the Scoping Reports. By finding out what the public opinion is, it would enable the generalist to indicate to each specialist team the issues on which intensive studies are required. For example, tourism might be most contentious in the Eastern Cape site near Cape St Francis, agriculture might be unimportant in the two Northern Cape site areas, the impact on agriculture might be greatest in the Cape St Francis area, and residential concerns might be greatest in the Koeberg area.

There will be at least three main phases with regard to the establishment of the proposed plants in which impacts need to be identified. These would include:

- Construction phase.
- Implementation phase.
- Operations phase (which would include waste disposal, etc).

During Scoping a thorough literature review will be undertaken on all information that is available on each site that is relevant to agricultural production. This will include the proposed site of each nuclear plant and its related infrastructure plus a defined affected area, which would represent the footprint of the plant. This will include identification and quantification of the agricultural activities in the immediate vicinity. From this information all potential impacts will be identified and outlined. These impacts may be positive or negative. A positive impact could be improved infrastructure (roads) in the area, while a negative impact could be the reduction in the amount of land available for agriculture in order to make way for the plant and housing. Some of these impacts could be perceived, e.g., the risk

perception of a farmer/potential farmer that an accident at the plant could affect his crops. This perceived risk could result in agricultural land values declining in the areas surrounding the plant.

A land audit will be undertaken on all agricultural property surrounding the proposed site. This will be a desktop exercise that will use the Deeds Office information that is available (the consultants have access to the Deeds Office through the internet for this information). The current agricultural activities and enterprises in the study area will be identified, and an estimate of the area devoted to agriculture, using aerial photography or satellite imagery, will be undertaken.

A model will then be compiled that will use the above information to simulate, in economic terms, the current agricultural and livestock production in the surrounding area. A programme for existing and potential production will be compiled for each enterprise. From these production programmes gross margins will be compiled which will be the building blocks for the model. The next step would be to develop a number of "typical" farmer models for the region. These models will show typical size, overhead costs and revenue, and can then be used to simulate current agricultural production in the region.

Impact Assessment
At this stage the proposed sites will be inspected, and verification of the information obtained in Scoping will be undertaken.

All potential impacts identified during Scoping will be confirmed and the economic impacts will be estimated. Interviews with farmers will be conducted to (i) establish the envisaged problems associated with the construction and the operational phase of the plant, and (ii) obtain information about recent production trends and costs. This is necessary to establish the perceptions of the farmers and possible unidentified negatives associated with the construction of the plant. These could include the direct loss in agricultural production from the site and any surrounding direct impacts, e.g., the effect of dust from the construction phase on surrounding crops. The impacts could be divided into two categories: (i) direct technical impacts that could result in a change in production, and (ii) economic impacts such as an improvement in the market for agricultural produce in the area.

The agricultural model will simulate current production, and can then be used to simulate different scenarios that could take into account the envisaged impacts. It will be important to liaise with the consultant preparing the report on ecology: the two reports will be closely interrelated, and inferences can be drawn for agriculture from the ecological report. Changes that are predicted by the ecologists, e.g., water quality, water pollution, etc., will be relevant to both the economic and agricultural studies, as will the economic drivers of change, e.g., increasing population size, increased urbanisation and more rapid economic growth.

The dependence of the local population on agriculture, and the role of agriculture in the economy of the area and in employment creation, will be examined. The macroeconomic impacts emanating from the construction and operation of the nuclear power station will be described with some quantification when possible, drawing on a Social-Accounting Matrix (SAM). These impacts will consist of three types, namely, direct, indirect and induced, and will focus on all direct and backward linkages associated with the proposed nuclear station. However, for purposes of this assessment, certain forward linkages (upstream industries) emanating from the need to utilise the outputs from the power station will also be measured.

3.3 Assumptions

It is assumed that recent aerial photography and satellite imagery will be available for these sites and the surrounding areas.

For the purposes of this report a study area within a 20 km radius from the plant was examined. It is furthermore assumed that, in order to complete the study as accurately as possible, the following documents amongst others will be made available by Eskom:

- any existing groundwater study documents;
- any existing surface water study documents;
- any available climatology (climatic) reports;
- any available soil survey/study reports;
- any existing air quality study reports;
- any logistics/transport or traffic related studies; and
- any socio-economic study documentation.

4 AGRICULTURAL SITE REVIEWS

A "birds eye" overview of agricultural activity and existing infrastructure that may need to be changed/upgraded, and this has an impact on agriculture, was conducted for each site using the Google Earth Satellite Imaging system. A thorough search was conducted for an area within a 20 km radius of the site. General observations were made taking into account possible impacts of establishing such a plant in the area in question. It must be stressed that this was exclusively a desktop study and no "on the ground" knowledge has been used.

4.1 Thyspunt

Coordinates: 34°11'22.51"S : 24°42'54.63"E

This site is located in the Cacadu District Municipality which covers an area of almost 60,000 sq km in the western portion of the Eastern Cape province.. The site is found on the south coast between Oyster Bay and Cape St Francis, 80km west of Port Elizabeth, the largest nearby metropolitan area.

The proposed Thyspunt site (Appendix 1) is situated about 5 km from Oyster Bay, 10 km from St Francis Bay and 19 km from Humansdorp as the crow flies. The roads leading to and from the site are classified as secondary, and access will currently be of a limited nature. Future roads to the site will in all likelihood have to pass through agricultural areas, with the resulting dust and increased traffic volume being undesirable from a crop disease point of view.

There is significant extensive agricultural activity in the area, with the closest seemingly being dairy pastures within 3km and centre-pivot irrigated crops (wheat?) at a distance of 5km. No intensive protected-type (greenhouse/shadehouse) agricultural activities were noted.

In addition, the site finds itself situated between two rivers, i.e., the Kromme to the north-east and the Slang to the west. There is extensive centre-pivot irrigation (>20) present in the larger 20 km radius as well as a great deal of land developed agriculturally under other forms of irrigation. The large-scale use of river and dam water in the area for such irrigation purposes would seemingly be undesirable in terms of the establishment of a nuclear power plant.

In addition, irrigated pasture crops for the grazing of dairy animals are highly vegetative and take up many soil nutrients and pollutants in high quantities. Once ingested by the animal, these compounds are digested and effectively concentrated in the muscle fibre, fat and milk products of that animal. Even small quantities of pollutants can in this manner be concentrated over the lifetime of such an animal, and be passed on to human beings by means of meat or milk consumption.

Irrigated crops such as wheat will largely undergo the same concentrating of pollutants and minerals. In the case of wheat, these can then become concentrated in the wheat seeds to some extent, and specifically in the gluten contained within the seed. Since wheat is the raw product for bread flour, a further process of concentration occurs by means of the baking process, and humans consume the complete product, bread, in large quantities.

4.2 Bantamskilp

Coordinates: 34°42'28.95"S : 19°33'12.17"E

This site is situated on a coastal plain near Cape Agulhas in the southern region of the Overberg District Municipality. In the 2001 census the population was slightly more than 200,000. The site is some 5 km east of Pearly Beach.

The proposed Bantamsklip site (Appendix 1) is situated some 5 km east of Pearly Beach. Roads leading to and from the site are classified as secondary, and access is seemingly of a limited nature. In addition, it would seem that the topography leading to the site is somewhat steep in nature and heavy vehicles may find the terrain difficult. Roads leading to the site pass through extensive farm lands from 11 km to beyond the 20 km zone. It would seem that an airstrip is present 6km east of the site.

Little agricultural activity is noticeable within the 5 km radius, with only one possible area under forestry cultivation observed at about 5.5 km east of the proposed site. Further to this, possible cropping areas are observable in the same direction (possibly as part of the same farm at 8 km) and a different set of crop lands noticeable 10 km due north. A great deal of cropping land is noticeable just outside the 20km radius zone.

As stated above, the extensive road network required for such projects, together with increased traffic volumes through farming land that result both from the building and operational phases are highly undesirable from an agricultural perspective. Moreover, although cropping lands are further from this site than was the case for Thyspunt, and are less noticeable in the immediate area, such a plant could negatively affect their value. With the proximity of this site to Cape Town, it is not unlikely that some of the produce grown here could be organically certified and sold as such. The effects of having a nuclear facility in close proximity to organic production on its certification status would have to be investigated.

4.3 Duynefontein

Coordinates: 33°40'36.00"S : 18°25'54.88"E

Located near the coast approximately 30km north of Cape Town, this site already contains the Koeberg nuclear power station. The Duynefontein site shares the same provincial information as the Bantamsklip site.

Koeberg nuclear power station and the proposed Duynefontein (PBMR) site (Appendix 1) are located on the boundary between Duynefontein (Cape Farm No. 34) and Kleine Springfontein (Cape Farm No. 33). Duynefontein measures 1,257 ha, stretching 4.4 km along the coast and 3.5 km inland. Kleine Springfontein, which also belongs to Eskom, measures 1,590 ha, stretching 3.6 km along the coast and 3.75 km inland, and is 25 km north of Cape Town as the crow flies.

Road access is good to the area since it is surrounded by residential development, and there are existing service roads to the Koeberg nuclear facility. A residential area known as Duynefontein is located some 3km to the south of the site. The Melkbosstrand and Van Riebeeckstrand urban areas further along the coast dominate the land use within a 5 km radius. Wheat and dairy farms (some 7 km away) are found within the north-eastern to east-south-eastern sectors bordering the Eskom properties. The farms Duynefontein and Kleine Springfontein were proclaimed as the Koeberg Private Nature Reserve in 1991.

The Atlantis industrial and residential areas form the most significant urban development to the north of Koeberg power station, and are situated approximately 10 km to the north-east of the Koeberg site. The residential town of Atlantis has an estimated population of approximately 50 000, with the economic growth of the industrial area being relatively stagnant. The area between Atlantis and the coastline has been identified for inclusion in the proposed West Coast biosphere reserve. There are no major fishing activities within a 15 nautical mile (27 km) radius from the proposed PBMR site. The closest commercial activity in the Atlantic ocean is at Robben Island, approximately 15 km south-southwest of the Koeberg site.

The land-use pattern within a 20 km radius of the Koeberg nuclear power station (KNPS) can be classified in the following categories: cultivated land; uncultivated land; residential development; industrial development; dune areas; vlei areas; and river valleys. The Melkbosstrand urban strip, which lies along the coast, is the dominant land use within a 5 km radius of Koeberg. The area to the immediate east of the KNPS is largely uncultivated as it consists of sandy soil of low agricultural value. The northern area consists of Sandveld Coastal Shrublands. Poorly vegetated sands occur in the dune areas along the coast and further inland to the north-northwest of the KNPS.

The soil quality generally improves outwards towards the 20 km radius, and this is reflected in the intensity and quality of the agricultural output. The farming is typically Swartland with wheat and fodder crop cultivation dominating agricultural activities. Dairy farming is also popular. Poultry farming occurs mainly in the north-east sector (approximately 9-13 km), particularly in the area of smallholdings east of Atlantis. The industrial and residential areas of Atlantis form the most significant urban development to the north of the KNPS. There is metropolitan growth in the area north of Milnerton (south-southeast and south-east of the KNPS). The area immediately north of Table View is exhibiting rapid growth. Residential development in this area is still beyond the 10 km radius from the KNPS. Scattered industries in the form of brickfields and waste sites also occur in the south-east and south-southeast sectors. Extensions of industrial areas south of the Diep River characterise the south-east sector around the 20 km radius.

As a result of the limited potential of the soil, there is no agricultural production of significance within the 5 km. radius of the KNPS. The 5-7.5 km band reflects the first intensive agricultural use between the north-east and south-southeast sectors. Cultivated land is dominant in this area with wheat, fodder crops and dairy farming the main agricultural products. There is much chicken farming activity in the north-east sector at about 13 km from the site. In addition, it would seem that intensive greenhouse production is taking place in the north-east at about 12 km, and the Groote Post winery is situated at approximately 21.5 km from the site.

The most fertile land is in the 10-16 km. band. Well-established wheat farms and accompanying high production of fodder crops characterises the east-northeast and east-southeast sectors. Some of the farmers here also have a well-established dairy component. The smallholdings of Klein Dassenberg characterise the north-east sector. This area shows more specialised farming activities that include: bee-farming; vegetables; chicken and egg production; stud-farming; and dairy farming. The only significant vegetable production (mainly potatoes) occurs in this sector. As a result of urban development and proximity to the sea, there is a decrease in agriculture towards the south. Most of the land north of Table View is owned in large tracts by property development companies and is destined for future urban development.

Whilst there is very little farming activity in the 5 km radius, there is a great deal present in the >10 km zone. As stated before, this would under ordinary circumstances be largely undesirable due to the impact that both the building and operation of such a facility would have on the surrounding farm land. In the case of Duynefontein, however, there is already an existing nuclear facility (Koeberg), and many of the factors that would ordinarily affect agricultural land have most probably been discounted since the population is used to living, working and farming in close proximity to such a facility.

4.4 Brazil

Coordinates: 29°48’51.40”S : 17°4’42.21”E

This site is in the Namakwa District Municipality in the Northern Cape. It is in a semi-arid area far from large metropoles. Population density in the area is low, and total population is only approximately 110,000. The labour force consists of 41,000 people, of whom 31,500 are employed and 9,500 unemployed. The site is surrounded by several small mining towns, namely, Springbok, Kleinsee, Hondeklipbaai and Port Nolloth.

The proposed Brazil site (Appendix 1) is remote being approximately 470km north-west of Cape Town. Roads leading to and from the site are rural, and access is currently made up of a limited number of mining roads. The topography leading to the site, however, seems to be fairly flat in nature, and it is envisaged that it would be both easy to build/upgrade roads and for heavy vehicles to traverse. Kleinsee is the closest town at 15km as the crow flies, and has an aircraft landing facility.

In addition to being extremely remote, there is no observed agricultural activity within the given study boundary of 20km. It stands to reason, therefore, that establishing a nuclear facility at the Brazil site can only have a positive impact on any future agricultural activities that may result as a consequence of the establishment of the facility. Current activities in the area seem to be limited to those of a mining nature.

4.5 Schulpfontein

Coordinates: 30°6'3.27"S : 17°11'10.69"E

Like Brazil, this site is situated in the Namakwa District Municipality in the Northern Cape. It is just north of Koiingnaas (south of Brazil) and shares the same characteristics as the Brazil site.

Observations for this site can by and large echo those observed for the Brazil site as it is situated about 33km south of Brazil and is equally remote (Appendix 1). The nearest town is Koingnaas (14km) which has an airport facility. Once again, no agricultural activities were observed here with future impacts of establishing a nuclear facility here probably only being positive. Current activities in the area seem to be limited to those of a mining nature.

5 IMPACTS AND MITIGATION MEASURES

At first glance it would seem that a project of this nature would have a largely negative impact on agricultural activities in a specific area. On closer inspection, though, it soon becomes obvious that this is not necessarily the case and that there are many sensitivities that need to be considered when evaluating the impact such a project has on an area.

5.1 Possible Negative Impacts on Agriculture

A project such as this has Very few technical negative impacts on agriculture in any given area since it occupies a relatively small piece of land and does not generate much waste. The "negative impacts", therefore, mostly stem from a perception-driven view of power plants as being "dangerous" or from the fear of what may happen in the event of a nuclear accident.

For these reasons, it would be expected that agricultural land values around such a site would decrease in value since farmers may be concerned that their produce or animals risk becoming contaminated in some manner. If any farmers were producing organically certified or "organic"-type produce/meat, they may also have the concern that their customers may become aware of their proximity to a nuclear facility, resulting in a loss of revenue and perhaps customers. The organic certification guidelines would have to be investigated with regard to this issue as such farmers could lose their certification status.

Other negative impacts on agriculture revolve mainly around the logistics of the construction and operating phases of such a facility. It would be expected that a large increase in heavy-vehicle traffic would occur, especially during the construction phase. This could result in rural roads becoming much busier than was the norm, thereby generating a great deal of dust which is undesirable from a human and animal living point of view, and also contributes greatly to the spread of diseases in plant crops.

The building of a nuclear facility could also result in a change in local labour employment trends. Traditional farm workers may opt to be employed by the facility itself or by the contractors involved in the building of the facility, resulting in a labour shortage for farmers in the area. In addition, wages for farm labour are not usually as high as in industry, which may result in farmers in the area having to pay a "premium" for their labour.

This situation would be exacerbated by the fact that the construction phase of such a facility would invariably use a lot of labour, thereby attracting workers from some distance. Since the building of such facilities is a protracted process probably lasting seven years or more, these workers (and possibly their families) would in all likelihood become established fairly close to the building site. Once the building phase is over and these jobs are effectively at an end, the surrounding landowners would be left with the problem of having many unemployed people now living in close proximity to their faming operations, which may create social problems.

5.2 Possible Positive Impacts on Agriculture

Although there are some negative impacts related mostly to the perceptions attached to nuclear facilities, it is likely that there would also be many positive impacts on surrounding agricultural operations.

Improved road networks may result in better access for farmers to their market destinations as well as better access by companies supplying the farmers in terms of deliveries of heavy goods such as agricultural lime, etc. It may be that transport operators are mostly delivering goods to the nuclear facility for either the building phase or running of operations, and are returning empty. Farmers may be able to use these empty return trips to their advantage in terms of getting produce to market more often and at cheaper rates than they would have been able to do in the past. This improved market access may result in many farmers opting

to grow different crops or to process the products on farm which they could not have done in the past. A general increase in the level of infrastructure (such as additional/more comprehensive electrical supply in rural areas) and allied industries (such as engineering businesses, etc.) would have a similar effect in terms of making operating conditions easier for farmers and also making operations possible that would not have been so in the past.

In addition, it may be possible to use nuclear facility by-products such as excess/return steam to heat nearby intensive greenhouse operations for the optimum winter production of high-value crops. Many high-value crops are in general short supply, but are especially so during the winter months when production becomes limited due to temperatures dropping to below optimum for their production. As a result, prices are often much higher during these months, which presents a further argument for researching this option.

It is not unlikely that, should the above positive impacts from the establishment of a nuclear facility come into play, an increased number of job opportunities would become available on surrounding farms. This could possibly attract more rural people to the area or be an avenue for employment of people who find themselves unemployed on completion of the building phase of the project. The skills that these people will have learnt during their work on the nuclear facility would probably also be a great benefit to farmers in the area.

The increased population as a result of the building and operating of such a facility, as well as possible increases due to more farming jobs becoming available, would result in a significantly larger community being present in the area for a number of years. This could be seen as an opportunity or positive impact for surrounding farmers in so far as these people all need to be fed. Farmers would experience increased market opportunities and may begin to produce fresh produce that they would not historically have had any reason or opportunity to produce.

5.3 Mitigation Measures

Mitigation measures around the above impacts of building a nuclear facility in close proximity to agricultural holdings would largely revolve around overcoming the negative perceptions people have of these facilities, whilst promoting the positive aspects. In addition, a thorough understanding and consideration, in all planning and implementation stages, of the possible impacts of such a facility would be of great value. Such mitigation could be gone about by keeping local residents and farmers well informed as to what decisions are under consideration through awareness campaigns, and by involving them in all the processes of decision making through a local forum between stakeholders and Eskom. This could result in win-win developments as a by-product of the building and operating of such a facility.

This may result in roads being built to the benefit both of the facility and farmers, or in water being purchased by Eskom from farmers for the wetting of roads to reduce traffic dust. Electrical supply and other infrastructure could also be upgraded or provided so as to benefit the local farming community.

6 SITE SENSITIVITY ANALYSIS

Some very broad deductions can be drawn/made by taking a broad overview of the five identified sites and considering their suitability in terms of the above possible negative/positive impacts that a nuclear facility may have on the surrounding agricultural area.

At the outset it must be stressed that these discussion issues and conclusions **are unsubstantiated and are based on an intuitive assessment.**

Nuclear power stations situated close to existing agricultural land are more likely to have negative impacts on land values, disrupt existing labour relations/structures, and create unforeseen impacts/problems in the future than would be the case for those surrounded by very little agricultural activity. Areas that are already being farmed due to having good climates and soils, and being within a reasonable proximity to markets will inherently benefit "less" from the positive impacts discussed above than areas where this is not the case (although the former areas will produce higher multiplier effects because of supporting industries). Thus, positive impacts will by and large not be as great on present farming areas as may be the case in an area where there is very little farming activity.

A preliminary desktop view, bearing in mind the above impacts, would therefore point towards the Thyspunt, Bantamsklip and Duynefontein sites being somewhat less desirable as possible sites for establishing a nuclear facility than would be the case for the Brazil and Schulpfontein sites from an agricultural perspective. Conversely, the Brazil and Schulpfontein sites offer more opportunities and fewer negative impacts from the establishment of a nuclear power plant from an agricultural point of view than is the case for any sites close to present farming areas.

7 SUMMARY

In this preliminary study a desktop agricultural analysis was performed on the five identified sites for the construction of a nuclear power plant. A 20km radius from the proposed site study area was used for this purpose.

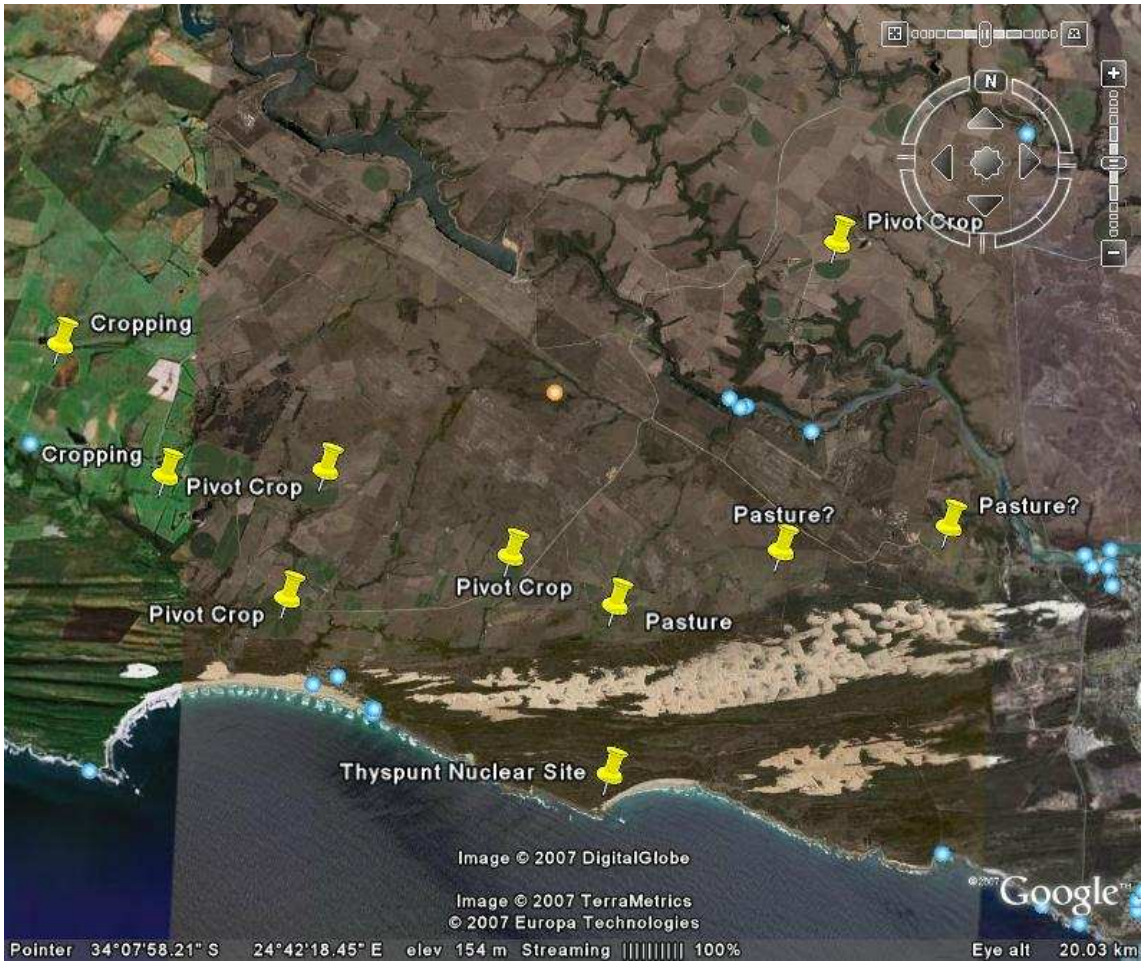
From this study it became evident that, the Brazil and Schulpfontein sites excepted, continued agricultural activity could possibly be problematic in terms of land value reductions, logistical upgrading especially during the construction phase, and labour supplies.

In order to perform a thorough analysis of the impacts that a nuclear plant might have on a given area it will be necessary to divide future studies into three sub-categories of study based on how a facility would affect agriculture:

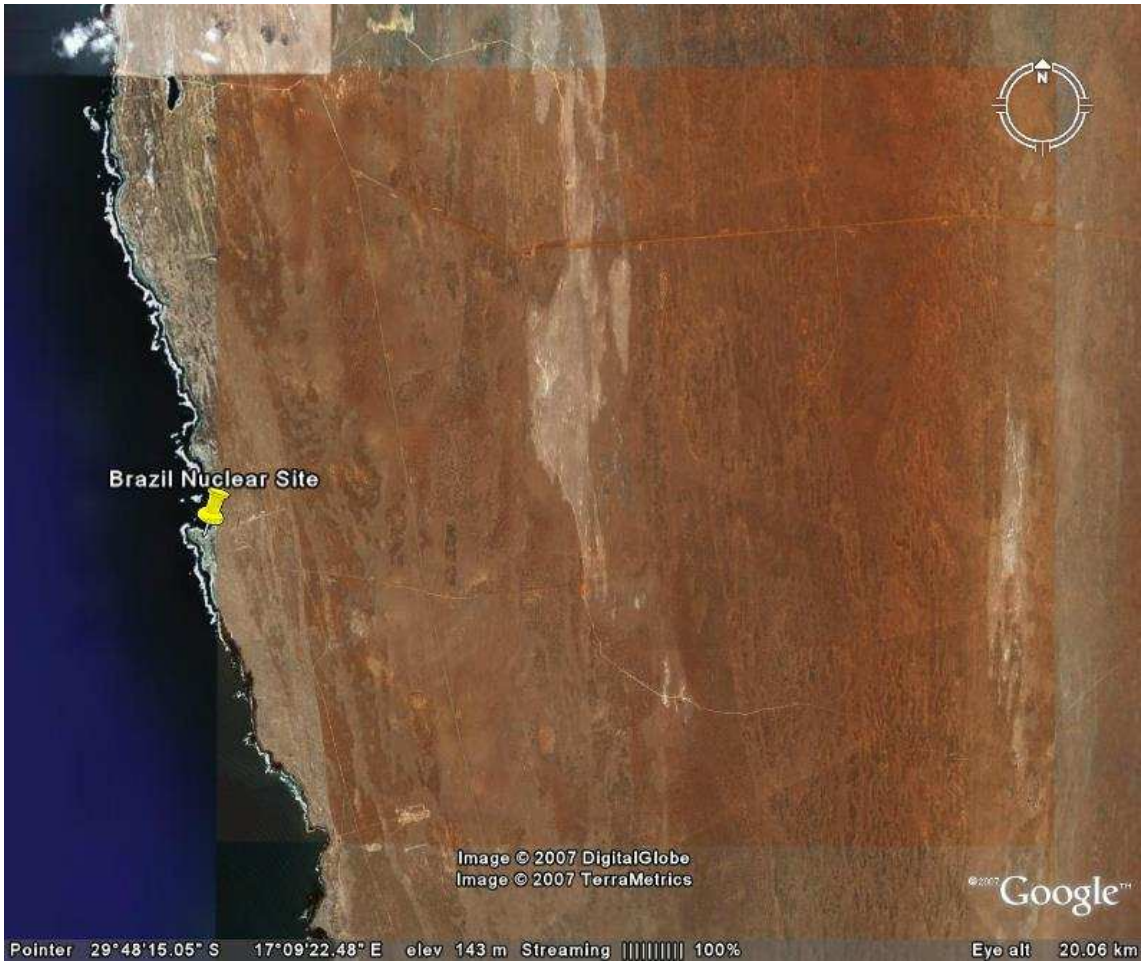
- during normal operations when it is foreseen that there would be relatively minor impacts;
- as a result of an incident occurring whereby the surrounding areas were exposed to radiation, and livelihoods and agricultural activities were threatened;
- as a result of perceived risk of contamination which might affect people's behaviour, leading to a reduction in land values.

APPENDICES


Maseru
Lesotho
Brazil Nuclear Site
Skulpfontein Nuclear Site
South Africa
Koeberg Nuclear Site
Thyspunt Nuclear Site
Cape Town
Bantamsklip Nuclear Site
© 2007 Europa Technologies
Image © 2007 TerraMetrics
Image NASA
Google
Pointer 30°47'47.35" S 22°30'42.86" E
Streaming 100%
Eye alt 1082.09 km


Pivot Crop
Cropping
Cropping
Pivot Crop
Pasture?
Pasture?
Pivot Crop
Pivot Crop
Pasture
Thyspunt Nuclear Site
Image © 2007 DigitalGlobe
Image © 2007 TerraMetrics
© 2007 Europa Technologies
Google
Pointer 34°07'58.21" S 24°42'18.45" E elev 154 m Streaming 100%
Eye alt 20.03 km


Cropping
Cropping?
Airstrip?
Cropping
Bantamsklip Nuclear Site
Cropping
© 2007 Europa Technologies
Image © 2007 TerraMetrics
Image © 2007 DigitalGlobe
Google
Pointer 34°39'48.99" S 19°36'45.87" E elev 122 m Streaming 100%
Eye alt 20.02 km


Brazil Nuclear Site
Image © 2007 DigitalGlobe
Image © 2007 TerraMetrics
Google
Pointer 29°48'15.05" S 17°09'22.48" E elev 143 m Streaming 100%
Eye alt 20.06 km


Chickens
Tunnels?
Chickens
Greenhouses
Cropping
Cropping
Koeberg Nuclear Site
© 2007 Europa Technologies
Image © 2007 DigitalGlobe
Google
Pointer 33°40'23.87" S 18°28'42.00" E elev 45 m Streaming 100%
Eye alt 20.06 km


Skulpfontein Nuclear Site
N
Image © 2007 DigitalGlobe
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©2007 Google™
Pointer 30°07'31.09" S 17°17'26.25" E elev 176 m Streaming 100%
Eye alt 20.03 km